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Financial inclusion of the poor and money laundering indicators: empirical evidence for Colombia*

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Abstract

Taking advantage of the largest financial inclusion program in Colombia, we estimate how increasing the access to such services for the poor impacts money laundering indicators in the country. We find that eventhough, on average, government's indicators of money laundering activities in Colombia decreased, complex and heterogeneous impacts across the country and in time are observed. While money laundering indicators decreased in areas with high historic values of this crime, indicators in areas with medium historic levels increased. The evidence suggests that after the bancarization process a fragmentation and expansion of money laundering indicators across municipalities in Colombia took place, diminishing the accuracy of the alerts that the financial institutions provide to the government in order to fight this crime.

Keywords: money laundering, bancarization, Sospicios Transaction Report, STR, IIF.

JEL Clasification: JEL: K42, C81, H56

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La inclusión financiera de los hogares pobres y los indicadores de lavado de activos: evidencia empírica para Colombia*

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Resumen

El presente trabajo analiza el efecto de un incremento en la inclusión financiera sobre los indicadores de lavado de activos en Colombia, a partir de la asignación aleatoria del programa de bancarización más grande que se ha implementado en el país. Los resultados sugieren que, a pesar de que los indicadores de lavado de activos disminuyen en promedio, hay impactos heterogéneos y acciones complejas de los individuos involucrados a través de los municipios del país. Mientras que los indicadores disminuyen en zonas caracterizadas históricamente por altos niveles de lavado de activos, éstos se incrementan en zonas con niveles medios de esta actividad ilícita. La evidencia sugiere que después de la bancarización, se desarrollaron procesos de fragmentación y expansión de los indicadores de lavado de activos que afectaron negativamente la precisión de la alertas que proveen las instituciones financieras.

Palabras Claves: lavado de activos, bancarización, Reportes de Operaciones Sospechosas, ROS, IIF.

JEL Clasificación: JEL: K42, C81, H56

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I. Introduction

There is a growing literature that studies the negative impacts of money laundering activities on the economy. Tanzi (1996) suggests that these activities can corrupt the financial system and reduce its reliance, reducing the growth rate of the economy. Similarly, Unger (2007) and Isern et al. (2005) conclude that money laundering negatively affects markets by distorting prices, consumption, savings rates and investment as it affects the demand for money, increases the volatility of the interest rate, exchange rate, credit availability and the levels of imports and exports. Argentiero (2008) presents evidence for Italy on the negative relationship between money laundering and GDP growth. More recently, Arnone et al. (2011) suggest that the main social consequence of money laundering is the consolidation of the economic power of criminal organizations, which later affects in different ways all sectors of the economy.

To reduce money laundering and its negative impacts, countries have agreed on several mechanisms and strategies under the recommendations of the Financial Action Task Force (FATF). This is an inter-governmental body that sets standards and promote effective implementation of legal, regulatory and operational measures for combating money laundering, terrorist financing and other related threats to the integrity of the international financial system. The FATF has developed a series of recommendations that are recognized as the international standard for combating money laundering, the financing of terrorism and the proliferation of weapons of mass destruction.

The implementation of these systems, though, has high costs for the private sector and regulatory bodies in all countries. For example, according to Arruda (2011) the United States and Europe spent \$ 5 trillion dollars in 2003 to implement international standards. Moreover, when legislators seek to implement effective regulatory measures, they face a trade-off between shielding the integrity of the country's economic system and undermining the efficiency of financial intermediaries due to the related costs of regulation (Masciandaro, 1999). There is evidence that the anti-money laundering measures now in place can negatively affect access to financial services. The regulations that banks face in order to prevent money laundering through their services involve additional costs and paperwork which are costly especially for the poor (Isern and De Koker, 2009). In fact, this trade-off was explicitly addressed in the Plenary Meeting of the Financial Action Task Force in Oslo in 2013 suggesting that regulations currently in place could hinder financial inclusion in the world.¹

¹ See for example the declaration of H.M. Queen Máxima of the Netherlands. <http://www.fatf-gafi.org/topics/financialinclusion/documents/unsgsa-20-june.html>

This is not a minor trade-off. Financial inclusion seeks to expand the accessibility and usage of the financial system to all individuals, including services such as bank accounts, digital services, loans and insurances. Today, more than half of the people living in developing economies cannot access these basic services due to numerous barriers that include pecuniary and non-pecuniary costs, regulatory barriers such as documentation requirements and even distrust on the system (Karlan et al., 2014). World Bank research estimates that more than 2.5 billion working-age adults have no access to the types of formal financial services delivered by regulated financial institutions (The World Bank, 2014). On the individual level, the lack of access to the financial system brings negative consequences as people are less able to smooth cash flows, are more vulnerable to unexpected financial crises or shocks and when required, they very often can only obtain credits from moneylenders who charge them high interest rates. On an aggregate level there are also negative impacts that translate into lower economic growth rates and higher poverty levels through lower investment in human capital and enterprises among others (i.e. Galor & Zeira, 1993; Burgess and Pande, 2005; Dupas and Robinson, 2013)

To the best of our knowledge, there is no study that analyzes if the current restrictions recommended by the FATF are effective or not and whether limiting access to the banking system effectively reduces levels of money laundering. In particular, there is no evidence if increasing access to financial services for the poor in less developed countries will increase this crime. Neither the magnitude nor the sign of such effect is clear. As recently argued by Rogoff (2016), cash facilitates crime through tax evasion, extortion, drug and human trafficking and terrorism among others; suggesting that a massive banking inclusion could decrease measures of money laundering activities. On the contrary, financial inclusion of the poor could increase such crime if these individuals are in economic and/or cultural conditions that make them more vulnerable to being used by criminal organizations as channels for money laundering activities.

This paper fills this gap in the literature by empirically evaluating the impact that increases in the access to the financial sector for the poor have on money laundering indicators through the banking system using a unique quasi natural policy experiment from Colombia. Colombia is a country that, given its drug production history, exhibits one of the highest levels of money laundering activities in the world (Mejía and Caballero, 2012; Misas et al. (2015). Moreover, between 2009 and 2010, the national government undertook a massive banking process where almost 2.6 million poor households in the country were introduced to the formal financial system for the first time. These two facts, united with detailed measures of both money laundering indicators and financial inclusion, makes the Colombian setting and ideal one to analyze such question.

After providing evidence on the exogeneity across time and space in which the massive financial inclusion campaign took place, we use monthly municipal level data for the period

2005 – 2013 and a fixed effects difference in difference strategy to estimate its impact on money laundering indicators. Using as dependent variables indicators used by the Colombian government to detect money laundering activities², we show that these measures significantly decreased in Colombian municipalities after the financial inclusion process took place. Estimates suggest that the total average value of money laundering activities, measured by the financial intelligence reports (IIF), decreased between 12 and 22 percent; the number of people involved in IIF did so between 2.7 and 3.5 percent, and the number of IIF diminished between 0.8 and 1.2 percent.

Yet, further analysis show that such decrease probably stems from a complex response of the agents involved in both the measure of illicit money laundering indicators as well as those involved in these activities themselves. First, we find heterogeneous impacts of the banking campaign when the data is analyzed at a regional level. The evidence suggests that the illicit financial flow through the banking system has spread across Colombian municipalities from municipalities with high historic values of such crimes to municipalities with lower historic levels. We argue and show robust statistical evidence that this could be explained by a division of laundering activity over different municipalities. This in turn may have lead to a weaker system in the investigation and reporting of unusual money movements in the financial system. We find that after the massive banking campaign, the banking system alerts that are then analyzed by the special central government agency in charge of investigating money laundering activities became noisier. As an example, we find that after the bancarization process took place, the value of the suspicious reports that are generated by the system and that were actually deemed as money laundering indicators sent for prosecution decreased by 6 percent.

These results have important policy implications that need to be taken into account by the banking regulation agencies. Particularly, we suggest to develop and implement adjustments, in parallel with financial inclusion programs, on the detection mechanisms of money laundering activities by the financial entities (reporting entities) and the charged authorities. Feasible adjustments should tackle properly the fragmentation dynamics that bancarization can cause in order to maintain precise regulation and certainty at the time to classify unusual transaction movements.

The remaining of the paper is organized as follows. Section 2 explains in detail the context of both the massive financial inclusion campaign and the illicit financial flow regulation in Colombia. Section 3 describes all data. Section 4 justifies the exogeneity of the bancarization process on money laundering indicators and clarifies the identification strategy and the

² Even though our data does not distinguish between money laundering activities through the financial sector and other sectors; it should be notes that between 95% and 98% of all the indicators stem from the former sector.

estimation results. Section 5 analyzes possible transmission channels. Finally, Section 6 concludes.

II. The Colombian context

Colombia provides an appropriate context in which the research question addressed in this paper can be analyzed. This section summarizes the two most salient features of the massive financial inclusion campaign as well as a detailed description of illicit money laundering in the country and how the government abides to the international standards to track and prosecute it.

a) Financial inclusion of the poor in Colombia

The Colombian government document CONPES 3424 from 2006 presented an innovative policy called *Banca de las Oportunidades*: a program that promote the access to credit and other financial services for the poor in order to pursue social equity in the country. At the time, the Colombian government knew that high costs and demanding opening policies for financial products were some of the biggest barriers poor households faced in order to be included into the financial sector. Under this view, one of the reforms proposed in the CONPES document was the simplification of the prevention system of money laundering for the population targeted by social programs such as *Familias en Accion*, the colombian conditional cash transfer program. Specifically, the document advocated to a reduction in the paperwork and pre-requisites that were in place at the time in order to open an account in the Colombian banking system.

Under this technical and legal recommendation, in 2009 the biggest massive inclusion process in the banking history of Colombia was undertaken. The project gave to every beneficiary household of the Familias en Acción program access to a savings account in *Banco Agrario*. The special savings account, called “electronic account”, had positive features such as zero management fee, a debit card which allowed them to make electronic withdrawals and included a special feature which excluded the users from the financial transaction tax applied in Colombia. Moreover, in order to decrease possible use of the account by illegal groups or money laundering activities, the bank also included a restriction so that not more than approximately US\$2,400 could be moved per month in the account.

The banking process of Familias en Acción beneficiaries was conducted in two broad stages between 2009 and 2010 generating variation across time. Graph 1 shows the number of families convened in each semester and the number of families that were effectively included in the formal financial system though this special savings account. The first phase was conducted

between April and June 2009 and during the second half of 2009; the second phase was developed in the first half of 2010 and the second half of the same year. By the end of the second phase, the number of families convened reached 2,636,980 out of which 91.8% opened the savings account.

Graph1. Families convened and finally included in the financial sector through Familias en Acción financial inclusion program

Source: Departamento para la Prosperidad Social

The financial inclusion process also generated variation across space. In the first semester of 2009 the financial inclusion campaign reached the first 37 municipalities, the second semester 192 municipalities were included, in the third one 639, and the last semester reached 229 municipalities. Map 1 presents the municipalities convened in each semester in 2009 and 2010. At first glance is very clear that this process enclosed almost all the Colombian geography. As can be observed, Importantly, it is clear that bancarization does not follow a specific geographical pattern (i.e it does not move from the north to the south of the country). On the contrary, each phase covered municipalities of different regions across the country.

Map 1: Bancarized municipalities through time

The magnitude of this financial inclusion process for the country was significant. The percentage of the Colombian adult population who have at least one financial product has experienced an increasing trend in recent years starting in 55.21% in 2007 to 71.5% in 2013. This represents an increase of 16 percentage points for the period, a growth that is directly related to the financial inclusion process of Familias en Acción as has been recognized by the banking association of the country. Graph 2 presents the annual growth rate of this financial indicator. In 2010, the last year of Familias en Acción bancarization process, the growth rate of adults that had at least one financial product almost doubles the annual average growth rate for the complete period. If we compare year by year growth rates, 2010 has the highest value for the entire period (2008-2013).

Graph 2. Yearly growth rate of the number of adults with at least one financial product in Colombia

This process of financial inclusion has also brought important benefits to the population served. Nuñez et al. (2011) in their study on the impact evaluation of Familias en Acción program find positive and significant effects on: credit application, credit application to financial institutions and credit approval requested to a financial institution. These results are consistent with those found by Attanasio and Pellerano (2012) who, using a regression discontinuity method, show that being or having been a beneficiary of the program generates an increase in the probability of having formal credit by 29 percentage points in rural areas. The authors also find that the program decreases the likelihood of informal savings by 7.8 percentage points.

b) Illicit financial flows in Colombia

Despite the high incidence of money laundering activities in the country, few studies provide a detailed description of their amount, its source of laundering and its evolution over time. Mejía and Caballero (2012) assert that money laundering could have three different channels through which illicit activities blind their earnings: financial system, smuggling and foreign money entrance. Misas et al. (2015) generate estimates of the size of illicit income and provide simulated and econometric estimates of the number of laundered assets in Colombia in the period 1985 to 2013. Their findings show that the volume of laundered assets rose from 8

percent of GDP in the middle of 1980 to a peak of 14 percent by 2002 and declined to 8 percent in 2013.

As a mechanism to prevent, detect and suppress various forms of money laundering, since 1999 Colombia has adopted the recommendations of the FATF. This has resulted in an anti-money laundering system and that also combats the financing of terrorism involving both the private and public sector. A crucial entity in the system is the Financial Intelligence Unit (UIAF for its acronym in Spanish)³, a special unit that is currently under the Ministry of Finance and whose inception in 1999 responds to the recommendations of the FATF. The main tool of the system is the Suspicious Transaction Report (STR)⁴, which can be understood as a signal that various entities report to the UIAF. This unit centralizes the information provided by reporting agencies, analyze the STRs and if its analysis yields a possible money laundering event, the unit reports it to the competent authorities (i.e. Attorney General) for possible prosecution.

For the special case of the banking sector, financial institutions in Colombia are forced to develop the Administrative System of Money Laundering Risk and Terrorism Financing (SARLAFT for its acronym in Spanish)⁵. SARLAFT allows all financial entities identify unusual financial operations. For this, financial institutions must develop different methodologies, models and qualitative or quantitative indicators with an important technic value for timely detection of unusual operations. In the event that a reporting institution detects one or several unusual operations, possibly related with money laundering activities, the compliance office of each bank studies and defines whether or not it is a suspicious transaction. If the test shows that the transaction studied is suspicious, the compliance office generates a STR that is sent to the UIAF (Bayona, 2015). In accordance with the rule, the models used by reporting entities must develop a segmentation of all the possible risk factors that include: customers (economic activity, transactions volume and frequency, income averages, expenditures and heritage), products (nature, characteristics, niche market or recipients), distribution channels (nature and characteristics) and jurisdiction (location, characteristics and transactions nature)

After receiving the different STRs, the UIAF team members assign them randomly to their analysts, who make a preliminary analysis. In parallel, the STR goes automatically through a detail revision on its database in order to detect if its related to a previous STR in the system. Using the analyst's judgment, STR that have elements that point to an effective money laundering activity are highlighted and studied in more detail. The STR that pass this first filter and hence should be studied in more detail are called Cases. In order to analyze in depth all

³ Unidad de Información y Análisis Financiero.

⁴ ROS for its acronym in Spanish, Reporte de Operación Sospechosa.

⁵ Sistema de Administración del Riesgo del Lavado de Activos y Financiación del Terrorismo.

Cases, the UIAF request further information from all the transaction related entities. Following a careful study of the information received, analysts can determine whether those cases are related to money laundering activities and are worthy to analyze them in a final stage. Those Cases turn into a Financial Intelligence Report (IIF for its acronym in Spanish)⁶. In this stage, all analysts assemble the available information and if necessary ask for additional data. Once the IIF is robust enough, it is handed in to the Attorney General for subsequent prosecution. Figure 1 summarizes the different stages of this process⁷.

Figure 1. Money laundering reporting system

A final note on the process is important. Once an unusual bank movement passes all the filters and is catalogued first as an STR, then as a Case and finally as an IIF a specific unique code is given in each stage. The codification depends on the source and final destination of STRs, which means a unique IIF code can have different associated STRs even from different municipalities. Figure 2 depicts a simple example of this aggrupation process. Hence, for each IIF it is possible to also estimate the number of STRs and municipalities associated to it.

⁶ Informes de Inteligencia Financiera.

⁷ For an extensive discussion refer to Bayona (2015)

Figure 2. Filtering process of unusual bank movements

III. Data

This paper uses three data sources that account for money laundering measures, banking, illicit crops and economic and socio demographic characteristics at the municipal level. The first one, comes directly from the UIAFs information system and contains all the Colombian government's indicators of money laundering activities. Specifically, we have information on all the STRs and IIF generated in the country in the period 2005 - 2013 at the municipality level. For each STR and IIF we have information on its monetary value and the number of individuals involved in each of them. On average the STRs and IIF monthly value in levels reached \$1,680,108 and \$823,253 USD⁸ at the municipal level respectively; on average, 1 and 2 persons are linked with these indicators at the municipality level respectively, and finally; the average number of STRs and IIF for the whole period is 0.724 and 0.123 respectively. It is important to note that, as the IIF are the result of the careful analysis of all STRs by the UIAF, its average value is less than half of STRs average value. This shows that part of STRs produced by the reporting entities does not correspond to effective money laundering activities, or at least there is no strong evidence to support a case.

⁸ This value was estimated using the official exchange rate in the country in September 13th 2016 of \$2,976 Colombian pesos per US dollar

The presence of money laundering indicators across the country has significantly changed in the in the last 10 years. Table 1 provides evidence of this change by presenting the transition matrix of Colombian municipalities before and after 2008 (one year before the beginning of the financial inclusion process) depending on the average value of the STRs in each of them. For example, the first row and column capture those municipalities that do not have any STR before nor after 2008. The second row and column present the proportion of municipalities that have an average value of STRs below the median; while the third row and column present the proportion of municipalities that have an average value of STRs above it. As a complement, Figure 2 presents this geographic distribution of STR in the Colombian territory at the municipality level.

Based on the transition matrix and the maps, it is possible to assert that the money laundering indicators have increased in time. Before 2008 a total of 498 municipalities had no STR report, a number that decreased to 315 by 2013. Only 48% of the municipalities that had no previous STR report continued having no suspicious transaction after 2008. Not surprisingly then, there was an increase in the proportion of municipalities that have a below and above the median values of STRs reports. It is interesting to note that 82% of the municipalities that previous to 2008 had STRs with an average value above the mean continue to present such high valued STRs. Similarly, 30% of the municipalities that prior to 2008 reported STRs below the average median value now belong to the high reporting group of municipalities. Such increase in the proportion of municipalities with higher average values of STRs is evident in the map too, especially those located in the Andean and Pacific regions in the country.

Although STRs provide a first glance of probable money laundering activities in Colombian municipalities, as described before, these are rather crude measures and only 16% of them actually become a IIF and are sent to the general attorney's office for prosecution. Hence, in this paper our main dependent variables of interest are based on this more accurate measure of money laundering activities. Specifically, we use the average value of the IIF in each municipality, the number of people involved in it, the total number of IIF in each month, the number of STRs in each IIF and the number of municipalities involved in them, normalized by the population in each municipality. The normalization includes the total yearly population of each municipality in the following way: $\ln(1 + (100000 * var / (total\ population + 1)))$ This group of variables gives a more precise indication of the level of probable money laundering activities in the Colombian banking sector. The normalized values of these indicators are presented in Table 2.

Figure 2. Geographical distribution of STR before and after 2008 at municipality level

Our independent variable of interest is related to the process of financial inclusion of *Familias en Accion* above described. Information for this process comes directly from *Prosperidad Social*, the national entity in charge of the *Familias en Accion* program. Information on the exact month and number of families that opened the savings account in each municipality during the financial inclusion campaign was provided. With this information we were able to create four main indicators that outline the progress of the bancarization program. The first one is a dummy variable that takes the value of one if the municipality's cumulative proportion of bancarized families is above 75% (Bancarization dummy 1). The second one is a dummy variable that takes the value of one if the municipality's cumulative proportion of bancarized families is greater than the maximum monthly proportion of bancarized families in the entire period (Bancarization dummy 2). The third one is the monthly cumulative rate of bancarized families out of the total bancarized families between 2009 and 2010 in each municipality. The last one is a discrete variable that captures the number of years that have elapsed since the bancarization process took place in each municipality.

The last source of data comes from the CEDE panel, a panel at the municipality yearly level that includes important controls that could be correlated with money laundering activities as well as poverty levels and hence need to be included in our regressions. Variables which the national literature have proven are related to money laundering activities include the average proportion of the municipality with illicit crops and homicide rate. Likewise, our regression also control for the proportion of individuals with a bank account in the municipality, municipality area, municipality development index (IDM⁹), total population.

IV. Financial Inclusion and money laundering indicators: main results

The exogeneity of the financial inclusion process

In order to empirically estimate the causal impact of the financial inclusion program on money laundering indicators, the former needs to be orthogonal to unobservable factors that also affect the latter. In particular, the identification assumption under our main empirical strategy is that the timing of the *Familias en Accion* financial inclusion program in each municipality is not endogenous to the previous levels or changes in the money laundering levels. In other words, the order in which each municipality started to be included in the financial inclusion program did not depend on the previous money laundering measures.

⁹ The municipality development index measures synthetically social and financial variables of all the Colombian municipalities. It includes the following variables: percentage of literacy people, percentage of people without basics necessities, energy coverage, education coverage, municipal taxes and public investments.

As mentioned above, the main objective of the financial inclusion process was making the payments of the conditional cash transfer program more efficient as well as allowing this vulnerable sector of the population to be integrated into the formal financial system. Taking this into account, it is difficult to foresee a scenario where policy makers considered the UIAF measures at the moment when they were taking the decision of which municipality to include in each of the four bancarization stages. Moreover, these UIAF reports are strictly confidential and hence the individuals in charge of this financial inclusion strategy had probably no access to them in the first place.

To justify this exogeneity formally, we use a hazard function model to analyze the timing in which the bancarization took place in Colombian municipalities. The duration model will allow us to determine if the hazard of bancarization in each municipality is related to its money laundering indicators. In these models, the dependent variable is duration: the time to the occurrence of an event. In the case of bancarization, we define duration as the time that it takes for a municipality to include in the financial system 75% of the total families that took part of the entire bancarization process in that municipality. Theoretically, duration is a non-negative continuous random variable, where duration is represented by an integer number of months. In these models, rather than specifying T 's probability density function $f(t)$ or its cumulative distribution function $F(t) = \Pr(T \leq t)$, we must refer to T 's survival function $S(t)$ or its hazard function $h(t)$.

The survivor function is the reverse cumulative distribution function of T , therefore it represents the probability that the duration of an event is larger than a time t : $S(t) = 1 - F(t) = \Pr(T > t)$. The hazard function (hazard rate) is the instantaneous rate of failure, it is the probability that the event takes place in a given interval, conditional on the fact that it survived until the beginning of that interval, divided by the width of the interval:

$$h(t) = \lim_{\Delta t \rightarrow 0} \frac{\Pr(t + \Delta t > T > t \mid T > t)}{\Delta t}$$

In order to apply empirically this model, we use the semiparametric proportional hazard model of Cox. This model supposes a baseline hazard function $h_0(t)$ with no specific parametrization, the effects of the additional variables alter the baseline hazard function multiplicatively. Thus, the hazard rate for the j_{th} municipality is

$$h(t|x_j) = h_0(t) \exp(x_j \beta_x + z_j \gamma_z + \phi_i) \quad (1)$$

The vector $\mathbf{x}_j$ contains monthly data of money laundering indicators (specifically STR and IIF) and the vector $\mathbf{y}_z$ contains yearly data of economic and social variables at the municipality level (rural index, industry and commerce tax revenues, illicit crops, etc.). We also include municipality fixed effects to control for unobserved characteristics. In this case, our independent interest variables are the money laundering indicators. We expect that the coefficients of these variables will not be relevant for the time to bancarization.

We estimated the model using partial likelihood method (Cox, 1972). Table 3 presents the main results for different specifications of the equation (1). First, we include a set of variables that indicate the previous bancarization levels in each municipality as well as its level of development. As one would expect, the timing of the financial inclusion of *Familias en Acción* beneficiaries is positively correlated with the levels of the financial sector penetration and developmental index in the municipality. We also control for both tax and transfers at the municipality level, measures of coca cultivation and conflict levels. None of these measures appear significant in explaining the timing of the financial inclusion process. More importantly, in the last model we include measures of IFF both in levels as well as in changes to analyze whether these are correlated with the timing of bancarization. As can be observed none is significant at any standard level either suggesting that the bancarization process was indeed exogenous to the money laundering activities indicators and the analysis proposed in this paper is valid.

Financial inclusion and its average impact on money laundering in Colombia

In order to analyze the impact of the financial inclusion of the poor on money laundering activities, we undertake a difference-in-differences (DID) methodology that exploits the fact that the banking process is exogenous to the levels of money laundering in each municipality. By including fixed effects at the municipality level we are able to compare money laundering indicators in each municipality before and after the introduction of the financial inclusion process. Specifically, the DID model used to identify this effect is:

$$\ln(LA_{i,t}) = \beta_0 + \beta_1 \text{FinInclusionFA}_{i,t} + \phi X_{i,t} + \lambda_i + \varphi_t + \varepsilon_{i,t} \quad (2)$$

Where $\ln(LA_{i,t})$ represents the specific money laundering indicator in municipality i in month t . Specifically, we use three different indicators which are all transformed to per capita levels and expressed in natural logarithms for ease of interpretation of the coefficients: value of IIF, number of individuals in each IIF, number of IIF in a given municipality, number of STRs in each IIF and number of municipalities involved in each IIF. $\text{FinInclusionFA}_{i,t}$ represents a

dummy variable related to financial inclusion process of *Familias en Acción* under the three specifications explained above. Meanwhile, $X_{i,t}$ is a matrix representing the socioeconomic or demographic variables of the municipality i in year t used as controls and summarized in Table 2. λ_i represents municipality fixed effects that captures all time constant characteristics of each municipality and φ_t represents monthly-yearly fixed effects which capture any particular trend in money laundering levels in Colombia and possible administrative changes in the performance of the UIAF reporting and detecting system across each month in the period observed. Finally, the error term $\varepsilon_{i,t}$ is not correlated with the bancarization variables and is clustered at municipality level.

Table 4 presents the coefficients of interest of fifteen different specifications of equation (2) using all the available sample between 2005 and 2013. Dependent variables are placed in the columns, and independent variables are in the corresponding rows. For all the indicators of IIF (value of IIF, people in IIF and number of IIF) and for all the dummy and cumulative variables of bancarization, we find a robust and negative effect of the bancarization process on the money laundering indicators. Given the log-normalization of the independent variables, the municipal average IIF value have significantly decreased between 12 and 21.8 percent. Similarly, the number of people involved in IIF have diminished between 2.7 and 3.5 percent and the number of IIF have also decreased between 0.8 and 1.2 percent. In practical terms, these impacts imply that on average, after the families in a given municipality in Colombia had opened the new savings account the value of money laundered decreased in US\$197,580 per month.¹⁰

These findings go in line with studies such as Misas et Al. (2015) who suggest that money laundering activities have decreased systematically in Colombia between 2003 and 2013. Moreover, it also follows the ideas recently put forward by Rogoff (2016) who claim that a reduction in the usage of cash could also decrease such type of criminal activity.

Heterogeneous impacts across space and time

The previous results suggest that the expansion of the formal financial system through the bancarization process of the beneficiary families of the Colombian CCT program reduced average money laundering activities in the country. Nonetheless, it is important to understand if this reduction occurs in a similar magnitude across the country and if there are differences depending on the time elapsed since the financial inclusion process was implemented.

¹⁰ This value was estimated using the official exchange rate in the country in September 13th 2016 of \$2,976 Colombian pesos per US dollar.

Table 5 present the heterogeneous impact of bancarization according to the prior level of money laundering activity in a given municipality. Specifically, we divide all municipalities in the country in three groups following the ideas in the transition matrix: those municipalities with no STRs before 2008, those with STRs with an average value lower than the median value in the country prior to 2008 and those with an average value above or equal to the median in the same period. The table is divided in three different panels, one for each of the alternative measures of the timing of bancarization. In each panel the coefficient associated to the regression of the three dependent variables (value, people and number of IIF) for each group of municipalities (NO STRs, values of STRs below median and value of STRs above the median) is depicted.

Observing the table, it is important to first note that all the estimations are robust to the usage of the alternative independent variable, the sign and significance of point estimates do not present major changes. In none of them, we find a significant effect of bancarization on IIF measures in those municipalities that did not present any STRs before 2008. On the contrary, point estimates suggest a significant effect in the other two groups. Nevertheless, these effects are different in sign and magnitude depending on the group we consider. In those municipalities that had low levels of STRs previous to 2008, after the bancarization process took place money laundering indicators (MLI) in these municipalities increase. In those municipalities characterized by higher levels of STR before 2008, results suggest a negative and significant impact of the financial inclusion process on the normalized money laundering indicators. Specifically, in those municipalities that had low levels of STRs before 2008, the IIF value increases between 12.4 and 14 percent after bancarization took place. On the contrary, in the municipalities that present higher levels of STRs value the IIF value decreases between 26.1 and 42.07 percent after the implementation of the financial inclusion process.

Results in the previous table present the average impacts across the complete period. Yet, the reaction of the agents may change in time, depending on how long the bancarization process has been in place in a given municipality. Table 6 presents the heterogeneous impact of bancarization across time and space. As can be observed, the positive impact in the municipalities that had low levels of STRs value prior to the financial inclusion process is rising during all years after bancarization. Specifically, after the fifth year of bancarization the IIF value rise in 39.65 percent. The same is true for both the number of people and the number of IIF in these municipalities. This suggest that money laundering indicators significantly increased after bancarization took place becoming stronger each year. Conversely, the instantaneous negative effect of bancarization in the first year on the municipalities that had high value of STRs before 2008 evolves to zero over time as the point estimates lose their statistical significance.

The fragmentation of money laundering activities and the difficulty in detecting them

The analysis of the heterogeneous impacts made clear that the response of agents involved in money laundering activities across the country was complex. Even though on average money laundering indicators decreased in Colombia after the bancarization process took place, results from tables 5 and 6 show that in a specific group of municipalities MLI actually increased. Taken together these results, as well as the descriptive statistics shown in the data section, suggest that money laundering activities expanded across the country from municipalities with historic high values of such criminal activity to municipalities with medium level values. If such hypothesis is true, at least two stylized facts should be observed in the data. First, as money laundering activities expand across the country a fragmentation of such activities should be observed. Second, if this is indeed the case, the alerts given by the system to the UIAF should become noisier making it more difficult to detect this type of crime.

In order to prove the first stylized fact, we estimate the following equation dividing all municipalities in the country in the three groups considered in the transition matrix (table 1):

$$MLID_{i,t} = \alpha + \beta Z_{i,t} + \gamma X_{i,t} + \lambda_i + \varphi_t + \varepsilon_{i,t}$$

Where $MLID_{i,t}$ is a variable that approximates the possible division of money laundering indicators. To fully understand this measure, it is important to recall section II in which we described MLI reporting system. Once an unusual bank movement has been named a Suspicious Transaction Report and has passed the first and second analysis process, it is linked to a specific IIF code. The codification depends on the source and final destination of STRs, which means a unique IIF code can have different associated STRs from different municipalities. Our variables in $MLID_{i,t}$ take into account this filtering process through two different definitions. The first one is the number of STR that are linked by code to all the IIF of a given municipality i in a specific month t normalized by total population. The second one captures the number of municipalities that are associated by code to all the IIF of a given municipality i in a specific month t . As in Table 6, $Z_{i,t}$ is a vector of year dummies that captures the yearly duration of the bancarization in each municipality¹¹. The term $X_{i,t}$ denotes a vector which contains social and economic controls of each municipality; λ_i represents municipality fixed effects that captures all time constant characteristics of each municipality and φ_t represents monthly-yearly fixed effects.

¹¹ The beginning of bancarization is defined taking into account the cumulative proportion of bancarized families. Specifically, we define a municipality is bancarized when the cumulative proportion of bancarized families in each month overcomes 75%.

Table 7 presents evidence in favor of the fragmentation of money laundering activities. Following the second year of bancarization the number of STRs and municipalities tied to a specific IIF code increased in those regions that had low and high values of STRs prior to 2008. Similarly, the number of municipalities linked to IIF raised through the years of bancarization in those municipalities that prior to 2008 present high values of STRS. Together, these results suggest that a possible fragmentation of money laundering activities could have taken place in the country. Specifically, after five years of bancarization the monthly normalized number of the STRs associated to a unique IIF code in each municipality significantly increases in 11 per cent on the municipalities that presented low values of STRs before 2008. Similarly, on those municipalities that had high values of STRs prior to 2008, the monthly normalized number of STRs linked to a specific IIF rises in 38.13 per cent after five years of bancarization. Regarding the second independent variable, point estimates suggest that in the low STRs value municipalities the number of municipalities tied to an exclusive IIF increases in 0.304; in the high STRs value municipalities the monthly number of municipalities associated with an IIF also increases in 18 after five years since the beginning of bancarization. Agents involved in money laundering activities could have taken advantage of the greater number of accounts in the formal financial sector and used them for hiding and camouflage their illegal earnings in more diverse accounts.

Such fragmentation of money laundering activities has probably increased the difficulty for tracking and identifying money laundering activities by the UIAF. In other words, it could have decreased the accuracy of the system in detecting high probable laundering activities and making it noisier. In order to test this second stylized fact, we first estimate the following equation:

$$\begin{aligned} \ln(IIF_{i,t}) = & \alpha_0 + \alpha_1 \ln(STR_{i,t}) + \alpha_2 (\ln(STR_{i,t}) * FinInclusion_{i,t}) + \alpha_3 FinInclusion_{i,t} + \lambda_t \\ & + \varepsilon_{i,t} \quad (3) \end{aligned}$$

This expression summarizes the monthly relation between IIFs and STRs before and after the *Banca de las Oportunidades* financial inclusion program. The coefficient α_1 captures the association between IIF and STR before the implementation of the bancarization process. We expect this coefficient to be positive and significant since intuitively an increase in STR must be related with a proportional increase in IIF, if the UIAF reporting system is working correctly. Similarly, $(\alpha_1 + \alpha_2)$ captures the relation between IIF and STR after bancarization; if our second hypothesis is correct, this point estimate should be negative.

Table 8 presents the main results of estimating equation (3) using as dependent variable either the number of people involved in IIF, the IIF value and the number of IIF in a given

municipality and month. As we expected, point estimates suggest a positive relation between STR and IIF prior to the bancarization in all the money laundering indicators. An increase in one percent in the value, number of people and number of STR is related with an increase of 31.18, 35.7 and 27.3 percent respectively in the corresponding IIF measures. Nevertheless, as the point estimate of α_2 is negative and significant, the efficiency of the STR in detecting money laundering activities is undermined after the bancarization process. Specifically, the positive relation between the IIF value and its corresponding STR measure has decline in 5.7 percent since the implementation of *Banca de las Oportunidades*. Similarly, the relation between the number of people in STR and the number of STR, and the number of people in IIF and the number of IIF has decreased in 0.4 and 0.9 percent respectively.

V. Conclusions

As has been previously acknowledged, there could exist a trade-off between the objectives of increasing access to financial services and money laundering and illicit financial flow activities. Using monthly data at municipality level of Money Laundering Indicators (MLI) and data concerned to the major bancarization process in Colombia, Banca de la Oportunidades, we show that increasing the financial inclusion of poor households in Colombia decreased money laundering indicators, principally the total value of the financial intelligence reports (IIF). However, our analysis show that such decrease probably stems from a complex response of the agents involved.

First, we find evidence that suggests that traditional indicators have become less precise after the massive banking campaign. This suggests that traditional models used by the financial system to report suspicious monetary movements may need to be adjusted to the new clients served. Second, our analysis at a regional level shows heterogeneous impacts of the banking campaign. This evidence suggests that the illicit financial flow through the banking system has spread across Colombian municipalities from municipalities with high historic values of such crimes to municipalities with lower historic levels. We argue that this could be explained by a division of laundering activity over different municipalities, division that in turn explains why the system may be weaker in the investigation and reporting of unusual money movements in the financial system.

Our results suggest the need to develop and implement adjustments to the anti-money laundering identification system that help improve the detection mechanisms by the financial entities, the reporting entities, of suspicious transactions. Feasible adjustments should not only properly tackle the fragmentation dynamics that bancarization may cause in order to maintain

precise regulation and certainty at the time to classify unusual transaction movements. The Colombian law (SARLAFT) indicates that reporting agents should make and use segmentation models. There may be the need to take greater care in different geographic areas in which the UIAF report as high-risk areas. Such segmentation may be important in the futures specially as the levels of illicit crop cultivation is increasing and as hopefully a process of peace agreements is finally reached in the country.

VI. Tables

Table 1: Transition matrix on the proportion of municipalities according to the average value of STRs

		After 2008			
		No STR	Below the median	Above the median	Total number of municipalities
Before 2008	No STR	47,59%	41,77%	10,64%	498
	Below the median value of STRs	22,85%	46,69%	30,46%	302
	Above the median value of STRs	2,97%	14,85%	82,18%	303
	Total number of municipalities	315	394	394	1103

Table 2: Descriptive statistics at the municipality monthly level

	Units	Observations	Average	S.D.	Max
Value IIF	Millions of COP	132,360	2,450	2,500,000	4.92e+07
People in IIF	Number of people	132,360	0.730	26.970	8088
IIF	Number	132,360	0.123	1.516	185
Value ROS	Millions of COP	132,360	5,000	3,620,000	8.48e+07
People in ROS	Number of people	132,360	2.222	38.028	8136
ROS	Number	132,360	0.724	8.974	1305
Ln (Value IIF)*	Millions of COP	132,324	0.617	3.360	28.372
Ln (People in IIF)*	Number of people	132,324	0.048	0.317	8.208
Ln (IIF)*	Number	132,324	0.033	0.215	4.661
Ln (Value ROS)*	Millions of COP	132,324	1.821	5.634	30.536
Ln (People in ROS)*	Number of people	132,324	0.179	0.612	8.208
Ln (ROS)*	Number	132,324	0.146	0.490	5.519
Bancarized families	Number of families	132,360	17.544	413.041	61664
Homicide rate	Ratio	111,456	1.157	6.986	272
Illicit Crops	Prop. of municipality area	132,043	0.000	0.002	0.030
Ln (Saving Accounts)*	Number	91,512	8.994	2.220	12.640
IDM	Index	118,416	48.232	14.606	94.525
Industry and commerce tax revenues	Millions of COP	105,108	4126.504	67911.05	2714593
Rural index	Index	105,864	0.570	0.240	1
Transfers (source of income)	Millions of COP	105,108	948.386	2,761.874	10,5524.8
Fiscal performance	Index	104,868	63.756	8.908	94.19
Integral performance	Index	105,276	61.994	14.795	92.446
Municipality area	Squared kilometers	105,888	916.027	3,048.405	6,5674
Total population	Number of people	132,324	40,988.16	25,0393.2	7,782,754

Note: * variables normalized by the following formula: $\ln(1+(100000 \times \text{var}/(\text{total population}+1)))$

Table 3: Survival Analysis

Variables	Time of Bancarization	
Bancarization	0.000*** (1.80e-05)	0.000*** (1.79e-05)
Saving Accounts	0.061*** (0.018)	0.062*** (0.018)
IDM	0.016*** (0.005)	0.016*** (0.005)
Industry and Commerce tax revenues	-6.98e-05*** (7.28e-06)	-6.90e-05*** (8.05e-06)
Illicit Crops	-4.764 (29.97)	-5.199 (29.96)
Homicide rate	-0.033 (0.064)	-0.031 (0.063)
Rural Index	-0.297 (0.195)	-0.316 (0.196)
Transfers (source of income)	0.000*** (8.12e-05)	0.000*** (8.10e-05)
Fiscal performance	-0.008 (0.006)	-0.009 (0.006)
Integral performance	-0.000 (0.003)	-0.000 (0.003)
ln (Value IIF)		-0.012 (0.043)
ln (People IIF)		0.569 (0.833)
ln (Number of Iif)		-0.937 (0.921)
Δ Value IIF		0.013 (0.036)
Δ People in IIF		0.002 (0.567)
Δ Number of IIF		0.218 (0.651)
Department fixed effects	YES	YES
Observations	52,388	52,388

Note: Coefficients are not hazard ratios

Standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4: Effect of bancarization on measures of IIF

Models	IIF		
	People	Value	Number
Bancarization Dummy (1)	-0.027*** (0.010)	-0.128 (0.087)	-0.008 (0.006)
Bancarization Dummy (2)	-0.036*** (0.012)	-0.246*** (0.087)	-0.012** (0.006)
Cumulative Prop.	-0.032*** (0.011)	-0.201** (0.086)	-0.010* (0.006)
Municipality controls	Yes	Yes	Yes
FE year*month	Yes	Yes	Yes
FE municipality	Yes	Yes	Yes
Observations	111,189	111,189	111,189
Number of municipalities	1,031	1,031	1,031

Note: all regressions contain the following controls: homicides rate, illicit coca cultivation and municipality development index (IDM). The independent variables are normalized applying the following formula: $\ln(1+(100000 * var/(total\ population+1)))$

*Clustered standard errors at municipality level in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%*

Table 5: heterogeneous impact of bancarization across the country

	People	Value	Number	Obs.
Panel A – Bancarization Dummy (1)				
No STRs before 2008	-0.000 (0.007)	-0.008 (0.044)	-0.000 (0.007)	48,092
Value STRs before 2008 below median	0.020** (0.010)	0.131* (0.069)	0.020** (0.009)	30,631
Value STRs before 2008 above or equal median	-0.066*** (0.023)	-0.302 (0.204)	-0.027** (0.013)	32,466
Panel B –Bancarization Dummy (2)				
No STRs before 2008	-0.001 (0.006)	-0.009 (0.042)	-0.000 (0.006)	48,092
Value STRs before 2008 below median	0.018** (0.009)	0.117* (0.064)	0.018** (0.009)	30,631
Value STRs before 2008 above or equal median	-0.082*** (0.026)	-0.546*** (0.200)	-0.032** (0.013)	32,466
Panel C - Cumulative Prop.				
No STRs before 2008	-0.001 (0.007)	-0.010 (0.044)	-0.001 (0.007)	48,092
Value STRs before 2008 below median	0.020** (0.010)	0.130* (0.069)	0.020** (0.009)	30,631
Value STRs before 2008 above or equal median	-0.079*** (0.026)	-0.490** (0.206)	-0.032** (0.014)	32,466
Municipality controls	Yes	Yes	Yes	-
FE year*month	Yes	Yes	Yes	-
FE municipality	Yes	Yes	Yes	-

Note: all the regressions contain the following controls: homicides rate, illicit coca cultivation and municipality development index (IDM). The independent variables are normalized applying the following formula: $\ln(1+(100000 * var)/(total\ population+1))$

Cluster standard errors at municipality level in parentheses; * significant at 10%; ** significant at 5%;

*** significant at 1%

Table 6: Heterogeneous impact of bancarization across time and space

	People	Value	Number
No STR before 2008			
Year 1	-0.001 (0.007)	-0.01025 (0.044)	-0.00049 (0.007)
Year 2	0.002 (0.008)	0.00692 (0.055)	0.00077 (0.007)
Year 3	0.002 (0.007)	0.02078 (0.060)	0.00107 (0.007)
Year 4	0.003 (0.009)	-0.00107 (0.068)	0.00156 (0.008)
Year 5	-0.002 (0.009)	-0.03022 (0.073)	-0.00313 (0.009)
Value STRs before 2008 below median			
Year 1	0.021** (0.010)	0.13159* (0.070)	0.02027** (0.009)
Year 2	0.017 (0.011)	0.16402* (0.093)	0.01698 (0.010)
Year 3	0.035** (0.014)	0.32197** (0.134)	0.03289** (0.013)
Year 4	0.044*** (0.016)	0.31540** (0.151)	0.03471** (0.013)
Year 5	0.059** (0.023)	0.33424* (0.198)	0.04698** (0.020)
Value STRs before 2008 above or equal median			
Year 1	-0.069*** (0.024)	-0.31775 (0.210)	-0.02658* (0.014)
Year 2	-0.010 (0.028)	0.27606 (0.309)	0.00953 (0.020)
Year 3	-0.017 (0.038)	0.53574 (0.438)	0.01770 (0.025)
Year 4	-0.089* (0.053)	-0.19228 (0.548)	-0.01086 (0.030)
Year 5	-0.097 (0.061)	-0.30371 (0.658)	-0.00452 (0.037)
Municipality controls	Yes	Yes	Yes
FE year*month	Yes	Yes	Yes
FE municipality	Yes	Yes	Yes

Note: all the regressions contain the following controls: homicides rate, illicit coca cultivation and municipality development index (IDM). The independent variables are normalized applying the following formula: $\ln(1+(100000 * var/(total\ population+1)))$
*Standard errors clustered at municipality level; * significant at 10%; ** significant at 5%; *** significant at 1%*

Table 7: Money laundering fragmentation across time and space

	No STRs before 2008		Low values of STRs before 2008		High values of STRs before 2008	
	STRs x IIF	Mun x IIF	STRs x IIF	Mun x IIF	STRs x IIF	Mun x IIF
Year 1	-0.002 (0.014)	-0.020 (0.027)	0.055** (0.026)	0.304* (0.184)	-0.110* (0.059)	0.785 (0.999)
Year 2	-0.004 (0.014)	-0.044 (0.036)	0.047* (0.028)	0.153 (0.162)	0.152* (0.080)	7.465*** (2.581)
Year 3	-0.003 (0.014)	-0.039 (0.043)	0.077** (0.035)	0.301 (0.232)	0.319*** (0.103)	14.038*** (4.681)
Year 4	-0.004 (0.015)	-0.052 (0.049)	0.070** (0.035)	0.187 (0.242)	0.197* (0.109)	13.695** (5.465)
Year 5	-0.015 (0.016)	-0.071 (0.047)	0.104* (0.059)	0.320 (0.381)	0.323** (0.143)	18.192*** (6.870)
Municipality controls	Yes	Yes	Yes	Yes	Yes	Yes
FE year*month	Yes	Yes	Yes	Yes	Yes	Yes
FE municipality	Yes	Yes	Yes	Yes	Yes	Yes

Note: all the regressions contain the following controls: homicides rate, illicit coca cultivation and municipaity development index (IDM). The number of STRs per IIF is normalized applying the following formula: $\ln(1+(100000 * var/(total\ population+1)))$
*Standard errors clustered at municipality level; * significant at 10%; ** significant at 5%; *** significant at 1%*

Table 8: Relation between STR and IIF

Variables	IIF		
	IIF people	IIF value	IIF number
People in STR	0.305*** (0.016)		
STR value		0.272*** -0.009	
Number of STRs			0.241*** (0.011)
STR*Bancarization dummy (1)	-0.009*** -0.001	-0.059*** (0.011)	-0.004*** (0.001)
Bancarization dummy (1)	0.021*** -0.007	0.075 (0.077)	0.013*** (0.005)
Observations	111,189	111,189	111,189
R-squared	0.26	0.163	0.222
Number of municipalities	1,031	1,031	1,031

Note: all regressions contain the following controls: homicides rate, illicit coca cultivation and municipality development index (IDM). MLI are normalized applying the following formula:

$\ln(1+(100000 * var/(total\ population+1)))$

*Cluster standard errors at municipality level in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%*

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