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Abstract

Branchless banking has proven to be an effective model to extend financial services to underserved populations. However, even though they are often mentioned, the benefits accrued to the network of retail stores outsourced as financial service providers—a key party to the branchless banking model—have not been rigorously quantified. Using a difference-in-differences matching approach, and taking advantage of an abrupt reduction in the size of the network of retail stores that served as non-bank correspondents, I estimate the benefits in terms of foot traffic, sales, and use of financial services that retail stores gain by having a non-bank correspondent contract. The results show that in an urban environment with a high concentration of financial service providers, and after years of expanding the network, sales were 8.7 to 13.2 percent higher for businesses that have a contract as a non-bank correspondent compared to similar businesses that lost their non-bank correspondent contracts during that year. Businesses with contracts also exhibit higher use of financial services. They are 26.7 percentage points more likely to have a business bank account and 20.1 percentage points more likely to have credit compared to similar businesses that lost their non-bank correspondent contracts during that year. Additional exercises show that gains are higher in areas with a lower concentration of bank branches and competing non-bank correspondents.

JEL Classification: *G23, G21, O16, L25*

Keywords: Non-bank correspondent, branchless banking, financial inclusion, impact evaluation

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1 Introduction

There are about 1.7 billion adults worldwide without a bank account, 31 percent of the global adult population.[1] Among the reasons cited by the unbanked for not having an account is affordability: fixed transaction costs and annual fees that make small transactions unaffordable for a vast swath of the population. Lack of competition and inadequate infrastructure are at the center of the problem (Demirguc-Kunt et al., 2015). Branchless banking, however, offers the potential to reduce these costs by leveraging real-time communication technologies and a network of brick-and-mortar retail outlets outsourced as financial service providers.

The branchless banking business model can be bank-based, if the customer has a direct contractual relationship with a financial institution, or non-bank-based if the customer has no direct contractual relationship with a financial institution but can exchange cash for an electronic record of value at the network of retail outlets (as in the case of M-PESA in Kenya). In both cases the retail outlet uses technology—point-of-sale terminals and cards, or mobile phones—to identify customers and authorize transactions electronically. Mobile phone-based delivery channels are usually led by mobile network operators while card-based delivery channels are usually led by banks (Lyman, Porteus, and Pickens; 2008).[2]

Retail outlets (convenience and grocery stores, lottery kiosks, gas stations, postal services, bakeries, pharmacies, etc.) are authorized by financial institutions or mobile operators as a distribution channel and provide access to basic financial services; they become access points to the formal financial system. The arrangement is governed by private contracts that determine the scope of services, fees received, risk shared, etc. The main characteristic of these stores is that their core business involves managing cash, allowing them to pool the cash requirements of the clients in the catchment area. In this study, I focus on the bank-based model and the arrangement between financial institutions and non-bank retail outlets, or non-bank correspondents.

Non-bank correspondents allow financial institutions to grow by reaching areas that are too costly to serve using bank branches. They can serve low-income and rural populations in areas where it is not profitable to establish a branch due to the large fixed cost and the low value of the average transaction. They can also help decongest branches by transferring activities from existing branches to non-bank correspondents. Assunção (2013) shows how non-banking correspondents eliminated entry barriers for the provision of banking services in Brazil. By extending access to the formal financial sector, non-bank correspondents help foster financial inclusion at a lower cost. In addition to providing access to the formal financial system, non-bank correspondents provide benefits to the population by offering flexibility in terms of hours of operation, and reduced travel and wait times even in areas where there are existing branches. Another benefit mentioned in the literature is the accessibility for illiterate and very poor clients who might feel intimidated in branches and more comfortable doing financial transactions via a well-known retailer in their neighborhood (Kingori, 2015). Carabarin et al. (2016) find large positive, significant effects of the entrance of non-bank correspondents on the volume of savings and the number of saving accounts in Mexico at the municipal level—driven mainly, but not completely, by people switching from rival banks to

[1] Last available estimate from The Global Findex Database, 2017.

[2] Banks can use cards or mobile phones to identify customers. Mobile network operators use mobile phones to identify customers and provide store-of-value accounts (mobile wallets) without the need of owning a bank account—usually backed by bank deposits. Some banks, in partnership with mobile network operators, offer bank accounts linked to a mobile wallet.

take advantage of the convenience offered by correspondents. Bruhn and Love (2014) find that the opening of mini branches in retail spaces by Banco Azteca had a positive impact on labor market activity and income levels, especially in municipalities with lower pre-existing bank penetration and for low-income individuals. Suri and Jack (2016) find that access to the mobile money system in Kenya, M-PESA, increased per capita consumption levels and lifted two percent of Kenyan households out of poverty—driven by increased financial resilience, savings, and labor market outcomes.

Non-bank correspondents offer clear benefits for financial institutions and their clients. The financial system also argues that businesses that enter into correspondent contracts with banks benefit from more traffic and higher sales, and improved image and reputation, in addition to new revenues that come directly from transaction fees and access to financial products. Although these benefits are often mentioned, they have not been rigorously quantified.

I estimate the benefits that businesses obtain by having a correspondent contract using three main data sources: (1) primary data collected in 2015 and again in 2016 from a sample of 2,408 non-bank correspondents located in the provinces of Pichincha and Guayas, in Ecuador; (2) administrative data about the number of financial transactions completed per month by every active non-bank correspondent in these provinces from January 2014 to December 2017; and (3) secondary data on average radiance composite images using nighttime data from the Visible Infrared Imaging Radiometer Suite (VIIRS) Day/Night Band (DNB) from the Earth Observation Group at the National Oceanic and Atmospheric Administration (NOAA) National Centers for Environmental Information (NCEI). The sample was drawn randomly from the universe of 4,580 non-bank correspondents affiliated with the largest bank in Ecuador, the partner bank, and active in these provinces in July 2015. During the first quarter of 2016, the partner bank implemented a strategy to improve the efficiency and productivity of its correspondent network by reducing the number of businesses with correspondent contracts by about 30 percent. This reduction allowed me to compare sales, number of clients served, and use of financial products for businesses that lost their correspondent contracts versus businesses that did not. All analysis presented in this paper is based on data from non-bank correspondents affiliated with the partner bank. Although there were other banks in Ecuador that offered these services in 2015, the partner bank had the largest penetration of the service—in July 2015, the bank had 54.3 percent of all non-bank correspondents in the country while the following bank had 20.3 percent. At the time, there were five banks in the country offering non-bank correspondent services.[3]

The decision to terminate the correspondent contract was made unilaterally by the bank and was based on sales and sector of economic activity. To account for the fact that the selection of businesses whose contracts were terminated was not random, and thanks to the fact that the decision to terminate the correspondent contract was made unilaterally by the bank and not by the business, I use propensity score matching techniques to find, in a group of businesses with contracts, those businesses that have similar observable characteristics to the businesses that lost their contracts in all relevant characteristics before the decision was made by the bank. I then estimate the double difference on the common support to account for time-invariant unobservable characteristics that could affect the bank's decision

[3]Data from $http://estadisticas.superbancos.gob.ec/portalestadistico/portalestudios/?page_id = 1826$, (Superintendency of Banks of Ecuador) accessed on July 9, 2018. In July 2015 the partner bank had 27.1 percent of all the ATMs in the country (the largest share), followed by the next bank with 22.5 percent of the ATMs. In September 2015, the partner bank had 22.2 percent of all the branches in the country (the largest share), followed by the next bank with 12.5 percent of the branches.

to terminate the contract and the performance of the businesses. I find that businesses that lost their contracts experienced a significant negative impact on foot traffic, which decreased by 6.2 to 11.6 percent; and consequently a negative and significant impact on their sales, which dropped by 8.0 to 11.7 percent. In comparison, businesses that kept their contracts saw foot traffic increase by 6.6 to 13.2 percent and sales increase by 8.7 to 13.2 with respect to businesses that lost theirs.[4] In addition to losing sales, businesses that lost their non-bank correspondent contracts also lost access to financial services. Businesses with terminated contracts were 26.7 percentage points less likely to have a business bank account, and 20.1 percentage points less likely to have credit. It is important to point out that these numbers may reflect low impacts since this exercise was carried out in the two main cities of Ecuador, in urban environments with a high density of neighboring competitors. Changes for non-bank correspondent businesses may be higher in a rural environment or in areas with a lower concentration of businesses as hinted by the results for non-bank correspondents without close competitors and nearby bank agencies where negative impacts on sales range from 9.7 to 19.1 percent for businesses that lost their contracts—in comparison, businesses that kept their contracts saw sales increase by 10.8 to 23.6 with respect to businesses that lost theirs.

To my knowledge, this is the first paper to rigorously quantify the impact that having a non-bank correspondent contract has on business traffic, sales, and access to financial services. Although there are studies that point to the benefits of being a non-bank correspondent in terms of additional foot traffic and increase in clientele, increase in sales, differentiation from other competitors, gains in reputation, customer loyalty, and new source of revenue (Kumar et al., 2006; Davidson and Leishman, 2010; Flaming et al., 2011), these benefits have not been rigorously quantified. The rest of the paper is organized as follows: Section 2 describes the context in which the study was carried out, section 3 describes the models used for the estimation, section 4 presents the results, and section 5 concludes.

2 Quantifying the benefits of being a non-bank correspondent

The scope of services offered by non-bank correspondents varies depending on the contracts signed with financial institutions and the legislation of the country. It can include deposits to and withdrawals from saving accounts (or investment funds), transfers, credit card payments, account balance inquiries, bill payments, and payment orders (including government benefits and pension receipts). In some cases correspondents can take loan and other financing requests, credit card applications, and client registrations (Kumar et al., 2006). In Latin America, where banking penetration is relatively high, the technology most used to provide branchless banking services are bank cards and point-of-sale terminals connected to the bank via a telephone line or wireless technology. In Africa, where banking penetration is lower, the use of mobile phone technology in much more prevalent (Mas, 2009).

When a bank's customer makes a cash deposit at a non-bank correspondent, the amount is automatically withdrawn from the non-bank correspondent's account and deposited in the customer's account in real time without settlement risk, thereby increasing the amount of cash in the business's cash register and reducing the balance in its bank account by the same amount. In the case of a withdrawal, the bank verifies the availability of funds in the

[4] To calculate gains from entering into a contract, I divided the average for businesses with non-terminated contracts by the average for businesses with terminated contracts minus 1 ($Gains = \mu_{NT}/\mu_T - 1$). Losses are calculated as the average for businesses with terminated contracts divided by the average for businesses with non-terminated contracts minus 1 ($Loses = \mu_T/\mu_{NT} - 1$).

customer's account and transfers the cash from the customer's account to the non-bank correspondent's account. This reduces the amount of cash in the business's cash register and increases the balance of its bank account by the same amount. These retail outlets' core business involves managing cash. Deposits and withdrawals are often offset at the correspondent's cash register, reducing the amount of cash that needs to be transported to and from the bank branch. Cash, however, is key for the smooth operation of the non-bank correspondent and some financial institutions require correspondents to hold a minimum amount of cash to guarantee that the balance between cash-in and cash-out transactions during the day is sufficient to serve all customers. If the service is unreliable, the reputation of the financial institution can be damaged.

The extra foot traffic entering the business to carry out financial transactions is likely to increase sales through purchases made at the non-bank correspondent that would have taken place elsewhere (sales that come at the expense of neighboring competitors), or unplanned impulse buys (sales that help the overall market grow). But there is also the possibility that the increase in traffic entering the business to carry out financial transactions crowds out the retail store's main business causing lost transactions, and that the cash handled attracts robbers.

In 2016, due to the country's challenging economic situation, our partner bank carried out a bank wide policy of expense optimization. After having grown its non-bank correspondent network of retail commercial outlets from 3,500 in 2012 to 13,850 in December 2015, our partner bank reduced the number of non-bank correspondents by 29.5 percent (9,764 in December 2016) in order to improve the efficiency and productivity of this distribution channel. Despite the reduction, the number of transactions channeled through the non-bank correspondents increased by 20.7 percent from 2015 to 2016, increasing the proportion of transactions funneled via this channel from 10.9 percent of the bank's total in 2015 to 13.2 percent in 2016.[5]

To carry out the strategy to improve the efficiency and productivity of the distribution channel, the bank identified the profile of the businesses it wanted to keep as non-bank correspondents. Key criteria included businesses with monthly sales of $3000 or more and those operating in selected sectors of economic activity. They also focused on businesses with the potential to increase their average number of transaction per month to 280. Other criteria often used to select non-bank correspondents include the business's ability to maintain sufficient cash, to ensure that agents will be able to serve customers for their catchment area; the business's location and target customers; its proximity to banks; the business owner's ability to perform processes that involve reading and writing; and that the business is trusted by the community (Davidson and Leishman, 2010; Flaming, 2011).[6]

Figures 1a and 1b show the location of businesses in Quito and Guayaquil (detail) whose non-bank correspondent contract was terminated by our partner bank (in blue), the ones that were not terminated (in green), the businesses that closed between the baseline—conducted between August and October 2015—and the follow up—conducted between November and December 2016 (in red), and the location of our partner bank branches (in orange). The

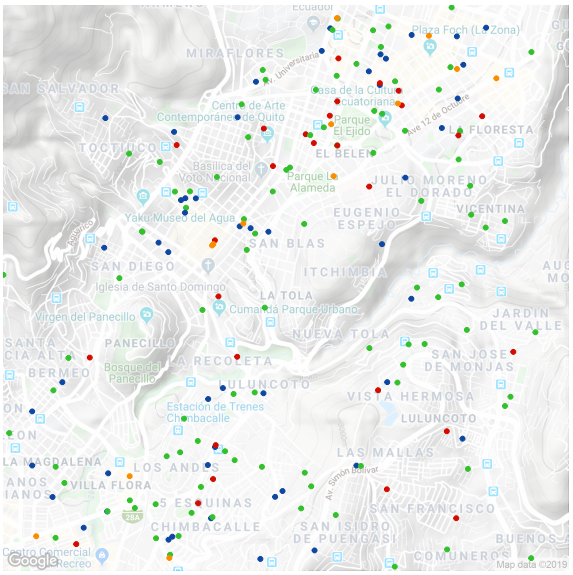
[5]Banco Pichincha's annual reports to shareholders (accessed on July 9, 2018), https://www.pichincha.com/portal/Informacion/Transparencia/Informes-anuales-y-memorias-de-sostenibilidad.

[6]Recommendation from the GSM Association to select mobile money agents (the equivalent of non-bank correspondents for mobile operators) and CGAP to select branchless baking agents in general. GSM stands for Global System for Mobile Communications, a standard for protocols for digital cellular networks. CGAP stands for Consultative Group to Assist the Poor.

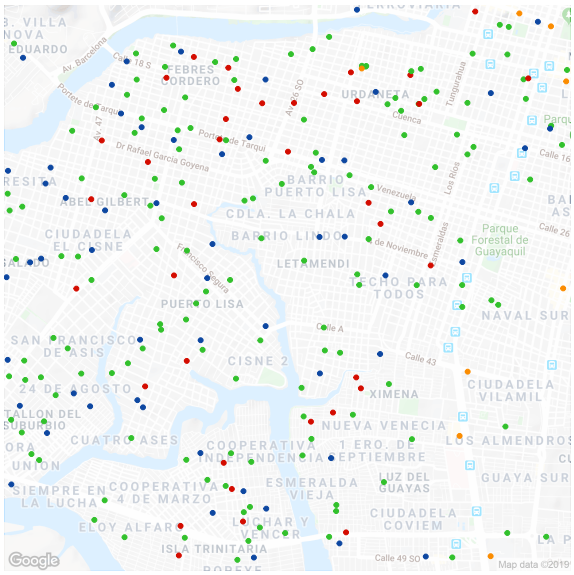
survey firm contacted and interviewed 87 percent of the businesses interviewed during the baseline. The incidence of business exit is 7.7 percent of the businesses that were interviewed at baseline, and a fraction of the contacted businesses declined to be interviewed.

Figure 1: Location of Businesses with Terminated and Non-terminated Contracts (detail)

(a) Quito



(b) Guayaquil



Dots in blue indicate the location of businesses whose contracts were terminated by the bank in 2016, the ones in green show the location of businesses whose contracts were not terminated, the ones in red show the location of businesses closed by their owners, and the ones in orange indicate the location of bank branches.

3 Empirical Strategy

I estimate the impact of losing the non-bank correspondent contract with our partner bank on several outcomes of interest: foot traffic, sales, and use of financial products (Average Treatment on the Treated—ATT). The causal effect of losing the non-bank correspondent contract is the difference between the mean value of the outcome variable in two different scenarios: one in which the business does not have a correspondent's contract and one in which it does. The main difficulty in estimating this causal effect is that businesses cannot simultaneously have and not have the contract, and therefore it is necessary to construct a counterfactual.

When the contract is randomly terminated, the counterfactual is easily estimated by averaging the value of the outcome variable for the businesses that have contracts. But when the contract is not randomly terminated, as in our case, businesses with and without contracts may differ in their characteristics—both observable and unobservable. Therefore, the simple comparison of averages between businesses with and without contracts does not provide an unbiased estimate for the causal effect. Moreover, it may be precisely the difference in those characteristics that explains why some businesses lose their contracts and others do not (like

number of transactions per month and sector of operation, in this case). Therefore, to identify the causal effect of having a contract, it is necessary to consider the effect of observable and unobservable characteristics on both the decision of the bank to terminate the contract and the outcome variables.

To account for observable and unobservable characteristics, I use a difference-in-differences matching approach. To account for observable characteristics, I use propensity score matching to find, in a group of businesses with contracts, those businesses that are similar to the businesses that lost their contracts in all relevant characteristics before the bank made the decision to terminate the contracts. There are several alternative ways to match businesses with and without contracts and, in general, results depend on the matching algorithm and the variables included to estimate the propensity score. In the selection of the matching algorithm there is a trade off between efficiency and bias reduction. I match observations using the kernel algorithm with a small bandwidth in the common support. This approach lowers the variance, and the quality of the matching is controlled using a small bandwidth (Caliendo and Kopening 2008; Heinrich, Maffioli, and Vázquez 2010).

After identifying the businesses whose contracts were not terminated but that have the same probability of their contracts being terminated as businesses that effectively lost their contracts, it was necessary to check that the observable characteristics of the businesses that kept their contracts were equal to the characteristics of the businesses that lost their contracts (Rosenbaum and Rubin 1983). I tested this by: (i) a difference in mean test before and after the matching; (ii) a joint test to ensure that all the characteristics in the businesses in the group that lost their contracts were equal in mean to those in the group that kept their contracts; and (iii) a test of the quality of the distribution of the propensity scores between businesses with and without contracts.

I then estimate the generalized difference-in-differences matching estimator using kernel density weighted matches on the common support (see Heckman et al. 1997) to account for time-invariant unobservable characteristics that could affect the performance of the businesses and the bank's decision to terminate the contract. I assess the impact of losing the contract by estimating $\widehat{\Delta}_{DID}$ in the following equation:

$$\widehat{\Delta}_{DID} = \frac{1}{n_t^1} \sum_{\substack{i=1 \\ \{D_i=1\}}}^{n_t^1} [Y_{ti}^1(X_i) - \widehat{E}(Y_{ti}^0 | P(X_i), D_i = 0)] - \frac{1}{n_{t'}^1} \sum_{\substack{j=1 \\ \{D_j=1\}}}^{n_{t'}^1} [Y_{t'j}^0(X_j) - \widehat{E}(Y_{t'j}^0 | P(X_j), D_j = 0)] \quad (1)$$

Where t and t' are two time periods: t before the contracts were terminated and t' after the contracts were terminated. $D_i = 1$ indicates if business i had a contract that was terminated and $D_i = 0$ indicates if business i had no contract terminated. Y_{ti}^0 is the outcome with no contract terminated observed for business i in time t while $Y_{t'j}^1$ is the outcome observed for business j in time t' after the contract was terminated. $P(X_i)$ is the probability of the contract being terminated for business i given the characteristics X used as conditioning variables. n_t^1 and $n_{t'}^1$ are the number of observations in the two time periods t and t'. The matched outcomes are estimated by:

$$\widehat{E}(Y_i^0|P(X_i), D_i = 0) = \sum_{\substack{j=1 \\ \{D_j=0\}}}^{n_0} W_j[P(X_i)]Y_j^0$$

Where $W_j[P(X_i)]$ are the weighting function of the kernel algorithm corresponding to the $j = 1, ..., n_0$ observations used for business i based on the probability $P(X_i)$ of its contract being terminated.

I calculate bootstrapped standard errors for the estimates to address the potential serial correlation problem in difference-in-differences models.

For robustness purposes, I also estimate the impact of having a contract terminated using a difference-in-differences model specified as a two-way fixed-effect linear regression. By conditioning on fixed effects, the model accounts for the potential selection of businesses based on time-invariant unobservable variables. By identifying observations in the common support after a matching method, I also account for potential differences in observable characteristics between businesses that lost and business that kept their contracts. The results of this exercise are presented in the appendix.

To account for the possibility of spillovers—that traffic and sales lost by businesses that had their non-correspondent bank contracts terminated were picked up by nearby businesses that kept their contracts—and their potential effect on the overestimation of the impacts, I restrict the sample to businesses without nearby non-bank correspondents that lost their contracts between August 2015 and November 2016 (i.e., businesses without neighbor non-bank correspondents within a specified radius a month before the survey was conducted in 2015 that later lost their contracts). These spillovers, if present, should affect the estimates for foot traffic and sales but not for use of financial products. Estimates for foot traffic and sales should be larger in magnitude under the original exercise compared to estimates when accounting for the possibility of spillovers. Because a priori we do not know the distance between neighboring non-bank correspondents that could affect traffic in one of them if the other were to lose its contract, I estimate average differences in traffic for neighboring non-bank correspondents within a specified radius of those that kept their contracts and those that lost their contract between August 2015 and November 2016. If non-bank correspondents located within a specific radius around the ones that lost their contracts increase the number of transactions with respect to the ones located within the same distance around the ones that kept their contracts, one can safely assume that the increase is due to traffic gains that come from non-bank correspondents that lost their contracts. For these exercises I use distances of 25, 50, 75, 100, 125, and 150 meters to determine the minimum radius we need to use to exclude these cases—businesses without neighboring non-bank correspondents within the minimum radius that lost their contract between August 2015 and November 2016—and guarantee that the effects are not overestimated because of spillovers. To estimate these differences I use an event study setup as in equation (2), restricting the periods before and after the event (*k=0*)—lost of a contract, and consequently financial transaction carried out by non-bank correspondents dropping from a positive number of transactions to zero—to 24 periods.

$$Y_{it} = \alpha_i + \gamma t + \sum_{k=-\infty}^{k=\infty} \beta_k \mathbf{1}\{K_{it} = k\} + \varepsilon_{it} \tag{2}$$

Where Y_{it} is the number of transactions carried out by neighboring non-bank correspondents within a specified radius of businesses that kept and businesses that lost their contracts between January 2014 and December 2017. K_{it} is the number of periods relative to the event—loss of contract. The parameters α_i and γt are unit and period fixed effects, respectively, and ε_{it} is random noise. I then test if the coefficients β_k corresponding to the periods twelve months before and twelve months after losing the contract are equal (β_{-12}=β_{-11}=...=β_0=...=β_{11}=β_{12}). If the coefficients are equal, then there is no evidence of spillover effects.

4 Results

4.1 Estimation of the Propensity Score

To estimate the propensity score, and match businesses with and without contracts with similar observable characteristics, I used a logit regression model and explanatory variables that are likely to have affected the bank's decision to terminate the contract (see Table 1). In an effort to reduce the number of correspondents—to minimize the cost of the channel while maximizing the number of transactions completed and population covered—the bank based its decision on each correspondent's sector of economic activity, sales, and the potential to increase the number of transactions. This does not mean that these variables were strictly applied—i.e., all businesses with less than $3,000 in sales per month were going to be let go. Instead, these variables were used as guidelines depending on the context—i.e., if there was a need to decide between two nearby correspondents, the one with lower sales, fewer transactions, or less desirable sectors of economic activity would be let go. The sector of economic activity and business sales were variables available to the bank and collected at the time the contract was signed. Since the transactions completed by the correspondents are processed by the bank in real time, this information is continuously collected and tracked by the bank.

I included in the model the sector of economic activity of the correspondent's main line of business, sales (in logs), the number of transactions completed by the correspondents (self reported), and the classification given by the bank based on the number of transactions (administrative data).[7] I also included variables that have been identified as useful to successfully select non-bank correspondents: the business location (Province), proximity to the bank branch (distance in meters to the closest bank branch), number of correspondents in the area (density within a 50 meter radius of each correspondent), and number of bank branches in the area (within a one kilometer radius of each correspondent). I also included variables related to the availability of cash to carry out financial transactions, and how the correspondent's activities may have affected the running of the business—time in minutes required to process an average financial transaction, average time in minutes to travel to the bank branch, and average number of visits per week to the bank branch. To capture the level of economic activity in the areas where the businesses were located, I included the average radiance (using nighttime light data) in a 50 meter radius around each correspondent in July

[7] Bronze classification is given to non-bank correspondents that channel up to 150 financial service transactions per month, silver classification to those that channel between 151 and 300 transactions per month, gold classification to those that channel between 301 and 600 transactions per month, and diamond to those that channel more than 600 transactions per month.

2015, one month before the baseline survey was conducted.[8] There is evidence that nighttime light is correlated with economic activity (Proville et al, 2017; Henderson et al., 2012). All the variables included in the participation model were measured at baseline.

According to the model, the variables correlated with the decision to terminate a non-bank correspondent's contract were the province where the business was located, the number of transactions completed, the classification given by the bank to the business based on the number of transactions completed, if the correspondent usually had enough cash to carry out transactions, time dedicated to complete a transaction, and time required to get to the bank branch.[9] The latter three variables—if the correspondent usually had enough cash to carry out transactions, time dedicated to complete a transaction, and time required to get to the bank branch—potentially affect the number of transactions completed. As mentioned earlier, although the bank indicated that it based its decisions on sector of economic activity and business sales, these variables were not correlated with the decision to terminate the contract. This is probably because they were used as guidelines and not as strict decision-making criteria since the main objective was to minimize the cost of the channel while maximizing the population covered and the number of transactions completed.

The results indicate that businesses located in Pichincha were 1.5 times more likely to have their contracts terminated than businesses in Guayas. The average business classified as bronze, which completed up to 150 transaction per month, was 22.0 times more likely to have its contract terminated than the average business classified as diamond, which completed more than 600 transactions per month. Businesses that did not usually have enough cash to carry out transactions were 1.3 times more likely to have their contracts terminated than businesses that usually had enough cash to complete financial transactions. Similarly, businesses that spent more time per transaction (one standard deviation more with respect to the average) were 1.2 times more likely to have their contracts terminated than businesses that spent less time per transaction (one standard deviation less with respect to the average). Finally, businesses that spent less time travelling to the bank branch (one standard deviation less with respect to the average) were 1.1 times more likely to have their contracts terminated than businesses that spent more time travelling to the bank branch (one standard deviation more with respect to the average).

As shown in Table 2, after the matching, the equality of means in businesses with terminated and non-terminated contracts cannot be rejected for any of the 19 variables included in the participation model. The table also includes the variables of interest at baseline to show balance. I also observe a reduction in the mean and median bias of the observable variables included in the participation model after matching: from 24.3 to 1.3 (mean bias) and from 25.5 to 1.2 (median bias). Moreover, the pseudo R2 from a logit of terminated contract on all the variables decreases from 0.196 to 0.001, and the corresponding p-value of the likelihood-ratio test of the joint insignificance of all the regressors increases from 0 to 1, indicating that after the match our regressors are not able to determine which businesses had contracts terminated and which ones did not. Therefore, businesses with terminated and non-terminated contracts in the matched sample are indistinguishable from each other across the variables included in the participation model.

[8] To estimate the radiance value in July 2015, I used the trend component of applying a Hodrick-Prescott filter to monthly data on radiance from January 2014 to November 2018.

[9] Non-bank correspondents classified as bronze made on average 85 financial service transactions per month, silver make 245, gold 439, and diamond 1,060 financial service transactions per month at the time the baseline was collected.

Table 1: Logit Model for Contract Being Terminated During 2016

	Coefficient		Std. Err.
Nighttime luminosity in a 50 mts radius	-0.002		0.003
Sales in a good day at baseline (in logs)	-0.243		0.244
Sales in a regular day at baseline (in logs)	0.035		0.183
Sales in a bad day at baseline (in logs)	0.016		0.120
Pichincha Province	0.684	***	0.118
Manufacturing	0.662		0.461
Retail	-0.194		0.359
Services	-0.319		0.376
Distance (mts) to closest bank branch	0.000		0.000
Number of bank branches within a 1 Km radius	0.034		0.064
Number of NBC within 50 mts radius	-0.098		0.109
NBC classified as silver	-1.684	***	0.181
NBC classified as gold	-2.271	***	0.266
NBC classified as diamond	-3.408	***	0.601
Number of transaction on a regular day	-0.016	***	0.006
Usually not enough cash to serve customers	0.468	***	0.109
Average minutes to process transaction	0.040	**	0.019
Average minutes to travel to the bank	-0.009	**	0.004
Number of weekly visits to the bank	-0.007		0.022
Constant	0.572		0.532
Number of Observations	2083		
Pseudo R2	0.196		

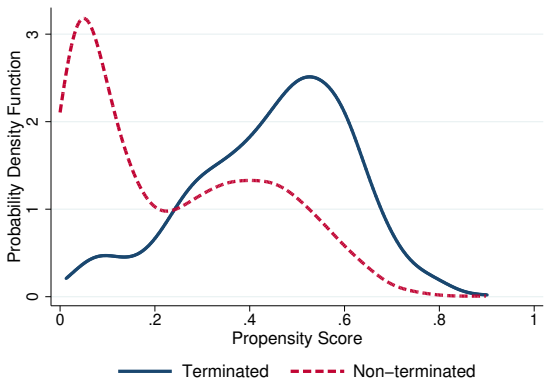
Note: *** denotes significance of the coefficients at 1%, ** significance at 5%, and * significance at 10% level.

The Kolmogorov-Smirnov test of the equality of distributions of the propensity scores for the matched sample cannot reject the null hypothesis that the distributions are equal for businesses with terminated and non-terminated contracts in the common support—the p value is 0.924.

Figure 2a and 2b present the distribution of the propensity score for businesses with terminated and non-terminated contracts before and after matching, respectively.

Figure 2: Distribution of the Propensity Score Before (left) and After (right) Matching

(a) Before



(b) After

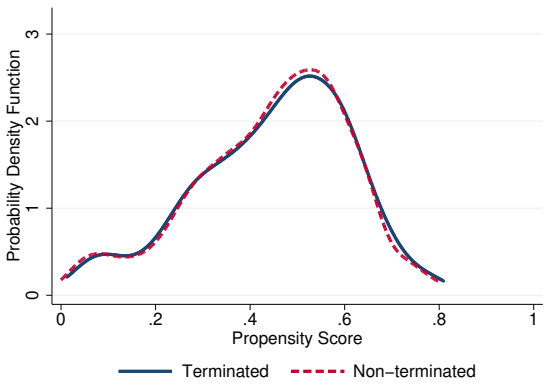


Table 2: Balance of Observable Characteristics in 2015, After Matching

Variables	Mean		%bias	t-stat†	
	Terminated	Non-terminated		t	p>| t |
Nighttime luminosity in a 50 mts radius	38.164	38.381	-1.1	-0.17	0.862
Sales on a good day at baseline (in logs)	4.820	4.816	0.4	0.07	0.948
Sales on a regular day at baseline (in logs)	5.229	5.224	0.4	0.08	0.939
Sales on a bad day at baseline (in logs)	4.129	4.115	1.2	0.21	0.832
Pichincha Province	0.588	0.579	2.0	0.33	0.738
Manufacturing	0.018	0.017	0.1	0.03	0.977
Retail	0.716	0.713	0.6	0.10	0.920
Services	0.242	0.243	-0.3	-0.05	0.957
Distance (mts) to closest bank agency	2627.4	2628.7	0.0	-0.01	0.995
Number of bank agencies within a 1 Km radius	0.580	0.549	3.0	0.49	0.622
Number of NBC within 50 mts radius	0.177	0.191	-2.9	-0.49	0.628
NBC classified as silver	0.074	0.067	2.1	0.47	0.637
NBC classified as gold	0.030	0.029	0.4	0.12	0.904
NBC classified as diamond	0.005	0.008	-1.3	-0.64	0.525
Number of transaction on a regular day	10.622	10.844	-1.2	-0.37	0.714
Usually not enough cash to serve customers	0.539	0.519	4.1	0.68	0.497
Average minutes to process transaction	4.163	4.129	1.2	0.19	0.846
Average minutes to travel to the bank	18.693	18.568	0.9	0.15	0.878
Number of weekly visits to the bank	1.942	1.980	-1.4	-0.26	0.797
Clients served on a good day at baseline	86.121	87.974	-2.0	-0.37	0.709
Clients served on a regular day at baseline	54.293	53.711	1.0	0.19	0.853
Clients served on a bad day at baseline	30.150	30.543	-1.1	-0.20	0.842
Business Bank Account	0.729	0.748	-4.5	-0.74	0.460
Savings Bank Account	0.539	0.568	-6.0	-1.00	0.318
Credit	0.493	0.486	1.3	0.23	0.821

Note: (†) t-test for difference in means: *** denotes significance at 1%, ** significance at 5%, and * significance at 10%.

4.2 Impact of Terminating the Contracts

I estimate the difference-in-differences for the variables of interest in the common support using (1). The sample in the common support included a total of 2,020 businesses (566 businesses with terminated contracts and 1,454 businesses with existing, non-terminated contracts).

The difference in sales between businesses with terminated and non-terminated contracts with identical distribution of characteristics on the common support is negative and statistically different from zero (see Table 3). The loss in daily sales due to a terminated contract ranges from 7.8 to 8.4 percent—differences in sales at baseline between groups are not statistically different from zero as shown in Table 2. There is evidence that these changes in sales are due, at least in part, to changes in foot traffic, which declines in ranges from 3.0 to 7.0 percent—although not all these differences are statistically different from zero. The claim made by financial institutions and mobile network operators regarding the positive effect that serving as non-bank correspondents or agents has on foot traffic and sales is correct, and in the case of Ecuador, gains in sales are around 8.8 percent. On average, the increase in foot traffic does not seem to crowd out the store's main business causing commercial transaction losses.

In addition to losing sales, businesses with terminated contracts are less likely to use financial services. The proportion of businesses with terminated contracts with a bank account

Table 3: Sales, Foot Traffic, and Use of Financial Products (dif-in-dif matching estimator)

Variables	Obs.	Non-terminated Mean	Coefficient	Bstrapped S.E.	t-stat†
	(1)	(2)	(3)	(4)	(5)
Sales on a good day in 2016 (in logs)	2020	5.412	-0.084	0.043	-1.93 *
Sales on a regular day in 2016 (in logs)	2020	5.017	-0.081	0.042	-1.95 *
Sales on a bad day in 2016 (in logs)	2020	4.357	-0.088	0.051	-1.72 *
Clients on a good day in 2016	2020	113.330	-3.432	4.238	-0.81
Clients on a regular day in 2016	2020	69.823	-4.903	2.965	-1.65 *
Clients on a bad day in 2016	2020	40.504	-1.446	1.826	-0.79
Business bank account, 2016	2020	0.793	-0.255	0.035	-7.36 ***
Savings bank account, 2016	2020	0.583	-0.039	0.038	-1.03
Credit, 2016	2020	0.488	-0.175	0.038	-4.54 ***

Note: The estimation reported in column (3) comes from the specification described in equation (1). Bootstrapped standard errors. (†) t-test for $\widehat{\Delta}_{DID}$: *** denotes significance at 1%, ** significance at 5%, and * significance at 10%.

solely dedicated to the business dropped by 25.5 percentage points with respect to businesses with existing contracts. In order to operate as a non-bank correspondent, retail stores need to have an active bank account to automatically offset the cash transactions processed. Although the proportion of business owners with savings accounts increased from 2015 to 2016, the increase was smaller for businesses with terminated contracts than for businesses with existing contracts. The difference in the proportion of business owners with a savings account is 3.9 percentage points, although the difference is not statistically different from zero. Businesses with terminated contracts are also more likely to lose access to credit. The difference in the proportion of businesses with credit is 17.5 percentage points. The difference in the use of financial products could be attributed to lost contact with the bank. These results are robust to different specifications (see Table A1 in the appendix).

4.3 Spillover Effects

To guarantee that impacts are not overestimated because of possible spillover effects (i.e., that traffic and sales lost by businesses that had their non-correspondent bank contracts terminated are picked up by nearby businesses that kept their contracts), I conduct some tests to identify the distance at which transactions carried out by non-bank correspondents that lost their contracts are no longer picked up by neighbor non-bank correspondents that kept theirs. To do so, I estimate the coefficients β_k in (2) and test for their equality for $k = -12, ..., 12$; i.e., for effects on the number of transactions of their neighbors a year before and a year after they lost their contracts, compared to the number of transactions of the neighbors of businesses that kept theirs. I do this for neighbors located within different radiuses ranging from 25 mts to 150 mts. Results of the F-test that (β_{-12}=β_{-11}=...=β_0=...=β_{11}=β_{12}=0) are presented in Table 4. Figures for the coefficients β_k and their 95% confident intervals are presented in the appendix (Figures A1a-A1f).

Results indicate that, on average, the number of financial transactions carried out by non-bank correspondents located within a radius of 25 mts of another non-bank correspondent can be affected if the latter loses its contract with the bank; i.e., non-bank correspondents within that distance pick up foot traffic lost by the terminated non-bank correspondent. That

Table 4: Joint Significance Test for (β_k=0)

Radius	25	50	75	100	125	150
F-Statistic for Ho: β_{-12}=...=β_0=...=β_{12}=0	2.461	2.379	1.698	0.940	1.023	0.969
p value	0.000	0.000	0.016	0.548	0.431	0.507
Number of NBCs	6445	6445	6445	6445	6445	6445
NBCs with neighbors that lost contracts within radius	308	657	1038	1464	1886	2319

Note: Joint significant test of coefficients estimated using equation (2), 12 months before and 12 months after the non-bank correspondents lost their contracts. Coefficients estimate the difference in the number of transactions carried out by NBC neighbors within the specified radius of NBCs that kept and NBCs that lost their contracts between January 2014 and December 2017. Transactions do not include transactions carried out by the reference NBC.

is also the case for non-bank correspondents located within a distance of 50 or 75 mts from neighboring non-bank correspondents. At these distances, non-bank correspondents seem to compete for bank clients. At 100 mts, however, there is no difference in the number of financial transactions carried out by neighbor non-bank correspondents around businesses that kept and businesses that lost their contracts. At this distance, as well as at 125 and 150 mts, there is no evidence that non-bank correspondents compete for bank clients or that on average they pick up foot traffic lost by nearby terminated non-bank correspondents. Provided that it is costly for banks to enter into these contracts with retail stores (equipment, material, technical and business support, etc.), there might be an optimal distance at which neighbouring non-bank correspondents should be located to maximize their gains from the contract, as well as minimize banks' costs given a desired level of coverage of the population.

The businesses included in the analysis that generated the results shown in Table 3 correspond to 2,020 businesses, of which 64.4 percent had no non-bank correspondents within a 100 meter radius one month before the 2015 baseline was collected. Out of the 2,020 businesses, 81.1 percent had no non-bank correspondents within a 100 meter radius that lost their contract between August 2015 and January 2017. There is, however, the possibility that the estimates presented in Table 3 are biased since foot traffic (and sales) lost by businesses that had their non-correspondent bank contracts terminated could have been picked up by nearby businesses that kept their contracts, thereby overestimating the impact of losing a non-bank correspondent contract—as shown in Table 4. The difference would have picked up losses in foot traffic (and sales) experienced by businesses that lost their contracts as well as gains in foot traffic (and sales) experienced by businesses that kept their contracts and benefited from the flow of new clients from ex-non-bank correspondents. To account for that possibility and for robustness purposes, Table 5 shows the results of an additional exercise that restricts the businesses in the analysis to businesses without neighbor non-bank correspondents in a radius of 100 meters a month before the 2015 survey was conducted and whose contracts were later terminated. (Using businesses without neighbor non-bank correspondents in 2016 will miss the cases that we want to account for: businesses that lost their non-bank correspondent contract and that do not appear as neighbors in the non-bank correspondent dataset anymore). I use the same matching algorithm and set of variables to estimate the propensity score.

The parameters that model the bank's decision to terminate contracts (Table A2), the balance of observable characteristics in 2015 after matching (Table A3), as well as the distribution of the propensity score before and after matching (Figures A2a and A2b) are presented in the appendix. All the tests done to verify the quality of the matching exercise show that, as in the previous exercise, this exercise satisfies the chosen criteria: 1) after the matching, the

equality of means in businesses with terminated and non-terminated contracts cannot be rejected for any of the 19 variables included in the participation model—Table A3 also includes the variables of interest at baseline to show balance; 2) there is a reduction in the mean and median bias of the observable variables included in the participation model after matching—from 25.1 to 1.5 (mean bias) and from 25.8 to 1.2 (median bias); 3) the pseudo R2 from a logit of terminated contract on all the variables decreases from 0.205 to 0.001, and the corresponding p-value of the likelihood-ratio test of the joint insignificance of all the regressors increases from 0 to 1, indicating that after the match our regressors are not able to determine which businesses had contracts terminated and which ones had not. The Kolmogorov-Smirnov test of the equality of distributions of the propensity scores for the matched sample cannot reject the null hypothesis that the distributions are equal for businesses with terminated and non-terminated contracts in the common support—the p value is 0.69. Therefore, businesses with terminated and non-terminated contracts, when I restrict the sample to exclude any business with neighbouring non-bank correspondents within a 100 mt radius in 2015 and whose contract was later terminated, are indistinguishable from each other across the variables included in the participation model.

Table 5: Sales, Foot Traffic, and Use of Financial Products (dif-in-dif matching estimator) for Businesses without Non-bank Correspondents Neighbors, within a 100 mts Radius, that Lost their Contracts

Variables	Obs. (1)	Non-terminated Mean (2)	Coefficient (3)	Bstrapped S.E. (4)	t-stat† (5)	p-value‡ $H_o: \lvert\beta_\star\rvert \geq \lvert\beta_{\star\star}\rvert$ (6)
Sales on a good day in 2016 (in logs)	1690	5.373	-0.124	-0.051	-2.461 **	0.00
Sales on a regular day in 2016 (in logs)	1690	4.980	-0.109	-0.048	-2.275 **	0.00
Sales on a bad day in 2016 (in logs)	1690	4.325	-0.084	-0.060	-1.398	0.64
Clients on a good day in 2016	1690	109.593	-6.775	-5.212	-1.300	0.00
Clients on a regular day in 2016	1690	67.875	-7.897	-3.335	-2.368 **	0.00
Clients on a bad day in 2016	1690	39.316	-2.786	-2.154	-1.294	0.00
Business bank account, 2016	1690	0.791	-0.267	-0.039	-6.889 ***	0.00
Savings bank account, 2016	1690	0.584	-0.015	-0.042	-0.355	0.99
Credit, 2016	1690	0.490	-0.201	-0.043	-4.660 ***	0.00

Note: The estimation reported in column (3) comes from the specification described in equation (1). Bootstrapped standard errors. (†) t-test for $\widehat{\Delta}_{DID}$: *** denotes significance at 1%, ** significance at 5%, and * significance at 10%. (‡) p-value of test for $H_o: |\beta_\star| \geq |\beta_{\star\star}|$ that compares the size of the coefficient $\beta_\star$ estimated using (1) and including all NBC (in Table 3) versus the coefficient $\beta_{\star\star}$ estimated using (1) and shown in this table (businesses without neighbor NBCs that lost their contract and are located within a 100 mts radius).

The estimates obtained when restricting the sample—only to businesses without neighbouring non-bank correspondents that lost their contract within a 100 mts radius—are statistically larger than the previous estimates shown in Table 3, as indicated by the p-values of the χ^2 tests shown in column (6). These values indicate that there are no spillover effects; that is, businesses that kept their contracts did not seem to have picked up gains in sales coming from neighboring non-bank correspondents that lost their contracts. If that were the case, results reported in Table 5 would be smaller than results reported in Table 3. For the cases where the p-value suggests that $H_o: |\beta_\star| \geq |\beta_{\star\star}|$ cannot be rejected (sales on a bad day and savings bank account, which are not statistically different from zero), additional tests carried out suggest that the coefficients in Table 5 and in Table 3 are statistically equal; i.e.:

$H_o : \beta_\star = \beta_{\star\star}$ cannot be rejected.[10]

4.4 Heterogenous Effects

Interestingly, results depend on the density of neighboring non-bank correspondents and the closeness to bank branches (measured at baseline). To carry out these additional exercises, I work with the sample of businesses without neighbouring non-bank correspondents that lost their contract, located within a 100 mts radius, to account for the possibility of spillovers. These estimates from Table 5 would be the reference for this set of exercises.

When restricting the sample to businesses located more than one kilometer from a bank branch (1214 observations), the results show that losses in sales increase for this group of businesses (11.1 percent loss on a regular day) in comparison to the exercise that includes all businesses (10.3 percent loss on a regular day when accounting for potential spillovers—Table 5). Similar exercises restricted to businesses without neighboring non-bank correspondents—no non-bank correspondents affiliated to the partner bank within a 50 meter radius (1,526 observations) or a 100 meter radius at baseline (1,289 observations)—show that losses in sales are also larger for these groups of businesses (11.7 percent loss on a regular day for the 50 meter and 15.3 percent loss on a regular day for the 100 meter radius) in comparison to the original exercise that includes all businesses.[11] And when limiting the sample to businesses located more than one kilometer from a partner bank branch and without neighbor non-bank correspondents affiliated to the partner bank (1,214 observations and 947 observations for the 50 meter and 100 meter radius, respectively), where the value that the service brings to the community and bank customers is larger, the losses in sales reach the highest value (13.5 percent loss on a regular day for the 50 meter and 17.5 percent loss on a regular day for the 100 meter radius) in comparison to the original exercise that includes all businesses. As shown in column (6) of Table 6, the tests indicate that the losses in sales are larger in magnitude in all but one of the cases (when there are no close bank branches) when compared to the original exercise where all businesses are included in the sample.[12]

Differences in foot traffic for these exercises with a restricted sample are not statistically different from zero in some cases. Results show, however, that after losing their contracts, businesses lose foot traffic when compared to businesses that kept their contracts. One can see patterns in foot traffic for businesses with non-terminated contracts, the businesses used as reference, under the different scenarios that point to lower foot traffic—potentially associated with lower economic activity and correlated with the absence of bank branches and neighboring non-bank correspondents in the area—in comparison to the original exercise that includes

[10] Estimates obtained when restricting the sample using different distances—to businesses without neighbour non-bank correspondents located within a 25, 50, and 75 mts radius, that lost their contracts between August 2015 and January 2017—are larger for most of the variables as well. Only in the case of sales in a bad day and savings accounts the hypothesis that $H_o : |\beta_\star| \geq |\beta_{\star\star}|$ is not rejected, but the hypothesis that $H_o : \beta_\star = \beta_{\star\star}$ is rejected, which suggest losses are larger in the original exercise and consequently there is a possibility of spillovers at least for these two variables. The evidence of spillovers disappear when restricting the sample using only businesses without neighbour non-bank correspondents, located within a 100, 125, and 150 mts radius, that lost their contracts between August 2015 and January 2017.

[11] In these exercises I restrict all businesses to have no neighboring non-bank correspondents, not just no neighboring non-bank correspondents that lost their contract. This restriction accounts for the density of neighboring non-bank correspondents and the closeness to bank branches measured at baseline, as well as potential spillover effects as described in section 4.3.

[12] All businesses but the ones with neighboring non-bank correspondents that lost their contract and are located within a 100 mt radius (Table 5).

all businesses. While for the original exercise foot traffic for businesses with non-terminated contracts is 67.9 clients on a regular day (see Table 5), for the restricted samples, foot traffic for this same group of businesses is lower: 65.0 clients on a regular day, for businesses located at more than one kilometer from a bank branch; 67.0 and 64.6 clients on a regular day, for businesses without neighboring non-bank correspondents within a 50 or 100 meter radius respectively; and 63.8 and 61.5 clients on a regular day, for businesses located at more than one kilometer from a bank branch and without neighboring non-bank correspondents within a 50 or 100 meter radius respectively (see Table 6). The lower density of non-bank correspondents may be correlated with lower economic activity and correspondingly lower foot traffic and lower sales.

The decline in foot traffic on a regular day is statistically different from zero for all cases. When restricting the sample to businesses located more than one kilometer from a bank branch, the results show that losses in traffic increase for this group of businesses (14.5 percent loss on a regular day) in comparison to the exercise that includes all businesses (11.6 percent loss on a regular day when accounting for potential spillovers—Table 5). In this case the estimate of Table 6 is statistically larger than the estimate of Table 5 as shown in column (6) of Table 6. Similar exercises restricted to businesses without neighboring non-bank correspondents—affiliated to the partner bank within a 50 meter radius or a 100 meter radius at baseline—show that losses in traffic are not statistically larger for these groups of businesses (11.5 percent loss on a regular day for the 50 meter and 12.2 percent loss on a regular day for the 100 meter radius) in comparison to the original exercise that includes all businesses.[13] And when limiting the sample to businesses located more than one kilometer from a partner bank branch and without neighbor non-bank correspondents affiliated to the partner bank, where the value that the service brings to the community and bank customers is larger, the losses in foot traffic reach the highest value (15.6 percent loss on a regular day for the 50 meter and 19.4 percent loss on a regular day for the 100 meter radius) in comparison to the original exercise that includes all businesses. As shown in column (6) of Table 6, the tests indicate that the losses in foot traffic are larger for these two latter cases as well when compared to the case where all, but neighboring non-bank correspondents that lost their contract and are located within a 100 mt radius (Table 5), are included in the sample.

Differences in use of financial services when using the restricted samples become larger for business accounts and credit, but not for savings accounts. For business accounts, differences are larger for businesses located at more than one kilometer from a bank branch (30.7 percentage point loss); businesses located at more than one kilometer from a bank branch and without neighboring non-bank correspondents (30.8 and 31.2 percentage point loss for businesses without neighboring non-bank correspondents within a 50 or 100 meter radius); and businesses without neighboring non-bank correspondents within a 50 or 100 meter radius (27.5 and 29.7 percentage point loss, respectively) in comparison to the original exercise that includes all businesses (26.7 percentage point loss). For credit, differences are larger for businesses without neighboring non-bank correspondents (21.9 percentage point loss for businesses without neighboring non-bank correspondents within a 50 or 100 meter radius); for businesses located at more than one kilometer from a bank branch (23.6 percentage point loss); and businesses located at more than one kilometer from a bank branch and without neighboring non-bank correspondents (23.6 and 24.7 percentage point loss for businesses with-

[13] As in the previous case, in these exercises I restrict all businesses to have no neighboring non-bank correspondents, not just no neighboring non-bank correspondents that lost their contract.

out neighboring non-bank correspondents within a 50 or 100 meter radius, respectively), in comparison to the original exercise that includes all businesses (20.1 percentage point loss). These reductions in the use of financial services could reflect the fact that businesses with terminated contracts, as well as the rest of the community and other bank customers, are affected by inadequate customer service infrastructure, in this case distance to bank branches, and when branches are not available, distance to non-bank correspondents. As shown in column (6) of Table 6, the tests indicate that the reductions in the use of financial services are larger in magnitude in all cases when compared to the original exercise where all businesses are included in the sample.[14]

These exercises shed light on how the concentration of non-bank correspondents and proximity of bank branches may affect the benefits gained by businesses that sign a contract with a financial institution to provide financial services as a non-bank correspondent. The results show that in areas with a high density of non-bank correspondents and nearby bank branches, the increase in sales may be smaller compared to areas of low density with no bank branches in close proximity. This points to a relationship between the benefits accrued to non-bank correspondents and the value added they offer as providers of financial services.

[14] All businesses but the ones with neighboring non-bank correspondents that lost their contract and are located within a 100 mt radius (Table 5).

Table 6: Sales, Foot Traffic, and Use of Financial Products (dif-in-dif) for Business without Close Bank Branches and without Neighbor Non-bank Correspondents

Variables	Obs.	Non-terminated Mean	Coefficient	Bstrapped S.E.	t-stat†	p-value‡ $H_o: \lvert\beta_\star\rvert \geq \lvert\beta_{\star\star}\rvert$
	(1)	(2)	(3)	(4)	(5)	(6)
No close bank branches						
Sales on a good day in 2016 (in logs)	1214	5.348	-0.119	-0.060	-1.97 **	0.61
Sales on a regular day in 2016 (in logs)	1214	4.951	-0.118	-0.056	-2.09 **	0.31
Sales on a bad day in 2016 (in logs)	1214	4.302	-0.114	-0.071	-1.61	0.13
Clients on a good day in 2016	1214	106.427	-9.512	-6.433	-1.48	0.07
Clients on a regular day in 2016	1214	64.977	-9.422	-3.756	-2.51 **	0.09
Clients on a bad day in 2016	1214	37.792	-4.338	-2.639	-1.64	0.02
Business bank account, 2016	1214	0.791	-0.307	-0.042	-7.38 ***	0.00
Savings bank account, 2016	1214	0.574	-0.003	-0.050	-0.06	0.80
Credit, 2016	1214	0.495	-0.236	-0.049	-4.81 ***	0.01
No close NBC within a 50 meters radius						
Sales on a good day in 2016 (in logs)	1526	5.366	-0.140	-0.048	-2.76 ***	0.03
Sales on a regular day in 2016 (in logs)	1526	4.976	-0.124	-0.047	-2.57 **	0.05
Sales on a bad day in 2016 (in logs)	1526	4.324	-0.102	-0.055	-1.64	0.04
Clients on a good day in 2016	1526	108.122	-6.463	-5.297	-1.22	0.72
Clients on a regular day in 2016	1526	67.029	-7.717	-3.505	-2.20 **	0.67
Clients on a bad day in 2016	1526	38.781	-2.632	-2.241	-1.18	0.80
Business bank account, 2016	1526	0.794	-0.275	-0.039	-7.11 ***	0.07
Savings bank account, 2016	1526	0.583	-0.009	-0.043	-0.20	0.95
Credit, 2016	1526	0.479	-0.219	-0.042	-5.27 ***	0.00
No close NBC within a 100 meters radius						
Sales on a good day in 2016 (in logs)	1289	5.334	-0.191	-0.056	-3.40 ***	0.00
Sales on a regular day in 2016 (in logs)	1289	4.955	-0.166	-0.055	-3.05 ***	0.00
Sales on a bad day in 2016 (in logs)	1289	4.315	-0.155	-0.065	-2.38 **	0.00
Clients on a good day in 2016	1289	104.306	-7.523	-5.541	-1.36	0.25
Clients on a regular day in 2016	1289	64.570	-7.864	-3.316	-2.37 **	0.52
Clients on a bad day in 2016	1289	37.432	-3.129	-2.173	-1.44	0.23
Business bank account, 2016	1289	0.795	-0.297	-0.043	-6.89 ***	0.01
Savings bank account, 2016	1289	0.581	-0.044	-0.049	-0.90	0.00
Credit, 2016	1289	0.465	-0.219	-0.047	-4.63 ***	0.04
No close bank branches and no NBC within a 50 meters radius						
Sales on a good day in 2016 (in logs)	1214	5.346	-0.151	-0.062	-2.42 **	0.12
Sales on a regular day in 2016 (in logs)	1214	4.951	-0.145	-0.058	-2.48 **	0.04
Sales on a bad day in 2016 (in logs)	1214	4.304	-0.148	-0.072	-2.06 **	0.01
Clients on a good day in 2016	1214	104.747	-10.152	-5.872	-1.73 *	0.05
Clients on a regular day in 2016	1214	63.764	-9.917	-3.785	-2.62 ***	0.05
Clients on a bad day in 2016	1214	36.933	-4.488	-2.629	-1.71 *	0.02
Business bank account, 2016	1214	0.794	-0.308	-0.045	-6.86 ***	0.00
Savings bank account, 2016	1214	0.577	0.007	-0.052	0.13	0.90
Credit, 2016	1214	0.495	-0.236	-0.049	-4.81 ***	0.00
No close bank branches and no NBC within a 100 meters radius						
Sales on a good day in 2016 (in logs)	947	5.310	-0.212	-0.063	-3.38 ***	0.00
Sales on a regular day in 2016 (in logs)	947	4.930	-0.192	-0.060	-3.23 ***	0.02
Sales on a bad day in 2016 (in logs)	947	4.299	-0.195	-0.073	-2.69 ***	0.00
Clients on a good day in 2016	947	100.547	-12.571	-6.116	-2.06 **	0.03
Clients on a regular day in 2016	947	61.490	-11.913	-3.819	-3.12 ***	0.00
Clients on a bad day in 2016	947	35.649	-6.603	-2.614	-2.53 **	0.00
Business bank account, 2016	947	0.794	-0.312	-0.049	-6.40 ***	0.00
Savings bank account, 2016	947	0.579	-0.005	-0.054	-0.10	0.00
Credit, 2016	947	0.474	-0.247	-0.057	-4.32 ***	0.00

Note: The estimation reported in column (3) comes from the specification described in equation (1). Bootstrapped standard errors. (†) t-test for $\widehat{\Delta}_{DID}$: *** denotes significance at 1%, ** significance at 5%, and * significance at 10%. (‡) p-value of test for $H_o: |\beta_\star| \geq |\beta_{\star\star}|$ that compares the size of the coefficient $\beta_\star$ estimated using (1) and shown in Table 5 versus the coefficient $\beta_{\star\star}$ estimated using (1) and shown in this table.

5 Conclusion

In this paper I estimate the impact that having a non-bank correspondent contract with a financial institution has on foot traffic, sales, and use of financial services for retail stores. Taking advantage of an abrupt reduction in the size of the network of retail stores that served as non-bank correspondents for the largest bank in Ecuador, I was able to compare—using a difference-in-differences matching approach—variables of interest for businesses that lost their contracts to businesses that kept their contracts and that had similar observable characteristics in all relevant aspects before the decision was unilaterally made by the bank. The exercise was conducted in the two main cities in Ecuador, in an urban environment with a high density of neighboring competitors and after the network of retail stores had continuously expanded for more than four years.

The results from different spillover exercises indicate that there might be an optimal distance at which non-bank correspondents should be located in order to maximize gains for both the retail stores and for banks in terms of the cost of building the network. If the retail stores are located too closely together, they may compete against each other for clients, potentially reducing the gains in traffic and sales that they could achieve by serving as a non-bank correspondent.

Retail stores with non-bank correspondent contracts benefit from higher foot traffic, higher sales, and greater use of financial services, particularly business bank accounts and credit. Gains for non-bank correspondents seem to be higher in areas where the customer service infrastructure is the most inadequate: areas located far from bank branches and with a low concentration of non-bank correspondents.

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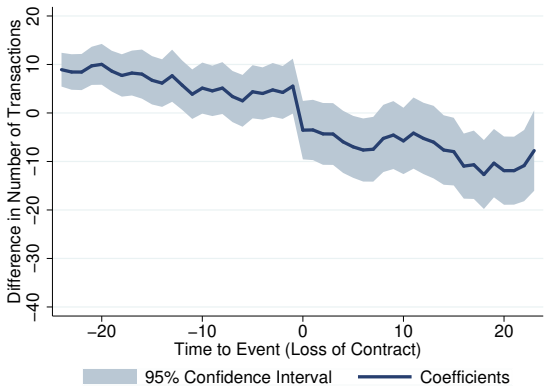
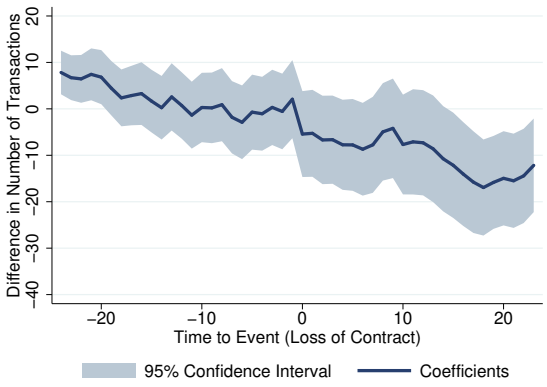
Appendices

Figure A1: Coefficients β_k of Event Study Setup for Different Distances

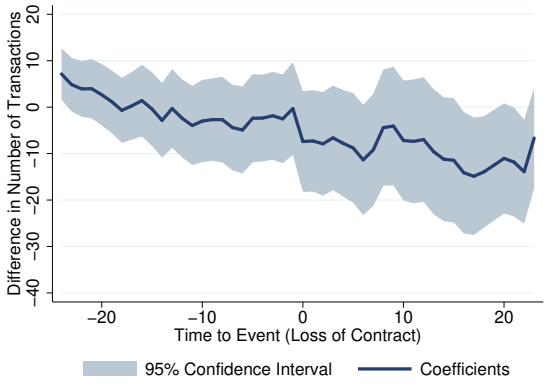
(a) Radius of 25 mts



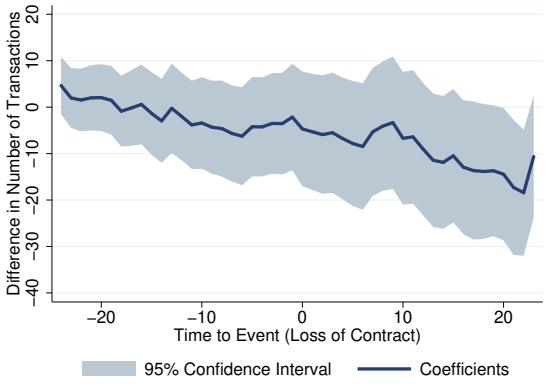
(b) Radius of 50 mts



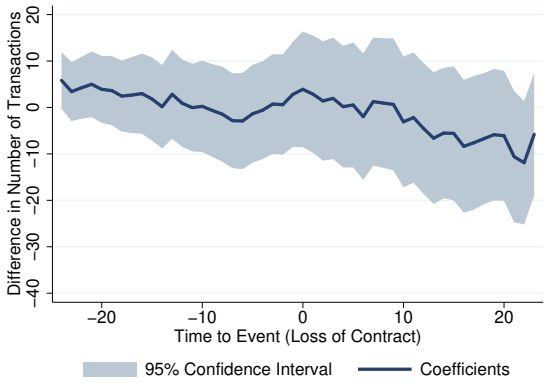
(c) Radius of 75 mts



(d) Radius of 100 mts



(e) Radius of 125 mts



(f) Radius of 150 mts

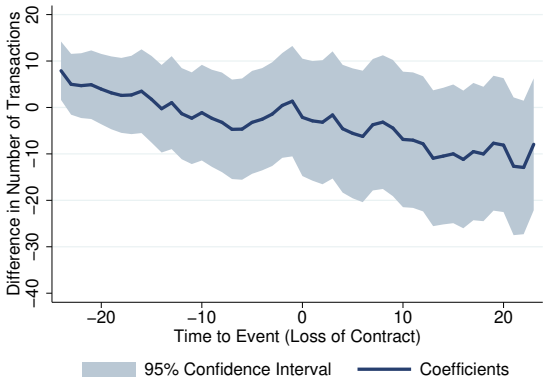


Table A1: Differences in Sales, Foot Traffic, and Use of Financial Products

Variables	Obs.	Non-terminated Mean	Coefficient	Standard Errors	t-stat†
	(1)	(2)	(3)	(4)	(5)
Sales on a good day in 2016 (in logs)	1632	5.378	-0.110	-0.043	-2.554**
Sales on a regular day in 2016 (in logs)	1632	4.987	-0.102	-0.042	-2.443**
Sales on a bad day in 2016 (in logs)	1632	4.333	-0.103	-0.052	-1.971**
Clients on a good day in 2016	1632	110.201	-4.899	-5.045	-0.971
Clients on a regular day in 2016	1632	67.983	-5.675	-3.257	-1.742*
Clients on a bad day in 2016	1632	39.576	-1.486	-2.138	-0.695
Business bank account, 2016	1632	0.787	-0.280	-0.034	-8.243***
Savings bank account, 2016	1632	0.584	-0.033	-0.037	-0.876
Credit, 2016	1632	0.489	-0.188	-0.038	-4.935***

Note: Coefficients reported in column (3) correspond to estimate, β, of separate regressions of the form $Y_{it} = \alpha_i + \beta D_i + \gamma \mathbf{X}_{it} + \delta_t + u_{it}$ restricted to business $i = 1, ...N$, in the common support using the nearest neighbor algorithm (one neighbor without replacement). These regressions account for potential spillover effects as described is Section 4.3. *** denotes significance at 1%, ** significance at 5%, and * significance at 10%.

Table A2: Logit Model for Contract Being Terminated During 2016 (for Businesses without Nearby Non-bank Correspondents, within 100 mts Radius, that Lost Their Contracts)

	Coefficient		Std. Err.
Nighttime luminosity in a 50 mts radius	-0.005		0.004
Sales on a good day at baseline (in logs)	-0.318		0.259
Sales on a regular day at baseline (in logs)	0.178		0.203
Sales on a bad day at baseline (in logs)	-0.015		0.136
Pichincha Province	0.724	***	0.131
Manufacturing	0.970	*	0.518
Retail	0.063		0.400
Services	0.012		0.420
Distance (mts) to closest bank agency	-0.000		0.000
Number of bank agencies within a 1 Km radius	-0.012		0.075
Number of NBC within 50 mts radius	-0.253	***	0.175
NBC classified as silver	-1.802	***	0.208
NBC classified as gold	-2.406	***	0.314
NBC classified as diamond	-3.615	***	0.730
Number of transaction on a regular day	-0.018	***	0.007
Usually not enough cash to serve customers	0.441	***	0.123
Average minutes to process transaction	0.041	**	0.021
Average minutes to travel to the bank	-0.009	**	0.005
Number of weekly visits to the bank	0.014		0.024
Constant	0.220		0.593
Number of observations	1690		
Pseudo R2	0.205		

Note: *** denotes significance of the coefficients at 1%, ** significance at 5%, and * significance at 10% level.

Table A3: Balance of Observable Characteristics in 2015, After Matching (for Businesses without Nearby Non-bank Correspondents, within 100 mts Radius, that Lost Their Contracts)

Variables	Mean		%bias	t-stat†	
	Terminated	Non-terminated		t	p>| t |
Nighttime luminosity in a 50 mts radius	36.605	36.717	-0.6	-0.08	0.934
Sales on a good day at baseline (in logs)	4.785	4.768	1.7	0.27	0.789
Sales on a regular day at baseline (in logs)	5.198	5.173	2.5	0.39	0.699
Sales on a bad day at baseline (in logs)	4.090	4.080	0.9	0.14	0.886
Pichincha Province	0.587	0.581	1.2	0.18	0.853
Manufacturing	0.020	0.022	-1.1	-0.21	0.835
Retail	0.717	0.709	1.9	0.29	0.773
Services	0.239	0.245	-1.4	-0.21	0.831
Distance (mts) to closest bank agency	2636.8	2672.6	-0.8	-0.15	0.882
Number of bank agencies within a 1 Km radius	0.491	0.489	0.2	0.03	0.975
Number of NBC within 50 mts radius	0.087	0.096	-2.6	-0.42	0.677
NBC classified as silver	0.067	0.064	1.0	0.21	0.834
NBC classified as gold	0.026	0.025	0.5	0.13	0.898
NBC classified as diamond	0.004	0.006	-0.9	-0.42	0.673
Number of transaction on a regular day	10.400	10.591	-1.4	-0.31	0.760
Usually not enough cash to serve customers	0.539	0.515	4.8	0.72	0.469
Average minutes to process transaction	4.165	4.074	3.1	0.48	0.632
Average minutes to travel to the bank	19.161	19.169	-0.1	-0.01	0.993
Number of weekly visits to the bank	1.907	1.943	-1.3	-0.22	0.827
Clients served on a good day at baseline	86.221	84.289	2.1	0.35	0.726
Clients served on a regular day at baseline	54.770	51.023	6.2	1.07	0.286
Clients served on a bad day at baseline	29.678	28.716	2.6	0.45	0.654
Business Bank Account	0.729	0.747	-4.0	-0.60	0.551
Savings Bank Account	0.530	0.579	-9.7	-1.47	0.143
Credit	0.491	0.491	0.0	0.00	1.000

Note: (†) t-test for difference in means: *** denotes significance at 1%, ** significance at 5%, and * significance at 10%.

Figure A2: Distribution of the Propensity Score Before (left) and After (right) Matching (for Controls without Nearby Non-bank Correspondents Neighbors)