The Change in Bricks and Mortar Banks and their customers in the City of Toronto, 2016-2019

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Author’s Declaration

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Abstract

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Master of Spatial Analysis 2020
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Abstract

The purpose of this research paper is examining the future of brick-and-mortar retail in finance with the rise of technological applications by comparing datasets of 2016 to 2019. This is common in demographics such as millennials with certain demographic traits. Some of the key objectives are analyze the change in customers in close proximity to ‘Big Five’ bank branches. The factor analysis technique was used to group the demographic variables such as age, education, income, occupation, and immigration status. The results concluded accessibility to bank branch did not change substantially for the central part of Toronto, however, the population around the banks – particularly those within a proximity of 1 km – did change between 2016 and 2019.

Keywords: Dissemination Area (DA), Factor Analysis, Proximity Analysis
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1. Introduction

Retail banking in North America has been facing an increasingly competitive and changing business market. Reductions in government regulation has resulted in a hybrid industry that is combining traditional way of banking (in branch) with technological ways (online, telephone). In addition, globalization and the development of new technology, such as the internet, has facilitated the introduction foreign banks in the markets irrespective of physical presence (Edward, Barry & Jonathan, 1999). The combination of these forces has led banks to either increase or decrease the branch network channels, which is influenced by the demand of consumers. In order to meet this demand, banks consider similar target markets for their bricks and mortar locations. Many researchers suggest that banks may choose to target similar markets because the similarity creates an opportunity to standardize some elements of the marketing strategy (Ozsomer & Prussia, 2000). Therefore, clusters of different bank branches tend to congregate in the same area. However, some banks are reducing the number of branches. For example, The Royal Bank of Canada (RBC) announced that it cut back its branch network by 4% in 2015 which is equivalent to the closure of 40 branches, with the overall goal of the bank to reduce its branch network by 20% (Reuters, 2018).

The changes in bank networks is important to study as there are 18,640 branches located in Canada. The branch networks cost over $10 billion to operate annually or more than $300 per customer (Armstrong, 2013); and additional costs associated with the current bricks and mortar banks, such as investing money into the branches to provide services to clients.

On top of this, it has been observed that in specific demographics do not use the branches and prefer to use other channels or combination of channels (Armstrong, 2013). Banks must consider factors such as target market’s lifestyle, life experiences when identifying which
channels and services should be offered in a region or a city (Lassar, Manolis, Lassar, 2005). Indeed, technological advancements are becoming central to the everyday lives of humans. The rapid growth of technology has introduced major changes in the worldwide economic and business atmosphere. These developments of technology in the banking sector have led to better and effective tools of communication and transactions for clients (Booz et al, 1997). The financial institutes utilize technology to improve services for their customers. The progressive competitive atmosphere in the banking sector has resulted in developing and operating substitute deliverance channels such as telephone banking. The recent deliverance channel to be introduced is electronic or online banking (Daniel, 1999). The introduction of these channels is impacting the usage of branch by customers. Consequently, the branch network can either increasing or decreasing and has evolved over time to meet the needs of consumers.

These are some of the long-term trends related to physical bank location closures, there are also shorter-term factors that may impact this. For example, the 2020 outbreak of Coronavirus (COVID-19) forced banks to temporarily close, limit physical access, or reduce hours of operations for many branches. The same strategy has been applied by Toronto Dominion Canada Trust (TD) and is encouraging customers to use digital channels for their day-to-day banking (Daley, 2020). This has sparked a new threat to the branch network of banks; thereby, more branch closures are expected (Scenarios for Resilient Leaders, 2020).

The purpose of this research is to examine the changes in the branch network by comparing the years of 2016 to 2019, and the related changes in access to nearby demographic groups. The change branch counts are expected to be influenced by the following: consumer’s age, education, income, occupation and immigration status.
1.1. **Financial Institution and the State of Canadian Banking**

Financial institution can be defined as a company engaged in business of dealing with financial and monetary transactions such as deposition, loans, investments and currency exchange (Thomas, 2009). The word “bank” comes from the Italian word *banco*, the bench on which money changers sat to conduct business. The specific services offered vary widely between different type of financial institution such as investment, insurance companies and commercial/ retail banking. Commercial/retail banks are a form of financial institute that accepts deposits and provides services such as checking account, create business by providing personal and mortgage loans, savings account to individuals and small business (Berger & Humphrey, 1992). The big five commercial/retail banks in Canada offer all these services; whereas, smaller banks do not offer services such as mortgages.

Canada has 88 banks and credit unions consisting of 18,640 bricks and mortar locations, or branches, to serve customers across the country. In 2017, 574 million banking transactions were completed online and 398 million completed using mobile banking. The increase in the number of transactions using other channels beyond in-person shows the reduction of branch network. Thus, in 2018 banks spent $14 billion on expanding these channels. In the last decade, banks spent $9 billion on technology-based channels such as online and mobile (Canadian Bankers Association, 2020). This indicates that consumers prefer online and mobile banking over the branch. According to Canadian Banker Association, 91% of Canadians believe banking became more convenient due to technology and 76% of Canadians do most of their banking using online or mobile channel.

The two largest Canadian banks are Royal Bank of Canada (RBC) and Toronto-Dominion Bank (TD), each of whom reported earning $14 million a year from each of their local
branch. Hence, this shows the increase in the number of branches to 1,201 for RBC and 1,091 for
TD to serve the customer (Alexander, 2019). A study conducted by Mintel (2018) reported that
eight in ten Canadians visited a physical branch of the bank in past year, a quarter visited their
local branch more than once in a month. These changes tend to vary depending on the location of
the bank. For example, in Germany, the percentage of individuals visiting a branch once in a
month has declined by 29%. Nonetheless, the biggest drop has been witnessed in Sweden where
it dropped from 27% to 8% (McKinsey & Company, 2020). According to the Canadian Bankers
Association-2019, Canadian banks are meeting the evolving preferences of their customers. The
change in the demographics is bringing in the new changes to the way people conduct their
everyday banking.

These top five banks are: Royal Bank of Canada, Bank of Montreal, and Canadian
Imperial Bank of Commerce, TD-Canada Trust, and Bank of Nova Scotia (Cohen & Mazzeo,
2010). The ‘Big Five’ financial institutes have approximately 5,300 branches out of 18,640
branches in Canada and majority of these branches are in the City of Toronto (Canadian Banks,
2015). Nonetheless, making 28% of bank branches in Canada. These branches have different
branch formats such as student, new immigration, and traditional branches (RBC, 2020). The
student format branch is designed to target student and are located near or on college and
university campus. For example, BMO branch at York University and it serves students by
providing information on different types accounts and loans. In addition, a branch designed to
target new immigrant that was introduced by RBC in the city of Brampton is located nearby
service Ontario and other facilities offered by government to immigrant. The purpose of this
branch is to educate newcomers about Canadian banking system and help them with the different
stages of life. For instance, with their growing family the bank will provide them information about loans (cars, education) and mortgages.

1.2. Research Question

The study aims to understand who has access to banks and if this is changing, broadly situated in a context of examining the future of brick-and-mortar retail and banking – and in particular thinking about the potential for easier accessibility through technology. While not directly examined here, the demographics around banks and the changing levels of physical access may provide clues on broader patterns occurring and suggest whether branch locations are at risk for closing because of a changing local customer base. This is becoming more common in some demographics (i.e. millennial residing in urban areas) that will likely change the future of everyday banking needs. On the flip-side, it also considers whether there are impacts of changing branch networks on who has access to physical, bricks and mortar locations. The study will be conducted by comparing spatial data of 2016 and 2019 in the city of Toronto with the key objective to: *examine the change in the number and locations of branches in Toronto between 2016 to 2019 and determine if local demographic characteristics of customers with access to these banks were impacted by the changing patterns (impact on age, income, education, occupation and immigration status)*.

These key objectives would be answered using datasets such as Census 2016, and location of financial institutes (bank branches). Some of the software to be used included ArcMap and SPSS. First, factor analysis will be used to understand the demographic characteristics of study area. Next, proximity analysis will explain the accessibility to bank branch by individuals with
certain characteristics. Nonetheless, these datasets are spatial to understand the impact of demographic in selecting or planning banking services.

1.3. Study Area

Canada has population of about 37 million and it has ten provinces and three territories. Its most populated province is Ontario with the population of roughly 15 million (Statistics Canada, 2020). Ontario has fifty-two cities and sixteen of them are Census Metropolitan Areas (CMA). The City of Toronto is Canada’s largest city and is known for its diversity and for many educational institutions (City of Toronto, 2020). Therefore, it is the selected area of study as it has diversity, majority of the bank branches and immigrants to give the big five to have various branch formats to serve customers (Figure 1.1).

City of Toronto has a population of approximately 3 million, and is very diverse in terms of age, income, and education of residents, and their household sizes. In 2016, the City of Toronto was reported to make up 8.67% population of Ontario (Van der Werf et al., 2020). It is the anchor of the Golden Horseshoe surrounding the western end of Lake Ontario. Toronto is an international center of business, finance, arts, culture and is recognized as one of the most multicultural cities in the world. According to Census 2016, city’s gender population is 48% male and 52% females. Overall, women out numbered men in all age groups from 15 years and above (City of Toronto, 2020). The city of Toronto has the second most educated individuals. Since, 28% of residents have a university degree. The diversity has resulted in 140 different languages to be spoken in the City of Toronto. This makes up the 70% of the different languages spoken in the entire country of Canada. Additionally, one-quarter of population in the City of Toronto define themselves as a visible minority.
1.4. Organization of Dissertation

This paper is organized as follow: first an overview of retail banking in North America is provided, focusing on the state of Canadian banking industry and study area. Then, a literature review develops a conceptual framework of evolving financial institute from a historical lens and various factors that influence branch channel. Next, the research methodology is explained with the description of various types of datasets used to analyze the changes in the branch network and potential customer demographics. In addition, the results and data analysis are presented. Finally, discussion explains the results and points the key areas for future research. Overall, this study aims to fill the gap in the literature by focusing on geographic level at census subdivision in the City of Toronto.

Figure 1.1: Location of City of Toronto, the study area (in pink).
2. Research Context and Literature Review

The literature review is intended to provide historical and spatial context upon which this research is based. Most of the literature, examines the use of services provided by banks to certain demographics and increase and decrease in the branch network due to consumer’s preference. Some papers measure the Canadian banking system to target certain racial and immigrant groups. These are selected because the role socio-economic variables play in determining the use of branch. Nonetheless, the purpose of this research is to look at the changes in the branch network due to the change in demographic and impacts on services.

This section proceeds as follows. Section 2.1 provides a condensed history of the banks and financial institution throughout the time. Section 2.2 examines the current banking of Canada and explaining how it has evolved over time to meet the changing needs of consumers. Section 2.3 aims to explain the changes in the service of delivery due to demographics and proximity. Finally, Section 2.4 highlights research gaps with Section 2.5 summarizing the literature review.

2.1. History of the Banks and Financial Institution

The first ‘bank-like’ system was introduced by the ancient Mesopotamia through temples and palaces in Babylonia to provide the loan services. These loans were in form of lending out seeds, to farmers for planting to produce products (Naik, 2014). These farmers would pay-back their loan seed from harvest. These grains were stored in the warehouse that was the first evidence of a bank branch. Since, the temple can be considered a form of bank branch that provided loans in the form of seeds. These warehouses and depositors wrote orders for
withdrawal as a method of payment (Donaldson, Piacentino & Thakor, 2018). This ‘bank-like’ system was developed based on the needs of targeted demographics such as farmers. The financial institutes evolved during the medieval times. These ‘bank-like’ systems provided services to merchants but still offering crop loans and financing expeditions (Fohlin, 2014). Nonetheless, the ‘bank-like’ system has been evolving based on the needs of individuals, occupation and developed in many other parts of the world such as in Persia.

The private banks in Persia were established in 7th century BC that provided services of Pawn-broking and floating loans. In addition, these banks held leases, dug canals, and sold water to farmers (Chachi, 2005). The origin of banking was established in Venice, Italy in the year of 1157 AD where the money transfers in Lombardia who used to sit behind wooden desks and called banco. Throughout the times, financial institutions have evolved with the change in political views and professional demand (Donaldson et al, 2016). For instance, the London’s goldsmith had a similar system as the Mesopotamians and Egyptians. Their system was backed by the “money or plate” which was secured in their safes. Hence these “safes systems” evolved into banks by providing loans to general public (Huang & Wright, 2005). In the 19th-century, the Canada banking system was divided into New France and British North America and was changed into Upper and Lower Canada in 1763 (Breckenridge, 1911). It was regulated by the colonial governments. The immigrants from England resulted in farming industry to expand; which, led to an increase in the milling industry and munificent expenditures upon public works provided the Upper Canadian economy to improve (Walker, 1899). Early 1900s, Canada began to receive immigrants from other European countries and United States of America (USA). Hence the number of bank loans and deposits increased in Canada. The bricks and mortar of banks with urban center were mostly located in the province of Ontario. In 1891 the number of
branches with urban center increased in the western region (Matthews & Measner, 1987). The branch network channel is either increasing or decreasing for the banks of Canada depending on change in the demographics.

2.2. Contemporary Banking in Canada: A Changing Field

The Canadian retail banking or commercial banking features a small number of large banks that conventionally provide an extensive network of branches for their customers. Prior to 1998, branch network shrank by 23%; and after 1998 the number of branches declined by 29%. In addition, Canadians are becoming more dependent on technology for their banking needs, and the top five banks (Royal Bank of Canada, Bank of Montreal, and Canadian Imperial Bank of Commerce, TD-Canada Trust, and Bank of Nova Scotia) of Canada compete to meet the needs of changing consumers (Kiladze, 2014). These top five banks provide similar products and services and are not different in terms of their standard measures of productivity and efficiency (Allen & Engert, 2007). The banking industry has been characterized by several key facts: these large banks hold 85% of banking assets, two of these top five banks operate in 81% of census division (CD), and at least one of these operates in 98% of the CD (Dube, Hitsch & Rossi, 2009). The remainder of banking industry in Canada is described by many of the foreign and domestically owned small banks and provincially regulated credit unions. In customer services, there is an important difference in the level of competition among these banks. The retail banking is described as a stable oligopoly (DeYoung, Lang & Nolle, 2007). In other term, one bank cannot stop the other from having significant influence.

The best and expeditious way for these banks to have significant influence is using technology. In 1996 Royal Bank of Canada (RBC) became the first Canadian bank to offer some
banking services online and soon after all the other four big Canadian Bank introduced their operational websites (Royal Bank, 2020). This indicates that online banking was being preferred by customers; thus, to meet the needs of customers other banks introduced online banking. This had a huge impact on the retail branches. From 1998 to 2006, Canadian banks on average reduced the number of branches by 23%, despite a 37% increase in number of deposits (Dube, Hitsch & Rossi, 2009). Whereas, during 1982 to 1996, the banks reduced their branch network by 2.3% (Dube, Hitsch & Rossi, 2009). This indicates that prior to online banking the branch network was relatively steady and stable. From 2000-2006, the number of transactions performed electronically increased from 47 million to 300 million a year. In addition, consumers who did use online banking occasionally increased from 3% to 49% in the same period (Prince, 2007). This brings the changes in the service delivery.

2.3. Changes in the Service Delivery: Long- and Short-Term Trends

With the new technology, large banks insisted that financial industry views brick and mortar as not the most convenient form of banking as reflected by their customer’s banking habits (Carbó-Valverde et al., 2020). However, in 2018 Mckinsey Analysis reported that in western Europe banks secured 91% new customers through bricks and mortar branch, while in North America it secured 77% (Mckinsey & Company, 2020). This highlights the importance of branch channel in attracting new clients in retail banking. Globally, every households visits a teller at least once a month; whereas, in Canada, the number of households visiting a branch is decreasing as households adapt to online banking (Mintel, 2018). Many studies conducted in Canada conclude that household adapting to online banking has increased by 40% from the 1999 to 2006 (Allen, Clark & Houde, 2009). Nonetheless, the average number of transactions per
month has not changed during this period (Allen, Clark & Houde, 2009). This indicates that online banking is substituting in-person banking at a branch. This is changing the methods of delivering services to the consumers. Therefore, it is important in understanding the change of bricks and mortar of banks.

Many studies have concluded that banks cannot reduce their branch network to zero as many services such cash withdrawal (ATMs have a limit of cash withdrawal in one transactions) cannot be done online (Mols et al., 1999). One study suggested that Canadians are not adapting to only using online banking, but they prefer to combine online banking with using branch for their day to day banking needs (Allen, Clark & Houde, 2009). Therefore, it is important for the banks to analyze the change in demographics to understand the preference of branch network. The characteristics of consumer’s demographics have been widely used to differentiate the variation between segments of customers. These characteristics are age, sex, income, occupation, education, race, religion, nationality, family size and life cycle (Kotler, 1982). Using these demographics factors is attributable to the observed relationship between the use of certain products, services, and certain demographic factors (Block & Roering, 1976). The most important demographic trend is age and the change of wealth. Since, segments of population that have money to spend gain knowledge about investing (Machauer & Morgner, 2001). These variables are analyzed using factor analysis as it will highlight the importance of each variable (Sohail et al., 2003; Clemes et al., 2012; Ghalandari, 2012; Matilla et al., 2003; Ramayah et al., 2002; Mutengezanwa et al., 2013). Some studies have used regression to find any variables that are dependent on each other (Raza et al., 2013). Hence, the information such as age, education, occupation, income, and status of immigration can assist in making decision of increasing or decreasing branch network and the format of a branch.
In 2020, the COVID-19 pandemic forced customers to consider online banking, with individuals adapting to digital technologies and contactless payments. These recommendations are applied by banks in their services. As the Canadian Bankers Associations stated that banks will maintain critical services and the top five banks are encouraging customers to use other channels such online and mobile banking (Fineextra, 2020). Canada’s largest banks cut back operating hours and reduced the number of branches open to the public, limit in-person banking interaction to practice social distancing.

The changes in consumer behaviour influences the usage of branches. First, declines in the number of withdrawals from automated teller machine (ATM) have been forecasted (Accenture, 2020). As a studied conducted in United Kingdom reported that 76% of people in Europe planned to use less cash post-COVID-19 (Accenture, 2020). Second observed change is that reported by Accenture (2020) is the adoption of e-Commerce. This study has reported that 25% of customer made their first online purchase during pandemic and expect to continue shopping online (Accenture, 2020). In United States of America (USA), a survey conducted by MasterCard has concluded that 73% of customers were regularly transacting online. Additionally, 21% of these customers were first-time users of online banking. In Europe, MasterCard has reported 76% of its customers plan to continue using contactless payments (Oliver-Wyman, 2020). Nonetheless, pandemic can increase or reduce the branch network as it has changed the hours of operation and variations in serving the customers based on their demographic characteristics.
2.3.1. Age

Banks serve clients of all age groups, but the type of channels used by clients has been shown to change based on their age. Studies in Iran, Malaysia and Chile have shown that age plays an important role in determining the acceptance of online banking and use of branch network (Clemes et al., 2012; Ghalandari, 2012). The study conducted in Malaysia, for example, concluded that younger generation relatively of lesser age are more tech savvy; hence, are more likely to prefer online banking. Nonetheless, the participants of this study were already technology users between the age group of 15-44 years old (Sohail & Shanmugham, 2003). The relationship between age and technological change was investigated by many researchers who concluded that mature individuals tend to be less adaptable to technological innovations (Harrison & Rainer, 1992). In addition, mature clients are hesitant to switch to new services (Oumlil & Williams, 2000). Since, age was inversely related to technology use (Morris & Venkaesh, 2000). This shows that young individuals prefer online banking whereas mature individuals prefer in-person banking. Since, mature individuals cannot use technology. However, these studies do not explain the age of individuals that are considered as mature.

When distinguishing between ages, individuals born between 1965-1979 in North America has shown ability to adapt to technology in order to conduct day-to-day banking without the use of branch network (i.e. online; Jones & Fox, 2009). However, the same age group in Malaysia prefer patronaging physical branches over the online banking (Kolodinsky et al. 2004), whereas in USA this age group prefers to use online banking (Jones & Fox, 2009). The relative impacts of age on adapting online banking or using branch for day to day banking may vary among countries (Yuen, 2013). As in Canada, the Millennial’s (24-31 years old) and Baby Boomers (54-72 years old) say they visit their local branch more than once a month (Mintel,
The younger Canadian characterizes a prime target for branch network since they are the most likely consumers to be increasing their visits. More than 28% of bank’s consumers are between the ages of 18-24 years and find themselves visiting their local branch more as they get older (Mintel, 2018). This proves that age can increase the use of branch depending on the location of an individual.

2.3.2. Education

Education influences an individual preference in life such as type and methods of services. Research in Ghana (Nimako et al., 2013; Ameme, 2015), which analyzed the role of education on the use and preference of online banking over brick and mortar channel, suggested a relation between education and preference of banking. Moreover, higher level of education resulted in a person using online banking and less of brick and mortar channel (Ameme, 2015). This conclusion is drawn by several other researchers that level of education increases the likelihood of using online banking over brick and mortar (Mattila, et al, 2003; Mutengezanwa & Mauchi, 2013). Indeed, higher literacy rates are associated with customers being more likely to adapt to online banking (Sohail & Shanmugham, 2003). The level of education increases the use of internet or online banking due to individuals having the knowledge and exposure to technology at a younger age. Mutengezanwa and Mauchi (2013) showed a positive relation between online banking use and education level. Nonetheless, some studies argued that there is no significant difference in online banking usage or preference based on age or educational level. Some studies support that individual with higher education are less likely to adopt or use online banking as a cautious behavior towards internet banking (Couto, 2013). A study conducted a decade ago concluded that people with less education do not have employment that provides them with the knowledge and resources to use internet or online banking (Yakhlef, 2001). This
reveals that education affects the patronage of brick and mortar of banking. In addition, less educated do not work in industries that promote technology or income for internet accessibility. Therefore, individuals with less education do not use online banking and prefer bricks and mortar banking.

2.3.3. Occupation

A study conducted in India regarding the relationship between occupation and preference of using online banking or brick and mortar banking (Upadhyay et al., 2017). The study found a strong relationship between occupation and usage of online banking. Furthermore, it concluded there is a relationship between time duration of occupation and usage of online or brick and mortar banking services (Upadhyay et al., 2017). People with more prominent roles in enterprise (in private owned company positions such as director, manager, analyst) are more likely to use online banking for their day to day banking over branch network (Matilla et al., 2003; Ramayah et al., 2002; Mutengezanwa et al., 2013). Karjaluoto et al. (2002), divided occupations into two categories: white-collar and blue-collar workers. This study concluded that occupation is a significant variable as blue-collar workers prefer bricks and mortar over online banking. This indicates that blue collar individuals prefer brick and mortar banking due to the lack accessibility to resources to use online banking.

Some researchers have divided the occupations into two categories based on the industry (Kim et al., 2005). A study by Kim et al., (2005) categorized consumers with managerial, professional, and technical jobs into group 1. Meanwhile, individuals with service, labor, farming, fishing jobs into group 2. This study concluded that group 1 preferred and used online banking over bricks and mortar (Kim et al., 2005). Group 1 selected online baking as it would
improve their productivity through doing day to day banking online (Liu et al., 2001). Some studies indicated that higher educated individuals require less training in response to technological change if their occupation is related to technology (Bartel & Sicherman, 1998). The higher education and certain occupations can result in these individuals to earn income which can be another variable to impact the use of brick and mortar banking.

2.3.4. Income

Prior literature has considered several determinants that impinge on the online banking adoption decision. Income is often cited as one of the factors as online banking requires users pay fees to access the internet (Howcroft et al., 2002; Patsiotis et al., 2012). There is a positive correlation between income and use of online banking. An individual with higher income is more likely to prefer online banking than in-branch. Since, these individuals have access to internet (Sohail & Shanmugham, 2003). This is true among the young (25-34 years old) individuals. A study conducted by the Central Bank of Malta reported that young individuals with high income are using online banking; despite, s having the highest number cash withdrawal transactions (Camilleri & Grech, 2017). This exists because individuals with higher income have access to a computer and pay internet fees compare to individuals with low income. Moreover, individuals with higher income have more financial resource to manage. Hence, stronger need to use online banking over branch network (Clemes et al., 2012). It has been reported that in Chile, older individuals and low income-groups are more likely to use branch for their banking needs (Flavian et al, 2006; Sohail et al., 2003). However, some researcher has found limited evidence that income impacts whether an individual uses online banking or in-person banking (Izogo & Nnaemeka, 2012). The results of these studies are dependent on the definition of low-income.
In Canada, low income is defined as household income being less than $39,999 (LICOs, 2018). The Federal Reserve’s Survey of Consumer Finances in United States of America (USA) has reported that older, high-income consumers use bank branches more than low-income consumers (Shevlin, 2020). It can be assumed that depending on the location income can either reduce the branch network or increase it. In other parts of world, high-income individuals prefer online banking as bank branches are in low-income neighborhoods. Since, high-income individuals have access to higher education and technology, more affluent neighborhoods prefer online banking over branch (Ergungor et al., 2011). In contrast, Canada has two of the top five banks that operate in 81% of census division (CD), and at least one of these operates in 98% of the CD (Dube, Hitsch & Rossi, 2009). This reveals that in Canada high to low income individuals prefer branch for day to day banking. A main cause of this could be that Canada is one of the countries with the highest number of immigrants.

2.3.5. Status of Immigration

Immigration status refers to whether a person is a non-immigrant, an immigrant or non-permanent resident of Canada (Statistics Canada, 2020). Li & Oberle (2014), in a case study of Vancouver, noted that bricks and mortar locations are utilized by immigrants. In Vancouver banks are able to reach out to their immigrant’s populations by having a branch near other immigrant services like an ethnic grocery store. Alternatively, Li & Oberle (2014) not that in San Francisco, banks advertise and encourage immigrants to use online channels. Despite this, it was found that immigrants still prefer to use in-person banking (Li & Oberle, 2014). This study has compared two Census Metropolitan Area (CMA) yet the findings were same that immigrants use the bricks and mortar over online banking and can be applicable in the other cities of Canada.
Nonetheless, in USA banks are developing low-cost accounts and products for low-income immigrants. These banks are increasing the number of bank branches in the neighborhoods concentrated with immigrants, as they anticipate that many of these immigrants will flourish and will carry a sense of customers’ loyalty towards the bank when they become financially strong (Anderson et al., 2007). These studies support a positive relationship between the use of the bricks and mortar of banks by immigrants. Research in United States of America (USA) has concluded that immigrants with higher education and income are more likely to use banking services through bricks and mortar (Rhine & Green, 2006). The banks are reaching out to low-income immigrants to expand their business; in turn, immigrants use their services by visiting the branch rather than online. However, the visit to the branch is influenced by the distance the consumers are willing to travel.

2.3.6. Proximity

Households are more likely to use online banking over the bricks and mortar of banking as the distance to the nearest branch increases (Brevoort et al., 2009). Khan (2004) tested whether or not the geographic distribution of bank branches and the distance to the closest branch is likely to be correlated with where an individual resides. The study concluded that distance to the closest bank branch does not influence the likelihood of online banking used by a household (Khan, 2004). Distance, in combination with, factors such as income, account type, education, age and occupation affect visits to local branch. However, an important concern for the consumers is to ensure that the distance required to travel to the nearest bank branch is as short as possible (Grzelonska, 2005). A nearby branch is defined as the one that is within one mile (1.6 km) of the consumer location. Between 1994 to 2000, bank branches began to exist in
clusters as some are located with retail; while, others in centers or near an existing branch (Ho & Ishii, 2011). Many consumers are willing to drive 14-20 minutes to access a bank branch. During this time, a customer can drive from 9-13 kilometers with the speed limit being 40 and excluding the factor of traffic (Merchant, 2014). Nevertheless, some studies suggest distance to the closest bank branch does not influence the likelihood of an individual to use online banking over the bricks and mortar (Petrin & Train, 2003). This may be explained that physical branch locations may have specific services an individual requires.

2.4. Gaps in Literature

Although the literature provides valuable contributions from a theoretical and practical perspective, there are a few limitations. The review of literature suggests that most of the studies have been done on issues related to online banking and branch network in other countries such as Malaysia, Finland and Singapore; whereas, very limited work has been done in Canada.

Additionally, within the limited Canadian research, few studies were conducted in Toronto, Canada. Many of the studies are conducted at the following geographic level: country, province and city. Additionally, in Canada banks are at geographic level of census tract and have yet to be used as the scale of bank-related research. None of the existing studies were conducted at Dissemination Area (DA) level of geographic scale (Sohail & Shanmugham, 2003; Li & Oberle, 2014; Ergungor et al., 2011; Nimako et al., 2013; Ameme, 2015).

The studies conducted in Canada generally focused on evaluations of customer satisfaction of services based on the channel. The study analyze experience from customers’ perspective rather than banks perspective (Ameme, 2015). By analyzing both perspectives can
provide a full understanding of banking in Canada. Current studies only focused on the characteristics of the population within the study area, as a result the variables selected may not ‘paint a full picture’ and cover all the reasons that could influence the adoption of the online banking over banking in branch. Therefore, studies can consider looking into factors related to cultural issues, which might have an influence in the adoption of new banking methods. Another limitation of the existing research is that demographic profiles are of a group of relatively young age users (Sohail & Shanmugham, 2003; Clemes et al., 2012; Ghalandari, 2012). Therefore, researcher need to explore different age groups to provide a better picture of banking customers. For example, respondents from the older age group might find it more of a challenge to conduct online banking transactions, thus ease of use might be a factor influencing the adoption of online banking for other age group of users. Thus, researcher can conduct a comparison between users from different age groups. Lastly, study can test whether there are any causal relationships between the variables and social events.

2.5. Summary and Conclusion

Many studies concluded that age, education, occupation, income, immigration status and proximity affect the use of bank branch by consumers. Some studies use the method of factor analysis to determine and select the variables to analyze and type of consumer using bank branch. These studies use the data set that provides information on the location of customers and transactions information. Many of these studies were conducted outside of Canada. Therefore, the demographic using bank branch can change based on the locations. In addition, studies included the education, cultural and psychological behaviors of individuals. Several studies combined the location of bank branches and census variables. This is like the data sets will be
used in this research paper. The variables, data sets and methods have been selected based on this literature review.
3. Data and Methods

The broad purpose of the research explores the patterns of bank locations and their potential customers in Toronto (i.e. have the patterns of banks and the population/customers around them changed), and to understand if implications for physical branch locations (i.e. whether they will open or close). This section, describing the methods used to explore this research objective is divided into two sub-sections. First, it describes the data selection and different types of data sets used. Additionally, explaining the resources. Second describes the methods explaining the statistical and spatial techniques.

3.1. Data Selection

To conduct the analysis, two unique datasets were combined. The first contain information on the demographic characteristics of individuals residing in the City of Toronto. The second contains the location of all branches in the study area. The table (Table 3.1) provides an overview of all the datasets utilized for the analysis. It describes the variables and the source of the datasets that are to be used for this study. The project will be comparing the year 2016 and 2019. The 2016 data was obtained from the 2016 Canadian census; while the 2019 data was projected by Simply Analytics. These are further described in sections 3.1.1. and 3.1.2. more in detail.
Table 3.1: Summarize detail of data sets and variables

<table>
<thead>
<tr>
<th>Variables</th>
<th>Description</th>
<th>Scale</th>
<th>Format</th>
<th>Year</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial Institute Location (Open)</td>
<td>Big Five in City of Toronto</td>
<td>City</td>
<td>CSV</td>
<td>2016, 2019</td>
<td>Annual Reports</td>
</tr>
<tr>
<td>Financial Institute Location (Closed)</td>
<td>Big Five in City of Toronto</td>
<td>City</td>
<td>CSV</td>
<td>2016, 2019</td>
<td>Annual Reports</td>
</tr>
<tr>
<td>City of Toronto Boundaries</td>
<td>The boundaries of City</td>
<td>Dissemination Area (DA)</td>
<td>Shapefile</td>
<td>2019</td>
<td>Statistics Canada</td>
</tr>
<tr>
<td>Age</td>
<td>Age of individuals</td>
<td>Dissemination Area (DA)</td>
<td>CSV</td>
<td>2016, 2019</td>
<td>Simply Analytics</td>
</tr>
<tr>
<td>Income</td>
<td>Household Income</td>
<td>Dissemination Area (DA)</td>
<td>CSV</td>
<td>2016, 2019</td>
<td>Simply Analytics</td>
</tr>
<tr>
<td>Occupation</td>
<td>Industry working</td>
<td>Dissemination Area (DA)</td>
<td>CSV</td>
<td>2016, 2019</td>
<td>Simply Analytics</td>
</tr>
<tr>
<td>Education</td>
<td>% of Households with no diploma, degree, or certificate</td>
<td>Dissemination Area (DA)</td>
<td>CSV</td>
<td>2016, 2019</td>
<td>Simply Analytics</td>
</tr>
<tr>
<td>Immigration Status</td>
<td></td>
<td>Dissemination Area (DA)</td>
<td>CSV</td>
<td>2016, 2019</td>
<td>Simply Analytics</td>
</tr>
</tbody>
</table>

Note: The Financial Institution Locations were provided by Dr. Joe Aversa.

3.1.1. Demographic Data

The word demography comes from the Greek word *demos*, meaning “people” and *graphia*, meaning “the study of”. Therefore, demography is the scientific study of population.

The statistical and mathematical aspect of the field constitute is known as formal demography which deals with quantitative study of population- distribution and development (Trovato, 2008).

The main questions in demography revolves around *how many, what kind and where*. The purpose of these questions is to analyze certain variables (Trovato, 2008). However, this research paper examines the second question *what kind* and *where*. *What kind* answers the specific variable like age, income, occupation, and education, while *where* considers the distribution of individuals with these characteristics. The information regarding these variables in Canada is collected by Census.
Census is conducted by Statistics Canada every five years. The last Census in Canada was conducted in the year of 2016 and next Census will be conducted in 2021. Thereby, the projected population for 2019 was used. It is designed to provide information about people and housing units in Canada by their demographics, social and economic characteristics. The Census of Population is the primary source of data for certain population groups and for detailed or small geographies (Census of Population, 2020). Based on the literature review, the following Census variables were selected: age, education, occupation, income, and status of immigration. The information of these variables for year 2016 and 2019 was retrieved from SimplyAnalytics. It provides two advantages: for 2016 is provides a correction or adjustment to census data, which is using reference data of July 1st instead of May 10th and the percent net-under coverage rate for the 2016 is 2.4; and it provides a population estimate for 2019 which provides demographic insights between census collections (Environics Analytics, 2018). The population for 2019 is estimated by using innovative methods that combine econometric, demographic, and geographic models. In addition, variety of data sources such as the latest and historical Census data, present economic indicators, post central estimator, immigration statistics and economic data. This information was selected at geographic level of Dissemination Area (DA). The geographical level makes this information geospatial.

3.1.2. Spatial Data

Spatial data can be either raster or vector (only vector data is used in this study). Vector data is explained as graphical representation of the real world. There are three main types of vector data: points (i.e. bank locations), lines (i.e. road networks), and polygon (i.e. DAs, trade areas) (Spatial Data, 2020).
3.1.2.1. **Boundary Data**

Boundary data is considered vector data as it is discrete. There are two types of boundary files: cartographic and digital. The cartographic boundary shows the geographic area using the major land mass of Canada and its coastal islands. The digital boundary files represent the full extent of the geographic areas including water area (2016 Census –Boundary Files, 2020). For this research, the boundary files at the geographic level of dissemination area (DA) are downloaded from Statistics Canada. There are 3,702 DAs in the study area. These boundary files are cartographic type.

3.1.2.2. **Branch Data**

The branch data is vector geospatial data as it is point form. The point form data is most common type of vector data. It is used to represent non-adjacent features and discrete data points. This data has zero –dimensions therefore, the length or area cannot be measures. The branch location of five big banks in City of Toronto were extracted from a larger (unpublished) Canadian dataset, collected by Dr. Joe Aversa (Ryerson University, 2020). Bank branch locations were identified from annual reports from 2016 to 2019 and were then geocoded. Branches in the City of Toronto were then extracted. There were 5,267 branches of big five banks across Canada and 611 of these are in the City of Toronto. Between 2016 and 2019, 48 branches have been closed. Toronto-Dominion (TD) has 93 branches in the city therefore, it is the largest bank in the study area. In contrast, Bank of Nova Scotia has 47 branches making this bank with the smallest branch network.
3.2. Methods

This section is described into two sections. The 3.2.1. explains the statistical analysis (i.e. factor analysis) while section 3.2.2. will explain the spatial analysis combined with statistics (i.e. location-allocation). This will help in answering the objectives of this research. The statistical analysis helps to understand the importance of the selected variables.

3.2.1. Statistical Analysis

Statistical analysis assists in understanding the datasets (and in particular, assists in data reduction and simplification) and present findings that assist in preliminary exploration and interpretation of the phenomenon that is being studied (i.e. bank locations and their customers).

Factor analysis (FA) was selected for this research to reduce the demographic variables. This method has been used in similar studies (Pathria, & Saini, 2006; Sohail et al., 2003; Clemes et al., 2012; Ghalandari, 2012; Matilla et al., 2003; Ramayah et al., 2002; Mutengezanwa et al., 2013). Indeed, FA is a common method used to determine the factors that contribute to the preference of banking (Clemes et al., 2012). FA operates on the notion that measurable variables can be reduced to fewer latent variables that share a common variance and are unobservable, which is known as reducing dimensionality. FA is used when a researcher wants to discover the number of factors influencing those variables and to analyze which variables ‘go together’ (Pallant, 2020). A basic hypothesis of FA is that there are more common ‘latent’ factors to be discovered in the dataset. The aim is to find the smallest number of common factors that will account for the correlations (Pallant, 2020). FA is used for the large datasets that consists of several variables that can be reduced by grouping of variables (Pallant, 2020). FA assembles
common variables into descriptive categories and is useful for studies that involve a few or several variables.

The FA analysis was performed using the Statistical Package for the Social Sciences (SPSS). In SPSS, the principal components (PC) methods and this method will create correlation matrix. The principal components method for an initial factor extraction with a criterion eigenvalue greater than 1.0 and Varimax rotation matrix method was applied. The goal of PC is to explain as much of the variance in the variables as possible. The (n.d., 2015), recommend suppress factor loading less than 0.40 and arbitrarily the variables cross-loading were removed. If the correlation matrix between variables is small that will indicate no commonality shared between common factors. The varies is measured between the variables by the Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO). KMO is between 0 and 1, and values closer to 1 are better. A value of 0.6 is a suggested and acceptable value. The Bartlett’s test of sphericity tests the null hypothesis that the correlation matrix is an identity matrix. An identity matrix is matrix in which all the diagonal elements are 1 and all off diagonal elements are 0. The null hypothesis is rejected. The factor score of FA are mapped to conduct the spatial analysis. This process was done first on the 2016 data, and then repeated on the 2019 population data.

3.2.2. **Spatial Analysis**

Spatial analysis or statistical spatial analysis includes any techniques that studies entities using their geometric or geographical properties. In this research, the spatial variables include locations of banks, census data. The factor scores of factor analysis are mapped to visualize the distribution of it in the City of Toronto. The data used are DA shapefiles and factor analysis results. The accessibility and distance to bank branches method is discussed in next two sections.
3.2.2.1. **Proximity Analysis**

Proximity analysis is a method of analyzing locations of features by measuring the distance between them or other feature in the area. This tool in GIS software is divided into two categories depending on the type of input the tool accepts. These categories are features and raster. The raster based is cost distance tool accumulate the cost of each cell travel. Whereas the feature-based tools vary in type. For the purpose of this research, feature based tool is applied and this includes buffers. Buffers are used to delineate protected zone around features or to show area of influence. Buffer is most common method of proximity analysis. The multiple ring buffer tool was used to show the three distanced surrounding the bank locations (1 km, 4 km, and 5 km). Based on the literature review, the closest distance is around 1 km and the furthest distance consumer would commute to for services is 5 km. This method has been used for bank locations of 2016 and 2019. This will show the accessibility to bricks and mortar of banking in the area. For both the 2016 and 2019 proximity data, a spatial join was then used to extract the factor scores calculated for each DA within the three distance buffers. This allowed for comparisons in the population at different levels of access, and how this changed between 2016 and 2019.
4. Results

This section will provide the visualization of results in form of a map of City of Toronto and tables. Section 4.1. describes the results in descriptive and factor analysis. Section 4.2. includes all spatial results.

4.1. Statistical Analysis Result

For this section the analysis was conducted using SPSS. It provides descriptive statistics about the variables and explains the distribution of bank branch across the study area. In addition, it highlights the change in the distribution of brick and mortar of banks.

4.1.1. Descriptive statistics

In 2019, TD-Canada Trust had the greatest number of branches in the City of Toronto (93) whereas the Bank of Nova Scotia had the least number of branches (47). In addition, TD had the second most branch closure or consolidation in the year of 2017 (4) whereas RBC had the highest number of branch closure and consolidation. During 2017-2019 CIBC did not have any bank branch closure or consolidation. During these years, Bank of Nova Scotia did have least number of closures (Figure 4.1). City of Toronto had 659 bank branches in 2016 and it reduced to 611 branches. This change in the number of bank branches is affected by the change in demographics.
The descriptive statistics for results for demographics variables indicated the following: for 2016 and 2019, the valid number of observations for the dataset variable is 3702 (as this was the number of DAs in Toronto). In 2016, the maximum or largest value of the variable is 5417 and for the immigration status variable and it has the largest standard deviation. The highest mean out of all the variables was for sales and services 93.23. For 2019, the same variables have the large maximum value 4608, mean and standard deviation. This reveals that immigration status for the population in the study area is the variable that is changing more than the other variable.

4.1.2. Factor Analysis

The KMO measure of sampling adequacy – is an index for comparing the magnitude of observed correlation coefficients to the magnitude of the partial correlation coefficients by comparing the correlation matrix with the identity matrix. In other words, it indicates the
proportion of variance in the variables that might be caused by the underlying factors. The higher KMO is the better, the values should be between 0.00 – 0.99. In the 2016 factor analysis the KMO is 0.928; in contrast, it has decreased to 0.900 in the year of 2019. The KMO value for 2016 variable is close to one indicates that small partial correlation coefficient; however, selecting 2019 variables the KMO has decreased. But the KMO value is still good and can be preceded further for the factor analysis. If the Bartlett test significant (at $\alpha = 0.05$) then the results are ideal. The Bartlett test of sphericity tests the hypothesis that selected correlation matrix in an identity matrix, which indicates that selected variables are unrelated and not suitable for factor analysis. This is for variables using 2016 and 2019 data sets factor analysis (Table 4.1). Hence, 2016 and 2019 variables are suitable for factor analysis.

<table>
<thead>
<tr>
<th>Table 4.1: Summarized KMO and Bartlett’s Test for 2016-2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>KMO and Bartlett's Test</td>
</tr>
<tr>
<td>Kaiser -Meyer-Olkin Measure of Sampling Adequacy (KMO)</td>
</tr>
<tr>
<td>Bartlett's Test of Sphericity</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

The next step of FA is to analyze the initial communalities. The communalities are for correlation analyses, the proportion of variance accounted for in each variable by the test of the variables. The extraction communalities are estimates of the variance in each variable accounted for by the factors in the factor solution. Small values indicate variables that do not fit well with the factor solution and should be dropped from the analysis. The extraction values for Census 2016 variables are high exception of the variable Income (15,000-19,999) that is 0.593. Whereas
all the other 17 variables are in the range of 0.94 to 0.753 and it indicates these are good extraction values.

The extraction values did not change much for 2019 demographic variables as it has decreased for some variables such as education (secondary high school) is 0.698 from 0.893. The values for several other variables have increased. Nonetheless, for some of the variables the values have increased such as the variables immigration status (immigrant). The value for 2016 is 0.872 and it increased to 0.918 in 2019 (Table 4.2).

The initial number of factors is the same number of variables used in the factor analysis. However, not all the variables would be retained. The factor analysis produced 2 factors for 2016 and 2019 datasets. The variance explained by the initial solution, extracted components and rotated components is displayed. The first section of this table in SPSS shows the initial eigenvalues. The eigenvalues – are used to show total variance. Normally eigenvalues of above 1.0 are acceptable where at least 5% of the model is explained (percent variance). The total column gives the eigenvalues, or the amount of variance in the original variables accounted for by each component. The percent of the variance column gives the ratio, expressed as a percentage, of the variance accounted for by each component of the total variance in all of the variables. The cumulative percent column gives the percentage of the variance accounted for the first n components. The SPSS extracted two factors or components and the cumulative percentage was 80.94 (2016 variables) and 81.89 (2019 variables). The two factors explain 81 percent for the 2016 variables and 82 percent for 2019 variables. Only two factors in the total variance have eigenvalues greater than 1 for 2016 and 2019 variables (Table 4.3). This suggests very little association is present but there remains room for a little unexplained variation. The second section of the total variance table shows the variance explained by the extracted factors
before rotations. The cumulative variability explained by these two factors in the extracted solution is same for the 2016 and 2019 variables (Table 4.3).
Table 4.2: Summarized Communalities for 2016 – 2019

<table>
<thead>
<tr>
<th>Variables</th>
<th>2016</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Extraction</td>
<td>Extraction</td>
</tr>
<tr>
<td><strong>Age (Years)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-24</td>
<td>0.753</td>
<td>0.786</td>
</tr>
<tr>
<td>25-29</td>
<td>0.892</td>
<td>0.889</td>
</tr>
<tr>
<td>30-34</td>
<td>0.92</td>
<td>0.923</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary High School</td>
<td>0.893</td>
<td>0.698</td>
</tr>
<tr>
<td>College, CEGED</td>
<td>0.862</td>
<td>0.765</td>
</tr>
<tr>
<td>University Certificate and Degree</td>
<td>0.942</td>
<td>0.862</td>
</tr>
<tr>
<td><strong>Income (dollars in thousands)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15,000-19,999</td>
<td>0.593</td>
<td>0.616</td>
</tr>
<tr>
<td>20,000-24,999</td>
<td>0.8</td>
<td>0.847</td>
</tr>
<tr>
<td>25,000-29,999</td>
<td>0.878</td>
<td>0.858</td>
</tr>
<tr>
<td>30,000-34,999</td>
<td>0.9</td>
<td>0.865</td>
</tr>
<tr>
<td>35,000-39,999</td>
<td>0.901</td>
<td>0.828</td>
</tr>
<tr>
<td><strong>Occupation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business, Finance and Administration</td>
<td>0.907</td>
<td>0.703</td>
</tr>
<tr>
<td>Natural Sciences and Applied Sciences</td>
<td>0.869</td>
<td>0.828</td>
</tr>
<tr>
<td>Health</td>
<td>0.687</td>
<td>0.907</td>
</tr>
<tr>
<td>Education and Law, Social Community</td>
<td>0.795</td>
<td>0.821</td>
</tr>
<tr>
<td>Sales and Services</td>
<td>0.9</td>
<td>0.882</td>
</tr>
<tr>
<td>Natural Resources and Agricultural</td>
<td>0.092</td>
<td>0.851</td>
</tr>
<tr>
<td><strong>Immigration Status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Immigrant</td>
<td>0.766</td>
<td>0.789</td>
</tr>
<tr>
<td>Immigrant</td>
<td>0.872</td>
<td>0.918</td>
</tr>
</tbody>
</table>
Table 4.3: Total Variance Explained 2016 and 2019

<table>
<thead>
<tr>
<th>Factors</th>
<th>Initial Eigenvalues</th>
<th>Extraction Sums of Squared Loadings</th>
<th>Initial Eigenvalues</th>
<th>Extraction Sums of Squared Loadings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Total</td>
<td>% of Variance</td>
<td>Cumulative %</td>
<td>Total</td>
</tr>
<tr>
<td>1</td>
<td>15.235</td>
<td>72.546</td>
<td>72.546</td>
<td>15.235</td>
</tr>
<tr>
<td>2</td>
<td>1.763</td>
<td>8.396</td>
<td>80.943</td>
<td>1.763</td>
</tr>
<tr>
<td>3</td>
<td>0.964</td>
<td>4.592</td>
<td>85.534</td>
<td>0.613</td>
</tr>
<tr>
<td>4</td>
<td>0.758</td>
<td>3.609</td>
<td>89.143</td>
<td>0.432</td>
</tr>
<tr>
<td>5</td>
<td>0.487</td>
<td>2.319</td>
<td>91.462</td>
<td>0.364</td>
</tr>
<tr>
<td>6</td>
<td>0.366</td>
<td>1.743</td>
<td>93.205</td>
<td>0.338</td>
</tr>
<tr>
<td>7</td>
<td>0.257</td>
<td>1.22</td>
<td>94.428</td>
<td>0.192</td>
</tr>
<tr>
<td>8</td>
<td>0.221</td>
<td>1.053</td>
<td>95.48</td>
<td>0.161</td>
</tr>
<tr>
<td>9</td>
<td>0.175</td>
<td>0.831</td>
<td>96.312</td>
<td>0.137</td>
</tr>
<tr>
<td>10</td>
<td>0.136</td>
<td>0.649</td>
<td>96.961</td>
<td>0.112</td>
</tr>
</tbody>
</table>
The scree plot helps to determine the optimal number of components. The eigenvalues of each component in the initial solution is plotted. Generally, it is recommended to extract the components on the steep slope. The components on the shallow slope contribute little to the solution. For 2016 the last big drop occurs between the second or third components so using the first two components is an easy choice (Figure 4.2). For 2019 the inflection point was between the third and fourth component (Figure 4.3).

Figure 4.2: The scree plot for 2016 variables.
The component matrix describes the factor loadings in factor analysis. It provides a summary of weight assigned to each factor. Factors with large coefficients are closely related. In the 2016 demographics data, all the variables are assigned to component 1. This shows a strong relationship between the selected variable. However, the 2019 demographic data reflects that all the variables are related except for Natural Sciences and Applied Sciences variables. This variable is in component 2 without any other variable. It can be assumed this variable is not related to other variables.

**Figure 4.3: The scree plot for 2019 variables.**

The component matrix describes the factor loadings in factor analysis. It provides a summary of weight assigned to each factor. Factors with large coefficients are closely related. In the 2016 demographics data, all the variables are assigned to component 1. This shows a strong relationship between the selected variable. However, the 2019 demographic data reflects that all the variables are related except for Natural Sciences and Applied Sciences variables. This variable is in component 2 without any other variable. It can be assumed this variable is not related to other variables.
The idea of rotation is to reduce the number of factors on which the variables under investigation have high loading. It assists in determining the representation of the components. The number of factors remains same for the 2016 and 2019 variables; however, the variables are different for each factor for 2016 and 2019. The variable such as occupation (Natural Sciences and Applied Sciences) moved from factor 1 in 2016 to factor 2 in 2019. In addition, reverse occurred for occupation category sales and services. It was part of factor 2 in 2016 and moved to factor 1 in 2019 (Table 4.5). This information was used to categorize each variable into two factors to give a name to each factor based on the variables (Table 4.4).
Table 4.4: Comparison of Rotated Component Matrix 2016 and 2019

<table>
<thead>
<tr>
<th>Variables</th>
<th>2016- Component</th>
<th>2019-Component</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td><strong>Age (Years)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-24</td>
<td>0.694</td>
<td>0.521</td>
</tr>
<tr>
<td>25-29</td>
<td>0.872</td>
<td></td>
</tr>
<tr>
<td>30-34</td>
<td>0.859</td>
<td></td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary High School</td>
<td></td>
<td></td>
</tr>
<tr>
<td>College, CEGED</td>
<td>0.543</td>
<td>0.753</td>
</tr>
<tr>
<td>University Certificate and Degree</td>
<td>0.938</td>
<td></td>
</tr>
<tr>
<td><strong>Income (dollars in thousands)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15,000-19,999</td>
<td>0.728</td>
<td></td>
</tr>
<tr>
<td>20,000-24,999</td>
<td></td>
<td>0.792</td>
</tr>
<tr>
<td>25,000-29,999</td>
<td></td>
<td>0.841</td>
</tr>
<tr>
<td>30,000-34,999</td>
<td></td>
<td>0.853</td>
</tr>
<tr>
<td>35,000-39,999</td>
<td></td>
<td>0.838</td>
</tr>
<tr>
<td><strong>Occupation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Business, Finance and Administration</td>
<td>0.89</td>
<td></td>
</tr>
<tr>
<td>Natural Sciences and Applied Sciences</td>
<td>0.879</td>
<td></td>
</tr>
<tr>
<td>Health</td>
<td>0.712</td>
<td></td>
</tr>
<tr>
<td>Education and Law, Social Community</td>
<td>0.842</td>
<td></td>
</tr>
<tr>
<td>Sales and Services</td>
<td>0.53</td>
<td>0.786</td>
</tr>
<tr>
<td>Natural Resources and Agricultural</td>
<td>0.51</td>
<td></td>
</tr>
<tr>
<td><strong>Immigration Status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Immigrant</td>
<td>0.61</td>
<td></td>
</tr>
<tr>
<td>Immigrant</td>
<td></td>
<td>0.73</td>
</tr>
</tbody>
</table>
Table 4.5: Rotated Component Matrix Factor Naming

<table>
<thead>
<tr>
<th>Factor 1</th>
<th>2016</th>
<th>2019</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Factor Name:</strong></td>
<td>Non-Immigrant Educated Millennial Professional Below Poverty</td>
<td>Poorest Certified Arts Millennial</td>
</tr>
<tr>
<td><strong>Variables:</strong></td>
<td>Non-Immigrant, Natural Resources and Agricultural, Education and law, Social Community, Health, Business and Finance, Income (15,000-19,999), 20-24 years old, 25-29 years old</td>
<td>20-24 years old, 25-29 years old, 30-34 Years old, College Certification, Education and law, Social Community, Health, Business and Finance, Income (15,000-19,999)</td>
</tr>
<tr>
<td>Factor 2</td>
<td><strong>Factor Name:</strong> Poor Immigrant Sales Service</td>
<td><strong>Factor Name:</strong> Professional Educated Canadian Residents</td>
</tr>
<tr>
<td><strong>Variables:</strong></td>
<td>Immigrant, Sales and Services, Income (20,000-24,999 and 25,000-29,999 and 30,000 -34,999), Secondary High School, College</td>
<td>Immigrant, Non-Immigrants, Income ((20,000-24,999 and 25,000-29,999 and 30,000 -34,999), Secondary High School, Natural Resources and Agricultural, Natural and Applied Sciences.</td>
</tr>
</tbody>
</table>

4.2. **Spatial Analysis Results**

This section is describing the distribution of factor score and proximity analysis. Section 4.2.1. shows the distribution of factor scores across the study area. In addition, comparing 2016 to 2019 and explaining the change in demographics. Section 4.2.2. is describing and illustration of bank branch based on distance to analyze if the bank branches are accessible in every area of the study area.

4.2.1. **Factor Scores of Factor Analysis**

Factor Scores can be used to extrapolate factor analysis to regression or cluster. The score range commonly from –2.0 to 3.0. The maps indicate factor score from -2 to approximately 3. For 2016, the variables in factor 1 (Non-immigrant Educated Millennials Professionals Below Poverty) are: Non-Immigrant, Certificate or University Degree, Age (20-24 years old, 25-29
years old, 30-34-year old), Business Finance and Administration, Health, Natural Science and Applied Sciences, Natural Resources and Agriculture, Education law and Social Community and Income ($15,000 – $19,999). The map indicates negative or inverse factor score in the northern, eastern and western part of City of Toronto. Whereas, the central Toronto has factor score is ranging from negative to positive values (Figure 4.4). This is the downtown area of the study area. This area has the large number of individuals between the age of 20-34 years old, graduate from college or university. These individuals belong to professional industries of: Health, Finance and administration, Natural Resources and applied sciences, education law and social community (Figure 4.4). Closer to the Lake Ontario, in central part of Toronto, the values are more positive. This is the area where bank branches are clustered together (Figure 4.4). In contrast, the eastern part of the study area has negative scores and no location of bank branch. In addition, in the central north of the study area the value run from negative to positive. Hence, bank branches are dispersed.

The second factor for 2016 is called: Poor Immigrants in Sales Services. The residents who are working in the sales services industry are in the north and east part of the study area (Figure 4.5). Since, the values are more positive in those DA. Nonetheless, the bricks and mortar of banks do not have locations clustered in those DA. Whereas, in the central or downtown of Toronto the values of individuals with characteristics of being immigrant, low income and employed in sales services are negative (Figure 4.5). These DA have larger number of bank branches. This shows bank branches are not utilized by immigrants who are employed in sales and services industry. The DA with positive value for factor 1 has negative value for factor 2.

For 2019, the variables for factor 1 (Poorest Certified Arts Millennials) are: Income ($15,000 – $19,999). Age (20-24 years old, 25-29 years old, 30-34 years old), college, university
degree, education and law, social community, health, business and finance, sales and services. The pattern of distribution for individuals with these characteristics reflects 2019 (Figure 4.6). The central part of the study area has clustered of positive values. In contrast, the factor 2 (Professional Educated Canadian Residents) are dispersed in outskirts of the study area rather than the central part (Figure 4.7). The downtown Toronto has negative values as it does not have high number of individuals with these characteristics. This indicates that in 2019 bank locations are clustered in DA where educated millennials are residing. Nonetheless, the central Toronto (study area) has values from negative to positive (Figure 4.6). Whereas in 2016, this area has positive values (Figure 4.4). Moreover, the values for northern part of the study area are negative therefore, few branches. In the east, the values are more negative than 2016 and banks do open new branch. However, reduce the number of branches. This decreases the level of accessibility to a bank branch to a resident (Figure 4.4 and Figure 4.6). For east end, traveling a distance of 5 km does not provide access to a bank branch.
Figure 4.4: The distribution of factor 1 scores across the study area. The values ranging from negative to positive.
Figure 4.5: The distribution of factor 2 scores across the study area. The values ranging from negative to positive.
Figure 4.6: The distribution of factor 1 scores across the study area. The values ranging from negative to positive.
Figure 4.7: The distribution of factor 2 scores across the study area. The values ranging from negative to positive.
4.2.2. Proximity Analysis

The accessibility to a bank branch was analyzed using proximity analysis. In the year of 2016, bank branches were more accessible. Nearly every individual residing in the study area has access to a branch within 5 km. The east of study area, however, does not have many branches so there are DAs that are not within 1 km of a bank location. A similar pattern is found in the west-end of the study area (Figure 4.8). When this area is compared with the factor score of 2016, these areas have negative value. Hence, low population of individuals from ages 25-34 years with the characteristics of being non-immigrant employed in the industry of natural resources, social community, health, business and finance. In contrast, the central part of the study area has largest number bank branches (Figure 4.8). These branches appear in cluster pattern. The factor score values for those DA’s are either positive or transitioning from negative to positive. Thus, these DA have large population of individuals between the ages 25-34 years old, employed in industries such as natural resources, social community, health, business and finance. Nonetheless, these individuals belong to low-income group and are grouped: Non-immigrant educated millennial professional below poverty. In 2016, bank branches are operating in DAs that have negative factor score. It can be described as those DA’s do not have or very little population of non-immigrant educated millennial professional below poverty.

In contrast, 2019 the accessibility to a bank branch decreased as fewer branches appeared on the map. The proximity analysis reveals accessibility to bank branch has decreased for the individuals residing in the east part of the study area (Figure 4.9). Moreover, the similar pattern can be noticed in the northern part of study area (Figure 4.9). This indicates that DA’s with negative factor score have fewer or no bank branches when compared to the other DA’s that have positive factor score and cluster of bank branches. The average factor scores are positive for
factor 1 in 2016 and 2019. The average factor scores for factor 1 has increased for 1 km and 4 km in 2019; however, it has decrease for 5 km (Table 4.6). The factor scores of factors 1 and factor 2 in 2016 are compared, we see the factor score going from positive negative (Table 4.6). This average is supporting the factor analysis based on accessibility. The area with positive factor score has more accessibility to a branch and to larger number of branches. The accessibility to a bank branch has decreased in 2019 compare to 2016; nonetheless, bank branches are still accessible in some of DA’s. The branches are more accessible in the central part of the study area.

**Table 4.6: Summary of the Average Factor Score**

<table>
<thead>
<tr>
<th></th>
<th>Factor 1</th>
<th>Factor 2</th>
<th>Factor 1</th>
<th>Factor 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 KM</td>
<td>0.471</td>
<td>-0.159</td>
<td>0.531</td>
<td>-0.157</td>
</tr>
<tr>
<td>4 KM</td>
<td>0.161</td>
<td>-0.144</td>
<td>0.164</td>
<td>-0.11</td>
</tr>
<tr>
<td>5 KM</td>
<td>0.115</td>
<td>-0.136</td>
<td>0.112</td>
<td>-0.104</td>
</tr>
</tbody>
</table>
Figure 4.8: The accessibility to a bank branch in the City of Toronto in 2016
Figure 4.9: The accessibility of bank branches in City of Toronto in 2019
5. Discussion / Conclusions

This research had two main objectives in exploring banking in Toronto between 2016 and 2019. The first was to understand if there were changes in the patterns of banks and their customers. Based on the research a general conclusion is the is a change in the demographics within close proximity of branches 2019 compared to 2016. This could be due to changes in the bank network, as number of bricks and mortar locations has been reduced in city of Toronto, but could also be capturing a change in the population dynamics of the city. Though these changes are subtle. However, the accessibility to bank branch did not change for downtown Toronto banks as it still has large branch network channel. As the distance increase, the accessibility to a bank branch decreases as it can be noticed in the east, west and north part of study area. This is an important factor as consumer like to commute less than 2 km to use a bank branch. These similar findings were concluded by a study conducted in USA that looked at distance to nearest branch is an important factor in the use of a branch (Ho & Ishii, 2011). The demographic has changed for the central part of the study area. In 2016, the central part was occupied by residents to non-immigrant educated millennial professional below poverty. In 2019, it has changed to low-income certified arts millennials. The accessibility has remained the same for these DA’s.

5.1. Implications

Banks will continue reducing their branch network channels. Some studies have concluded that bank consolidations have improved banks financial performances. This is the approach applied by banks in USA and Malaysia (Hughes et al., 1999). The results are positive; in other words, consolidation is beneficial for banks. In order, to serve customer a location of branch and design will be on the needs of consumers demographic characteristics. This will
reduce the accessibility to bank branch. Consumers will use the online banking for their day to
day banking needs. This will increase due to COVID-19 as social distancing and public safety
efforts have changed operations and accessibility of banks. If these trends continue, there will be
implications for the patronage of the physical locations. In Toronto, it was noted that factor 1
was higher at closer proximity in 2016 and 2019, while factor 2 remained steady as distance
increased. This suggests that non-immigrant, educated millennial with less affluency live in
closer proximity to banks on average. Since these are a group more likely to use online services,
there is potential that the banks that are in close proximity to this population may see reduced in-
person patronage.

5.2. Strengths of the Study

The review of literature suggests that most of the studies have been done on issues related
to online banking and branch network in other countries. However, insufficient work has been
done in Canada. This study was conducted at geographic level of dissemination area (DA). In
addition, the census variable information was used for analyses. The proximity analysis showed
that bank branches are not accessible to all the individuals living in the study area. This study did
not combine any other statistical analysis that other studies have combined such as regression or
cluster. The factor score helped to group the variables. It showed the distribution of
demographics characteristics across the study area. This research combined the statistical
analysis with the spatial to provide visualizations.
5.3. Limitations and Further Research

This research paper provides valuable contributions from theoretical and practical perspective, yet some limitations are present. First, this research was conducted in City of Toronto with assumption that all young individuals require in-person banking services. That can be extended to including all the age groups. Since banks serve customers of all ages. Perhaps changing the study area in a different geographic area may reveal different results within Canada. Therefore, future researchers should select two study areas that are similar in characteristics and compare the use of bricks and mortar network. Secondly, this research paper uses the Census demographic information and literature review for variables. However, many other factors may influence consumer’s use of a bank branch such as previous life experiences. Further research is required to identify the other variables that can decrease or increase the use of branch channel. This is particularly important when comparing different lifestyles. Thirdly, this research paper focused on the consumer’s needs; excluding, target revenues expected to be generated by the banks. Therefore, future research should focus on the bank’s perspectives mainly look at these locations are increasing the bank profitability or not. Since, banks branches are to serve customers but to make money from providing those services. Finally, banking provides education programs and seminars when encouraging consumer to utilize online channels in the COVID-19. A main question remains unanswered is does online banking generate more revenues compare to traditional banking?

5.4. Conclusion and Summary

The research paper looked at the patterns in the demographic characteristics of customers within close proximity to a bank branch. The FA analysis showed that factor score composite
were calculated the variation of these variables and application of these variables. The FA divided all the variables into two factors for both 2016 and 2019. The variables changed in the factors for 2016 and 2019. It showed branches are moving from immigrant to non-immigrant. In addition, the population within close proximity of the bank branches accessibility has changed from 2016 to 2019.
6. References


