Cultural Affinity, Regulation and Market Structure: Evidence from the Canadian Retail Banking Industry*

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Abstract

We estimate a perfect information static entry game to study how cultural entry barriers affect firm entry and competition in the retail banking industry. Canada provides a good setting for analysis due to its high linguistic diversity, concentrated market, and regulatory entry barriers. We find that cultural affinity plays an important role in explaining the significant comparative advantages some credit unions and banks have relative to other financial institutions. Using several counterfactual experiments and additional empirical evidence, we show that the effectiveness of certain market strategies and regulations intended to foster competition are significantly limited by the cultural barriers, which is a key determinant that shapes the competitive landscape of the industry.

JEL classification: L13, L51, G21, G28.

Keywords: Entry barriers, cultural affinity, banks, credit unions, competition.

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1 Introduction

Language is a salient marker of culture, and culture is an important determinant of economic phenomena because it impacts consumers' expectations and preferences (Guiso *et al.*, 2009). Therefore, culture may be a relevant factor to explain firms' performance and profitability, the effect of competition, and the entry barriers faced by entrants. Although there is an increasing interest in the literature in studying cultural effects (Hjort, 2014; Fisman *et al.*, 2017), there has not been much empirical evidence on the role that culture may play in the level of competition between firms or the entry barriers to new entrants.

In this article, we provide novel evidence on how cultural barriers affect firm entry and competition by analyzing the geographic presence of retail depository institutions in Canada. The banking industry is particularly interesting because it relies on borrower-lender relationships and soft information to function (Diamond, 1991; Petersen and Rajan, 1994) where linguistic and cultural affinity may play an important role (Fisman *et al.*, 2017). Canada provides a good setting for analysis because it has two official languages (English and French), and a large immigrant population, which provides a large variation in cultural diversity across local markets. In addition, this industry is dominated by few large institutions with clear cultural origins. This complex sociopolitical environment has contributed to the creation of a dual regulatory banking system (Calomiris and Haber, 2014) that imposes entry barriers. Indeed, large banks are regulated federally and can operate nationwide, while others—credit unions—are regulated provincially and can only operate within the province in which they are incorporated.

We estimate a static entry game that models competitive effects between financial institutions and takes into account cultural and regulatory entry barriers that prevent expansion across markets. Because the Canadian financial industry is relatively concentrated,[1] we can clearly identify all the potential entrants (i.e. firms that may consider entry into markets) in every market. Additionally, most financial institutions provide a full range of retail products so there is very little product specialization. We use a static model because the structure of the Canadian banking industry has been relatively stable (i.e. in equilibrium) between 2002 and 2010, with no significant mergers, new entries into the market, or changes in the total number of branches.

We find that cultural affinity is important in determining firm entry decisions, with historically French institutions facing lower cultural entry barriers when entering in French-speaking markets, and historically English institutions facing lower entry barriers in English-speaking markets. More specifically, a one-standard deviation increase in the proportion of French speakers in a market has an effect equivalent to the combined effect of a one-standard deviation change in income per capita, population, business activity, and unemployment rate. We also find that credit unions

[1] The federally regulated "Big Six" banks - Royal Bank of Canada (RBC), Bank of Montreal (BMO), Bank of Nova Scotia (BNS), Canadian Imperial Bank of Commerce (CIBC), National Bank of Canada (NAT) and Toronto-Dominion Bank (TD) - control over 80% of the assets of all depository institutions.

have a slight advantage in markets with large numbers of non-official language speakers, which is consistent with the fact that many credit unions were founded to serve linguistic and ethnic minorities. These results suggest that language specialization, particularly for French and English languages, is significant in the Canadian banking industry

In the second part of our paper, we use our estimated model parameters to evaluate counterfactuals in order to further characterize the importance of cultural affinity. We first calculate the market structure that would arise when financial institutions are identical in terms of cultural affinity, for example, if language specialization cannot exist. We then evaluate the effect of a recent regulation that would allow provincially-regulated credit unions to be regulated at the federal level and therefore become national competitors in all provinces. Our results show that the effects of these different market strategies and regulations are limited by the importance of cultural entry barriers, and we find a very strong effect when considering the French language. In other words, the strong cultural affinities of some financial institutions with French speaking markets would eliminate most of the advantages to expanding beyond the markets they currently serve.

We explore potential mechanisms for these cultural entry barriers using data on language requirements for job offers in bank branches, and a household-level financial survey. First, we find that financial institutions specialize in English or French languages by hiring customer-facing employees who speak that language. However, language specialization at the branch level is not easily replicable across markets due to internal communication constraints and the low level of bilingualism in some provinces. English-oriented financial institutions can compete in French markets by hiring bilingual customer-facing employees that can speak French with customers, and English with their high-level managers so they can communicate "soft" information. However, French-oriented financial institutions can not easily find bilingual customer-facing employees in English markets (such as western provincies) so they can speak English with customers, and French with their high-level managers. Second, we use a highly detailed household-level survey to show that a significant cultural branding effect exists in financial institutions, even in a largely bilingual city like Montreal, where all institutions hire bilingual workers. In summary, we show evidence which suggests that cultural affinity might be the result of a combination of language specialization at the branch level and branding effects.

Our results have relevant policy implications by showing that language specialization may be very important in some industries and that cultural entry barriers may prevent some firms from expanding and diversifying geographically.[2] In Canada, competing at the national level by becoming a federal credit union and being subject to more restrictive federal regulations may not be a profitable strategy because cultural entry barriers prevent financial institutions from expanding to other provinces. Hence, cultural entry barriers may have a large effect on competition, and the removal of regulatory barriers may be ineffective. Therefore, policymakers may need to take cul-

[2] Aguirregabiria *et al.* (2016) is a recent article that uses a new and precise measure of bank geographic diversification gains not previously used in the literature ("deposit risk").

tural entry barriers into consideration for market definitions when analyzing competition. In the European context, there is also evidence that language often creates large barriers to expansion and consolidation (Berger *et al.*, 2001; Hartmann *et al.*, 2003). Contrary to Europe, in Canada federal regulations are consistently applied nationwide and there are only two major languages spoken, which facilitates empirical research. Our results also have implications for merger policy because they suggest that entry by acquisition may be a more profitable strategy in certain industries.

Our research contributes to the literature that studies the importance of language and culture in explaining various economic phenomena (Guiso *et al.*, 2006). The literature has focused on macro-level effects on economic growth (Easterly and Levine, 1997; Alesina and Spolaore, 1997), trade flows (Kogut and Singh, 1988; Helpman *et al.*, 2008; Guiso *et al.*, 2009), or on within-firm effects (Hjort, 2014; Fisman *et al.*, 2017, 2018). Our empirical approach is structural, as in Bresnahan and Reiss (1991b), Berry (1992) and others, and we use an estimator of discrete games of complete information from Bajari *et al.* (2010). Our paper adds to a recent literature that uses sophisticated structural methods to study bank competition (Aguirregabiria *et al.*, 2016; Egan *et al.*, 2017; Allen *et al.*, 2017). We differ from previous structural papers on bank competition (Cohen and Mazzeo, 2007, 2010) by examining a concentrated and stable market that helps us identify the set of potential entrants.[3]. Our paper adds to the large literature on bank specialization and focuses on the importance of cultural affinity between financial institutions and customers (Fisman *et al.*, 2017), and its effect on competition. We use a maximum simulated likelihood estimator based on Gourieroux and Monfort (1990) to estimate the entry game. In cases of multiple equilibria, we adopt an equilibrium selection rule as in Bajari *et al.* (2010).

This paper is divided into seven sections. Section 2 focuses upon more detail regarding the evolution of the Canadian banking industry. Section 3 examines the data we use, as well as our market and potential entrant selection criteria. Section 4 explains our estimation methodology. Section 5 analyzes the estimation results. Section 6 discusses results from the counterfactual experiments and other empirical results. Section 7 concludes.

2 The Canadian Retail Banking Industry

The Canadian retail banking industry is mainly composed of a small number of very large banks and other institutions (credit unions) that provide a broad range of retail financial products to their customers. This concentrated market structure has been remarkably stable for decades, and its origins can be traced back to the complex political and cultural foundations of Canada, a linguistically and culturally diverse young nation. The financial regulatory system is dual, which allows federally-regulated banks and provincially-regulated credit unions to compete by providing a similar broad array of financial services.

[3] We are able to identify up to 9 financial institutions as potential entrants for each market. This number represents more than 90% of the bank presence in Canadian rural and medium-sized urban markets.

Canada's oldest bank, Bank of Montreal (BMO), was founded in 1817 by English-speaking merchants. Five of the six largest banks today (BMO, CIBC, Scotiabank/BNS, RBC and TD) can trace their history to English-speaking founders, while National Bank was founded and controlled by French speakers. Despite this varied history, all six banks provide universal services across almost all of the provinces, in both English and French-speaking areas.[4]

Another type of depository institution exists in Canada to compete with the banks. Credit unions (*caisses populaires* in French) are financial institutions founded on co-operative principles and owned by their members. They can provide the same type of depository and lending services as banks. Credit unions are often created by members of ethnic and cultural minorities with the objective of serving their own community. In fact, many credit unions explicitly state their original ethnic and cultural affiliation in their name.[5] Credit unions are also created to serve a common employer, religious belief, or particular communities on a territorial basis.

In contrast to banks, credit unions are often very small, in part because they face the significant constraint of operating[6] within their home province, where they are incorporated and regulated[7]. In contrast, the federally chartered banks are regulated at the federal level, and they can operate across Canada because they are subject to a national regulatory framework.

Table 1: Importance of financial products by financial institution

This table shows the importance of financial products sold by each financial institution (percentage of households that have that product). Source: CFM data base.

Bank	Total assets	Accounts	Credit cards	Mortgages	Personal loans	Lines of credit	GIC	TOTAL
BMO	301	29%	42%	7%	5%	9%	8%	100%
BNS	324	33%	22%	12%	7%	16%	10%	100%
CIBC	289	31%	38%	8%	5%	11%	7%	100%
CU	84	43%	11%	9%	10%	12%	15%	100%
DES	123	36%	24%	10%	8%	11%	10%	100%
NAT	104	31%	33%	9%	6%	10%	10%	100%
RBC	486	33%	30%	8%	6%	15%	9%	100%
TD	369	35%	26%	8%	5%	16%	10%	100%
OTHER		12%	69%	4%	7%	3%	6%	100%

Desjardins is a special case among credit unions and it is the only credit union that operates in multiple provinces. It is also the fifth largest financial institution in Canada by assets, and larger

[4] The only exception is National Bank, which does not operate in 2 of 10 provinces, Nova Scotia, Newfoundland and Labrador.

[5] As an example, the Ukrainian Credit Union was established in 1944 to serve the Ukrainian-Canadian community. This is still its mission statement today.

[6] The Credit Union Central of Canada was created to provide a national financing facility and liquidity pool for its member credit unions. However, at best it is only an imperfect substitute for a truly national credit union.

[7] More specifically, credit unions in each province are regulated by the provincial regulator. Therefore, expanding to other provinces would imply *de facto* creating a new financial institution in each province entered.

than all other credit unions combined. Desjardins was founded in 1900 in Quebec by Alphonse Desjardins as a system of caisses populaires in Quebec. It was a created with the motivation of serving French Canadians, who were neglected by the financial industry in the context of a difficult political environment (Calomiris and Haber, 2014). Hence, the caisses populaires started as exclusively French-oriented institutions, organized by local French Canadian community leaders. The movement of caisses populaires then spread to communities around the country with a high concentration of French speakers, creating affiliates in Quebec, Ontario, Manitoba and New Brunswick. Desjardins and its affiliates are regulated under provincial law, which differed across provinces and limited their expansion into other provinces.

The Canadian retail banking industry is very concentrated today, with the "Big Six" banks controlling 98% of total banking system assets in 2008, and over 80% of the assets from all Canadian financial firms combined. This dominance has been enhanced over the past three decades as deregulation gradually weakened restrictions on activities by banks, as well as cross-ownership, and foreign-ownership restrictions.[8]

In contrast with the United States, in Canada the majority of the population is served by retail financial institutions that are not specialized and provide a full range of financial products, so they can be considered as being universal.[9] Table 1 uses data from a detailed survey of retail financial products to show the distribution of products across financial institutions. We do not observe a large degree of specialization in any product by any financial institution.[10] The mortgage market, which was relatively specialized decades ago, has also been deregulated and gradually controlled by these large financial institutions.

After decades of decline following the deregulation of the financial sector, the Canadian retail banking industry entered into a relatively stable market structure by 2002. Table A.1 presents the evolution of the industry for 1998-2008, and shows that the total number of branches in the country stabilized after 2002. Additionally, this stable market structure was not supported by openings of branches that were offset by branch closings. The average percent of branch openings and closings is very low during this period (approximately 2%), which supports our hypothesis of relatively stable market structure and no significant market dynamics. Despite the growth of online banking in recent decades, the number of branches since 2002 has not declined, which provides evidence that physical branches may still be very important for banks' profitability.[11]

[8] Traditionally, Canadian banks' activities were strictly regulated, with product portfolio regulations differentiating banks from trust and loan companies. Various Bank Act revisions allowed banks to establish subsidiaries in other markets such as mortgage lending (Allen and Engert, 2007) or acquire trust companies. Also, foreign banks were allowed to establish subsidiaries. The industry consolidated and the trust share of the mortgage lending market dropped from around 30% to less than 10% in 2004 (Allen *et al.*, 2014).

[9] In the U.S., there were 8,680 bank and thrift charters in 2006, of which 7,016 were small community banks with highly specialized bank lending activities.

[10] The exception is the case of credit cards, which in many cases are provided by non-banks, such as airlines or retailers.

[11] The largest online-only bank in Canada at the time, ING Bank of Canada, had an asset base of only $23 billion by the end of 2006, which is similar to some regional banks and much smaller than the Big Six or Desjardins.

Table 2: Financial institution classification

This table classifies financial institutions according to regulatory barriers and cultural entry barriers. Federally-regulated banks are able to open branches across Canada, while provincially-regulated credit unions are constrained to operate in their home province. In the "other credit unions" category we include other credit unions different than Desjardins.

Regulation	**Cultural Affinity**		
	English	**French**	**Non-Official Language**
Federally Regulated	BMO, BNS, CIBC RBC, TD	National Bank (NAT)	
Provincially Regulated	Other CU	Desjardins	Other CU

In summary, the Canadian retail banking industry is highly concentrated and mainly served by a small number of universal banks and credit unions. It has developed in a culturally diverse nation, under a dual regulatory system with federally-regulated banks and provincially-regulated credit unions. Table 2 summarizes how the different types of financial institutions are classified depending on the regulatory and cultural barriers that they face. This industry provides a good setting to empirically analyze the effect of cultural entry barriers on the market structure.

3 Data

We gather branch location data for 2006 from depository institutions such as domestic banks, trust companies and credit unions, and exclude non-depository institutions such as life insurers. We use the 2006-07 edition of *Financial Services Canada*, a comprehensive directory of all Canadian financial institutions, their offices and branches with exact location information. We define geographical markets using census subdivisions, which is a general term for municipalities in Canada. They vary widely in area, population and other observed characteristics.[12] Apart from cities and towns, subdivisions also include rural areas grouped together into counties, First Nations' reserves and other unorganized territories. There are 5,253 census subdivisions in Canada. We obtain demographic data from the 2006 Census by Statistics Canada.

Because census subdivisions do not necessarily reflect the boundaries of a market, we manually select isolated small rural and medium-sized urban subdivisions based on well-defined criteria.[13] In particular, we only include subdivisions that have between 200 and 250,000 inhabitants. The lower population limit eliminates regions too uninhabited to support branches, while the upper limit ensures that we do not include large cities, which are composed of multiple neighbourhoods

[12] For example, Toronto, with a population of more than 2.6 million people, constitutes one census division, just like Martensville (Saskatchewan), a small city with fewer than 8,000 inhabitants.

[13] Alberta is also excluded from our sample. ATB Financial is a very large institution in this province and since it is government-owned, it could have a very different objective function from privately owned financial institutions.

and have an internal structure that makes it more challenging to obtain a well-defined market. Our model does not take into account the number of branches a financial institution has in a market, only whether it enters into a market.[14] We then select markets that are separated by at least 10 km, and eliminate those located less than 30 km away from any major urban centres, which we define to be a subdivision with more than 250,000 people. Excluding markets that are close to each other, or located close to large urban centres will help avoid the confounding factor of commuters. Indeed, if workers live in a suburb and commute downtown for work, they might satisfy their banking needs at a branch closer to work than at a branch close to home. According to the Canadian Census, the vast majority of people do not commute far.[15] A map of one of the selected markets, Moose Jaw (Saskatchewan), is shown in Figure A.1 in the Appendix. The final sample we use in our model includes 2637 markets, and accounts for approximately 40% of total Canadian population.[16]

Descriptive statistics for the selected markets are shown in Table 3. There is a large linguistic variation across provinces, with the proportion of native French speakers ranging from 91% on average for markets in Quebec to 3.4% in British Columbia. There is also some presence of native non-official language speakers in all provinces, particularly in British Columbia and Manitoba. The average population across all markets is slightly more than 4,200, reflecting the fact that the vast majority of the markets we use are relatively small and medium-sized towns.

Using these market definitions, we construct indicators of entry into a market by considering branches of each financial institution located within a 10 km radius of the centroid of a given census subdivision. We use exact latitude-longitude information for branches and markets to do this selection. Figure A.2 in the Appendix shows an example of the exact location of branches in Moose Jaw (Saskatchewan).[17]

Table 4 shows the distribution of financial institutions across provinces. In our model, the "Big Six" banks and credit unions are considered to be potential entrants in all provinces, with the exception of Desjardins. Notably, 817 out of 2637 markets do not have any financial institution present. Desjardins is the financial institution with the highest presence, followed by RBC and CIBC. We also observe relatively large variations across provinces and financial institutions. For example, RBC is the largest financial institution in Ontario, but not in British Columbia. We divide credit unions into two broad categories: Those that have a network size of fewer than 10 branches across Canada are categorized as Small Credit Unions, while those with 10 or more

[14] In our sample, more than 85% of financial institutions present in a market have only one branch.

[15] According to the 2006 Canadian Census, the median commuting distance of workers in Canada is 7.6 km. Large urban centres have the longest median commuting distances, such as Toronto (9.1 km), or Montréal (8.1 km). These results are in line with our market-selection criteria.

[16] The Federal Reserve and other central banks define market boundaries in retail banking in a similar way. For instance, the Federal Reserve Bank of New York uses commuting rates between counties to define markets with clear boundaries (Federal Reserve Bank of New York, 2014).

[17] We use the 6-digit postal code to locate every bank branch in Canada. This a relatively small geographic area. There are more than 900,000 6-digit postal codes in Canada, and in many cases, they uniquely identify an area as small as a condominium building or a group of houses in a suburb.

Table 3: Summary statistics for markets considered in estimation

This table shows a summary of statistics for the 2637 markets considered in our empirical model. We present results for the entire sample, and by province. Provinces considered are British Columbia (BC), Manitoba (MB), New Brunswick (NB), Newfoundland and Labrador (NFL), Nova Scotia (NS), Ontario (ON), Prince Edward Island (PEI), Quebec (QC), and Saskatchewan (SK). Alberta is excluded from our sample. Variables are obtained from Statistics Canada.

Variable	All markets	BC	MB	NB	NFL	NS	ON	PEI	QC	SK
Population:										
mean	4,219	6,767	2,020	2,878	1,639	7,270	13,214	1,339	2,970	1,631
min	200	200	265	205	200	440	225	205	200	200
p50	1,055	2,665	968	1,260	580	4,443	5,103	755	1,085	460
max	214,260	122,175	40,705	66,690	99,425	100,980	214,260	31,295	144,595	199,385
Per capita income (in dollars):										
mean	21,245	23,793	21,336	20,416	16,047	20,418	25,336	21,765	21,186	19,033
min	0	0	13,229	0	0	15,858	0	0	0	0
p50	21,500	23,933	20,775	20,337	16,644	20,367	25,475	22,205	21,045	20,707
max	58,871	38,508	38,311	34,875	51,732	27,443	39,947	35,876	58,871	41,726
Number of business:										
mean	286	555	185	167	76	422	816	98	173	150
min	0	0	0	0	0	0	0	0	0	0
p50	79	202	110	68	20	244	320	0	64	49
max	14,249	11,087	2,906	4,455	6,719	3,966	11,547	2,955	8,516	14,249
Proportion of French population (in %):										
mean	36.2	3.4	7.0	35.3	7.4	4.7	11.7	4.0	90.8	7.0
min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
p50	3.1	1.5	1.5	6.7	0.0	1.2	2.1	1.3	97.7	0.0
max	100.0	100.0	100.0	100.0	100.0	65.8	100.0	86.8	100.0	100.0
Unemployment rate (in %):										
mean	11.2	8.7	5.7	14.2	31.5	13.4	8.3	12.9	11.5	5.3
min	0.0	0.0	0.0	0.0	0.0	5.7	0.0	0.0	0.0	0.0
p50	8.0	7.2	4.8	13.2	29.9	11.8	7.3	12.0	9.1	3.2
max	80.0	50.0	27.8	57.9	80.0	37.2	36.6	35.5	61.1	58.8
Proportion of Other population (in %):										
mean	6.5	10.3	15.6	1.5	1.5	2.4	7.3	1.6	3.5	10.6
min	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
p50	3.2	9.1	13.2	1.1	0.0	2.1	6.0	1.5	1.1	7.2
max	99.0	60.8	60.4	10.3	88.2	10.4	38.9	6.7	99.0	88.3
Proportion of Bilingual population (in %):										
mean	13.7	6.1	8.2	28.6	2.5	10.2	13.8	11.1	24.5	3.8
min	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.0	0.0
p50	6.9	5.8	4.1	18.0	1.9	6.3	6.8	8.5	19.3	2.4
max	94.3	20.0	91.4	83.5	39.3	74.9	73.7	94.3	77.5	61.0
Number of markets	2637	265	147	229	282	72	360	81	911	290

branches are categorized as Large Credit Unions. The market presence for each set of credit unions is added together to become the other two potential entrants. Desjardins is treated separately from other credit unions because of its size and historical origin. With all of these entrants we cover around 90% of all branches in rural and medium-sized urban markets.

We aggregate the presence of credit unions in rural and medium-sized urban markets for two reasons. First, grouping credit unions into two potential types of entrants makes our estimation tractable, since our simulation strategy cannot estimate the entry of hundreds of credit unions "one by one." More importantly, all credit unions are small compared to the Big Six banks and Desjardins,[18] and are also limited geographically, since regulations prior to 2012 limited their activities to their home province. Coupled with their inability to raise money on the equity market, this means that each province contains dozens of small credit unions with one to a dozen branches.

Table 4: Market entry by province and institution

This table shows the number of markets where every financial institution is present by province, including Large Credit Unions (Large CU) and Small Credit Unions (Small CU). Our sample consists of 2637 markets.

Province	BMO	BNS	CIBC	Desj	Large CU	NAT	RBC	Small CU	TD	Markets entry	Markets no entry
British Columbia	73	68	105	0	70	0	86	71	57	141	124
Saskatche.n	25	30	54	0	72	2	55	58	27	160	130
Manitoba	13	14	27	10	20	0	50	50	18	96	51
Ontario	134	129	140	43	76	38	164	80	129	258	102
Quebec	110	6	158	751	1	380	114	2	38	778	133
New Bruns.	49	89	34	94	0	68	58	63	37	165	64
PEI	13	34	27	0	40	10	14	1	9	57	24
Nova Scotia	17	27	22	0	5	0	36	22	15	50	22
Newfound.	55	77	30	1	0	0	34	28	18	115	167
Total	489	474	597	899	284	498	611	375	348	1820	817

We can interpret small and large credit unions as a "fringe" of competitors that may endogenously arise in every market. However, credit unions do differ from each other in one crucial aspect: their bond of association. This is the common social connection that links all members of a credit union, which can be based on a common ethnicity, employer, religious belief, gender, or location. Some bonds are more restrictive, such as the ones based on a common ethnicity or employer, and the credit unions that rely on such bonds tend to remain small. In contrast, credit unions with location bonds tend to be larger because they can expand much more easily, since the only requirement of becoming a member is to be resident of the city in which the credit union is present. It is plausible that credit unions with tight bonds of association compete differently from those with loose bonds, and this justifies our division of credit unions into two categories: small credit unions

[18] The largest credit union, Vancity, has less than 10% of the asset of Desjardins, and the sum of the assets of all credit unions other than Desjardins are less than the assets of the smallest of the Big Six banks.

and large credit unions.[19] Table 4 also shows that the presence of large and small credit unions differ greatly across provinces.

We use six market-level demographic variables in our estimation, obtained from the 2006 Census. Table 5 shows average values of these market-level variables by type of financial institution that enters in a market. Panel A shows the sample of rural and medium-size markets used to estimate our model. We use t-tests for significant differences in the means of demographic variables for markets where a certain type of financial institution is present. We find that Big Six banks tend to be in markets with much larger populations, higher per capita income, number of businesses, and lower unemployment rate than markets for Desjardins and the other credit unions.

Panel A also shows results for variables related with the cultural characteristics of the markets, such as the proportion of French and non-official language speakers. We find that Desjardins tends to be in markets with much larger French population and low proportion of non-official language speakers, compared to the Big Six and other credit unions. This is consistent with the founding principles of Desjardins with the goal of being focused on French Canada customers. As discussed before, many other credit unions are created with the objective of serving certain ethnicity or religious belief.

Panel B in Table 5 does similar calculations as in panel A but it considers all census subdivisions in Canada.[20] In general, we find that markets in both panels have similar demographic characteristics, and when comparing between the different types of financial institutions, we also find similar results in both panels. This suggests that entry patterns in the rural and medium-sized urban markets that we consider, versus all markets in Canada, are relatively similar. Therefore, our results and conclusions for rural and medium-sized urban markets can be generalized to the entire country.

Table 6 shows with more detail the proportion of the French-speaking population for markets where Desjardins and National Bank of Canada are present. Desjardins is a potential entrant in four provinces in Canada, but it usually enters into local markets with relatively higher French-speaking population than the average market in each province. Similarly, NAT is a potential entrant in all provinces in Canada, but it only enters into markets with relatively high French populations.

[19] Using the name of each credit union as a guide, we computed the proportion of credit unions that have religious or ethnic bonds for both large and small credit unions. For large credit unions (those with at least 10 branches), only 1 out of 58 has an ethnic or religious bond based on their name, representing less than 2% of the total, whereas 56 out of 760 small credit unions have an ethnic or religious affiliation, representing more than 7% of their total. In addition, at least 139 of the 760 small credit unions are employer-based, while none of the large credit unions are. This provides evidence that our classification scheme represents a real difference between credit unions.

[20] Large CU and Small CU are aggregated in a single entity for all of Canada owing to a lack of available data.

Table 5: Summary statistics for markets considered in estimation by type of entrant

Summary statistics for markets where only Big Six banks, Desjardins, Large CU or Small CU enter. Panel A considers the 2637 markets (census subdivisions) used in our empirical model. Panel B considers all census subdivisions in Canada. Large CU in Panel B refers to all credit unions (except Desjardins). We perform t-tests for significant differences in the means of different variables across types of financial institutions. Variables are obtained from Statistics Canada. **Denotes significantly different from zero at 5% level. ***Denotes significantly different from zero at 1% level.

	Entry								Test		
	Big6 only		Desjardins only		Large CU only		Small CU only		Big6 - Desj	Big6 - LCU	Big6 - SCU
Variable	mean	se	mean	se	mean	se	mean	se	t-test	t-test	t-test
Panel A: Markets considered											
Population	3,996	365	1,183	46	1,143	191	1,260	227	7.65***	6.93***	6.37***
Per capita income (in dollars)	22,278	290	19,859	201	20,089	724	18,324	690	6.86***	2.81***	5.29***
Proportion French (in %)	7.43	0.90	93.38	0.74	8.94	2.14	3.45	1.16	-73.52***	-.65	2.7***
Number of businesses	336	27	81	3	111	12	104	13	9.38***	7.56***	7.73***
Unemployment rate (in %)	11.48	0.51	12.78	0.49	6.52	0.75	9.44	1.14	-1.84*	5.49***	1.64
Proportion Other (in %)	6.95	0.47	1.72	0.32	9.84	0.84	9.44	1.14	9.16***	-3***	-2.9***
Panel B: All Canada											
Population	3,637	316	1,200	47	1,150	160			7.62***	7.02***	
Per capita income (in dollars)	20,345	371	19,720	242	15,388	569			1.41	7.3***	
Proportion French (in %)	4.83	0.60	92.86	0.79	2.87	0.50			-89.01***	2.52**	
Number of businesses	278	22	82	3	91	9			8.77***	7.86***	
Unemployment rate (in %)	12.60	0.52	12.66	0.50	8.62	0.71			-.08	4.51***	
Proportion Other (in %)	9.28	0.57	2.11	0.42	10.97	0.65			10.14***	-1.97**	

Table 6: Percent of French-speaking population across markets

This table shows the average percentage of French-speaking population in markets where Desjardins and National Bank of Canada enter. Desjardins is a potential entrant in our model in Manitoba, New Brunswick, Ontario and Quebec, so it could potentially enter in all markets of these provinces. Interestingly, we find that Desjardins only enters in markets with a relatively large French population. NAT is also a potential entrant in all provinces in Canada, but it only enters in markets with a relatively large French population. The French-speaking population at the market level is obtained from Statistics Canada.

Province	All markets	Markets where Desjardins enters	Markets where NAT enters
Manitoba	5.72%	32.28%	-
New Brunswick	35.44%	74.00%	66.18%
Ontario	8.88%	29.46%	15.86%
Quebec	89.68%	93.42%	92.76%

Table A.2 provides information about the joint presence of pairs of financial institutions by market. There are few markets where Desjardins and the other credit unions are jointly present, suggesting either strong competitive effects between them, or that they serve different customers.

We also use two firm-level exogenous variables in our model; the assets of a financial institution within a province's borders (including rural and non-rural areas), and the total asset size (including international subsidiaries). Asset sizes are provided by the Office of the Superintendent of Financial Institutions (OSFI). We chose asset size partly because it can be a significant variable in the financial institutions' cost function, and it can be correlated with potential consumer preference for banks that have a larger national or international presence. Finally, we use the historical distance from the market to the financial institution's headquarters, a variable that varies for each market-financial institution pair, which we explain in more detail in the next section.

4 Empirical Framework

4.1 Estimation of an entry model for the Canadian banking industry

We estimate a static entry game of perfect information (Bresnahan and Reiss, 1991a; Berry, 1992; Cohen and Mazzeo, 2007; Ciliberto and Tamer, 2009; Bajari *et al.*, 2010) for the Canadian retail banking industry. Each potential entrant decides whether to enter into a market taking into account the actions of the other potential entrants, and by considering all the factors that enter into the profit function. We solve for the Nash equilibrium of this game. In case of multiplicity of equilibria, there is an equilibrium selection rule in the static game as used in Bajari *et al.* (2010) and more recently in Perez-Saiz (2015).

Entry of a potential entrant i in market m depends on the expected profits given by the latent

variable $\pi_{i,m}$. Let $a_{i,m}$ denote an observed indicator variable that is equal to 1 if potential entrant i enters into market m, and 0 otherwise. Entrant i enters into market m if it is profitable,

$$a_{i,m} = \begin{cases} 1 & \text{if} \quad \pi_{i,m} \geq 0 \\ 0 & \text{otherwise.} \end{cases} \tag{1}$$

The assumption of profitable entry is clearly reasonable for the case of banks and credit unions, which are private companies that cannot afford to lose money if they want to stay in business. If potential entrant i enters into market m, profits from entry are given by a reduced-form linear profit equation $\pi_{i,m}$ equal to

$$\pi_{i,m} = \alpha_0 + \alpha_1 X_m + \gamma Z_{i,m} + \sum_{j,j \neq i} \beta_{ij} a_{j,m} + (1-\rho)\varepsilon_{i,m} + \rho\varepsilon_m, \tag{2}$$

where X_m is a vector of market-level exogenous variables, and $Z_{i,m}$ is a vector of financial institution and market-level exogenous variables. Both variables are observed by all the potential entrants and the econometrician. We include provincial fixed effects, and financial institution fixed effects in X_m and $Z_{i,m}$, respectively. α, γ, β and ρ are parameters to be estimated. α_0 is a constant parameter that represents a fixed entry cost, while $\varepsilon_{i,m}$ is a market- and firm-specific error term. ε_m is a market-specific error term and ρ is a parameter to be estimated with $\rho \in [-1, 1]$. $\varepsilon_{i,m}$ and ε_m are both iid with variance normalized to one, and they are observed by all potential entrants, but not by the econometrician. Parameter ρ reflects the fact that entry may be driven only by unobserved market-specific variables ($\rho = 1$), by firm-specific effects ($\rho = 0$), or a combination of both.

We model competitive effects between financial institutions in the profit equation. β_{ij} is the competitive effect of financial institution j's entry on financial institution i's profit if j enters into the market. By allowing the competitive effect to vary across financial institutions, we differentiate between financial institutions or group of financial institutions such that the effect of the entry of a Big Six bank on Desjardins's profit would not be the same as that of a large CU on the profit of a Big Six bank. This is a flexible way to consider firm-level unobserved effects that affect each financial institution's competitiveness against one another. This also allows us to flexibly take into account different competitive models. For instance, credit unions could compete more aggressively because they have a different business model.

Profit equation in Eq. (2) can be interpreted as a reduced form profit expression obtained from a more complex competition game where financial institutions compete in prices and there is horizontal differentiation as in Hotelling (1929) or Salop (1979). Section 2 discusses the complex sociopolitical context of Canada that gave birth to Desjardins and other credit unions that were created with the goal of serving customers with a common ethnic background. Because of the particular historical context previously discussed, our model assumes that the level of differentiation chosen by every financial institution is exogenously given due to historical reasons and other factors. In addition, the low level of product specialization across financial institutions allows us to assume

that product choice is exogenous, as opposed to endogenous product-type models such as Mazzeo (2002) or Cohen and Mazzeo (2007).

We treat the entry decision independently in each market. Nevertheless, network effects or scale and density economies could exist to some extent. For instance, the size or density of the branch or ATM network could provide an advantage to large banks (Ishii, 2005; Dick, 2007; Aguirregabiria *et al.*, 2016). As in Aguirregabiria *et al.* (2016), we use distance from the market to the bank's headquarters to capture some of these effects. We also use variables related to financial institutions' size (total assets) that are related to these network effects and density/scale economies.

A Nash equilibrium in pure strategies in a market m is given by the vector a_m^* for all potential entrants in the market, and is obtained by the following set of inequalities:

$$\pi_{i,m}(a_{1,m}^*, ..., a_{i,m}^*, ..., a_{E,m}^*) \geq \pi_{i,m}(a_{1,m}^*, ..., a_{i,m}, ..., a_{E,m}^*) \quad \text{for any } i \in E_m \text{ and any } a_{i,m} \ , \qquad (3)$$

where E_m is the set of potential entrants in market m. We assume that the entry of each competitor affects other potential entrants' profits only through the competitive term, given that our markets are isolated, and therefore we assume that there are no network effects.

We consider identical potential entrants across provinces, except for Desjardins, which only enters in Ontario, Quebec, Manitoba and New Brunswick, owing to existing regulatory barriers explained in Section 2. The other 8 potential entrants include the Big Six banks and the large/small credit unions. Therefore, $E_m = 8$ or 9, depending on the province where market m is located. This is a relatively large number of potential entrants to consider, compared with recent banking industry models (Cohen and Mazzeo, 2007).

We use a recent estimator of discrete games of complete information from Bajari *et al.* (2010) to estimate our model, and use maximum simulated likelihood (MSL) as in Gourieroux and Monfort (1990) . We maximize the predicted probability of observing the equilibrium behaviour of every potential entrant in every market. Simulation methods are necessary to estimate this model because there is no closed-form solution for the equilibrium in Eq. (3), so we cannot straightforwardly calculate the predicted probabilities of entry. An alternative approach would be to use the simulated method of moments estimator from McFadden (1989). There are several impediments when using this estimator. Since we have 51 parameters to be estimated, we need a large number of moment conditions to construct the method of moments estimator. A difficulty when using many moment conditions is that the estimator can be asymptotically very biased (Newey and Smith, 2004). Another obstacle is the selection of the appropriate moment conditions because a very large number of possible moments could potentially be used[21] and some of them may be weak (Han and Phillips, 2006; Newey and Windmeijer, 2009; Cheng and Liao, 2015). To overcome these difficulties,

[21] For instance, there could be moments constructed with the individual entry behaviour of each potential entrant, interacted with each of the exogenous variables. Other moments that could be used are derived from joint entry behaviour of two or more potential entrants.

we use the MSL estimator where we maximize the probability of observing the entry behaviour $a_{i,m}$ of every potential entrant E_m in every market m with respect to the set $\theta = \{\alpha, \gamma, \beta, \rho\}$ of parameters,

$$\max_{\theta} \sum_{m=1}^{2637} \sum_{i=1}^{E_m} \log \left[\widehat{\Pr}(a^*_{i,m} | X_m, Z_{i,m}; \theta) \right]. \tag{4}$$

We use a frequency estimator to compute numerically the sample probability in Eq. (4) for every market and potential entrant,

$$\widehat{\Pr}(a^*_{i,m} \mid X_m, Z_{i,m}; \theta) = \frac{1}{S} \sum_{s=1}^{S} \left\{ 1[\textit{entrant } i \textit{ chooses } a^*_{i,m} \textit{ in equilibrium}; X_m, Z_{i,m}, \varepsilon^s; \theta] \right\}, \tag{5}$$

where S is the total number of simulations, ε^s is a vector of independent realizations drawn for each simulation. Following Gourieroux and Monfort (1990), the MSL estimator is consistent and equivalent to the maximum-likelihood estimator if $N, S \to +\infty$, $\sqrt{N}/S \to 0$, where N is the number of observations. For our estimator, we choose a relatively high S ($S = 700$) so this condition is satisfied.

The probability in (5) is not well defined if there are multiple equilibria in this model. Given the assumptions of our model, multiple equilibria are possible, and this poses a problem for the identification of $\pi_{i,m}$. Previous literature (Mazzeo, 2002; Cohen and Mazzeo, 2007) has used additional modelling assumptions in the entry game to guarantee a unique equilibrium and allow for identification of the model. As in Bajari *et al.* (2010), the approach we use to estimate the game is to have an equilibrium selection rule. We assume that the efficient equilibrium (the one with highest total profits) is selected with probability one.[22]

The main computational difficulty of the estimation procedure is the calculation of the probability in (5). The set of all pure-strategy equilibria must be computed (up to 2^E possible equilibria) a large number of times to find the optimum of the MSL objective function in (4). The calculation of all equilibria must be done at every stage of the optimization routine.

4.2 Identification

Identification of the parameters in our model is achieved by using exclusion restrictions in the profit function. These are variables that affect the profit of one firm, but not the profit of the rest of the firms. This is a well-known approach used in the literature to identify the profit function in static entry games (Berry, 1992; Bajari *et al.*, 2010). We use distance to the provincial historical location centres of banks, weighted by the its inverse historical market share in the province, as our main demand shifter in each bank's profit equation. This distance variable is an appropriate measure that

[22] The selection of the efficient equilibrium in an entry game has already been suggested by Berry (1992) and Ciliberto and Tamer (2009).

accounts for the existing branch-network economies of density, and similar distance measures have been used in the literature. As shown in Goetz *et al.* (2013), Aguirregabiria *et al.* (2016) and Goetz *et al.* (2016), banking services exhibit economies of density because banks usually have greater familiarity with the economic conditions of closer markets and face lower costs to establishing and maintaining branches than in farther markets. We use the geographical presence of the banks in 1972 to construct this variable, since it occurs before financial deregulations that permitted the formation of universal banks. As banks were restricted from offering mortgages and brokerage services, their profit equation for determining branch locations was significantly different from the present. Nevertheless, we expect significant inertia in the subsequent expansion of banks over the decades, therefore this variable should be correlated with the geographic presence in 2006. Also, this variable varies across markets and financial institutions.[23]

Other variables we use for identification are the total asset size of each financial institution (which does not vary across markets), and the asset size of each financial institution in the province (which varies across provinces but not across markets within a province). Total asset size includes all geographic markets, including international markets and any business line. Big Six banks are global banks with significant presence in other countries, and have considerable non-retail activity. Therefore, total asset size can be considered to be, to a large extent, an exogenous variable. Also, regional size includes large urban markets, which are not included in our database. Therefore, it can also be considered, to a certain extent, to be an exogenous variable.

In order to identify cultural affinity we use variation in the observed entry behavior and in the proportion of French or English population in local markets where financial institutions are potential entrants. For instance, as previously discussed, Desjardins is a potential entrant in four provinces in Canada, but it usually enters into local markets with relatively higher French-speaking population than the average market in each province. One example is Ontario, which has a large variation of French population across local markets.

5 Estimates of Entry Model

Table 7 presents the estimation results along with standard errors obtained through bootstrapping. All variables are normalized by their means in order to facilitate comparisons. Panel A shows the effect of cultural affinity with the proportion of French-speaking population. We consider separately this effect for Desjardins, NAT and the rest of financial institutions. Estimates of the model show that the effect of French population is positive and large for both Desjardins and NAT, whereas it is negative for the rest of the financial institutions. These estimates are larger than any other estimate of the demographic variables, suggesting that Desjardins and NAT are particularly focused

[23] More precisely, we use the largest city in each province as the provincial headquarters for each bank. Using the geographic presence of every bank in 1972 (see Canadian Bankers Association, 1972), we determine the market share of every bank in every province and use the inverse as a weight.

on markets with high French-speaking populations. In fact, the difference between our estimated French coefficient for Desjardins and the Big Five banks is 1.531, double the difference in the income per capita coefficient between them, at 0.779. This implies that the Big Five banks would need a two-standard deviation increase in income per capita (more than $13,000, or 60%) to overcome the advantage that Desjardins possesses with a one-standard deviation increase in the proportion of French population (or 44%). This ratio is even larger for other demographic variables such as unemployment or amount of business activity. For both Desjardins and NAT, this French effect is also larger than all differences between provincial fixed effects, and the difference between the FI fixed effects, suggesting that cultural affinity is quantitatively more important in determining entry than other demographic variables. This result is consistent with evidence shown in Table 6.

This result is also consistent with the actual observations of bank entry in our data. While Desjardins is a potential entrant in four provinces in Canada, it only enters into markets in provinces with a relatively high French population. Also, NAT is a potential entrant in all provinces, but it too only enters into markets with a relatively large French population. The large variation of French population across provinces where Desjardins and NAT are potential entrants allows us to estimate this effect.

We find more results on the cultural affinity of financial institutions by looking at the effect of the proportion of non official-language population. We find that the estimates of non official-language population are much smaller, compared to the French population estimates. The estimates show that credit unions tend to be more focused on markets with non official-language population than the Big Six, which agrees with our intuition that many of them were created to serve ethnic and cultural minorities.

When considering other demographic variables, we find that Big Six banks have a positive and larger coefficient on per capita income and business activity, compared with Desjardins and the credit unions. Also, their coefficient on the unemployment rate is negative and large in absolute value, suggesting that they are focused on markets that are economically more attractive. Also, Desjardins tends to be located in economically less attractive areas (negative effect on income, and very small effect on business activity), but that are more populated.

Panel B in Table 7 provides estimates of fixed-effect variables for provinces and financial institutions, which could be interpreted as regulatory entry barriers and other type of fixed entry costs not captured by the rest of the variables. The constant term (intercept) is normalized to represent the entry cost for RBC in Ontario, and the estimate is a large negative number, showing that the entry cost is high.[24] We observe large variations in the provincial fixed effects, with the Atlantic provinces (Nova Scotia, New Brunswick, Newfoundland and Labrador, Prince Edward Island) having a large positive effect, which means they have lower entry barriers than Ontario, our benchmark, whereas Quebec has a negative effect, meaning that it has a higher entry barrier than Ontario.

[24] We also drop the fixed effect for TD because it is collinear with national size.

Table 7: Estimates of model

This table shows the estimates from our empirical model in Eq. 2. All variables (except fixed effects) have been normalized by their means, so the average of every variable is equal to 1. "Competitive effect of X on Y" is the effect on the profit of financial institution Y if financial institution X enters into the market. Standard errors have been generated using bootstraping.

Variable	Estimate	Std error
Panel A: Demographics:		
Population (BIG6)	-0.030	0.137
Population (DESJ)	0.136	0.032
Population (LARGE/SMALL CU)	-0.083	0.051
Income per capita (BIG6)	0.630	0.141
Income per capita (DESJ)	-0.149	0.075
Income per capita (LARGE/SMALL CU)	0.186	0.129
Unemployment (BIG6)	-0.216	0.067
Unemployment (DESJ)	-0.362	0.084
Unemployment (LARGE/SMALL CU)	-0.201	0.101
Business activity (BIG6)	0.246	0.111
Business activity (DESJ)	-0.072	0.040
Business activity (LARGE/SMALL CU)	0.160	0.065
Proportion French (BIG5/LARGE/SMALL CU)	-0.396	0.062
Proportion French (DESJ)	1.135	0.153
Proportion French (NAT)	0.661	0.090
Proportion Non-Official (BIG6)	-0.048	0.037
Proportion Non-Official (CU/DESJ)	0.048	0.039
Panel B: Fixed effects:		
Intercept (RBC in Ontario)	-2.869	0.391
British Columbia	0.108	0.067
Manitoba	0.014	0.071
New Brunswick	0.453	0.106
Newfoundland and Labrador	0.418	0.077
Nova Scotia	0.300	0.067
Prince Edward Island	0.356	0.075
Quebec	-0.044	0.096
Saskatchewan	0.024	0.107
BMO	0.327	0.062
BNS	0.207	0.053
CIBC	0.539	0.076
DESJARDINS	0.966	0.185
LARGE CU	2.082	0.343
NATIONAL	-0.508	0.108
SMALL CU	1.394	0.241

More interestingly, we also observe large systematic differences in the financial institution fixed effects, with credit unions and Desjardins facing lower entry barriers than the Big Six banks. This result suggests that they face lower barriers to entry in markets that are economically less attractive, despite them being restricted to operate in their home province. We will examine a counterfactual scenario that explores this possibility later in the paper. Table 9 provides entry costs across provinces and financial institutions by adding the constant term, provincial fixed effects and financial institution fixed effects. As we would expect, the effects are negative in almost all cases.

Panel C of Table 7 shows the estimates of the competitive effects. We group the Big Six together and assume that each of them has identical competitive effects against the other Big Six banks. In most cases competitive effects are negative or close to zero and statistically insignificant, which matches our expectations that a firm's profit is negatively affected by entry from rival firms. The only exception is the effect of Desjardins on the profits of the Big Six, which is positive and significant.

Estimates of the model (continuation)

Variable	**Estimate**	**Std error**
Panel C: Competitive effects:		
Competitive effect of BIG6 on BIG6	0.136	0.307
Competitive effect of DESJ on BIG6	0.613	0.191
Competitive effect of LARGE CU on BIG6	0.052	0.095
Competitive effect of SMALL CU on BIG6	-0.030	0.170
Competitive effect of BIG6 on DESJ	0.071	0.189
Competitive effect of LARGE CU on DESJ	-0.363	0.085
Competitive effect of SMALL CU on DESJ	-0.181	0.053
Competitive effect of BIG6 on LARGE CU	0.160	0.117
Competitive effect of DESJ on LARGE CU	-0.211	0.055
Competitive effect of SMALL CU on LARGE CU	-0.576	0.127
Competitive effect of BIG6 on SMALL CU	0.205	0.114
Competitive effect of DESJ on SMALL CU	-0.271	0.073
Competitive effect of LARGE CU on SMALL CU	-0.402	0.088
Panel D: Firm characteristics:		
National size	0.661	0.111
Regional size	0.043	0.034
distance to historical HQ	-0.335	0.090
distance to historical HQ (square)	0.044	0.118
Market-level error correlation	0.391	0.162

One overall pattern emerges from the competitive effects. Credit unions tend to be more

competitive among themselves than against the big banks. Indeed, the competitive effect between any two Big Six banks is positive and insignificant, while the competitive effect between the different types of credit unions is always negative and significant. This result suggests that credit unions and banks serve different customers, and that their addressable markets do not overlap exactly, so competition is less fierce between them. It also extends Cohen and Mazzeo (2007)'s findings in the US market to a much more concentrated market. Also, Table 8 uses estimates of the competitive effects to show comparative advantages between pairs of financial institutions. By comparing all possible pairwise combinations across financial institutions, we find that, in general, credit unions tend to be more competitive than the Big Six.

Table 8: Comparative advantages between financial institutions using competitive effects

This table compares for every pair of financial institution A and B, the competitive effect of the entry of financial institution A on financial institution B and vice versa. We use estimates from Table 7. The intuition is the following: if the competitive effect of the entry of financial institution A on financial institution B is greater than the effect of B on A, then it is more likely that financial institution B enters into a market than financial institution A, everything else constant. For instance, if the effect of the entry of financial institution A on financial institution B is +1 and the effect of financial institution B on financial institution A is -1, then financial institution B will enter with higher probability.

Pairs of entrants considered	**Entrant with highest comparative advantage**
BIG6 and DESJARDINS	BIG6
BIG6 and LARGE CU	LARGE CU
BIG6 and SMALL CU	SMALL CU
DESJARDINS and LARGE CU	LARGE CU
DESJARDINS and SMALL CU	DESJARDINS
LARGE CU AND SMALL CU	SMALL CU

To finalize the analysis of Table 7, in panel D we present estimates of the firm-level variables. The effect of national size is positive, whereas the effect of regional size is also positive, although economically much smaller.[25] Also, as we would expect, the coefficient on distance negatively affects profits. This gives an advantage to regional players that expand to areas close to large population centres where they had their headquarters or main historical centre of activity. Interestingly, the square term is positive (but very small), suggesting a small nonlinear effect of distance.

To summarize our main results, although market segmentation, geographic proximity, or entry

[25] Aguirregabiria *et al.* (2016) show that the gains from additional geographic diversification are negligible for large banks. The Big 6 are present in all provinces, and Desjardins is already present in four provinces, including Ontario and Quebec. This suggests that most financial institutions are already taking advantage of geographic diversification gains.

Table 9: Entry barriers by potential entrant and province

In this table, we show total fixed effects by firm and province. They are calculated by adding the constant term, the financial institution fixed effects, and the provincial fixed effects.

Province	BMO	BNS	CIB	DES	LCU	NAT	RBC	SCU	TD
British Columbia	-2.4	-2.6	-2.2	-1.8	-0.7	-3.3	-2.8	-1.4	-2.8
Manitoba	-2.5	-2.6	-2.3	-1.9	-0.8	-3.4	-2.9	-1.5	-2.9
New Brunswick	-2.1	-2.2	-1.9	-1.4	-0.3	-2.9	-2.4	-1.0	-2.4
Newfoundland and Labrador	-2.1	-2.2	-1.9	-1.5	-0.4	-3.0	-2.5	-1.1	-2.5
Nova Scotia	-2.2	-2.4	-2.0	-1.6	-0.5	-3.1	-2.6	-1.2	-2.6
Ontario	-2.5	-2.7	-2.3	-1.9	-0.8	-3.4	-2.9	-1.5	-2.9
PEI	-2.2	-2.3	-2.0	-1.5	-0.4	-3.0	-2.5	-1.1	-2.5
Quebec	-2.6	-2.7	-2.4	-1.9	-0.8	-3.4	-2.9	-1.5	-2.9
Saskatchewan	-2.5	-2.6	-2.3	-1.9	-0.8	-3.4	-2.8	-1.5	-2.8

barriers play a role in explaining entry, cultural affinity is the most important effect. Overall, a one-standard deviation increase in the proportion of French speakers in a market has an effect equivalent to the combined effect of a one-standard deviation change in income per capita, population, business activity and unemployment rate.

6 Estimating the importance of cultural affinity

In this section we show the results of two counterfactual experiments that allow us to better quantify the size of the cultural affinity effect. Then, we explore potential channels through which this effect occurs, and provide suggestive evidence that it is a combination of language specialization at the branch level, which can not be easily replicable across all markets, and demand-side branding effects that native English and French speakers have for institutions with the same cultural origin.

6.1 Counterfactual experiment 1: Importance of cultural affinity

In the first counterfactual exercise we try to quantify the importance of cultural affinity relative to other variables. We quantify this effect by recalculating the market structure in equilibrium, assuming that all potential entrants are identical in terms of the effect of French and non official-language population. By considering that these effects are zero (variables "Proportion French" and "Proportion Non-Official" in Panel A of Table 7), we are implicitly assuming that all financial institutions have a neutral focus on the cultural background of every market, and that the possible comparative advantages are coming from other demographic effects (e.g. income, business activity) or other variables.

The results of the counterfactual are shown in Table 10. The table shows observed entry (i.e., number of markets where each financial institution is present) from our database, entry that our econometric model predicts, and the effect of the counterfactual exercises. These last two results are obtained by solving for the probability of entry using a large number of simulations as shown in Eq. (5). The predicted values are obtained by calculating the entry probabilities for every potential entrant in every market using the estimated parameters from Table 7 and assuming that the French population effects are zero for all potential entrants (counterfactual 1), and that the non official-language population effects are zero (counterfactual 2).

Table 10 shows that our econometric model can replicate fairly well the observed entry. There are 4574 entries observed in all the markets considered, and our model predicts 4518 entries. Considering each province separately, we find a very good fit in the aggregate number of markets where there is entry in every province, and for most of the banks within each province. However, there are some discrepancies for specific banks in specific provinces such as BMO and Scotiabank in Manitoba, BNS and CIBC in New Brunswick, BMO and BNS in Newfoundland and Labrador, etc, where the predicted number of branches varies by up to a factor of two compared with the observed number of branches.

Our counterfactual results help shed light on the importance of cultural entry barriers relative to other variables. Counterfactual (1) considers that all financial institutions are identical in terms of the focus on the French population of every market. In this counterfactual we find that on aggregate for Canada, the total effect is negative in terms of number of markets where financial institutions are present, as it decreases from a predicted value of 4518 to 3948.1, a 12.6% decrease. Across provinces, we observe a large negative effect for Quebec, and a smaller positive effect for the rest of the provinces. On aggregate, the negative effect for Quebec is not compensated by the positive effect for the rest of the provinces. In Quebec, the number of markets with branch presence decreases from 1557.8 to 978, a 37.2% decrease. In the rest of the provinces, we observe increases of less than 5%.

When comparing different financial institutions, we find that Desjardins and NAT reduce their number of markets with presence by 88.0% and 77.8% respectively. On aggregate, the rest of the financial institutions increase their number of markets with presence by less than 20% each, but these increases cannot compensate the large reduction of markets with presence for Desjardins and NAT, resulting in a negative effect for Canada. For the individual provinces, we find that the rest of financial institutions increase significantly their presence in Quebec, and also in New Brunswick, but this increase in these and other provinces does not compensate for the decrease of presence of Desjardins and NAT.

Table 10 also shows counterfactual (2), which considers the effect of non-official language population. Consistent with the relatively small coefficients found for the non official-language population effect, we find that when financial institutions have a neutral position with regard to the non official-language population, the market structure does not change significantly. We find that

Table 10: Estimating the importance of cultural entry barriers

In this table, we show results from counterfactual experiments where cultural effects are zero. In counterfactual (1) we consider that the French-speaking population effects are zero (parameters "Proportion French" in Table 7 are equal to 0). In counterfactual (2) we consider that the foreign population effects are zero (parameters "Proportion Non-Official" in Table 7 are equal to 0). The outcome presented for every financial institution and province is the number of markets where every financial institution enters into a province. Also, total market shares in percentages are presented for Canada. The observed outcomes are obtained from our 2006 database. The predicted outcomes are obtained by calculating the probability of entry for every potential entrant using the estimated parameters and S=350.

Province	**BMO**	**BNS**	**CIB**	**DES**	**LCU**	**NAT**	**RBC**	**SCU**	**TD**	**TOTAL**
British Columbia:										
Observed	73.0	68.0	105.0	0.0	70.0	0.0	86.0	71.0	57.0	530.0
Predicted	71.4	64.4	86.5	0.0	59.8	13.1	86.6	68.3	59.7	509.7
Counterfactual(1)	72.8	65.9	88.2	0.0	60.9	12.9	88.3	69.9	61.1	520.1
Counterfactual(2)	78.5	71.3	94.4	0.0	57.3	14.3	94.6	65.1	66.1	541.6
Manitoba:										
Observed	13.0	14.0	27.0	10.0	20.0	0.0	50.0	50.0	18.0	202.0
Predicted	24.0	20.4	30.0	12.0	28.5	3.5	30.7	24.8	19.6	193.5
Counterfactual(1)	25.1	21.3	31.4	7.1	31.0	2.2	32.1	26.9	20.6	197.7
Counterfactual(2)	28.6	24.7	35.2	10.2	25.8	4.3	36.0	22.2	23.7	210.7
New Brunswick:										
Observed	49.0	89.0	34.0	94.0	0.0	68.0	58.0	63.0	37.0	492.0
Predicted	55.3	53.7	65.9	89.5	12.5	52.0	67.1	42.8	41.0	479.9
Counterfactual(1)	65.2	63.7	77.6	18.5	19.2	13.1	78.7	63.0	48.5	447.4
Counterfactual(2)	56.1	54.6	66.8	89.0	12.4	52.4	68.1	42.5	41.6	483.5
New Foundland and Labrador:										
Observed	55.0	77.0	30.0	0.0	0.0	0.0	34.0	28.0	18.0	242.0
Predicted	37.0	35.2	44.7	0.0	0.3	3.5	46.0	43.6	16.1	226.5
Counterfactual(1)	37.1	35.4	44.9	0.0	0.3	3.5	46.2	43.8	16.2	227.5
Counterfactual(2)	37.6	35.7	45.5	0.0	0.3	3.6	46.8	43.1	16.4	228.9
Nova Scotia:										
Observed	17.0	27.0	22.0	0.0	5.0	0.0	36.0	22.0	15.0	144.0
Predicted	19.3	18.8	23.3	0.0	12.8	3.7	23.9	16.6	14.1	132.6
Counterfactual(1)	20.4	20.0	24.6	0.0	13.5	3.2	25.1	17.7	15.0	139.5
Counterfactual(2)	19.8	19.4	23.9	0.0	12.5	3.9	24.5	16.5	14.5	135.0
Ontario:										
Observed	134.0	129.0	140.0	43.0	76.0	38.0	164.0	80.0	129.0	933.0
Predicted	130.8	125.9	153.4	48.1	74.7	53.2	159.7	91.7	123.6	961.1
Counterfactual(1)	135.5	130.5	159.2	27.3	77.4	42.6	165.4	100.3	127.9	966.2
Counterfactual(2)	137.2	132.4	160.2	45.6	72.0	56.1	166.5	88.8	130.0	988.8
Prince Edward Island:										
Observed	13.0	34.0	27.0	0.0	40.0	10.0	14.0	1.0	9.0	148.0
Predicted	19.1	18.4	23.4	0.0	25.1	3.2	23.5	16.5	15.3	144.6
Counterfactual(1)	19.8	19.3	24.5	0.0	26.0	2.9	24.4	17.3	16.1	150.2
Counterfactual(2)	19.5	18.8	23.9	0.0	24.9	3.3	23.9	16.4	15.7	146.4

market entries increase from 4518 to 4634.1, a 2.5% increase. Big Six banks are positively affected in this counterfactual, as they are able to increase their presence in the provinces, whereas the credit unions enter in less markets. On aggregate, the effect is slightly positive for Canada.

Our results show that cultural affinity is very important in explaining the competitiveness of

Estimating the importance of cultural entry barriers (continuation)

Province	BMO	BNS	CIB	DES	LCU	NAT	RBC	SCU	TD	TOTAL
Quebec:										
Observed	110.0	6.0	158.0	751.0	1.0	380.0	114.0	2.0	38.0	1560.0
Predicted	78.0	68.8	99.8	761.7	0.4	369.4	103.6	21.2	55.0	1557.8
Counterfactual(1)	147.8	132.7	181.7	56.2	3.6	27.7	187.2	131.6	109.5	978.0
Counterfactual(2)	80.7	71.3	103.0	757.6	0.4	373.1	107.1	18.1	56.9	1568.2
Saskatchewan:										
Observed	25.0	30.0	54.0	0.0	72.0	2.0	55.0	58.0	27.0	323.0
Predicted	39.6	32.0	51.3	0.0	57.8	4.7	51.6	45.5	29.9	312.3
Counterfactual(1)	40.8	33.1	52.7	0.0	59.3	4.6	53.1	47.0	30.9	321.3
Counterfactual(2)	44.4	36.2	57.2	0.0	54.1	5.2	57.6	42.2	33.9	330.9
TOTAL CANADA:										
Observed	489.0	474.0	597.0	898.0	284.0	498.0	611.0	375.0	348.0	4574.0
Predicted	474.3	437.7	578.2	911.3	272.0	506.4	592.6	371.0	374.4	4518.0
Counterfactual(1)	564.5	521.9	684.7	109.1	291.3	112.7	700.5	517.5	445.9	3948.1
Counterfactual(2)	502.5	464.5	610.0	902.4	259.7	516.2	625.1	354.8	398.9	4634.1
TOTAL CANADA: **(market share %)**:										
Observed	10.7	10.4	13.1	19.6	6.2	10.9	13.4	8.2	7.6	100.0
Predicted	10.5	9.7	12.8	20.2	6.0	11.2	13.1	8.2	8.3	100.0
Counterfactual(1)	14.3	13.2	17.3	2.8	7.4	2.9	17.7	13.1	11.3	100.0
Counterfactual(2)	10.8	10.0	13.2	19.5	5.6	11.1	13.5	7.7	8.6	100.0

French versus English-origin institutions, and that this effect maximizes market presence on the aggregate.

6.2 Counterfactual experiment 2: The 2012 Federal Credit Union Regulations

For the second counterfactual exercise, we explore the consequences of relaxing regulatory entry barriers without changing cultural ones. This exercise is also motivated by the amendment to the Bank Act in December 2012, which allowed the establishment of federally chartered credit unions subject to federal regulations, with the stated goal of fostering competition in the financial industry.[26] Before then, credit unions could only be incorporated provincially and therefore were regulated provincially, which limits their capacity of expansion.[27]

In contrast, a federally chartered credit union (FCU) would be able to do business nationwide, allowing it to increase its ATM and branch network. The federally chartered credit union would be under the supervision of a single regulator, just like federal banks. Also like federal banks, they would be subject to federal regulatory standards. In particular, an FCU would be subject to federal deposit insurance limits, which tend to be lower than provincial limits. From the point of view

[26] The Regulatory Impact Analysis Statement of the Bank Act in 2012 states that the change was made "to promote the continued growth and competition of the [banking] sector and enhance financial stability." (see www.fin.gc.ca)

[27] In July 2016, the *Caisse populaire acadienne* became the first provincial credit union to enter the federal credit union regime. This is a group of 15 caisses populaires in New Brunswick that decided to merge and continue their operations as a single federal credit union.

of access to Bank of Canada lending, Central 1 credit union is a trade association that represents more than 300 credit unions and has access to Bank of Canada lending, so credit unions may not need to become federally regulated to have access to central bank funds. Our counterfactual exercise evaluates the long-run consequences of dropping interprovincial barriers for Desjardins, by assuming that it becomes a potential entrant in all provinces, as opposed to just Quebec, Ontario, Manitoba and New Brunswick.[28]

6.2.1 Cases considered

Counterfactual (3) in Table 11 shows the market structure that arises if Desjardins applies for a federal charter and becomes a potential entrant in all Canadian provinces (not just in Ontario, Manitoba, New Brunswick and Quebec). The probability of entry for each firm in each market is calculated using the estimated parameters from Table 7. In particular, the estimated coefficients for Desjardins are kept the same as it expands into all provinces.

We also need to make a number of additional assumptions. First, we assume that the total asset size of Desjardins as a potential entrant in all provinces is equal to its observed size in 2006. This underestimates the size that a "national" Desjardins would have and represents a lower bound for the number of markets that a "national" Desjardins would enter in.[29] We also assume that the provincial size of Desjardins in every province is equivalent to the size of all the credit unions in every province, and that distance to historical headquarters is zero, given the large autonomy enjoyed by the local caisses.

Additionally, we run two other counterfactual experiments that are similar to Counterfactual (3). Counterfactual (4) is identical to Counterfactual (3), except that it assumes that the entry cost for Desjardins (parameter "DESJARDINS" in Table 7) is positive and equal to 3. Therefore, Desjardins can expand to other provinces with a lower entry cost than we have previously estimated. This lower entry cost could reflect potential rebranding and management changes or perhaps other factors such as regulatory advantages.

Counterfactual (5) is also identical to Counterfactual (3), except that we consider that Desjardins changes its strategy regarding the markets with French-speaking populations and adopts a strategy more focused on English-speaking markets. More specifically, we assume that the estimated coefficient for the proportion of the French population for Desjardins is identical to the coefficient for the Big Five.

[28] Alternatively, a high number of smaller credit unions could merge and create a large federal credit union that could try to expand to other provinces.

[29] This assumption is not very reestrictive as the estimated effect of size is not large. We have reestimated the results assuming that the size of Desjardins doubles as it expands to other provinces and we have not found significant differences.

Table 11: Effects of the 2012 Federal Credit Union Regulation

In this table, we show results from a counterfactual experiment where Desjardins becomes a Federal Credit Union so it is a potential entrant in every province in Canada. The outcome presented for every financial institution and province is the number of markets where every financial institution enters into a province. Also, total market shares in percentages are presented for Canada. The observed outcomes are obtained from our 2006 database. The predicted outcomes are obtained by calculating the probability of entry for every potential entrant using the estimated parameters and S=350. Counterfactual(3) outcomes are obtained by assuming that the new potential entrant (Desjardins or large CU) is an entrant in all provinces in Canada. Counterfactual(4) is similar to Counterfactual(3), but assumes that the entry barrier for Desjardins or large CU (parameter "DESJARDINS" in Table 7) is equal to 2. Counterfactual(5) is similar to Counterfactual(3), but assumes that the effect of the proportion of French-speaking population is identical to the case of the Big 5.

Province	**BMO**	**BNS**	**CIB**	**DES**	**LCU**	**NAT**	**RBC**	**SCU**	**TD**	**TOTAL**
British Columbia:										
Observed	73.0	68.0	105.0	0.0	70.0	0.0	86.0	71.0	57.0	530.0
Predicted	71.4	64.4	86.5	0.0	59.8	13.1	86.6	68.3	59.7	509.7
Counterfactual(3)	75.4	68.5	90.4	16.3	59.8	14.8	90.4	68.2	63.8	547.6
Counterfactual(4)	91.0	83.7	106.0	77.2	59.7	19.1	106.3	68.6	78.5	690.0
Counterfactual(5)	74.9	68.0	89.8	14.2	59.7	14.5	89.9	68.2	63.2	542.5
Manitoba:										
Observed	13.0	14.0	27.0	10.0	20.0	0.0	50.0	50.0	18.0	202.0
Predicted	24.0	20.4	30.0	12.0	28.5	3.5	30.7	24.8	19.6	193.5
Counterfactual(3)	24.0	20.4	30.0	12.0	28.5	3.5	30.7	24.8	19.6	193.5
Counterfactual(4)	32.1	28.0	38.6	46.6	28.4	5.8	39.4	25.0	26.9	270.9
Counterfactual(5)	22.8	19.3	28.8	6.5	28.5	2.8	29.5	24.7	18.6	181.5
New Brunswick:										
Observed	49.0	89.0	34.0	94.0	0.0	68.0	58.0	63.0	37.0	492.0
Predicted	55.3	53.7	65.9	89.5	12.5	52.0	67.1	42.8	41.0	479.9
Counterfactual(3)	55.3	53.7	65.9	89.5	12.5	52.0	67.1	42.8	41.0	479.9
Counterfactual(4)	67.6	65.9	78.6	140.9	12.6	59.7	79.8	43.6	52.1	600.7
Counterfactual(5)	45.0	43.8	54.0	12.0	12.5	32.8	55.2	42.8	34.1	332.0
New Foundland and Labrador:										
Observed	55.0	77.0	30.0	0.0	0.0	0.0	34.0	28.0	18.0	242.0
Predicted	37.0	35.2	44.7	0.0	0.3	3.5	46.0	43.6	16.1	226.5
Counterfactual(3)	39.3	37.8	47.0	9.1	0.3	4.4	48.6	43.6	18.0	248.2
Counterfactual(4)	50.0	48.4	58.1	50.8	0.3	7.3	59.6	43.9	25.5	344.1
Counterfactual(5)	39.3	37.7	47.0	8.9	0.3	4.4	48.6	43.6	17.9	247.7
Nova Scotia:										
Observed	17.0	27.0	22.0	0.0	5.0	0.0	36.0	22.0	15.0	144.0
Predicted	19.3	18.8	23.3	0.0	12.8	3.7	23.9	16.6	14.1	132.6
Counterfactual(3)	21.0	20.6	25.1	6.9	12.7	5.0	25.6	16.8	15.7	149.3
Counterfactual(4)	26.0	25.5	30.1	25.0	12.7	7.7	30.6	17.0	20.3	195.0
Counterfactual(5)	20.4	20.0	24.4	4.4	12.7	4.5	24.9	16.7	15.2	143.3

6.2.2 Interpretation of the results

Our counterfactual results in Table 11 help shed light on the economic interpretation of the model estimates. In Counterfactual (3), we find that, by becoming a potential entrant in all provinces,

Effects of the 2012 Federal Credit Union Regulation (continuation)

Province	BMO	BNS	CIB	DES	LCU	NAT	RBC	SCU	TD	TOTAL
Ontario:										
Observed	134.0	129.0	140.0	43.0	76.0	38.0	164.0	80.0	129.0	933.0
Predicted	130.8	125.9	153.4	48.1	74.7	53.2	159.7	91.7	123.6	961.1
Counterfactual(3)	130.8	125.9	153.4	48.1	74.7	53.2	159.7	91.7	123.6	961.1
Counterfactual(4)	151.0	146.2	173.5	137.5	74.3	66.1	179.6	91.8	143.5	1163.5
Counterfactual(5)	126.2	121.5	148.4	24.9	74.8	48.0	154.6	91.6	119.1	909.0
Prince Edward Island:										
Observed	13.0	34.0	27.0	0.0	40.0	10.0	14.0	1.0	9.0	148.0
Predicted	19.1	18.4	23.4	0.0	25.1	3.2	23.5	16.5	15.3	144.6
Counterfactual(3)	20.4	19.6	24.7	5.0	25.1	4.0	24.9	16.7	16.5	156.9
Counterfactual(4)	25.3	24.5	29.6	22.3	25.3	6.1	29.8	17.0	21.2	201.0
Counterfactual(5)	20.1	19.2	24.3	3.4	25.1	3.7	24.6	16.7	16.2	153.3
Quebec:										
Observed	110.0	6.0	158.0	751.0	1.0	380.0	114.0	2.0	38.0	1560.0
Predicted	78.0	68.8	99.8	761.7	0.4	369.4	103.6	21.2	55.0	1557.8
Counterfactual(3)	78.0	68.8	99.8	761.7	0.4	369.4	103.6	21.2	55.0	1557.8
Counterfactual(4)	82.5	72.7	105.4	867.3	0.4	384.2	109.4	20.7	58.0	1700.6
Counterfactual(5)	28.2	24.2	37.1	8.6	0.4	200.4	38.7	22.5	19.5	379.6
Saskatchewan:										
Observed	25.0	30.0	54.0	0.0	72.0	2.0	55.0	58.0	27.0	323.0
Predicted	39.6	32.0	51.3	0.0	57.8	4.7	51.6	45.5	29.9	312.3
Counterfactual(3)	42.4	34.9	54.2	13.2	57.6	5.7	54.8	45.4	32.8	340.9
Counterfactual(4)	54.4	46.2	67.6	67.8	57.2	8.7	68.2	45.7	43.8	459.8
Counterfactual(5)	41.8	34.5	53.7	11.1	57.6	5.6	54.2	45.4	32.3	336.2
TOTAL CANADA:										
Observed	489.0	474.0	597.0	898.0	284.0	498.0	611.0	375.0	348.0	4574.0
Predicted	474.3	437.7	578.2	911.3	272.0	506.4	592.6	371.0	374.4	4518.0
Counterfactual(3)	486.5	450.2	590.5	961.8	271.7	512.0	605.4	371.2	385.9	4635.2
Counterfactual(4)	580.0	541.1	687.6	1435.2	270.8	564.9	702.8	373.3	469.9	5625.5
Counterfactual(5)	418.7	388.2	507.6	93.8	271.7	316.7	520.2	372.2	336.1	3225.2
TOTAL CANADA: **(market share %)**:										
Observed	10.7	10.4	13.1	19.6	6.2	10.9	13.4	8.2	7.6	100.0
Predicted	10.5	9.7	12.8	20.2	6.0	11.2	13.1	8.2	8.3	100.0
Counterfactual(3)	10.5	9.7	12.7	20.7	5.9	11.0	13.1	8.0	8.3	100.0
Counterfactual(4)	10.3	9.6	12.2	25.5	4.8	10.0	12.5	6.6	8.4	100.0
Counterfactual(5)	13.0	12.0	15.7	2.9	8.4	9.8	16.1	11.5	10.4	100.0

Desjardins gains little in provinces where it has not already entered. It gains 0.5% in market share on aggregate over all of Canada, spread fairly evenly across all provinces. Desjardins fares best in British Columbia, where it would enter in 16.3 markets. Overall, however, the market structure barely changes. Provinces where Desjardins expands typically have an average proportion of native French speakers at or below 2%. The only exception is Nova Scotia, with more than 6% of French speakers, and we do observe high new entry by Desjardins in this province, in percentage terms. This result seems intuitive.

In Counterfactual (4), we assume that Desjardins has a positive entry cost and therefore we find that its total market share in Canada would increase substantially more, from 20.7% in Counterfactual (3) to 25.5% in Counterfactual (4). The expansion is across the board, with Desjardins becoming the biggest financial institution by market share in New Brunswick and Manitoba, where it had a previous presence, and similar in size to the Big Six banks in all other English-speaking provinces. It also expands its presence further in Quebec and Ontario, where it has been previously established.

In Counterfactual (5) we assume that Desjardins becomes similar to the Big Five in terms of their focus on French-speaking markets. We observe a large negative effect for Desjardins as its total market share would significantly decrease from 20.2% to 2.9%. We observe a reallocation in the provinces where Desjardins enters, as there is a much lower presence in provinces with large French populations (Quebec, Ontario), and additional entry in Western provinces, with a much lower presence of French-speaking populations. However, this additional entry in British Columbia, Newfoundland and Labrador or Nova Scotia cannot compensate for the large decrease in the market share in Quebec. These results are consistent with the results previously obtained in Counterfactual (1). We do not observe significant changes in the presence of other financial institutions. On aggregate, the total effect for Canada is negative in terms of number of markets with branch presence, as it decreases from a predicted value of 4518 to 3225.2, a 28.6% decrease.

In summary, the second set of counterfactual results shows that cultural entry barriers dominate regulatory entry barriers in determining market structure in the Canadian retail banking industry. Eliminating regulatory barriers alone does not resolve in greater entry and competition in the case of Desjardins, which can only overcome this barrier by increasing its comparative advantage massively in other areas.

These results also imply that cultural entry barriers prevent Desjardins to increase its level of geographic diversification by expanding nationally. Hence, potential gains from diversification as discussed in Aguirregabiria *et al.* (2016) would not be enough to compensate for the more restrictive federal regulations, such as the lower deposit insurance limits that FCUs would have compared to provincially regulated credit unions.[30]

6.3 Additional evidence on the sources of cultural entry barriers

In this section we explore potential mechanisms of cultural specialization. First, banks could choose to specialize in either English or French by hiring branch managers who primarily speak that language. However, there could be higher costs of transferring "soft" information within an organization if local branch managers do not speak the same language as the high-level management,

[30] The banking literature shows that the existence of insurance to bank deposits generates a moral hazard effect that could generate incentives on financial institutions to take higher risks and increase profits. However, the effectiveness of the Canadian bank supervision suggests that the effect of this channel may not be large (Anginer *et al.*, 2014).

resulting in higher costs for financial institutions in markets where cultural affinity of the local population is different from the bank's cultural origin. Second, there could be taste-based demand-side effects where consumers simply prefer to bank with an institution because of their common cultural origin, everything else equal.

We first use job postings data to show that language specialization does occur, as French-origin banks do hire more French-speakers employees than English-origin banks in nearly all markets. We then use data on high-level managers to show that they tend to disproportionately come from the cultural origin each bank is identified with, allowing for the possibility of high internal communication costs between employees. Second, we use highly detailed household-level financial survey information to show that there exists a significant cultural branding effect for financial institutions, even in a largely bilingual city like Montreal where all institutions hire bilingual branch workers. In summary, we show suggestive evidence that the estimated cultural affinity might result from a combination of language specialization at the branch level and demand-driven branding effects.

6.3.1 Language specialization at the branch level

Financial institutions choose to specialize in a certain language by selecting customer-facing employees with specific language requirements for their branches, so employees can speak the same language of the clients they serve. As shown in the literature (Fisman *et al.*, 2017), cultural proximity between borrower and lender could lower information frictions and facilitate the transfer of "soft" information. This can generate a cultural affinity effect that leads to an increase in the demand for their products and creates a comparative advantage with respect to competitors.

For cultural specialization to be a persistent comparative advantage, it must not be easily replicated by competitors of a different cultural origin. An intuitive strategy from the latter might be to simply hire customer-facing employees who speak the local language. Why does this not appear to work? The answer could be that the choice of employees with specific language requirements may have relevant effects on the internal communication costs in financial institutions. There is a large management literature that studies the effect of language and other cultural barriers in the internal organization of multinational corporations (see Gibson and Hodgetts, 1986; Luo and Shenkar, 2006). Assuming a highly simplified internal structure of financial institutions, employees could be divided in two broad categories: customer facing employees that communicate with final clients in every branch, and high-level managers that are located in the main headquarters. Customer-facing employees report to high-level managers and transmit important loan and other key soft financial information to them. As discussed by the aforementioned management literature, language can play a key role in explaining the effectiveness of this internal communication within the firms. Differences in language between customer-facing employees and high-level managers may create severe inefficiencies that could negatively impact the cost of providing financial services, thus raising high cultural entry barriers for English-origin banks to serve French-speaking local populations, and vice

versa.

To test for this language specialization effect, we manually compile and identify language requirements from job postings for customer-facing employees of all Canadian FIs on a major Canadian job search website (ca.indeed.com), obtaining 8765 job postings. If French-origin banks do specialize in serving French-speaking consumers, we would expect that their job postings are more likely to require fluency in French than English-origin banks. We present the results in Table B.1. Indeed, the two French-origin financial institutions (Desjardins and NAT) have very high demand for French-speaking customer-facing employees in most Canadian provinces, much higher than all other financial institutions. In Ontario, they require 50% of its positions to be French-speaking , versus 15% on average for the other institutions. For New Brunswick, the proportions are 100% versus 32%, while in all other provinces except Quebec, the proportions are 70% and 13%, respectively. Interestingly, Quebec presents an exception to the trend, where the demand for French-speaking workers only differ by 13%, at 83% for the French-origin banks and 70% for English-origin banks.

Table B.2 shows the language of high-level managers and board members by financial institution in Canada. We obtain data from Boardex, which maintains a database on senior management of companies. We first obtain the names of 3640 senior managers and board members of the Big 6 and Desjardins from the 1970s to 2018. We then match manager names to their cultural origin via NamePrism, an online ethnicity classification tool for names (Ye *et al.*, 2017). We find that throughout the past few decades, Desjardins and NAT have very high percentage of high-level managers of French origin (78% and 54%, respectively), compared to the rest of the financial institutions, which have a majority of English-origin high-level managers.

The differences in the cultural background of high-level managers from French-origin financial institutions are crucial to understand the effect that language requirements of employees have on the comparative advantage of these institutions. In Canada's western provinces, French-origin financial institutions need bilingual customer-facing employees to effectively serve English-speaking customers and report to French high-level managers. Since bilingual employees are rarely found in western provinces (see Table B.3 for the level of bilingualism across provinces), French-oriented financial institutions may not be able to find bilingual employees or may need to pay a high cost once they are found, which raises the cost of providing services in English provinces, and reduces their comparative advantage.

We propose a simple Bertrand oligopoly game between English and French-origin financial institutions competing across Canadian provinces (details provided in Appendix). In the unique Nash equilibrium of the game, we find that French and English-origin financial institutions compete in the French provinces and serve an equal share of the market. However, in the English provinces, French-origin institutions are not able to compete with English-origin banks because the low supply of bilingual employees. Therefore, language specialization at the branch level is not easily replicable across markets due to internal communication constraints and the low level of bilingualism in some

provinces.[31]

Table 12: Percentage of households that have French as language, and main financial institution

This table shows the percentage of households that have French as language, and the financial institution that households report as their main one. Source: CFM data base.

Province	BMO	BNS	CIBC	Desjardins	NAT	RBC	TD	OTHER
Manitoba	2.6%	7.0%	1.9%	68.6%	0.0%	3.7%	5.3%	4.2%
New Brunswick	14.8%	12.2%	12.5%	85.3%	72.3%	13.1%	14.4%	22.3%
Ontario	4.8%	4.5%	3.5%	56.8%	20.1%	4.4%	3.0%	4.6%
Quebec	61.9%	51.3%	58.3%	93.3%	87.9%	59.5%	45.9%	82.1%
Rest of Canada	2.6%	1.9%	2.1%	21.1%	0.0%	1.9%	1.5%	2.0%

6.3.2 Demand-side branding effect

While the model and results in the previous section show that language specialization could generate the large cultural entry barriers we observe, demand-side branding effects could rationalize these results as well. If native French speakers prefer to bank at French-origin institutions for purely taste reasons, and vice versa for native English speakers at English-origin institutions, we would observe the similar strong French population effect for Desjardins and NAT, who would then prefer to hire French speakers in order to serve their mostly French-speaking customers.

To test whether native French speakers prefer to bank at French-origin banks, we use data from the Canadian Financial Monitor (CFM), a survey of Canadian household finances for approximately 12,000 households annually that contains very detailed information on all the financial products, as well as household characteristics (see Damar *et al.*, 2014; Allen *et al.*, 2016), and crucially the main language spoken by the head of household. We pool together panel data from 2002 to 2010, and make sure that each household only appears once in our data.

In Table 12 we show the percentage of households that report French as the main language in each province by their main financial institutions. The table shows that for those households that report Desjardins as the main financial institution, French is the main language in 93.3% of the households in Quebec, and 85.3% in New Brunswick. Desjardins is the financial institution with the largest share of French households in all provinces considered and the rest of Canada. Also, NAT also has a very high share of French-speaking households in New Brunswick, Ontario and Quebec.

[31] In practice, the sociodemographic characteristics of Canadian provinces are a little more complex than described. Some provinces like Ontario, New Brunswick and Manitoba have relatively important French population. However, as we have show in Table B.4, Desjardins and NAT enter in the markets of Ontario, Manitoba or New Brunswick where there is a larger fraction of French (and bilingual) customers. For instance, this Table shows that the proportion of French and Bilingual individuals in the New Brunswick markets where Desjardins enters is 56.8% and 48.4%, compared to 31.8% and 35.2% for Big5, respectively.

The rest of the Big6 and other financial institutions have a much smaller share of French-speaking households, compared to Desjardins and NAT.

In order to separately identify the demand-side branding effect from the language specialization effect previously discussed, we consider the case of Quebec, and particularly the island of Montreal. Intuitively, to separately identify demand-side effects, we need to hold the language specialization at the branch level fixed, meaning that a potential customer can access the same services at either French or English-origin banks. As shown in Table B.1, both English- and French-origin banks hire mostly bilingual employees in Quebec, and particularly in Montreal. Montreal also has the highest number of bilinguals of any large city in Canada, with more than 50% of the population able to speak both languages, which means that the costs of searching and hiring bilingual employees should not be high, and all FIs can always hire bilingual customer-facing employees to reduce the cost of transmitting information to the high-level managers. Therefore, from a Montreal customer's perspective, he should expect the same services in his language of choice whether he banks with French-origin vs. English-origin banks. In other words in Montreal, the effect of language specialization at the branch-level should be identical across all financial institutions.

In Table 13 we have compiled information on the language of customers of financial institutions, by financial product, for the case of Montreal. We observe a significant difference between French and English-speaking households, with Desjardins and National together being the bank of choice for the majority of French-speaking Montrealers across all four financial products, versus being the bank of choice for less than 20 % of English-speaking Montrealers. This large and significant difference is consistent with the existence of taste-based cultural branding effects being a significant source of cultural affinity.

7 Conclusion

In this paper, we estimate a perfect information static entry game to study how cultural entry barriers affect entry and competition in the Canadian banking industry. The Canadian retail banking industry provides a good setting to study this question because of the important role of "soft" information, the presence of high regulatory entry barriers, and large linguistic and cultural diversity. The high concentration of the Canadian industry, with a small number of universal financial institutions, and a relatively stable market structure, helps to identify the set of potential entrants.

Our results show that financial institutions have a strong degree of linguistic and cultural specialization, but this specialization cannot be easily replicated due to internal organization constraints, and a strong branding effect. Given the importance of cultural affinity in explaining the competitiveness of some financial institutions, we find that the effectiveness of certain regulations, such as allowing credit unions to get a federal charter, and market strategies are limited by the high

cultural barriers. Regulators and policy makers need to take these factors into account in order to design effective policies that help promote competition and contribute to significantly change the competitive landscape of the banking industry. Policymakers also need to consider the implications that cultural entry barriers have on antitrust policy, since it implies that banks of different cultural origin may be less substituble than previously thought.

Our paper could also have implications for other industries that rely on trusted interpersonal relationships such as health care and education. Studying whether this cultural effect on market structure extends to other economic sectors would be a future direction of research.

Table 13: Language of customers and products by financial institution

This table shows the market share by product and language of the customer, for each financial institution. We only use the city of Montreal. Source: CFM data base.

Bank	**Product**	**English**	**French**	**Difference**
BMO	Accounts	17%	8%	9%
BNS	Accounts	7%	3%	4%
CIBC	Accounts	12%	4%	8%
DES	Accounts	9%	41%	-31%
NAT	Accounts	6%	23%	-17%
RBC	Accounts	29%	16%	13%
TD	Accounts	20%	5%	14%
BMO	Lines of Credit	13%	8%	5%
BNS	Lines of Credit	6%	5%	1%
CIBC	Lines of Credit	11%	7%	4%
DES	Lines of Credit	4%	28%	-24%
NAT	Lines of Credit	6%	22%	-16%
RBC	Lines of Credit	35%	23%	12%
TD	Lines of Credit	25%	8%	17%
BMO	Mortgages	18%	6%	12%
BNS	Mortgages	9%	8%	1%
CIBC	Mortgages	7%	6%	2%
DES	Mortgages	10%	43%	-33%
NAT	Mortgages	6%	16%	-10%
RBC	Mortgages	28%	14%	14%
TD	Mortgages	21%	7%	14%
BMO	Personal Loans	18%	11%	7%
BNS	Personal Loans	7%	8%	-1%
CIBC	Personal Loans	13%	6%	7%
DES	Personal Loans	9%	42%	-33%
NAT	Personal Loans	7%	19%	-12%
RBC	Personal Loans	25%	13%	13%
TD	Personal Loans	20%	2%	18%

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Appendix

A Figures and Tables

Table A.1: Number of Branches Nationally by FI

This table shows the evolution of number of branches by Financial Institution in Canada. Source: Financial Services Canada and authors' own calculations.

	Year					
Financial Institution	**1998**	**2000**	**2002**	**2004**	**2006**	**2008**
ATB	148	147	144	146	154	287
BMO	1110	1035	965	961	968	953
CIBC	1301	1268	1150	1101	1058	1041
Desjardins	1438	1339	1184	1109	1100	1093
NAT	643	605	523	498	489	480
RBC	1284	1243	1140	1131	1112	1120
BNS	1101	1156	972	951	933	924
TD	925	1329	1049	1010	1006	1031
Other Credit Unions	1329	1351	1366	1388	1488	1492
Other Depository Institutions	1198	790	769	706	847	911
Total	10477	10263	9262	9001	9155	9332

Figure A.1: Example of market: Moose Jaw in Saskatchewan (I)

This map shows one example of the geographic characteristics of one market (census subdivision) considered in our sample (Moose Jaw in Saskatchewan). Markets selected have a low population and a relatively small area, are separated by at least 10 km, and are at least 30 km away from major urban centres.

Figure A.2: Example of market: Moose Jaw in Saskatchewan (II)

This map highlights the various branches of financial institutions located near Moose Jaw (Saskatchewan). Each dot represents a branch, and different colours represent different financial institutions. Branches are identified in a radius of 10 km around the centroid of the market. We use exact latitude-longitude information for branches and market centroids.

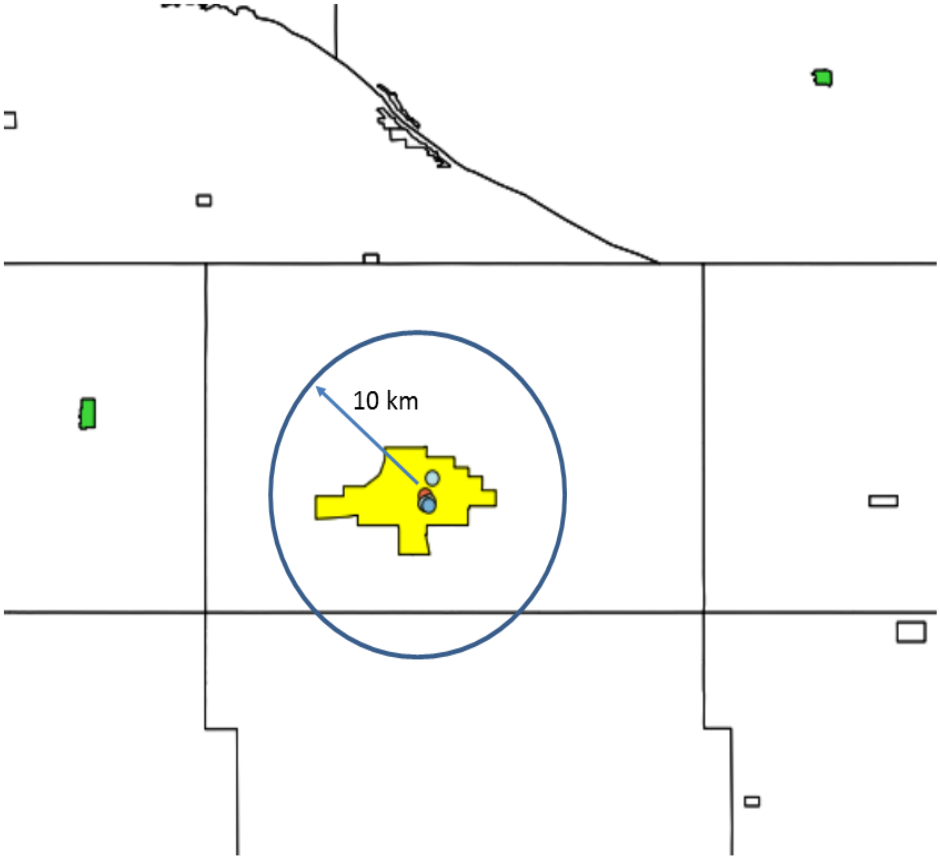

Table A.2: Market configurations by institution pairs

This table shows the number of markets where any pair of financial institutions have presence. We consider the 2637 markets that we use in our empirical model. "No others" shows the case where there is one or zero financial institutions present.

	No others	**BMO**	**BNS**	**CIBC**	**DESJ**	**Large CU**	**NAT**	**RBC**	**Small CU**	**TD**
No others	817	26	64	51	370	58	7	63	71	6
BMO	26		280	333	161	125	158	351	196	267
BNS	64	280		283	73	141	81	290	191	256
CIBC	51	333	283		194	161	178	368	205	272
DESJ	370	161	73	194		15	453	184	54	85
Large CU	58	125	141	161	15		33	149	79	125
NAT	7	158	81	178	453	33		187	47	103
RBC	63	351	290	368	184	149	187		232	294
Small CU	71	196	191	205	54	79	47	232		170
TD	6	267	256	272	85	125	103	294	170	
Total	817	489	474	597	900	284	498	611	375	348

B Additional empirical evidence

This section provides additional empirical evidence related to language requirements for customer-facing employees. Box 1 proposes a simple Bertrand game discussed in section 6.

BOX 1: A SIMPLE BERTRAND GAME

We propose a simple Bertrand model to understand the effect of language on comparative advantage of Canadian financial institutions. To simplify the exposition, we assume there are only two firms competing, one with English-speaking high-level managers (Big5), and the other with French-speaking high-level managers (Desjardins). We assume that in each market, the two competitors need to provide services in the language preferred by the customers, otherwise their demand would be 0, and they would not sell anything. We assume that in Quebec the customers speak French, and in the rest of the provinces, they speak English.

We assume that the labor market is competitive and the wage of customer-facing employees is w. Moreover, at the competitive wage w, the marginal cost of producing the financial service is c if customer-facing employees and high-level managers speak the same language. If they do not, then the cost is c'>c.

In order to compete in Quebec, Big5 needs to hire bilingual workers so customer facing employees offer services in French, and can speak English with high-level managers. Desjardins hires customer-facing employees who speak French (or are bilingual) so they can also speak to their high-level managers.

For the rest of the provinces, Big5 needs to hire workers who speak English (or bilingual), whereas Desjardins needs to hire bilingual customer-facing employees.

Given the high share of bilingual population, we can assume that bilingual workers in Quebec can be hired at the competitive wage w, but there is a much higher wage w'>w in other provinces to hire them. Therefore, using bilingual workers raises the cost of providing financial services outside Quebec. We assume that the cost is also c' in this case.

The unique Nash equilibrium in pure strategies of this simple Bertrand game is the following: In Quebec, Big5 and Desjardins get each half of the market and provide financial services with price p which equals the marginal cost c. In the rest of the provinces, Desjardins incurs a higher cost c' to provide services, so Big5 serves the entire market and charges a price p slightly below c'.

Table B.1: Language requirements for customer-facing employees

We gathered job listings data from one of the largest Canadian job search websites (ca.indeed.com). Based on the job description, we identified those that require English, French, or other language skills. Because job descriptions are written either in English or in French, we also identify English job listings as requiring English and French job listings as requiring French. For example, a job listing written in English and mentioning in the job description that French would be an asset, would be classified as requiring both languages. We then compiled the percentage of jobs having language requirements in their description by Financial institution and by province. We drop all job descriptions that are French only in the provinces that have less than 2% native French speakers, since we do not believe they accurately reflect true language requirements. Only job listings for customer-facing employees are considered.

Region	**Bank**	**English**	**French**	**English + French**	**Other**
Canada	Big Five + CU	71%	3%	21%	5%
Canada	Desjardins + NAT	28%	6%	64%	1%
Canada except QC, ON, and NB	Big Five + CU	79%	2%	13%	5%
Canada except QC, ON, and NB	Desj + NAT	10%	0%	70%	20%
Quebec	Big Five + CU	22%	7%	70%	1%
Quebec	Desj + NAT	8%	8%	83%	1%
Ontario	Big Five + CU	77%	2%	15%	6%
Ontario	Desj + NAT	45%	5%	50%	0%
New Brunswick	Big Five + CU	64%	4%	32%	0%
New Brunswick	Desj + NAT	0%	0%	100%	0%

Table B.2: Language of high-level managers by institution

Language of most senior managers and board members of main financial institutions in Canada. Language is determined using the ethnic origin of the names. Online tool NamePrism has been used to find the ethnic origin. Source: Boardex data base

	BMO	**CIBC**	**Desjardins**	**NAT**	**RBC**	**BNS**	**TD**	**Total**
English	528	675	36	77	345	367	297	2366
As % of total	74%	70%	14%	31%	66%	71%	73%	65%
French	62	76	204	132	50	42	25	591
As % of total	9%	8%	78%	54%	10%	8%	6%	16%
Other	127	215	22	36	127	109	87	723
As % of total	18%	22%	8%	15%	24%	21%	21%	20%
Total	717	966	262	245	522	518	409	3639

Table B.3: Bilingualism across Canadian provinces

This table shows the percentage of bilingual individuals by province in Canada. Source: Stats Canada.

Province	% Bilingual (English + French)	% French
Alberta	6.9%	1.9%
British Columbia	7.3%	1.3%
Manitoba	9.1%	3.9%
New Brunswick	33.3%	32.3%
Newfoundland and Labrador	4.7%	0.4%
Nova Scotia	10.5%	3.6%
Ontario	11.5%	4.1%
Prince Edward Island	12.1%	3.2%
Quebec	41.3%	78.2%
Saskatchewan	5.0%	1.7%

Table B.4: Bilingualism and entry of financial institutions

This table shows the percentage of bilingual individuals in the markets where financial institutions enter. Only markets with population less than 50,000 have been used. Source: Stats Canada.

	Big5 enter		Desjardins enters		NAT enters	
Province	% Bilingual	% French	% Bilingual	% French	% Bilingual	% French
Alberta	6.5%	2.5%			0.0%	0.0%
British Columbia	7.4%	1.6%			11.0%	1.1%
Manitoba	5.5%	2.3%	31.4%	22.5%	16.6%	9.4%
New Brunswick	35.2%	31.8%	48.4%	56.8%	45.8%	50.9%
Newfoundland	4.6%	0.3%	17.8%	4.4%		
Nova Scotia	7.8%	2.2%	74.9%	65.8%		
Ontario	12.5%	7.0%	29.6%	23.6%	19.3%	13.7%
Prince Edward Island	11.7%	2.7%			13.5%	3.2%
Quebec	38.9%	85.6%	34.2%	88.6%	35.8%	87.9%
Saskatchewan	4.5%	1.8%				