

**THREE ESSAYS ON FINANCIAL REGULATIONS AND
REMITTANCES**

by

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ABSTRACT

In this dissertation, I study the anti-money laundering and counter-terrorism financing regulations (AML-CTF) and migrant remittances.

First chapter explores the unintended consequences of Anti-money Laundering and Counter Terrorism Financing (AML-CTF) regulations on remittance services. Migrant workers predominantly use money transfer operators (MTOs) and banks to transfer money to their country of origin. However, banks are ceasing the provision of low-cost remittance services and closing MTOs' accounts due to the strict enforcement of policies that exist to fight money laundering and financing of terrorism. Therefore, the AML policies could pose a significant challenge to the global objective of reducing remittance costs. My paper is the first to provide a rigorous causal investigation of the unintended consequences of AML/CTF enforcement on the cost and flow of remittances. Using the Remittance Price Worldwide, PwC's KYC guide, and other supplementary datasets, my results show that AML regulations cause an increase in the total cost of remittances, with origin countries being the most affected. I also analyze the downstream effect on remittance flows and see a decrease in remittance outflows but no significant effect on inflows. The results show that AML/CTF regulations are unintentionally impacting migrant workers by eradicating safe ways to transfer money, as well as increasing transfer fees. Strict AML/CTF policies could lead to the financial exclusion of the poor and could force some of these transfers into unregulated markets. As a result, these policies could be counter-productive.

Second chapter derives an applied theory model on the topic of remittances. I derive an equilibrium in the remittances market. I analyze not just the migrant's decisions but also the decisions of the financial intermediaries. Financial intermediaries include banks and money transfer operators (MTOs). Senders maximize their own utility and the utility of the receiving households subject to the budget constraint. The comparative statics prove altruism as a motive and suggest that remittances increase with the increase in the wage of a remitter, and decrease with the increase in household income of those receiving remittances. Furthermore, migrant sends less when remitting cost increase. Remittances also increase with an increase in degree of altruism. Intermediaries take the demand for remittances from senders problem and use Cournot competition to determine the optimal volume of remittances sent. They compete on quantities and set them simultaneously. The comparative statics suggests that volume of remittances transferred by a bank or an MTO goes down when its cost increases, and volume increases when the cost of the competitor increases. There are several extensions to this model such as including remittance receivers, endogenizing migration, and allowing products to differentiate as well as cost curves. These model can guide empirical works on remittances.

Third chapter focuses on the sudden increase in frequency and severity of penalties associated with money laundering and terrorism financing. Title III of Patriot Act spells out provisions of prevention, detection, and prosecution of international money laundering and terrorism financing. After the passage of Dodd-Frank Act in 2010, the number of AML penalties increased by 65 percent, with monetary value going from \$161 million to more than \$2.6 billion. I examine the financial burden imposed by stricter and more frequent financial crime enforcement actions that occurred after 2010 and compare that to 2001-2009 time period when the Patriot Act

was initially passed. More specifically, I compare the financial performance of banking institutions located in counties inside and outside of high-risk money laundering and related financial crime areas(HIFCA). The data comes from the Statistics of Depository Institutions (SDI) by the Federal Deposit Insurance Corporation (FDIC). The results show that, after the increase in AML enforcement, institutions located in HIFCA see improved profitability as measured by return on assets and return on equity relative to the non-HIFCAs. If regulators indeed follow a risk-based approach then I would expect for HIFCA counties to experience higher burden of the high AML penalties and therefore see a decline in their financial performance. Improved profitability in the banks located inside HIFCA counties could be because those banks already had effective AML mechanisms in place. Also, the nature of fixed costs of regulations can explain how survivor banks were able to take advantage of the cost asymmetry to be more profitable.

Chapter 1

DO YOU KNOW YOUR CUSTOMER? THE EFFECT OF ANTI-MONEY LAUNDERING AND COUNTER-TERRORISM FINANCING REGULATIONS ON REMITTANCE TRANSFERS

1.1 Introduction

Despite the existence of domestic payment systems such as Venmo and Zelle, through which customers can engage in domestic transfers for zero marginal cost, it's puzzling why international transfer fees remain high. The high transfer costs are especially hurting the foreign workers. The remittance industry is a multi-billion-dollar international business in which many intermediaries compete, and remittances are also an important source of development finance. The money that migrants send home to their families can be an important source of income for these households, as well as a driver of growth. The World Bank Group estimates that in 2020, the global average cost of sending remittances was roughly 6.5% of the amount sent. When we focus solely on banks, that percentage climbs up to 10.73%. In dollar terms, it is estimated that the aggregate transfer cost is about \$25-30 billion a year. The G8 leaders have endorsed the pledge to decrease the cost of remittances transfers to 5%, but this has been a slow-moving process.

Lowery and Ramachandran (2015) suggest that anti-money laundering and counter-terrorism financing regulations may have unintentionally hurt the remittance industry. However, the data at the time was too weak to provide causal estimates. The efforts to cut financing to terrorist groups has caused many developing countries'

banks and money transfer organizations to completely lose access to financial institutions. Banks are not only closing the accounts of MTOs due to monitoring costs, but have stopped offering low cost remittance services themselves. For example, in 2014, Australian government received concerning reports that banks were closing or declining to open accounts for remittance service providers (Working Group on Remittance Account Closures Outcomes statement, 2014).

In this paper, I examine the unintended consequences of Anti-Money Laundering and Counter-Terrorism Financing (AML/CTF) regulations on remittances. I exploit the variation across country and time in the implementation of AML/CTF regulations, using a staggered difference-in-difference research design. The channel through which AML/CTF regulations could impact remittance costs and flows is as follows. Complying with the AML regulations is time consuming and expensive. LexisNexis estimates that the worldwide spending on AML/CTF sanctions and compliance exceeds \$180bn a year. Due to strict AML/CTF regulations, banks engage in de-risking which involves a sectoral approach to closing the accounts of high-risk clients rather than a case-by-case basis. Migrants need MTOs in order to transfer money but de-risking leads to MTOs losing access to financial services. MTOs need bank accounts at both the receiving and sending ends of the transfer. This closure of bank accounts has also forced some small MTOs to completely close businesses (Plaza 2014). This could seriously dwarf the efforts to provide low-cost remitting channels. Increasing the remittance fees could also decrease the growth of formal remittance flows.

For the purpose of this research, I compile different and unique datasets on AML regulations, as well as remittance cost and flows. Using Remittance Price Worldwide data, I analyze the effects of the AML regulations on the cost of remittances. I also use World Bank's remittance inflows and outflows data together with

World Development Indicators data to capture the impact of AML regulations on the remittance flows. I compile the country-level data on AML/CTF regulations using PwC's KYC reference guide, as well as PwC's Financial Crime Tool that required special access.

There are few things that could impact the estimates. It's worth noting that these regulations are forcing some MTOs to use banks with less secure and less transparent mechanisms in developing countries where compliance programs are not as stringent (Lowery and Ramachandran, 2015). If the closure of the accounts by big banks is forcing MTOs to engage in "race to the bottom" tactics then we may not observe the negative relationship between the regulations and remittances. AML/CTF regulations could be entirely counter-productive and could be pushing remittances to informal channels (abandonment of banks and MTOs altogether). However, this is often difficult to measure, and will be discussed further in section 2.1.

I find that the country's implementation of AML/CTF regulation has the large effect on remittances both in source and destination country, but this effect is bigger and more robust in the source country. The full specification model that includes country and time fixed effects, region-by-year fixed effects, and time varying control, shows that after the source country implements these regulations, the total cost of sending 200\$ increases by 68 percentage points, while the total cost of sending 500\$ increases by 59 percentage points. Both results are significant at a 5% level. The implementation of AML/CTF regulations by the receiving country, increases the cost of sending 500\$ by 46 percentage points, significant at 10% level. When it comes to remittance flows, the remittance outflows as percent of GDP decrease by 21 percentage points once the AML/CTF regulations are implemented and this is significant at a 5% level.

I also capture the intensity of compliance with regulations using the Basel Index. The Basel Institute of Governance provides the data on the Basel Index. The index captures the country-level risk of AML/CTF regulations where low values correspond to low risk and stricter regulatory environments and high values correspond to high risk and weaker regulatory environments. The results suggest that weak and ineffective AML/CTF regulations lead to decreases in net remittance flows. A point increase in the risk of money laundering and terrorism financing in the country that enacted these regulations, as measured by Basel Index, leads to a decrease in remittances per capita of about \$47. However, the results using the Basel Index are less robust.

Overall, both the cost and flow estimation follow the similar narrative that the source country bears the brunt of these regulations. After the regulations are implemented, the source country's cost of remitting increases while the outflows decrease. The decrease in flows by itself could mean that the regulations are effectively intercepting criminal activities which is outside of the scope of this research. However, the analysis on remittance prices shows that these regulations are impacting all migrant workers through an increase in costs.

My paper contributes to the existing literature in several different ways. This is the first research focusing on the interactions of regulators and intermediaries and bringing the research on KYC regulations and remittances together. There is no other research that studied the impact of KYC regulations on the flow of remittances.¹ Existing research tends to use household-level data to measure its economic impact, but remittances are not just household income, they are embedded in and

¹ Later theoretical and empirical work should analyze how hypothesized KYC benefits in the form of reduced money laundering and terrorism financing trade off against the costly KYC reduction of remittance flows studied here.

mediated by complex social relations and institutions (Lindley 2009). I show, using country-level data, that institutional determinants of remittances coming from AML/CTF regulations have a significant impact on the flow of remittances. Lowery and Ramachandran (2015) from the Center for Global Development, report that the data remains too weak to make general conclusions and systemic judgements of the effect of these regulations. My significant contribution is that I strengthen the data by collecting important information on all players in the remittance market. I merge worldwide remittance data together with unique PwC coding of KYC regulations to be the first to empirically study the effect of anti-money laundering and counter-terrorism financing (AML/CTF) regulations on remittances. Another factor motivating me to use aggregate country-level data instead of household-level data is the fact that to my knowledge most household-level data does not report the cost of remittances. My research primarily focuses on the price of remittances and I analyze downstream effects on flows. Since the flows are secondary in my analysis, it was not time-effective for me to collect household-level data for all the countries in my analysis. I want to have enough countries in my analysis, since large differences in cost are observed among different sender-destination country pairs (Alberola and Salvado, 2006). Also my research is the first to use Basel AML Index data in the context of remittances.

My paper contributes to the literature on the effect of remittance fees on the magnitude of their flows. The existing research shows that transaction costs have a large effect on recorded remittance receipts—migrants either refraining from remitting money, or remit large amounts through lower-cost informal channels (Orozco 2002; Freund and Spatafora 2005; Freund and Spatafora 2008; El Qorchi, M, S, Maimbo, J. Wilson, 2003; Schiopu and Siegfried, 2006; Jack and Suri 2014; Kakhkharova, Akimovb , and Rohdeb, 2016; Gelb 2016). These transaction costs decrease when

the financial systems are more developed and the exchange rate less volatile (Freund and Spatafora 2008).

My research would also contribute to the literature on the Know Your Customer Regulations that has so far mostly consisted of qualitative research. KYC regulations have wide implications as outlined by the current research. KYC regulations form a set of anti-money laundering (AML) regulations, first introduced in the 2001 in USA as part of the Patriot Act and adopted in 2003. These regulations were constructed to curb the flow of money away from terrorist organizations. They require financial firms to identify information about each customer. Any financial institution doing business with US financial institutions are expected to uphold the international KYC standards (Lindley 2009). The dates of full implementations of KYC regulations worldwide vary country by country. Specific countries already had some form of AML regulations put in place prior to 2001, but they weren't as stringent or comprehensive so they had to amend these regulations. The countries that need financial assistance from the USA are forced to adopt stringent regulations even though there is a big concern that banking systems will be unable to support the weight of such regulations (Lindley 2009; Mulligan 1998). This is true for developing countries with underdeveloped financial systems. Some researchers go as far as claiming that the heavy regulation of alternative money transfer channels has been counter-productive and damaging to migrants (Passas 2006; Lindley 2009). Criminalization of small-scale money transmission affects immigrant communities negatively, especially those in rural areas (Lindley 2009; Wimaladharma, Pearce, Douglas and Stanton, 2004). Customers in rural areas have a hard time obtaining proof of address since property rights are not very well established in such countries. However, early researchers argue that KYC policies are still important, because they prevent illicit funds from entering the system through suspicious transaction reporting and they

are effective and widely implemented (Mulligan 1999).

Research that helps us understand the drivers behind the cost of remittances is important if we want to find effective ways to decrease fees. International organizations and governments stress the importance of decreasing the remittance fees, because remittances facilitate economic development. Remittance income helps the receiving families move up the income ladder and gives them economic power. (De Haas 2005; Prabal and Ratha, 2012). Remittances are predominantly spent on health, education, and housing, which in return increases those in the households' well-being and prosperity (De Haas, 2005; Ratha, 2006). Remittances have a strong effect on poverty reduction (Adams and Page, 2005; Spatafora, 2005; Munzele, 2005). Remittance volume increases in times of political or economic crisis in receiving countries (Hysenbegasi and Poza, 2002; Quartey and Blason, 2004; Ratha, 2006; Page and Plaza, 2006). Since two thirds of all remittances are sent to developing countries, they can also contribute to a decrease in global income inequality (Van Doorn, 2002). These remittances can contribute to the exchange rate appreciation to the benefit of a home country, possibly leading to a long-term growth (Amuedo-Dorantes, Basank, and Pozo, 2004; Page and Plaza, 2006).

Remittances encourage financial inclusion—households that receive remittances are more likely to have a deposit account at a financial institution (Aggarwal, Demirguc Kunt, and Per 2011). Remittances allow recipient households to overcome financial constraints (Giuliano and Ruiz-Arranz, 2009). Mobile money has helped improve financial inclusion and overcome constraints in transferring remittances. When faced with an income shock, households with access to the technology M-PESA are more likely to receive a remittance and they receive a greater number of remittances (Jack and Suri, 2014). In the places with inadequate financial systems, remittances serve as substitutes and are channeled towards productive investments. Remittances are

most beneficial when there are safe and effective ways to transfer money without policies that regulate the use of these remittances (Van Doorn, 2002). The regulations are keeping banks absent from the market. The market for remittances is dominated by MTOs and fintechs, even though the industry could benefit from increased competition by bank entry (Suro 2002, Orozco 2004, Alberola and Salvado, 2006). If the remittances are sent to remote areas of developing countries, banks have a hard time reaching those recipients if most of them don't have bank accounts or have to travel far to reach their bank. In this aspect, fintechs have been much more efficient at reaching such costumers through the revolution of mobile banking. Also, regulations like KYC are forcing banks to require a lot more documentations which hinders the process of sending (Sure at al 2003).

The rest of the paper is organized as follows. Section 2 discusses more about the structure of remittance fees and AML/CTF regulations. Section 3 introduces the relevant data for the study. Section 4 outlines the econometric strategy, and Section 5 provides the main results. Section 6 includes the analysis with the Basel Index and the corresponding results. Finally, section 7 and 8 present robustness checks and concluding remarks.

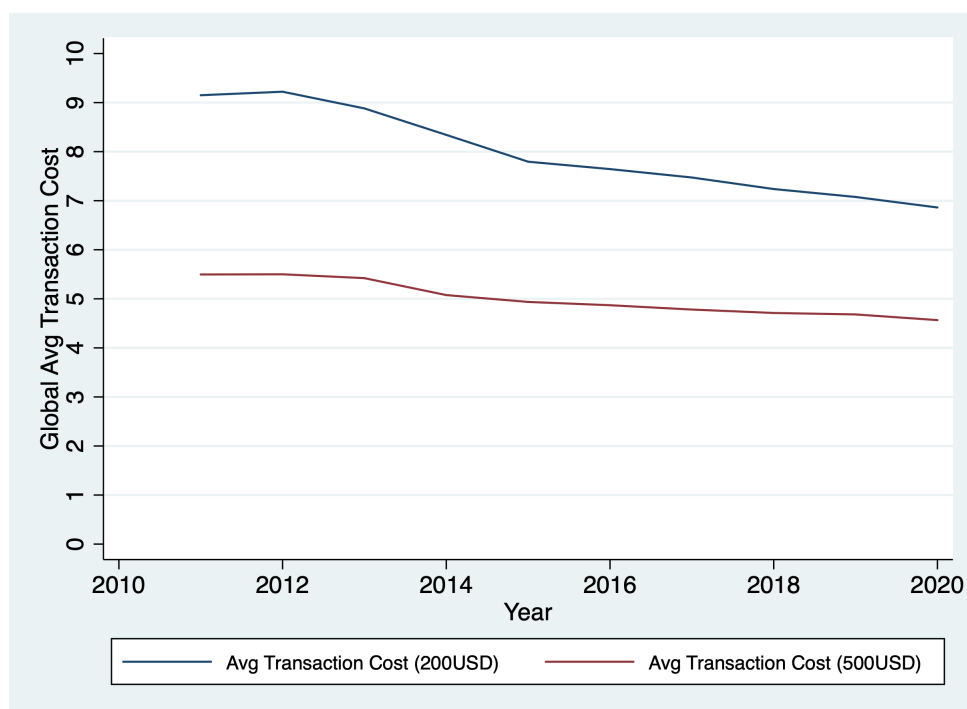
1.2 AML/CTF Regulations and Remittances

1.2.1 Cost of Remittances

The market for remittances is dominated by money transfer operators (Western Union, MoneyGram, etc), banks (Bank of America, JP Morgan, Wells Fargo), and fintechs (Transferwise, Xoom, etc). The charge for sending \$200, a common benchmark used to compare costs, is on average \$14. The cost consists of a fixed fee and exchange rate spread and together they average of about 7% of the total amount sent. Banking institutions remain the costliest route to transfer remittances: this

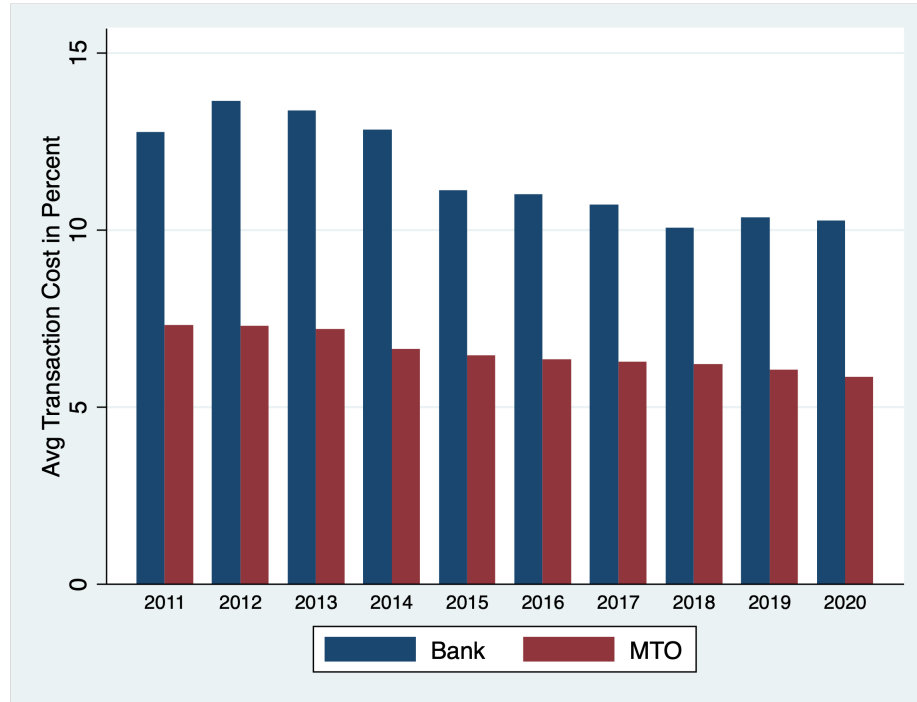
cost of transferring money abroad through a bank is on average 11%. These costs are not fixed and they can vary greatly—for example, the cost of sending \$200 from US to Mexico is \$8.91, from Germany to Turkey is \$12.83 and from South Africa to Botswana is \$36.60 (Cecchetti and Schoenholtz, 2018). The average of 12% of the amounts sent back to relatives in sub-Saharan Africa is lost to transfer fees (ODI Remittance Report, 2014). New players like financial technology companies have entered the market and have taken a bigger share of transfers but despite this increase in the competition, banks’ pricing has not changed much since 2015. Banks generally charge higher fees than MTOs and the transfers take longer. From the figure 1.2 that shows the average transaction cost from 2011 to 2020, one can see that the banks charge higher fees. However, the fees for both bank and MTOs have been on decline, which can also be seen on the figure 1.1. MTOs are also more present in the remittance market than banks. The high fees also arise from anti-competitive behavior among other reasons. For example, state-run organizations are contractually obligated to use MTOs for single transfer payments. My paper suggests that one important reason behind the high cost of remittances is the strict compliance with AML/CTF regulations.

Figure 1.1: Global Average Cost of Remittances in %



Note: Graph created by the author based on the Remittance Prices Worldwide data.

Figure 1.2: Global Average Cost of Remittances in % by Type



Note: Graph created by the author based on the Remittance Prices Worldwide data.

1.2.2 Anti-Money Laundering and Counter-Terrorism Financing Regulations

When it comes to the timing of implementations of AML/CTF regulations, the US has led the efforts after the terrorist attacks on 9/11 and pressured the rest of the world to enforce similar regulations. Almost 90% of global foreign exchange transactions involve the US dollar and therefore a majority of the transactions have to pass clearing houses in the USA (Stanley and Buckley, 2016). As such foreign banks also have to comply with US AML regulations. US banks, for example, can be held liable for any failures to comply with AML/CTF regulations of foreign banks whose funds they cleared (Stanley and Buckley, 2016). The part of AML/CTF

regulations that particularly pertains to the remittance industry is revolving around Know Your Customer (KYC) regulations. Even though anti-money laundering laws date to as early as 1970s, an example of which is the Bank Secrecy Act in the United States, the early regulations didn't specify modern KYC regulations that are used as a standard today—specifically, the risk-based approach. The Bank Secrecy act requires financial institutions to help the US government detect and prevent money laundering. However, it wasn't until the Patriot Act that we saw the birth of sophisticated KYC regulations (Testimony of Herbert A. Biern, 2004). The Patriot Act criminalized the financing of terrorism and strengthened customer identification requirements for banks and other financial institutions. The Patriot Act also required banks to strengthen their due diligence procedures. These were the regulations that started directly affecting the remittance industry.

Being accused of assisting criminal activities for banks means facing the prospects of hefty fines, as well as a blow to their reputation. The spike in AML related fines in the USA went from trivial amounts of money to billions of dollars in the last ten year. This is one of the main reasons bank costs remain so high. Meeting the Know Your Customer (KYC) standard is expensive. It imposes stringent regulations on banks by which they have to identify their customers, ensure that they are not on any prohibited lists, and assess and predict their risk factors. As a part of the KYC act, banks have to follow requirements on the Customer Identification Program (CIP) and Customer Due Diligence (CDD). According to CIP, the bank must require identifying information and documents before it can do business with these individuals. CDD is a more complicated component and it involves predicting the type of transactions most frequently made by consumers so that the bank can detect any suspicious activity. The Financial Crime Enforcement Network strictly regulates CDD. The fines for failing to comply with stringent KYC regulations are

substantial and to attest to that, JP Morgan and HSBC both had to pay \$2 billion in 2019 for failure to comply with the regulations and thus failure to report suspicious activity. This occurs in cases in which a fraud is detected by regulatory governmental agencies in your client's or business' bank accounts after which the fine is levied. Regulatory bodies then accuse banks of not doing enough to prevent money laundering and terrorism financing which in turn can hurt the reputation of the bank. (Anti-Money-Laundering (AML) and Countering Financing of Terrorism (CFT) Risk Management in Emerging Market Banks, 2019). Banks are, therefore, forced to cut ties with clients for whom the associated compliance cost is too high.

The most important global player in financial regulations is the Financial Action Task Force (FATF). The organization was founded in 1989, and currently has 33 country members. It develops global policies and regulations to fight money laundering and terrorist financing. FATF has forty recommendations on money laundering policies and nine Special Recommendations on Terrorism Financing. FATF-a strengthened it's recommendations in 2001 and 2004 to deal with issues surrounding terrorism financing. FATF audits the strength of each country's regulations against their recommendations. The countries that fail to comply with global AML standards often face economic sanctions. The organization evaluates member countries performances based on two assessment standards. First, they examine the technical compliance which refers to legal and institutional frameworks put in place to fight money laundering and terrorism financing, as well as powers and procedures of the relevant competent authorities. Second, they perform an effectiveness assessment which refers to the extent to which the legal and institutional framework is producing the expected results (FATF-Who We Are, n.d.). FATF revised their recommendations in 2009 and 2012 to place a significant emphasis on risk-based approach to AML. Banks are required to take enhanced measures for high-risk customers. The

risk-based approach also requires financial institutions to actively assess and prevent risks associated with illicit activities. This emphasis on the risk-based approach has caused financial institutions to engage in de-risking.

The de-risking process involves increasing the compliance program and cutting off relations with institutions banks deem too risky. This occurs when banks decide they can no longer manage the money laundering risk introduced through the business relationship with their client. The problem arises when instead of case by case, banks decide on the sectoral approach of de-risking and cutting off the entire sector, as is the case with money transfer operators. MTOs need bank accounts to transfer all individual remittances as a lump sum. However, the act of moving large lump sum transfers makes the remittance industry a high-risk business for the banks. In the 2013 survey, the Consultative Group to Assist the Poor found that in Australia 70 percent of remittance transfer companies had accounts closed or at least had been threatened with closure (Capal, 2014). The World Bank surveyed 82 MTOs and 25 banks around the world: 46% of MTOs received notifications, closures of their account, or have been threatened with closures. Five banks reported that they do not offer services to MTOs at all, and 15 do not open accounts for agents of MTOs. Barclays, the sole provider to remittances companies in Somalia, closed all their accounts, which forced those companies to look for other banks. Then in 2015 Merchants Bank of California stopped their relationship with Somalian MTOs causing an annual decrease of \$200 million in remittance flows (Gelb 2016). Similar cases have been noted outside of the US. In 2016, the IMF surveyed banks in the Middle East and Africa and found reports of them terminating their relationships with MTO's.

1.3 Data

Data on the remittance transfer costs comes from the publicly available Remittance Prices Worldwide data available from the World Bank ². This dataset was collected with the purpose to increase the transparency of remittance prices in the market. In order to collect the necessary information, World Bank researchers' contacted each corridor posing as customers. This bilateral data is intended to serve as a snapshot of cost on remittances on specific dates and times. The database covers 367 country corridors from 48 remittance sending countries to 105 receiving countries. This data contains the reports on the cost of sending and receiving \$200 or \$500 from the source to destination country. It includes variables like exchange rates, transfer fees, speed, product, payment instrument etc. Data ranges from 2011 to 2019 and is measured quarterly. The dataset was grouped at each service level. However, it wasn't entirely clear what the service level referred to and aggregating data could therefore lead to errors. I instead focused on the subset of dataset with one observation per each firm type-period-corridor level. Where firm type represent MTO or bank and corridor represent bilateral country pair. Table 1.1 and 1.2 contain the summary statistics of the main variables. Table

In order to calculate the net flow of remittances, I use the country-level Global Remittances Inflow and Outflow (2019) data from the World Bank. This data is publicly available, and It includes 214 countries since 1990s. It is based on IMF's balance of payment (BOP) data and measured as a sum of personal transfers and compensation of employees. The latter refers to the income of short-term workers who are employed in an economy outside of their country of residence, as well as residents employed by nonresident entities. Before 2013, remittances used to be measured as

² The World Bank, Remittance Prices Worldwide, available at <http://remittanceprices.worldbank.org>

employees compensation, workers' remittances, and migrants' transfers. The new definition improved data collection because it uses definition that most countries in the world use to compile their own data. In fact, in 2006, Paga and Plaza estimated that the real size of remittances is about two and a half times bigger than the ones reported in the IMF Balance of Payments data. This could overestimate the true growth of remittance flows. Furthermore, AML regulations require MTOs to be licensed and registered, as well as to keep records of every financial transaction. One major consequence of AML regulations is a crackdown on informal remittances. This means that remittance transactions that previously weren't reported to BOP data, now are reported. This change in the way remittances were measured may make it difficult to capture the real remittances. This is yet another way that the data could overestimate the true emittance growth (Clemens and McKenzie, 2014). Due to data reliability issues, I only focus on the data ranging from year 2000-2019. To get the necessary information on each country, I supplement the data with the publicly available country-level data on World Development Indicators also published by the World Bank. This dataset provides various country-level control variables for my analysis. The table

The World Bank also provides Bilateral remittance matrix (2017). It provides data on bilateral remittance flows. However, there are concerns about reliability of this data. The World Bank has admitted at times that credible data on bilateral remittances doesn't exist due to difficulty in tracking the actual source country that the money comes from (Alvarez, Briod, Ferrari, and Rieder, 2015).

The main source of information on AML/CTF regulations is PwC's KYC Reference Guide and PwC's Financial Crime tool. KYC Reference Guide summarizes the key information needed to understand and mitigate AML risks at the country level. It is a comprehensive source for those seeking to understand AML requirements

globally, covering almost one hundred countries. The guide and the tool contain up to date information on regulatory and other cultural issues as well as useful links to Financial Action Task Force ("FATF") reports and country evaluations, and information on suspicious activity reporting obligations, penalties for non-compliance, AML audits and data privacy. Identical set of questions is answered for each country. While KYC Reference Guide is publicly available, PWC has since retired their Financial Crime Tool that contains broader information concerning these regulations. This data is also more recent. Upon request, I was able to gain temporary access to this tool during which I extracted all the necessary data. Tracking these regulations globally is becoming increasingly difficult and complex since AML/CTF laws are being updated with greater regularity and these differ widely from country to country. Main problem with PwC's dataset is that collecting data on each country's regulations was left to individual offices in these countries, which made for some inconsistency in data reported. For example, for some countries the data reported most recent amendment to the law, while for others it reported only the original regulation. For that reason, I carefully analyzed the data and used FATF's mutual report documents on each country, as well as US state department's guide on AML/CTF regulations around the world in order to help identify relevant dates and reconcile the existing inconsistencies in the data.³ Collecting this information was complex, since there is a lack of clear world standards in these regulations. Some countries enacted strong AML/CTF laws from the start, while others had to amend the law numerous times to make it effective. Nevertheless, attempts to solidify these informations are

³ The FATF conducts peer reviews of each member country on their implementation of the FATF Recommendations on AML and terrorism financing regulations providing an in-depth description and analysis of each country's system and giving ratings for each country on multiple of these indicators.

very valuable in order to start analyzing their actual effects on remittances. Any such relationship has yet to be shown by actual data. Like discussed before, a lot of countries had introduced AML regulations in the 90s but these regulations were weak and ineffective and there was no global effort to enforce these. For that reason, it was important to identify dates that modern AML/CTF regulations (specifically KYC) were introduced and for most countries that came in late 2000s and even early 2010s. For example, EU modified its anti money laundering regulations to include counter-terrorism financing language and introduce stricter KYC regulations that were born after 9/11 attacks with the third EU anti-money laundering directive in 2005. It wasn't until 2008/2009 that most EU member countries started ratifying this directive. The data on each country's relevant AML regulation (name and date) is presented in Appendix A.

As discuss in section on AML/CTF regulations, anti-money regimes vary across countries in their sophistication, coordination, and strength. Even though almost every country in the world has these policies in places, their language can be very different and is something that FATF investigates in their mutual evaluation reports. This fact leaves in future the opportunity to possibly preform language processing of KYC regulations. In order to capture the differences, I use the Basel AML Index published by Basel Institute in Governance based in Switzerland. The index is the leading comprehensive annual measure capturing the risk of money laundering and terrorism financing around the world (Basel AML Index, n.d.). The European Commission relies on this index to identify countries at high risk for money laundering and terrorism financing. The index has been calculated since 2012 and covers 141 countries. The data is based on 16 sources, most notable being FATF, World Bank, and World Economic Forum. The score covers "quality of AML/CFT framework (65%), bribery and corruption (10%), financial transparency and standards (10%),

public transparency and accountability (5%), legal and political risks (10%)" (Basel AML Index, n.d.) In short, it covers the effectiveness of AML/CTF regimes. The overall index score is publicly available, but their expert edition that requires special access contains more detailed breakdown of the score. Basel Index is widely used in studies on anti-money laundering regulations (Naheem, 2017; Islam, Akter and Manning, 2017; Levi, Reuter, and Halliday, 2018; Amara and Khlif, 2018; Wong, Jevtovic 20).

Table 1.1: Descriptive Statistics

Amount in local currency (200USD)	7,629.46 (40,406.37)
Fee in local currency (200USD)	799.25 (5,521.89)
Total Cost in percent (200USD)	7.79 (3.89)
Amount in local currency (500USD)	19,001.18 (100,753.34)
Fee in local currency (500USD)	936.06 (6,221.16)
Total Cost in percent (500USD)	4.93 (2.34)

[1] Note: Summary statistics is at the corridor level.
Each cell contains the mean with the standard
deviation in parentheses.
Based on the Remittance Prices Worldwide Data.

Table 1.2: Descriptive Statistics

	Bank	MTO
amount sent in local currency (200)	22,064.22 (69,276.52)	3,325.84 (22,334.92)
fee in local currency (200)	2,412.73 (11,479.96)	165.68 (1,288.11)
foreign currency exchange rate (200)	182.10 (1,395.74)	689.49 (3,058.16)
exchange rate margin (200)	1.79 (2.49)	1.99 (2.38)
total cost of the transaction in percentage (200)	11.43 (8.23)	6.36 (4.15)
amount sent in local currency (500)	54,863.99 (172,425.09)	8,273.66 (55,666.29)
fee in local currency (500)	2,457.10 (11,561.01)	282.94 (2,270.48)
foreign currency exchange rate (500)	182.66 (1,397.94)	689.09 (3,056.56)
exchange rate margin (500)	1.79 (2.50)	1.99 (2.38)
total cost of the transaction in percentage (500)	5.78 (3.99)	4.39 (3.20)

[1] Note: Summary statistics using the entire dataset across all countries and all years by the firm type.

Each cell contains the mean with the standard deviation in parentheses.

Based on the Remittance Prices Worldwide Data.

Table 1.3: Descriptive Statistics

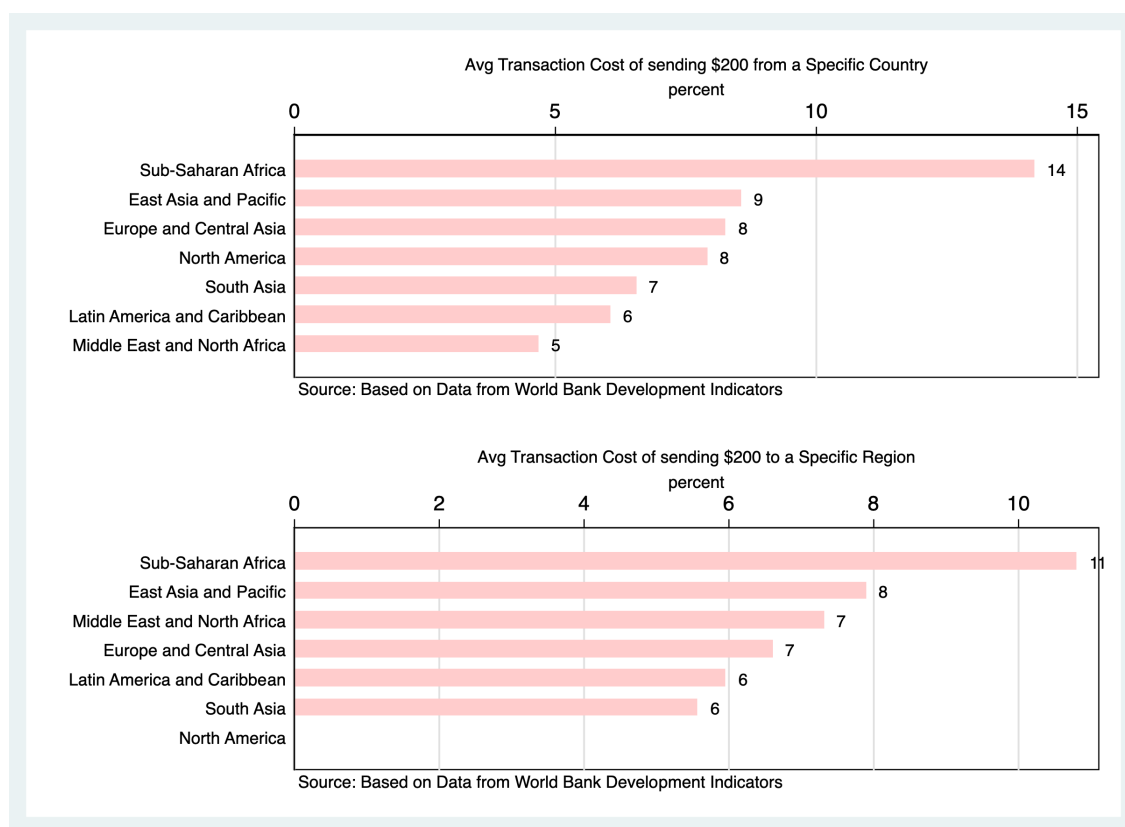
	Bank	MTO
amount sent in local currency (200)	15,159.21 (60,491.43)	5,076.99 (29,310.48)
fee in local currency (200)	3,015.27 (15,328.35)	241.95 (1,571.55)
foreign currency exchange rate (200)	201.06 (1,416.70)	666.42 (2,956.78)
exchange rate margin (200)	1.64 (2.43)	1.84 (2.45)
total cost of the transaction in percentage (200)	11.36 (8.71)	6.00 (4.16)
amount sent in local currency (500)	37,835.10 (151,211.94)	12,624.83 (73,042.16)
fee in local currency (500)	3,104.74 (15,457.86)	432.86 (2,938.75)
foreign currency exchange rate (500)	203.40 (1,429.45)	664.39 (2,950.14)
exchange rate margin (500)	1.64 (2.45)	1.83 (2.45)
total cost of the transaction in percentage (500)	5.70 (4.11)	4.17 (3.22)

[1] Note: Summary statistics for the subset of data with unique firm type-period-corridor observation.

Each cell contains the mean with the standard deviation in parentheses.

Based on the Remittance Prices Worldwide Data.

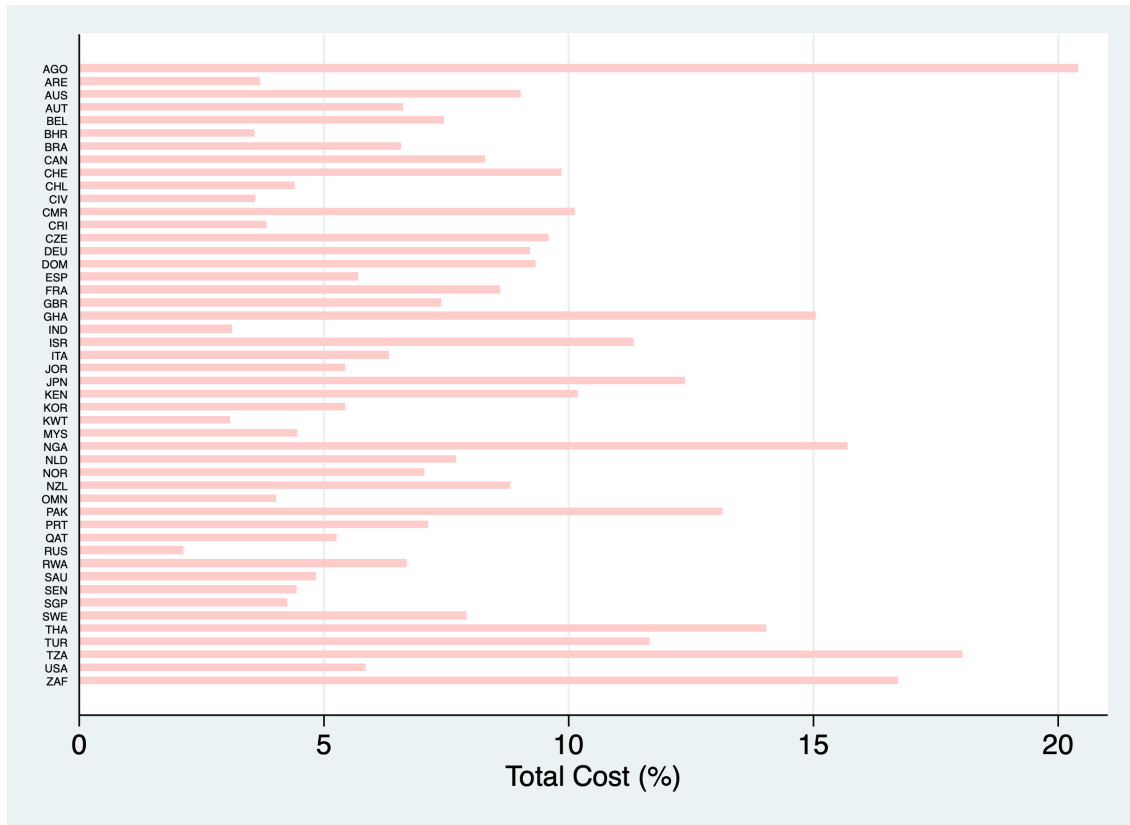
Figure 1.3: Regional Transaction Cost



Note: Graph created by the author based on data from World Bank Development Indicators.

The figure 1.3 shows the regional transaction cost. On average the sub-saharan Africa has the highest transaction cost from both sending and receiving end. Unsurprisingly this reflects poor financial and regulatory infrastructure. Somewhat more noteworthy is that North America and Europe and Central Asia are comparatively in the middle. The remittance transaction costs are still not as low as some would have hoped. Part of the story that this paper focuses on is that the regulatory pressure affecting remittance industry that also leads to anti-competitive behavior might be partly to blame. Figure 1.4 shows a more detailed picture and focuses on

Figure 1.4: Average Total Cost by Source Country



Note: Graph created by the author based on Remittance Prices Worldwide Data. The bar labels are ISO3 codes for each source country.

average transaction cost per source country over time. Again underdeveloped countries stand out with the highest transaction costs. However, countries like Germany, France, Israel, Japan still report transaction costs that are nowhere near to G8's 5% target.

1.4 The Effect of AML/CTF Regulations on Remittance Prices

1.4.1 Identification

In this paper, I estimate the causal effect of the anti-money laundering and counter-terrorism financing regulations on the transfer cost of remittances, as well as

Table 1.4: Descriptive Statistics

	Mean
Remittances Inflows	4390.7 (8999.6)
Remittances Outflows	3324.1 (7688.3)
Remittance Inflows per Capita	0.000202 (0.000366)
Remittance Outflows per Capita	0.000458 (0.00205)
Remittance Outflows as percent of GDP	1.38e-08 (3.07e-08)
Remittance Inflows as percent of GDP	2.85e-08 (4.67e-08)
Net Remittances(millions)	1076.1 (10867.7)
Avg transaction cost of sending remittances from (%)	8.218 (4.283)
Aveg transaction cost of sending remittances to(%)	7.351 (3.321)
GDP (current US)	6.12275e+11 (1.85553e+12)
GDP per capita (current US)	18670.2 (21066.4)
Inflation, consumer prices (annual%)	5.028 (8.235)
International migrant stock (% of population)	12.74 (16.83)
International migrant stock, total	1948353.0 (4698310.6)
Population, total	61277394.1 (185210842.8)
Unemployment, total (% of TLF)	7.420 (5.258)
Basel Index	5.289 (1.077)
Life expectancy at birth, total (years)	73.52 (7.721)
Mortality rate, under-5 (per 1,000 live births)	24.37 (32.61)

Note: Each cell contains the mean with the standard deviation in parentheses. Most main variables have over 1500 observations except for migration variables that have 380 observations. Basel Index contains 766 observations.

the remittance flows. In other words, I am estimating whether AML policies caused country-level remittances flows to be costlier than they otherwise would have been and if the flows are lower. One way I could answer this question is to compare adopting countries' remittance flows after they enacted these regulations to other countries over that time period. However, there are many differences between different countries other than just the presence of these regulations that could cause these flows to be different. Another way to look at this question would be to compare how remittance flows of a certain country changed after it enacted the AML/CFT, relative to before. However, the remittance flows could have changed absent this law too. I could perhaps determine that by looking at similar countries that haven't enacted these laws. This calls for use of difference-in-difference approach to try to establish the causal relationship. Essentially, in this approach I subtract the change that occurred in the control countries from the change that occurred in the treatment countries in order to isolate the impact of AML/CTF regulations.

Therefore, to identify the effect of KYC regulations on remittances, I rely on difference-in-differences design. This paper exploits the quasi-exogenous variation caused by introduction of AML regulations. Standard difference-in-difference structure involves two groups and two periods that under common trends assumption identifies the average treatment effect on the treated. However, in the case of worldwide Anti-Money Laundering and Counter-Terrorism Financing regulations timing of the implementation varies. This kind of policy implementation with differential timing of the treatment calls for staggered difference-in-difference design approach. The nature of panel data allows me to include time and country fixed effects. This type of model is commonly referred to as the two-way fixed effects with differential timing (Stevenson and Wolfers 2006; Angrist and Pischke, 2009; Cheng and Hokestra, 2013; Borusyak and Jaravel 2017; Abraham and Sun, 2018; Goodman-Bacon, 2019).

Goodman-Bacon (2019) showed that the two-way fixed effects DD estimator is a weighted average of all possible 2x2 difference-in-difference estimators and these single components are weighted based on a sample size and variance of their treatment dummy. This is known as Bacon decomposition theorem.

The basic empirical specification for the bilateral cost data looks as follows:

$$C_{ijt} = \alpha(DestinationAML * SourceAML)_{ijt} + \beta DestinationAML_{it} \\ + \lambda SourceAML_{jt} + \delta \chi_{it} + \gamma \chi_{jt} + \theta_{ij} + \theta_t + \epsilon_{ijt}$$

where i is the destination country, j the source country and t is the time. C_{ijt} is the total cost in percent from i to j at time t . $DestinationAML_{it}$ is the treatment variable for destination country i after it has implemented AML regulations. $SourceAML_{jt}$ is the treatment variable for source country j after it has implemented AML regulations. While $DestinationAML * SourceAML_{jt}$ is treatment variable for years after both the destination and source country implement the regulations. This difference-in difference specification removes differences between the treatment and control group that could result from permanent differences between those groups and biases from comparisons over time in the two groups that could be the result of trends. The specification also includes corridor fixed effects θ_{ij} that eliminate any confounding that might be caused by effects (observed or unobserved) that are constant over time within each country pair. Time fixed effect θ_t eliminate any confounding that might be caused by effects (observed or unobserved) that are constant across all countries within each year. Robust standard errors are clustered at the corridor (destination-source pair) level. The specification includes destination country level covariates $\delta \chi_{it}$ and source country covariates $\gamma \chi_{jt}$ which

are not necessary for identification but may reduce the residual variance and hence increase the power of statistical tests. $\alpha + \beta$ shows the full effect of destination country's AML/CTF implementation, while $\alpha + \lambda$ shows the full effect of source country's AML/CTF implementation.

In order to check the degree to which the post-treatment treatment effects were dynamic and if the two groups were comparable on outcome dynamics pre-treatment, I run the following event study specifications separately by destination and source countries:

$$C_{it} = \alpha + \sum_{k=-q}^{-2} \beta_k D_{ik} + \sum_{k=0}^m \delta_k D_{ik} + \delta \chi_{it} + \theta_t + \epsilon_{it} \quad (1.1)$$

$$C_{jt} = \alpha + \sum_{k=-q}^{-2} \beta_k D_{jk} + \sum_{k=0}^m \delta_k D_{jk} + \gamma \chi_{jt} + \theta_t + \epsilon_{jt} \quad (1.2)$$

where the treatment occurs in year 0. Specification includes q leads (anticipatory effects) and m lags (post-treatment effects). D_{ik} and D_{jk} are the dummy variables, where $D=1$ if the observation's periods relative to the country's i or j first treated period is the same value as k . I plot the regression coefficients on their treatment leads and lags.

1.4.2 Results

The US has led the fight against terrorism financing and money laundering and has pressured the rest of the world to follow. The risk-based approach, emphasized by AML-CTF regulations requires banks to actively engage in mitigating risks or face hefty penalties. Banks are, therefore, taking part in de-risking by ceasing to provide service to high-risk firms among which are the MTOs. Banks have also stopped offering low-cost remittance services themselves. These developments

should increase the remittances prices, especially from the source countries' perspective where most of the impact is felt. In this section, I present the results on the empirical specification from the first equation regarding the cost of remittances. The Remittance Prices Worldwide dataset wasn't aggregated in an obvious way. I instead focused on the subset of data that for each firm type-period-corridor level has only one observation. Where firm type represent MTO or bank and corridor represent bilateral country pair. In the robustness section, I also present data that was collapsed to firm type, period, and corridor level. The table 1.5 shows that the interaction between source and destination post dummy is positive in the full interaction model but not statistically significant. However, after the source country implements the AML/CTF regulations, the total cost of remitting \$200 increases by 68 percentage points in the full specification model that includes time and corridor fixed effects. The second panel in the same table shows the same analysis for remitting higher amount of \$500. The source country's implementation of AML/CTF regulations increases cost of remittances by 59 percentage points, but now destinations country AML/CTF regulations matter as well. In fact, it increases the cost of remittances by 43 percentage points, significant at 10% level. Column 1 and 3 present results without control variables. For both \$200 and \$500 amounts, the estimates without controls are slightly higher. In order to capture the full impact of source country's AML implementation, I add up coefficients on Source and Destination KYC and Source KYC and test the significance for both panel one and panel two. The full effect for the source country is portrayed in table 1.6: the coefficient for \$200 is positive and significant at 1% level while the coefficient for \$500 is also positive but much smaller in magnitude and significant at 10% level. The full effect for the destination country is portrayed in table 1.7: the coefficients for \$200 and \$500 are also positive but insignificant. This shows that the AML-CTF regulations have important

unintended consequences. They exist to fight money laundering and to stop funding terrorist activities. Any reduction in the formal remittance flows could simply mean that the regulations are successful in stopping illegal activities. However, the clear impact on costs of remittances in the source country emphasizes the important consequences of these regulation. Workers are lacking cheap and reliable ways to send funds home to their families. Therefore, the regulations reach far beyond just stopping the financial crime.

Table 1.5: The Effects of AML/CTF Regulations on Remittance Prices

	Cost of sending 200USD		Cost of sending 500USD	
	(1)	(2)	(3)	(4)
Source and Destination KYC	0.0912 (0.379)	0.1224 (0.342)	-0.3401 (0.286)	-0.3240 (0.281)
Source KYC	0.9434*** (0.278)	0.6756** (0.275)	0.6623*** (0.235)	0.5949** (0.237)
Destination KYC	0.2002 (0.357)	0.1630 (0.329)	0.4673* (0.274)	0.4631* (0.270)
Observations	135128	135128	134650	134650
Controls	No	Yes	No	Yes
Corridor FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes

[1] Note: Based on the bilateral remittance price data from World Bank. The dependent variable is percent total cost of remitting 200USD and 500USD. Source and destination KYC is for years after both source and destination introduced KYC regulations. Each column in each panel represents a separate regression. Robust standard errors are clustered at the corridor level.

Time-varying controls include remitting location (bank or MTO), speed of transfer (day or less and two days or more) , and income level of sending and receiving country (high income, low income, lower middle income, upper middle income).

All columns include time and corridor fixed effects.

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

Figure 1.5 is the event study graph—we can see that for the source countries for the most part there is no statistically significant difference between the treatment

Table 1.6: Total Effect of Source Country’s AML/CTF Implementation

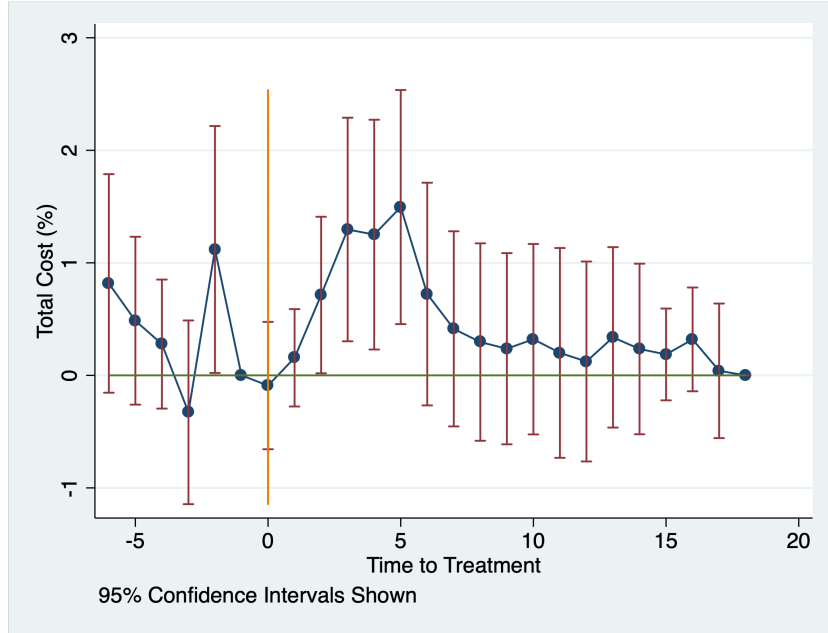
Total Cost (200USD)	Coefficient	Std. Err.	t	p-value
$\alpha + \lambda$	.797966	.2536894	3.15	0.002
Total Cost (500USD)	Coefficient	Std. Err.	t	p-value
$\alpha + \lambda$	.2709137	.1591796	1.7	0.090

Table 1.7: Total Effect of Destination Country’s AML/CTF Implementation

Total Cost (200USD)	Coefficient	Std. Err.	t	p-value
$\alpha + \beta$	.2853772	.1818198	1.57	0.117
Total Cost (500USD)	Coefficient	Std. Err.	t	p-value
$\alpha + \beta$	.1390945	.1186602	1.17	0.242

states and the control states. In the year of adoption and shortly after the treatment, the treatment group sees the increase in the cost of remittances as compared to the control group. Interestingly, this differences between treatment and control group seems to phase out. This could mean that intermediaries eventually adapt to these regulations more effectively and efficiently, or perhaps find the way to internalize these costs and not pass them to consumers. The graph for the source countries is not equally believable and shows some pre-treatment differences in trends. Thus, any results for the destination countries should be interpreted with caution. In this section, I only show the event study results for the destination country where we also see the biggest impact of these regulations. The event study for the destination country is in the appending—the results for the source country are noisy and should be interpreted with caution.

Figure 1.5: Event Study Plot: Remittance Prices

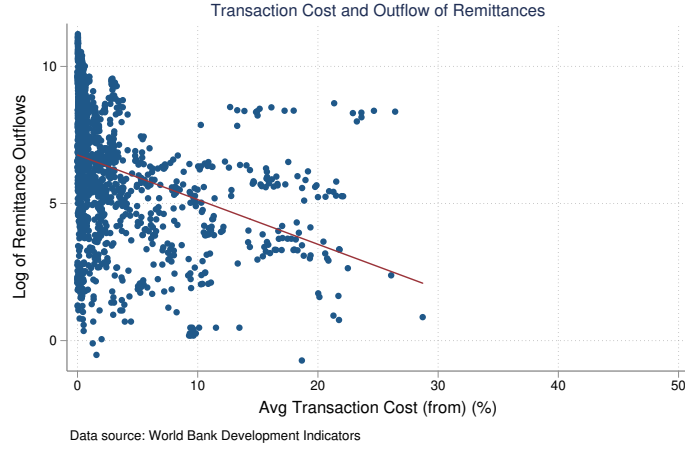


Note: Graph created by the author based on data from World Development Indications and Remittance Prices Worldwide from World Bank. Graph plots leads and lags on the number of years until or after the country received the treatment. The omitted category is the year before the treatment, so all coefficients are with respect to that year. Specification includes country and year fixed effects. The graph contains all lags and leads. The dependent variable is total cost of sending \$200 from the specific source country.

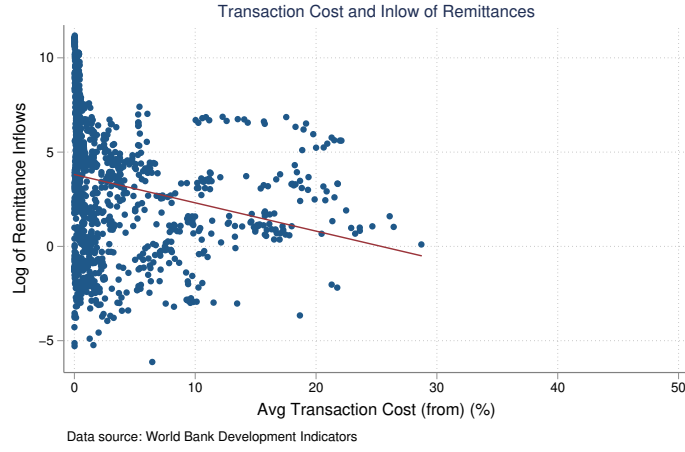
1.5 The Effect of AML/CTF Regulations on Flows

1.5.1 Identification

In this section, I turn my attention to the impact of AML/CTF regulations on remittance flows. On the figure 1.5.1 of the average transaction cost and flow of remittances, one can see that with high transaction costs, both inflows and outflows decrease. This negative relationship is well documented in the field as already discussed in the introduction. The high remittance transfer fees remain a high barrier to efficient international money transfer.



(a) Outflows



(b) Inflows

Figure 1.6: Transaction costs and flow of remittances

In order to understand the impact of AML/CTF regulations on remittance flows using World Development Indicators data, I use the following empirical specification:

$$R_{ct} = \beta AML_{ct} + \lambda \chi_{ct} + \delta_t + \gamma_c + \epsilon_{ct} \quad (1.3)$$

Where R_{ct} refers to the remittances outflows or inflows from country j at time t standardized per capita and also GDP. Research shows that the most important determinants of rise in remittance flows is a rise in the stock of migrants (Freund and Spatafora, 2008). However, since the data on migration is sparse and includes only about 300 observations, I instead account for the population size and size of the economy. The variable AML_{ct} equals to 1 for years after the implementation of relevant AML/CTF regulations ($\text{year} \geq \text{year of compliance}$). The specification also includes country fixed effects γ_c and a year fixed effect δ_t . One important confounding that comes to mind when thinking of capturing volume of remittances is migration numbers. Migration patterns are a function of complex interactions between local politics, visa requirements, development issues, shocks to receiver country's economic conditions, etc. For example, post 9/11 in USA, the volume of remittances likely did not go down just because of the strict implementations of KYC that caused increase in costs, but also because of the stricter migration policies, especially concerning immigrants coming from countries portrayed as high risk. To address these concerns, similar to (Cheng and Hokestra, 2013) $\lambda\chi_{ct}$ variable includes region-by-year fixed effects. It is a vector of dummies for each region of the world the country belongs to interacted with each year fixed effect—this way explicit counterfactual come from within the same region.⁴

The identifying assumption behind this is that conditional on fixed effects (country fixed effects and region-by-year fixed effects) and observables, paths of worldwide remittance flows would not be systematically different in the absence of AML/CTF regulations. Groups should be the same on all observables pre-treatment.

⁴ Regions are following World Bank classification. There are 6 World bank regions: East Asia and Pacific, Europe and Central Asia, Latin America and the Caribbean, Middle East and North Africa, South Asia and Sub-Saharan Africa.

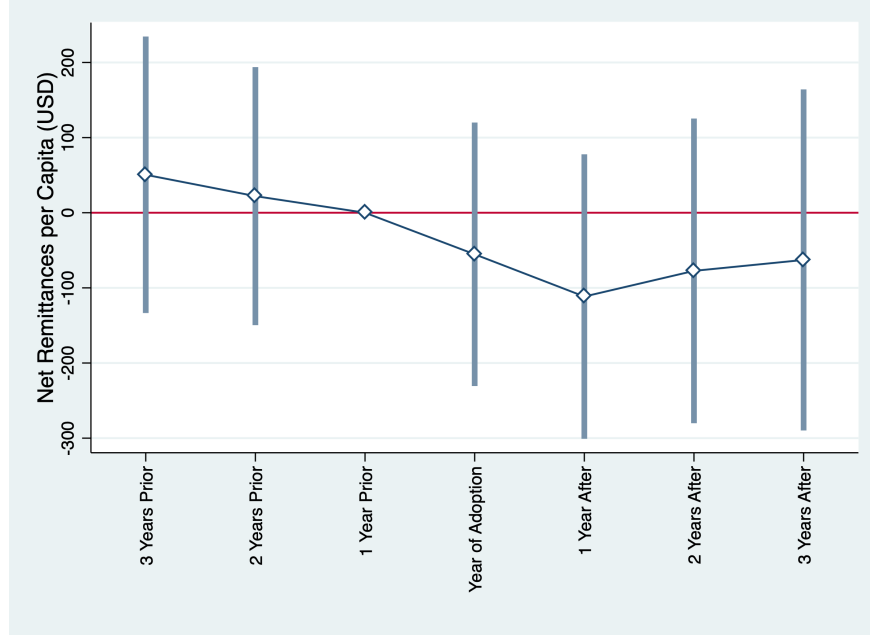
The only difference in outcome, due to treatment and quasi-random assignment to treatment, is the treatment itself. The data allows me to test whether the conditional expectations were parallel in the pre-period. First, I present event plot as a graphical evidence of whether the groups diverged prior to treatment. Similar to Cheng and Hokestra (2013), I am testing here whether countries that passed the AML/CFT laws diverged even before the law passage. If this indeed is happening, it means that the identifying assumption is violated.

In order to check the degree to which the post-treatment treatment effects were dynamic and if the two groups were comparable on outcome dynamics pre-treatment, I run the following event study specification:

$$R_{ct} = \alpha + \sum_{k=-q}^{-2} \beta_k D_{ck} + \sum_{k=0}^m \delta_k D_{ck} + \delta_t + \gamma_c + \epsilon_{ct}$$

where the treatment occurs in year 0. Specification includes q leads (anticipatory effects) and m lags (post-treatment effects). D_{ck} is the dummy variable, where $D=1$ if the observation's periods relative to the country's c first treated period is the same value as k . I plot the regression coefficients on their treatment leads and lags. First, from figure 1.7 and 1.8 notice from the graph that for the few years prior to treatment, there is very little difference between the treatment states and the control states and this difference is not statistically significant. In the year of adoption and after the treatment, net remittance flows begin decreasing. Since difference-in-difference coefficients are statistically zero pre-treatment, then this difference-in-differences between treatment and control groups followed a similar trend prior to treatment and we assume that if there were similar pre-treatment they would have followed the same pattern after the treatment, conditional on observables.

Figure 1.7: Event Study Plot: Remittance Flows

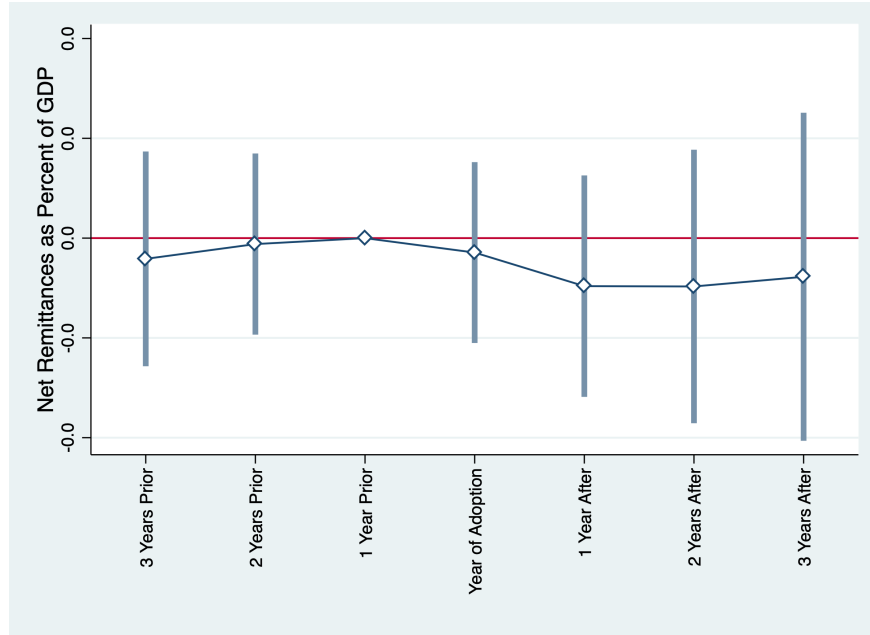


Note: Graph created by the author based on data from World Bank Development Indicators and Basel AML Index from Basel Institute of Governance. Graph plots leads and lags on the number of years until or after the country received the treatment. Our omitted category is the year before the treatment, so all coefficients are with respect to that year. Specification includes country and year fixed effects. 21 countries with missing observations of relevant variables, as well as insufficient number of lags and leads were dropped to create a balanced panel.

1.5.2 Results

The literature on determinants of remittances shows that the cost is the important factor determining the amount sent. Therefore, the increase in cost should have some downstream effects on remittance flows. Also, MTOs are disrupted by bank account closures which is another channel through which flows could be affected. Therefore, AML/CTF regulations are disrupting the remittance industry: the remittance flows should be decreasing with the passage of these regulations. The relative decrease in remittance flows can be seen graphically. Similar to Cheng and

Figure 1.8: Event Study Plot



Note: Graph created by the author based on data from World Bank Development Indicators and Basel AML Index from Basel Institute of Governance. Graph plots leads and lags on the number of years until or after the country received the treatment. Our omitted category is the year before the treatment, so all coefficients are with respect to that year. Specification includes country and year fixed effects. 27 countries with missing observations of relevant variables, as well as insufficient number of lags and leads were dropped to create a balanced panel.

Hokestra(2013), I constructed a figure [A.4](#) that shows the average remittance outflows for the countries that adopted AML/CTF regulations in 2005, as well as for the countries that did not enact these regulations from 2000 to 2010. I did the same for 2006, 2007, and 2008 adopters. It shows that while the trends of the two groups track each other closely prior to the passage of the money laundering regulations, after the passage remittances decreased in adopting countries relative to control states.

Table 1.8: The Effects of AML/CTF Regulations on Remittance Outflows

	Log Outflows (Percent of GDP)			Log Outflows per Capita		
	(1)	(2)	(3)	(4)	(5)	(6)
post	-0.074 (0.137)	-0.276* (0.147)	-0.238** (0.119)	-0.060 (0.145)	-0.264* (0.149)	-0.212* (0.118)
Observations	1629	1629	1458	1630	1630	1458
Country and Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Region by Year FE		Yes	Yes		Yes	Yes
Controls			Yes			Yes

[1] Note: Each column in each panel represents a separate regression. The unit of observation is country-year. Robust standard errors are clustered at the country level.

Time-varying controls include inflation, unemployment rate, life expectancy at birth, mortality rate under 5, access to electricity. The dependent variables are log outflows as percent of GDP in Panel A and log outflows per capita in Panel B. Since the migration variables only have 300 observations, dependent variable is standardized by population and GDP.

Region by year fixed effects, include six regions East Asia and Pacific, Europe and Central Asia, Latin America and the Caribbean, Middle East and North Africa, South Asia and Sub-Saharan Africa.

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

I run the empirical specification outlined in the second equation to look at the impact on remittance inflows and outflows. From the table 1.8. Consistent with what we saw on the remittance prices side, the effects are mostly on the outflows side. The implementation of AML/CTF regulation is associated with a decrease of 0.238 in log outflows as percent of GDP. In other words, the outflows as percent of GDP decrease by 21% once the AML/CTF regulations are implemented and this is significant at 5% level. Similarly, these regulations are associated with 21% decrease in log outflows per capita. When the same analysis is preformed on the remittance inflows in the table 1.9, no significant effects are found. The regression coefficient are small and positive but not statistically significant.

Table 1.9: The Effects of AML/CTF Regulations on Remittance Inflows

	Log Inflows (Percent of GDP)			Log Inflows per Capita		
	(1)	(2)	(3)	(4)	(5)	(6)
post	0.081 (0.063)	0.046 (0.076)	0.012 (0.074)	0.097 (0.065)	0.056 (0.084)	0.026 (0.083)
Observations	1685	1685	1512	1686	1686	1512
Country and Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Region by Year FE		Yes	Yes		Yes	Yes
Controls			Yes			Yes

[1] Note: Each column in each panel represents a separate regression. The unit of observation is country-year. Robust standard errors are clustered at the country level.

Time-varying controls include inflation, unemployment rate, life expectancy at birth, mortality rate under 5, access to electricity. The dependent variables are log inflows as percent of GDP in Panel A and log inflows per capita in Panel B. Since the migration variables only have 300 observations, dependent variable is standardized by population and GDP.

Region by year fixed effects, include six regions East Asia and Pacific, Europe and Central Asia, Latin America and the Caribbean, Middle East and North Africa, South Asia and Sub-Saharan Africa.

* Significant at the 10% level

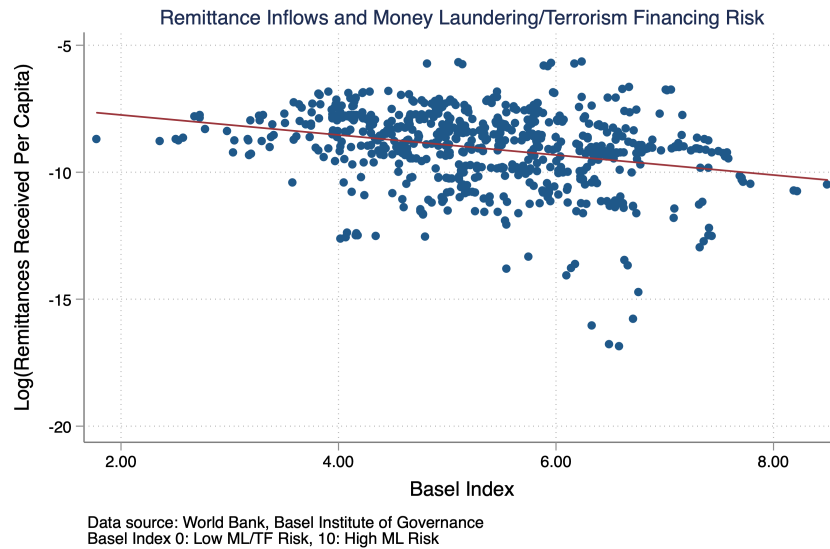
** Significant at the 5% level

*** Significant at the 1% level

1.6 Policy Variation and Heterogeneity: Estimation with Basel Index

One problem with the previous specification on remittance flows is that it doesn't take into account the cross-country differences in the implementation of AML/CTF regulations. FATF conducts mutual evaluations of each country's AML framework and identifies strategic deficiencies. The regulations are extremely complex and it's up to individual countries to decide how strictly they want to implement FATF's recommendations. There is absence of international convergence on these regulations due to domestic differences. Most countries have implemented at least some parts of it, but few countries are at either extreme (not implementing them

Figure 1.9: Remittances Per Capita and The Risk of ML/TF



Note: Graph created by the author based on data from World Bank Development Indications and Basel AML Index from Basel Institute of Governance.

at all or implementing them perfectly). Some countries have strong legal framework and have high AML standards. Some countries on the other hand have implemented standards on customer identification poorly and their current measures are not risk-based. Based on the mutual evaluations report, as well as other indicators outlined in the data discussion, Basel Institute of Governance creates an index to help us compare the countries level of ML/TF risk. Basel Index ranges from 0 to 10, 0 being countries with low ML/TF risks, and 10 being countries with high ML/TF risks. Using this index also helps address the fact that some countries already had some anti-money laundering policies in place, so it is easier for them to implement KYC policies than other countries.

The basic empirical specification using Basel Index looks as follows:

$$C_{ct} = \beta Basel_{ct} + \lambda \chi_{ct} + \delta_t + \gamma_c + \epsilon_{ct} \quad (1.4)$$

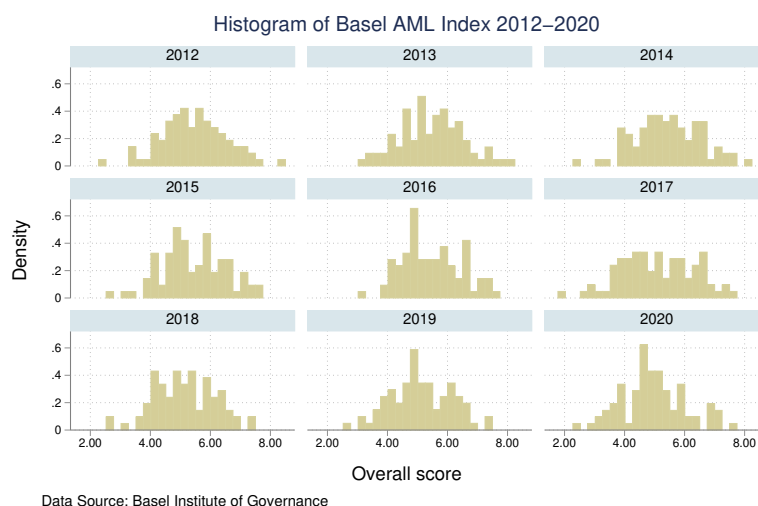
$$R_{ct} = \beta Basel_{ct} + \lambda \chi_{ct} + \delta_t + \gamma_c + \epsilon_{ct} \quad (1.5)$$

Where C_{ct} and R_{ct} refers to the cost of remittances and remittances outflows from country j at time t standardized per capita and also GDP, respectively. $Basel_{ct}$ is a treatment variable that captures the intensity of compliance with AML/CTF regulations in the years after the adoptions of these regulations (year \geq year of compliance). In other words, $Basel_{ct}$ is a continuous treatment variable captured by the Basel Index. Figure 1.10 shows the histogram of the Basel AML index from 2012-2020 (the available years of the index) capturing variation in our index, which is important assumption the analysis relies on. The specification also includes country fixed effects γ_c and a year fixed effect δ_t . Robust standard errors are clustered at the country level.

1.6.1 Results with Basel Index

The results on the cost with the interaction of Basel Index and AML implementation in the source country are presented in table 1.10. The dependent variable captures the intensity of treatment compliance. The treatment interaction estimates whether countries with higher risk of ML/TF, saw an increase in remittance costs following the passage of the AML/CTF laws. Point increase in the risk of money laundering and terrorism financing in the source country that enacted these regulations, as measured by Basel Index, leads to an increase in remitting \$200 of about 33 percentage points, significant at 1% level, and increase in remitting \$500 of about 17

Figure 1.10: Histogram of Basel AML Index showing variation in index over time



Note: Graph created by the author based on data from World Bank Development Indicators and Basel AML Index from Basel Institute of Governance.

percentage points, significant at 1% level. When I estimated the effects of AML/CTF regulations with just the treatment dummy, I didn't pick up any significant results in the destination country. However, now the results shows positive and significant impact at the level of destination countries. Increase in the risk of terrorism financing and money laundering means, among other things, that the AML/CTF framework is overall weak. That would indicate that weaker AML frameworks lead to increase in cost of remittances. The significant burden comes from not only the personnel and monetary cost of regulations compliance but also from the fact that the seemingly weak AML frameworks often lead to closure of banks accounts of those MTOs who remit money to corridors that are at higher risk of money laundering and terrorism financing.

Figure in the appendix, [A.2](#), shows that with higher Basel AML Index that indicate country is high risk of of money laundering and terrorism financing, the

Table 1.10: The Effects of AML/CTF Regulations on Remittance Prices (Basel) in Source Country

	Cost of Sending 200USD		Cost of Sending 500USD	
	(1)	(2)	(3)	(4)
Basel AML	0.159 (0.104)	0.327*** (0.093)	0.089 (0.062)	0.165*** (0.061)
Observations	111046	111046	110631	110631
Controls	No	Yes	No	Yes
Country FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes

[1] Note: Based on the bilateral remittance price data from World Bank and the Basel Index from Basel Institute of Governance. The dependent variable is percent total cost of remitting 200USD and 500USD.

Each column in each panel represents a separate regression. Robust standard errors are clustered at the source country level.

Time-varying controls include remitting location (bank or MTO), speed of transfer (day or less and two days or more) , and income level of sending and receiving country (high income, low income, lower middle income, upper middle income).

All columns include time and corridor fixed effects.

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

Table 1.11: The Effects of AML/CTF Regulations on Remittance Prices (Basel) in Destination Country

	Cost of Sending 200USD		Cost of Sending 500USD	
	(1)	(2)	(3)	(4)
Basel AML	0.072* (0.042)	0.079** (0.034)	0.039* (0.022)	0.042* (0.023)
Observations	111046	111046	110631	110631
Controls	No	Yes	No	Yes
Country FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes

[1] Note: Based on the bilateral remittance price data from World Bank and the Basel Index from Basel Institute of Governance. The dependent variable is percent total cost of remitting 200USD and 500USD.

Each column in each panel represents a separate regression. Robust standard errors are clustered at the destination country level.

Time-varying controls include remitting location (bank or MTO), speed of transfer (day or less and two days or more) , and income level of sending and receiving country (high income, low income, lower middle income, upper middle income).

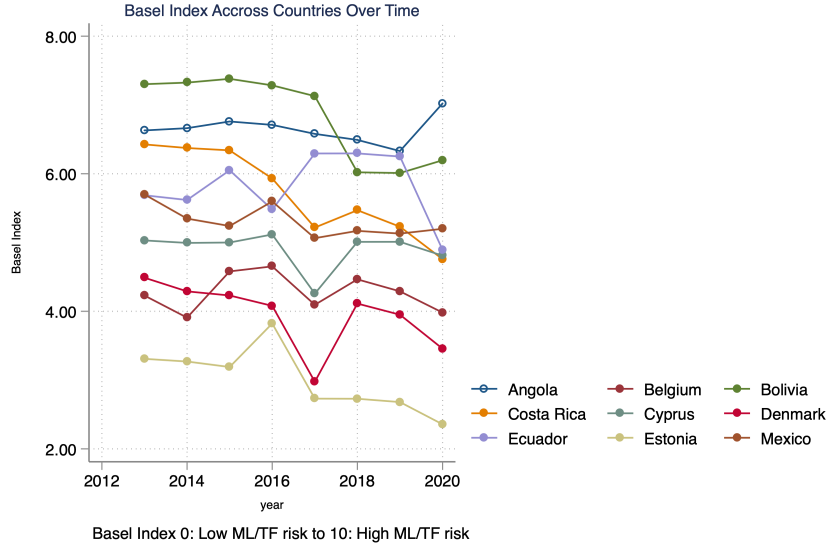
All columns include time and corridor fixed effects.

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

Figure 1.11: Basel Index over Time

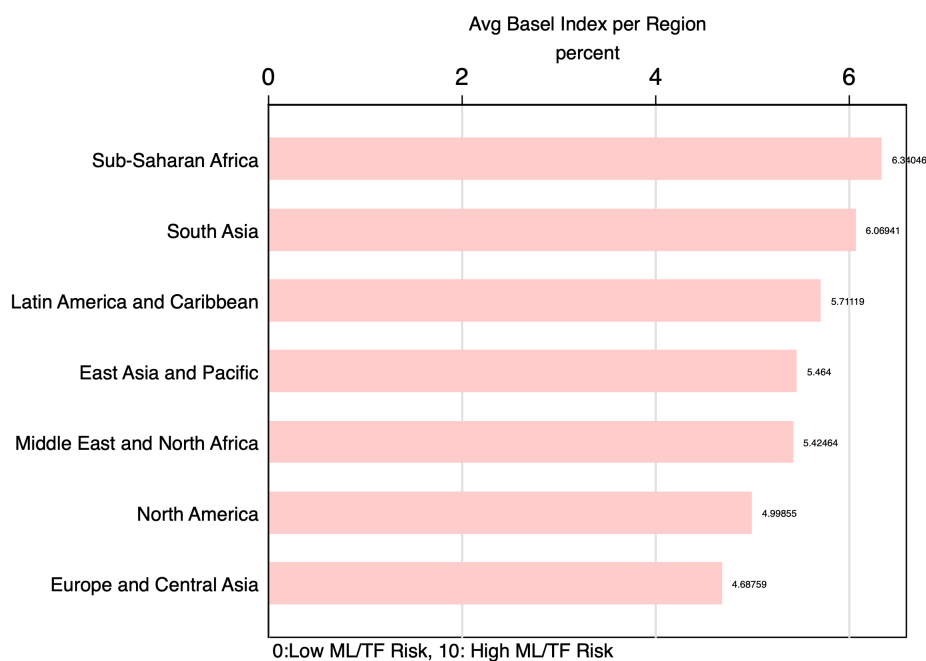


Note: Graph created by the author based on data from Basel AML Index from Basel Institute of Governance. Countries were chosen randomly to depict the variation in Basel Index over time.

remittance outflows from those countries are lower. While the appendix graph [A.3](#) shows a negative relationship meaning that countries who are considered high risk for ML/TF because of their regional position or weak AML framework, also have higher transaction costs.

Main results on the remittance flows with the Basel Index are presented in table [1.12](#). The dependent variable is standardized by the population and size of the economy as represented by the GDP. The treatment interaction estimates whether countries with higher risk of ML/TF, saw a decrease in remittances following the passage of the AML/CTF laws. Point increase in the risk of money laundering and terrorism financing in the country that enacted these regulations, as measured by Basel Index, leads to a decrease in remittances per capita of about \$47, significant at 10% level. The net flows decrease by \$22 when I include just the state and

Figure 1.12: Regional Basel Index



Note: Graph created by the author based on data from World Bank Development Indicators.

year fixed effects and it is not statistically significant. However, once I account for time-varying regional differences, the effect doubles and becomes significant at 10%. The effect captured by net remittances as percent of GDP, in turn, is very small and not statistically significant. Finding the effect of AML regulations on remittance flows is challenging because of the nature of these regulations. Since they enforced more stringent reporting on international transactions, the remittances that were previously going unnoticed were now increasingly getting reported. Also BOP improved the way they collected data in 2013 so more remittances were getting reported for that reason, as well. The coefficients will therefore be an underestimate of the true negative impact on remittance flows. Taking this into account, it is also

not surprising that some of the effects of the regulations on remittances seem small.

Table 1.12: The Effects of AML/CTF Regulations on Net Remittance Flows

	Net Remit/ GDP			Net Remit/Capita		
	(1)	(2)	(3)	(4)	(5)	(6)
AML_CFT	-21.255 (16.221)	-44.286* (24.467)	-46.912* (25.476)	0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)
Observations	1766	1766	1587	1761	1761	1587
Country and Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Region by Year FE		Yes	Yes		Yes	Yes
Controls			Yes			Yes

[1] Note: Each column in each panel represents a separate regression. The unit of observation is country-year. Robust standard errors are clustered at the country level.

Time-varying controls include inflation, unemployment rate, life expectancy at birth, mortality rate under 5, access to electricity. The dependent variables are net remittances per capita in dollar terms in Panel A and net remittances as percent of GDP in Panel B. Since the migration variables only have 300 observations, dependent variable is standardized by population and GDP.

Region by year fixed effects, include six regions East Asia and Pacific, Europe and Central Asia, Latin America and the Caribbean, Middle East and North Africa, South Asia and Sub-Saharan Africa.

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

Table 1.13: The Effects of AML/CTF Regulations on log(Net Remittance Flows)

	log (Net Remit/ GDP)			log (Net Remit/Capita)		
	(1)	(2)	(3)	(4)	(5)	(6)
AML_CFT	-0.0103 (0.020)	-0.0135 (0.018)	-0.0094 (0.019)	0.0018 (0.022)	-0.0094 (0.019)	-0.0034 (0.024)
Observations	1049	1049	1049	1050	1050	1050
Country and Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Region by Year FE		Yes	Yes		Yes	Yes
Controls			Yes			Yes

[1] Note: Each column in each panel represents a separate regression. The unit of observation is country-year. Robust standard errors are clustered at the country level.

Time-varying controls include inflation, unemployment rate, life expectancy at birth, mortality rate under 5, access to electricity. Dependent variable is standardized by population and GDP.

Region by year fixed effects, include six regions East Asia and Pacific, Europe and Central Asia, Latin America and the Caribbean, Middle East and North Africa, South Asia and Sub-Saharan Africa.

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

Table 1.14: The Effects of AML/CTF Regulations (Basel) on Remittance Outflows

	Log Outflows (Percent of GDP)		Log Outflows per Capita	
	(1)	(2)	(3)	(4)
Basel AML	-0.0361 (0.026)	-0.0211 (0.025)	-0.0227 (0.028)	-0.0081 (0.029)
Observations	1629	1458	1630	1458
Controls	No	Yes	No	Yes
Country and Year FE	Yes	Yes	Yes	Yes
Region by Year FE		Yes		Yes

[1] Note: Each column in each panel represents a separate regression. The unit of observation is country-year. Robust standard errors are clustered at the country level.

Time-varying controls include inflation, unemployment rate, life expectancy at birth, mortality rate under 5, access to electricity. The dependent variables are log outflows as percent of GDP in Panel A and log outflows per capita in Panel B. Since the migration variables only have 300 observations, dependent variable is standardized by population and GDP.

Region by year fixed effects, include six regions East Asia and Pacific, Europe and Central Asia, Latin America and the Caribbean, Middle East and North Africa, South Asia and Sub-Saharan Africa.

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

Table 1.15: The Effects of AML/CTF Regulations (Basel) on Remittance Inflows

	Log Inflows (Percent of GDP)		Log Inflows per Capita	
	(1)	(2)	(3)	(4)
Basel AML	-0.0167 (0.018)	-0.0155 (0.019)	-0.0030 (0.022)	-0.0022 (0.022)
Observations	1685	1512	1686	1512
Controls	No	Yes	No	Yes
Country and Year FE	Yes	Yes	Yes	Yes
Region by Year FE		Yes		Yes

[1] Note: Each column in each panel represents a separate regression. The unit of observation is country-year. Robust standard errors are clustered at the country level.

Time-varying controls include inflation, unemployment rate, life expectancy at birth, mortality rate under 5, access to electricity. The dependent variables are log inflows as percent of GDP in Panel A and log inflows per capita in Panel B. Since the migration variables only have 300 observations, dependent variable is standardized by population and GDP.

Region by year fixed effects, include six regions East Asia and Pacific, Europe and Central Asia, Latin America and the Caribbean, Middle East and North Africa, South Asia and Sub-Saharan Africa.

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

1.7 Robustness

In this section, I test the robustness of the main findings. When presenting main results, I focused my analysis on the particular subset of Remittance Prices Worldwide data. I preformed the analysis on the subset of data with unique observation for each firm type-period-corridor level. In this section, I instead aggregate the data and collapse the data into means of variables where means are calculated over source country, destination country, and period. This way I could define a panel with bilateral remittance costs where the individual variable is each country-pair or the corridor and the time variable is the year. Just like with the main analysis in

the previous section, I use corridor and time fixed effects. The results in the 1.16 do not differ much from the previous analysis that focused on the subset of data. Source KYC variable remain the strongest predictor for the increase in the cost of sending money abroad. The cost of sending 200\$ increases by 86 percentage points. While the cost of sending 500\$ increases by 76 percentage points. Consistent with the story on the complaints of remittance account closures in countries like USA, United Kingdom, and Australia, we can see that the biggest impact is felt in the source countries.

Table 1.16: The Effects of AML/CTF Regulations on Remittance Prices

	Cost of sending 200USD	Cost of sending 500USD
	(1)	(2)
Source and Destination KYC	0.1546 (0.429)	-0.3831 (0.283)
Source KYC	0.8648** (0.350)	0.7601*** (0.231)
Destination KYC	0.1723 (0.420)	0.5397* (0.277)
Observations	2729	2729
Corridor FE	Yes	Yes
Time FE	Yes	Yes

[1] Note: Based on the bilateral remittance price data from World Bank. The dependent variable is percent total cost of remittances. Source and destination KYC is for years after both source and destination introduced KYC regulations. Each column in each panel represents a separate regression. Robust standard errors are clustered at the corridor level.

Full specification includes time and corridor fixed effects.

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

Table 1.17: The Effects of AML/CTF Regulations on Inflows and Outflows (in logs)

	log (Outflows/GDP)			log (Inflows/GDP)		
	(1)	(2)	(3)	(4)	(5)	(6)
AML_CFT	-0.0163 (0.027)	-0.0361 (0.026)	-0.0310 (0.026)	-0.0147 (0.017)	-0.0167 (0.018)	-0.0186 (0.019)
Observations	1629	1629	1629	1685	1685	1685
Country and Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Region by Year FE		Yes	Yes		Yes	Yes
Controls			Yes			Yes

	log(Outflows/Pop)			log(Inflows/Pop)		
	(1)	(2)	(3)	(4)	(5)	(6)
AML_CFT	0.0020 (0.028)	-0.0227 (0.028)	-0.0187 (0.029)	0.0003 (0.021)	-0.0030 (0.022)	-0.0068 (0.023)
Observations	1630	1630	1630	1686	1686	1686
Country and Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Region by Year FE		Yes	Yes		Yes	Yes
Controls			Yes			Yes

[1] Note: Each column in each panel represents a separate regression. The unit of observation is country-year. Robust standard errors are clustered at the country level.

Time-varying controls include inflation, unemployment rate, life expectancy at birth, mortality rate under 5, access to electricity. Dependent variable is standardized by population and GDP.

Region by year fixed effects, include six regions East Asia and Pacific, Europe and Central Asia, Latin America and the Caribbean, Middle East and North Africa, South Asia and Sub-Saharan Africa.

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

Table 1.18: The Effects of AML/CTF Regulations on Remittance Flows by Region
(standardized by population)

	log(outflows/Pop)						log(inflows/Pop)					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
post	0.1276 (0.217)	0.1113 (0.115)	-0.5724 (0.380)	-0.0630 (0.156)	-0.0332 (0.109)	-0.5696** (0.219)	-0.0774 (0.128)	0.0102 (0.093)	0.0439 (0.076)	-0.0861 (0.147)	0.0072 (0.064)	0.0551 (0.345)
Observations	183	654	277	221	59	196	216	666	335	167	60	202
Country and Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

[1] Note: Each column in each panel represents a separate regression for a different region. The unit of observation is country-year. Robust standard errors are clustered at the country level.

The six regions in the order they appear on the table are East Asia and Pacific, Europe and Central Asia, Latin America and the Caribbean, Middle East and North Africa, South Asia and Sub-Saharan Africa.

Dependent variables are log of remittance outflows per capita and log of remittance inflows per capita.

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

Table 1.19: The Effects of AML/CTF Regulations on Remittances Received by
Region (standardized by GDP)

	log(outflows/GDP)						log(inflows/GDP)					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
post	0.1614 (0.216)	0.1725 (0.106)	-0.6951* (0.379)	-0.0930 (0.141)	-0.0346 (0.086)	-0.6021** (0.244)	0.0191 (0.131)	0.0952 (0.093)	-0.0619 (0.071)	-0.1295 (0.160)	0.0134 (0.100)	-0.0332 (0.329)
Observations	183	654	277	220	59	196	216	666	335	166	60	202
Country and Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

[1] Note: Each column in each panel represents a separate regression for a different region. The unit of observation is country-year. Robust standard errors are clustered at the country level.

The six regions in the order they appear on the table are East Asia and Pacific, Europe and Central Asia, Latin America and the Caribbean, Middle East and North Africa, South Asia and Sub-Saharan Africa.

Time-varying controls include inflation, unemployment rate, life expectancy at birth, mortality rate under 5, access to electricity. Dependent variable is standardized by population and GDP.

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

Table 1.20: The Effects of AML/CTF Regulations of Net Remittances Received by Region

Panel A: East Asia and Pacific	
Basel Index (KYC)	-0.0715*
	(0.0365)
(N)	106
Panel B: Europe and Central Asia	
Basel Index (KYC)	-0.0239
	(0.0395)
(N)	381
Panel C: Latin America and Caribbean	
Basel Index (KYC)	0.00375
	(0.0177)
(N)	290
Panel D: Middle East and North Africa	
Basel Index (KYC)	-0.0458*
	(0.0577)
(N)	103
Panel E: South Asia	
Basel Index (KYC)	0.176
	(0.0919)
(N)	60
Panel F: Sub-Saharan Africa	
Basel Index (KYC)	0.106
	(0.0593)
(N)	110
Country and Year FE	Yes
Time-Varying Controls	Yes

[1] Note: Each column in each panel represents a separate regression. The unit of observation is country-year. Robust standard errors are clustered at the country level.

Time-varying controls include inflation, unemployment rate, life expectancy at birth, mortality rate under 5, access to electricity. The dependent variables are log net remittances per capita. Dependent variable is standardized by population.

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

Table 1.21: Granger Type Causality Test

	Log Outflows (Percent of GDP)	
	(1)	(2)
treatment year	0.0065 (0.087)	0.0120 (0.097)
1 year after	0.0004 (0.105)	-0.0014 (0.111)
2 years after	0.1527 (0.108)	0.1385 (0.120)
3 years after	0.1815 (0.113)	0.1588 (0.123)
4 years after	0.1673 (0.133)	0.1422 (0.142)
5 years after	0.1971 (0.137)	0.1842 (0.142)
6 years after	0.1893 (0.141)	0.1749 (0.144)
7 years after	0.1945 (0.139)	0.1652 (0.138)
8 years after	0.1215 (0.128)	0.0995 (0.135)
Observations	949	949
Controls	Yes	Yes
Country and Year FE	Yes	Yes
Region by Year FE		

[1] Note: Log of outflows per GDP and log of outflows per capita are regressed on lead of treatment variables. The full specification includes country and year fixed effects, as well as region-by-year fixed effects.

Note: Leading values of treatment variable are used to examine the possibility that future treatment exposures are anticipated by current outcomes. * Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

I include the leading values of the AML/CTF treatment variable in order to check if future treatment exposures can be anticipated by current outcomes. Under the assumption of strict exogeneity, future policy change in AML regulations should not be associated with current outcomes. Indeed, table 1.21 shows the result of Granger-type causality test shows that treatment leads are insignificant and not associated with current outflows as percent fo GDP and outflows per capita. Next, in the table 1.22 I am interested in seeing if timing of regulations is exogenous. I regress both the AML/CTF treatment variable and Basel Index that captures treatment intensity on the set of development variables that include GDP per capita, inflation, unemployment, electricity access, life expectancy and mortality rate. I also include country and year fixed effects, as well as region-by-year fixed effects. These development variables do not seem to have an effect on timing of implementation of AML/CTF regulations and they don't impact the Basel Index variable. All variables are small and insignificant. Notable exception is GDP per capita has a positive impact on the timing of AML regulations, but this impact is very small.

I preform a falsification test as another way to test the identifying assumption. I examine whether global flows are affected by the AML/CTF regulations. The global flows refer to Foreign Direct Investments (FDI) and Official Development Assistance (ODA) flows that are generally analyzed together with remittances in the literature and follow similar patterns. More specifically, I examine if global flows that should not be affected by the regulations, and therefore serve as proxy for general trends in global financial flows, appear to be affected. If these global flows are affected that would invalidate the research design as these flows should be exogenous to AML/CTF laws. It is possible that strong AML/CTF framework could attract more FDI because strong compliance could indicate financial stability but such effects are at most secondary. Table 1.23 and table 1.25 show the full specification including

Table 1.22: Tests of Balance: AML/CFT and World Development Indicators

	AML/CTF	Basel Index
	(1)	(2)
GDP per capita	0.0000** (0.000)	-0.0000 (0.000)
inflation	0.0011 (0.002)	0.0008 (0.005)
unemployment	0.0067 (0.004)	-0.0107 (0.023)
electricity access	-0.0008 (0.002)	-0.0072 (0.009)
life expectancy	0.0114 (0.014)	0.1463 (0.102)
mortality rate	0.0007 (0.002)	-0.0282 (0.017)
Observations	1767	587
Controls	Yes	Yes
Country and Year FE	Yes	Yes
Region by Year FE	Yes	Yes

[1] Note: Dependent variable in the first column is the AML/CTF implementation dummy variable. Dependent variable in the second column is the Basel Index. Independent variables are values of World development Indicator variables. * Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

country and time fixed effects, as well as region-by-year fixed effects and time varying controls. Each column contains independent variable scaled by population, GDP both in level and logs. Estimates for FDI show some effects possibly due to those secondary effects but are not statistically insignificant. While estimates for net ODA are close to zero and statistically insignificant across all specifications. I next capture the intensity of compliance with AML regulations using Basel Index and show those results as well. Table 1.23 and table 1.25 show the results where independent variable now is the treatment intensity. Again, we can see that the estimates are small and statistically insignificant. These results further validate the research design together with identifying assumptions.

Table 1.23: The Effects of AML/CTF Regulations on FDI flows

	FDI/pop	FDI/GDP	log(FDI/pop)	log(FDI/GDP)
	(1)	(2)	(3)	(4)
post	-212.492313 (735.166001)	0.017928 (0.016151)	0.188963 (0.190179)	0.248926 (0.189125)
Observations	2060	2059	559	559
Country and Year FE	Yes	Yes	Yes	Yes
Region by Year FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes

[1] Note: Each column in each panel represents a separate regression for a different region. The unit of observation is country-year. Robust standard errors are clustered at the country level. Time-varying controls include inflation, unemployment rate, life expectancy at birth, mortality rate under 5, access to electricity. Dependent variable is standardized by population and GDP.

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

Table 1.24: The Effects of AML/CTF Regulations on FDI flows (with Basel Index)

	FDI/pop	FDI/GDP	log(FDI/pop)	log(FDI/GDP)
	(1)	(2)	(3)	(4)
AML_CFT	-98.571047 (132.519045)	-0.003160 (0.002689)	0.143042 (0.116318)	0.144469 (0.113643)
Observations	2060	2059	559	559
Country and Year FE	Yes	Yes	Yes	Yes
Region by Year FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes

[1] Note: Each column in each panel represents a separate regression for a different region. The unit of observation is country-year. Robust standard errors are clustered at the country level. Time-varying controls include inflation, unemployment rate, life expectancy at birth, mortality rate under 5, access to electricity. Dependent variable is standardized by population and GDP. The dependent variable measures the intensity of compliance with regulations as measured by Basel Index.

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

Table 1.25: The Effects of AML/CTF Regulations on Net ODA flows

	NODA/pop	NODA/GDP	log(NODA/pop)	log(NODA/GDP)
	(1)	(2)	(3)	(4)
post	-0.000010 (0.000010)	-0.000000 (0.000000)	-0.012485 (0.087722)	-0.005758 (0.081667)
Observations	895	895	895	895
Country and Year FE	Yes	Yes	Yes	Yes
Region by Year FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes

[1] Note: Each column in each panel represents a separate regression for a different region. The unit of observation is country-year. Robust standard errors are clustered at the country level. Time-varying controls include inflation, unemployment rate, life expectancy at birth, mortality rate under 5, access to electricity. Dependent variable is standardized by population and GDP.

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

Table 1.26: The Effects of AML/CTF Regulations on Net ODA flows (with Basel Index)

	NODA/pop	NODA/GDP	log(NODA/pop)	log(NODA/GDP)
	(1)	(2)	(3)	(4)
AML_CFT	0.000002 (0.000005)	0.000000 (0.000000)	0.049627 (0.047535)	0.069263 (0.041183)
Observations	895	895	895	895
Country and Year FE	Yes	Yes	Yes	Yes
Region by Year FE	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes

[1] Note: Each column in each panel represents a separate regression for a different region. The unit of observation is country-year. Robust standard errors are clustered at the country level. Time-varying controls include inflation, unemployment rate, life expectancy at birth, mortality rate under 5, access to electricity. Dependent variable is standardized by population and GDP. The dependent variable measures the intensity of compliance with regulations as measured by Basel Index.

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

1.8 Discussion and Conclusion

Remittances, in the context of my research, are defined as the money sent to the country of origin by an international migrant. It's important to study remittances as they are recognized by both international organizations and national governments as important tools to combat poverty and promote local development. Remittances help improve the economic situation of receiving households and are often the primary or only source of income for receiving households. Remittances are the second largest source of external funding for developing countries. In 2018, officially recorded annual remittance flows to developing countries reached \$529 billion, an increase of 9.6 percent over the \$483 billion in 2017. Remittances have a significant impact on the lives of children, as well as the prospects of the whole country. In an attempt to cut

illicit fund transfers, the regulators have made the process of remitting money difficult for international workers. AML/CFT regulations are impacting remittance industry in few different ways. Bank are closing MTOs' accounts and have stopped offering low-cost remittance services themselves. The closure of bank accounts have forced some small MTOs to completely close business. There are also notable downstream effects on outflows.

Due to account closures many MTOs exited the market, which pushed more remittances to be sent through banks that charge significantly higher fees (Stanley and Buckley, 2016). In fact, Australia's and New Zealand's government carries a remittance cost comparison website that showed that at one point the cost to send AUD 200 from Australia to Tonga via MTO was 0.84% while with a bank it was 27% (Capal, 2014). While from banks point of view, it may be easier to close risky MTO accounts than to engage in diligent monitoring, the risks remain that these overzealous reactions are hindering financial access of foreign workers. MTOs have to comply with AML/CTF regulations in order for banks to embrace them as their customers but money transfer softwares similar to what banks use to verify individual payments, are very costly for MTO businesses. MTOs were able to offer lower remittance costs than banks but the disruption in their access to bank accounts could possibly affect the overall pricing of remittances and the attempts to bring the global average down. Given that MTOs and banks have to devote as much as 65% of their time and personnel to compliance issues, this remains a big obstacle in decreasing the costs (Cecchetti and Schoenholtz, 2018). Prices are one of the major determinants of the amount remitted. Therefore, these regulations can also impact global flows of remittances. Regulations are not only impacting the remittance industry in source countries. Local banks in recipient countries rely on their international networks and are often pressured from their international correspondent banks to enforce similar

measures.

While there are many reports on cases like this all over countries like USA, UK, and Australia, quantifying this impact can be difficult as international data was weak. There was a lack of reliable worldwide data on the implementation of these regulations. In this paper, I solidify the most important data sources on remittances and AML/CTF regulations in order to capture the impact on the cost and global flow of remittances. The most important data sources used in this paper are PwC KYC's reference guide, World Development Indicators data (World Bank), and Price Remittances Worldwide data. Using the two-way fixed effects with differential timing of treatment, I find that after the source country implements these regulations, total cost of sending 200\$ increases by 68 percentage points. While total cost of sending 500\$ increases by 59 percentage points, both significant at 5% level. The implementation of AML/CTF regulations by the receiving country, increases the cost of sending 500\$ by 46 percentage points, significant at 10% level. Beyond just the impact on costs, there is a decrease in outflows too. Remittance outflows as percent of GDP decrease by 21 percentage points once the AML/CTF regulations are implemented and this is significant at 5% level. Similarly, these regulations are associated with 21 percentage points decrease in log outflows per capita. I also capture the intensity of compliance with regulations using Basel Index, but these results are less robust.

It can be argued that some of the recorded decrease in remittances is a sign that these regulations are stopping transfers of illicit funds. However, since banks are engaging in closing remittance transfer accounts due to monitoring costs, this is impacting all foreign workers as well. The de-risking approach that banks are taking is causing some sectors like MTOs to completely lose access to banks. The banks transfer remittances too but they are the costliest option for money transfers. The

fact that these regulations are hurting foreign workers is also portrayed by their effect on costs. The impact on the foreign workers has so far been theorized and my papers quantifies the impact. Some countries, like Australia, are taking actions and assigning governmental task force in order to investigate the effects of money laundering laws on remittance industries. The world leaders are urging regulators to avoid taking the hard-line approach that can lead to financial exclusion and hurt the foreign workers. Such approach can push remittances to unregulated channels that are harder to monitor. Perhaps the big step towards making regulations more coherent would be for lawmakers to clearly define the provisions of risk-based approach. The vague definitions and procedures lead to overzealous reaction on the side of financial institutions. Also, lack of harmony on both national and international level when it comes to AML/CTF regulations is another obstacle at minimizing the negative spillovers. The burden of these regulations is especially felt by banks in developing countries who find it very costly to comply with such regulations. The policymakers should perhaps wonder if banks should be responsible for customers of MTOs. Since MTOs are customers of banks, it is banks responsibility to help them minimize risk through knowledge and technology sharing. Beyond that, perhaps MTOs should be held more responsible for their customers which will, in turn, help banks to once again embrace them as their customers. The biggest obstacle to this is the cost of technology that for some small MTOs cannot be justified.

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Chapter 2

A MODEL OF REMITTANCE SENDERS AND INTERMEDIARIES

2.1 Introduction

Remittances are recognized by both international organizations and national governments as important tools to combat poverty and promote local development. Remittances help improve the economic situation of receiving households and are often the primary or only source of income for receiving households. They are the second largest source of external funding for developing countries. In 2013, the United Nations reported that more than 230 million people lived outside of their country of birth, and over 700 million migrated within their countries. In 2018, officially recorded annual remittance flows to developing countries reached \$529 billion in 2018, an increase of 9.6 percent over the \$483 billion in 2017. Remittances have a significant impact on the lives of receiving households, as well as the prosperity of the entire country. Countries such as the Philippines have become economically dependent on the remittances. Ten percent of the country's GDP is composed of those remittances. What is more, remittances comprised a whopping 42 percent of Tajikistan's GDP and 29 percent of Nepal's GDP in 2013.

Remittances are not just household income, they are mediated by complex social relations and institutions (Lindley 2009). Remittances are largely handled by banks and money transfer operators (MTOs). These financial intermediaries charge high fees for sending remittances. On average, the charge for sending \$200 which is a

common benchmark used to compare costs, is \$14, and the combination of fees and exchange rate can take up 7% of the total amount sent. These costs are not fixed and they can vary greatly, for example, the cost of sending \$200 from US to Mexico is \$8.91, from Germany to turkey is \$2.83 and from South Africa to Botswana is \$36.60. ODI Remittances Report writes that average of 12% of the amounts sent back to relatives in sub-Saharan Africa is lost to transfer fees. To put that in perspective, the amount would be enough to pay for primary school education of 14 million kids in sub-Saharan Africa. As the new players are entering the market, the fees have surprisingly stayed stable.

In this paper, I present an applied theory model on the topic of remittances. I model the equilibrium between the remittance senders and remittance intermediaries. Funkhouser (1995) examined the determinants of remittances from international migration using case study of El Salvador and Nicaragua. Funkhouser modeled the remittance behavior of the emigrant who values both his own utility and utility of the household in the home country. I build on his paper by modeling a supply side as well. It is important to analyze not just the migrant's decisions but also the determinants of how price and quantity are set in the remittance service market. Thus, this paper presents a model of senders of remittances and intermediaries. It would be one of the first papers to theoretically analyze the complex relations between the two in order to fully understand their behaviors and how their decisions impact one another. Most theoretical models focus on portraying the behavior of households and migrants. However understanding how financial institutions act as intermediaries in the market and maximize their profit can help us gain an important insights. The main purpose of this paper is to derive useful comparative statics that can help guide empirics. However, I also present possible model extensions. I model a migrant in a Becker-type equation who derives utility from his own consumption

but also from the consumption of the receiving household. There are many motives behind the decisions to remit but migrant in my model is driven by pure altruism. The comparative statics prove altruism as a motive and suggest that remittances increase with the increase in the wage of a remitter, and decrease with the increase in household income of those receiving remittances. Furthermore, migrant sends less when remitting cost increase. Remittances also increase with an increase in degree of altruism. On the remittance intermediaries side, I model a representative bank and a representative MTO. They compete on quantities and set them simultaneously. It wasn't possible to obtain a closed-form solution using the demand from the senders problem but more importantly I was able to find useful comparative statics using arbitrary inverse demand curve. The comparative statics suggests that volume of remittances transferred by a bank or an MTO goes down when its cost increases, and volume increases when the cost of the competitor increases.

My paper would fit into the extensive literature modeling the theoretical determinants of remittances. Apart from Funkhouser, early on, Glystos (1988) developed a model of remittance determination that looks at remittances as an important endogenous variable in the family decision making process on migration. Glystos models both the behavior of remitter and households and he found that desired level of remittances estimated by the model can't be reached because of conflict of interests between the migrant and family. This is because of the instability of the migrant income expectations and because of the chosen strategy to implement the target savings level and distribution of surplus savings. The only way both family and sender would be in agreement is if the savings target very ambitious and thus surplus savings and level of remittances low. Similarly, Bougha-Hagbe (2004) modeled expected utility model of a worker residing abroad and choosing to allocate revenue between remittances, consumption, and asset accumulation, including real estate in the home

country. The worker maximizes utility consisting of size of non-financial asset in the home country, parent's real consumption in the home country, and workers real consumption abroad. However, Bougha-Hagbe (2004) included the term that capture attachment to the home country and altruism. In the long run equilibrium, the level of acquisition of non-financial assets by remitter in the home country depends on degree of altruism and the level of consumption abroad by the remitter. The author then tests these empirical findings for Morocco using Johansen (1999) approach, and finds that altruism, attachment to home country and the economic growth of these countries are main long run determinants of remittances.

My paper would also fit into a literature outlining theoretical models for motives behind worker's remittances. One of the most notable motives is altruism where migrant's utility consists of both his own utility and utility of his family in his home country. Here, total utility is weighted average of the two utilities. Since migrants are emotionally tied to their family and friends abroad, it is simply that emotion that drives them to remit. The models show that remittances motivated by altruism increase with the migrant's income and degree of altruism and decreases with the recipient's income and degree of altruism (Stark, 1995; Rapoport and Docquier, 2005). Another explanation for migrant's remittances are based on models of exchange motive. According to the exchange motive, remittances pay for services performed by stayers who take care of elders, children, migrant's assets, et (Cox, 1987). For that reason, migrants will want to pay the minimum amount needed to have that service provided. Comparative statics show that remittances increase with the quantity of service to be offered but react ambiguously to an exogenous increase in the recipient's pre-transfer income. The main difference between the exchange and altruistic model, is that in an exchange model an increase in the recipient's income may raise the amount transferred because the ones who stay will need a higher payment to

perform the service. Exchange motive is often also referred to as self-interest motive. There is also strategic motive behind migrants sending remittances (Stark, 1995). Migrants have heterogeneous skills and productivity that can't be perfectly observed by the host country, and therefore employers use statistical discrimination by which migrants are paid the average salary of their minority group. In that case, the more skilled migrants can act cohesively and work to maintain the less productive migrants at home. Stark shows that efficiency can be achieved by side-payment of skilled to unskilled if unskilled don't want to migrate unless they are pooled with the skilled workers (otherwise employers could differentiate). The model predicts that migration is selective, and selectiveness is positively related with remittances. Remittances have to be sent to those who are earning wage at home otherwise it would not be a credible threat that these stayers would move to work abroad. Once the productive workers are identified, there is no need to send remittances anymore. This model is not easily testable and there is no empirical study testing this model exactly.

Remittances could also serve as an insurance against the unpredicted events. Migrant send remittances home in response to negative shocks to income such as crop failure in agricultural communities. In return, migrants can receive assistance back from stayers in case of unemployment or retirement. This model predicts that migration and remittances are more likely to occur when income at the home country is more volatile. Compared to the altruism model, in this model remittances are not sent on a regular basis. Altruism model also implies that remittances should decrease over time because degree of altruism fades away with distance and time. Insurance model implies more irregular behavior with no decrease during periods of negative income shocks to stayers and then a sharp decline. Azam and Gubert (2002) present moral hazard problem in insurance model. There is no altruism in this model and household's income, before receiving remittances, depends solely on productive

error and idiosyncratic risk that affects local production. According to insurance motive the migrant guarantees specific minimum level of income to household in case of negative income shocks in a state of nature where household's income is reduced to zero regardless of effort. The no-moral-hazard condition requires that the expected utility level with some positive effort must be higher than without any effort. Related to that is the inheritance model that predicts that amount remitted should be independent of recipient's income but should be strongly correlated with probability of receiving inheritance (Rapoport and Docquier, 2005). According to the insurance motive, the remitters send money home to ensure their parents include them in their will. The competition among siblings could also stimulate them to migrate and send higher amounts of remittances.

There are theoretical models in which remittances act like a capital inflow from abroad (Le, 2011). This model is set up based on altruism and investment motive: migrants both care about their family and also want them to take care of their investment projects on their behalf. This theoretical model uses the mix of both motives to show that remittances are important source of finance for economic development through investment and not just source to increase consumption at home. Based on prediction of the model, migrant will remit more money if her income is higher, family home is poor, or when she wants to incentivize the stayers to manage her investment project by monetary rewards. The model is solved by backward induction, where recipients first chose their effort level to maximize their wage and remittances that are tied to investment project that recipients manages. Then the migrant makes a decision on how much to invest and transfer based on the returns from the investment project. When studying altruism motive Le (2011), the migrant's remittances are fixed regardless of the returns on the investment project. In the altruism model, the stayer's effort decreases with mover's income and also

stayer's effort doesn't depend on his income because this simply cares about migrant's well-being and expresss that through taking care of their investment project. The important conclusion of the paper is that in countries with a developed financial system, investment motive dominates altruism motive and remittances have positive effect on economic development.

This paper would also fit into the literature on theoretical models trying to explain receiving households behavior. It is important to model the way household could use remittances to maximize their expected utility. In such models, each period households make choices on their level of consumption but they also face uncertainty so they will only make consumption choices for future once those periods arrive (Adams, 1998). In each period, yield on assets and labor income are allocated between consumption and investment in assets. The model assumes that households cannot borrow. The important part of the model is if household can receive enough remittances to afford to make an investment to accumulate assets. However, remittances are allocated between consumption and assets. The model predicts that remittances will help households accumulate more assets. Using the data from Pakistan, Adams (1998) showed that most stayers do not have any assets, and that indeed availability of remittance income helps to increase investment by increasing the marginal propensity to invest.

It is also important to understand and estimate the income elasticity of remittances. Research show that remittances move together with the short-run fluctuations in income, which includes seasonalities and weather shocks (Nyarko and Wang, 2018). A long run shock to income, such as a labor reform increased remittances. The labor reform made it easier for workers to switch jobs and therefore increased their bargaining power with current and future employers. Nyarko and Wang (2018) found that this labor reformed increased workers' wages, as well as remittances.

These results are consistent with the models of remittances incorporating altruism and exchange motive. Also, on average private income earnings increase over time while remittances fall. There is an asymmetric behavior by which remittances decrease with decrease in earning but stay flat with increase in earnings. Interestingly, the authors also found that individuals who have coworkers from the same country tend to remit more with the increase in income. This suggests that migrants might be hiding their true income from relatives and in instances when their true income could be revealed by others, they tend to be more truthful and remit more (Nyarko and Wang, 2018).

The rest of the paper is organized as follows: section 2.1 models the demand for remittances by migrants and discusses relevant comparative statics, section 2.2 models the remittance intermediaries taking the demand derived from the sender's problem. Section 3 proposes some model extensions. Finally, section 4. concludes the paper.

2.2 Equilibrium in Remittance Market

In this paper, I propose a theoretical model that defines the equilibrium between the remittance senders and remittance intermediaries. In the first subsection, I derive a demand curve for remittances. Second subsection studies the supply side.

2.2.1 Senders of Remittances

Suppose we have an altruistic migrant who wishes to maximize his own utility and utility of his immediate household in the origin country. The migrant has to split his wage and non-wage income on his own own consumption and consumption of remittance receiving household.

Assumptions:

1. This is a one period model: implies no borrowing or savings
2. Inelastic supply (given)
3. Log Utility

n=1, inelastic supply

$$\begin{aligned} \max U(U_r, U_h) &= (1 - \alpha)U_r(C_r) + \alpha U_h(C_h) \quad \text{s.t} \quad C_r + (1 + e + f)q_i^r = W_r \\ & \quad C_h = Y_h + q_i^r \\ \max U(U_r, U_h) &= (1 - \alpha) \log C_r + \alpha \log C_h \quad \text{s.t} \quad C_r + p q_i^r = W_r \\ & \quad C_h = Y_h + q_i^r \end{aligned}$$

Since $(1+e+f)$ is the price of sending remittances, we can assign : $p = (1 + e + f)$

(2.1)

Where utility of a remitter depends on both his own utility U_r and utility of the household U_h receiving remittances. The idea is that when a remitter sends money to his family that decreases his own utility since he can consume less but that is offset by increase in utility of his family. This is a one period model in which

remitter maximizes the utility with respect to amount of remittances sent q_i^r subject to budget constraint, where remitter allocates his earnings e and non-wage income on consumption C_r and remittances (where remittances consists of total amount sent q_i^r plus fee $f * q_i^r$ and exchange rate $e * q_i^r$). There is no savings or borrowing in this one period model. The household receiving remittances also allocates their income Y_h and remittances q_i^r on consumption C_h . I am using a special case of concave utility function which is log utility which has the risk aversion property: the marginal utility of wealth decreases as wealth increases. Log utility function is a special case of CRRA or iso-elastic (CRRA) class which gives rise to income and substitution effects for an increase in interest rates that exactly cancel out.

The remitter derives utility from the recipient's consumption, which is funded in part by the remittances sent, therefore remittances increase with an increase in altruism as captured by *alpha*. Remittances increase with the increase in wage of a remitter and decrease with the increase in household income of those receiving remittances.

Remitter is driven by altruistic feelings towards the family left behind. Therefore, the migrant cares about any income shocks of the family and adjusts remittance amounts accordingly. There is a negative relationship between household income and remittances sent: when household income decreases, the migrant sends more remittances. The migrant also sends more when his wage increases because he is able to share more of his income. Income doesn't necessarily have linear effect, and literature shows that income has a different impacts at different points of income distribution (Cox, Eser, Jimenez, 1997). This altruism motive is in contrast to the self-interest motive where remittances increase with the increase of receiving household income. In that case, a migrant wants to be seen favorably by his family with the hopes to get a piece of family's inheritance. In my model, migrant is not driven by self-interest

but altruism.

Cost of remittances acts as a tax on altruism: increase in the price of services decreases the amount sent.

The migrant exhibits negative cost elasticity—lowering remitting costs leads to migrant remitting higher amount. At the extensive margin, individuals who weren't remitting before or used informal channels, may be encouraged to send money through remittance service providers if the fees are low. At the intensive margin, lower fees should encourage existing remitters to send a higher amount. The remitting fees consist of the fixed component and the exchange rate margin. The response to the fixed component is the more important one due to the hidden nature of the exchange range cost. Migrants might not be aware of the current exchange rate and the fact that they are being charged through exchange rate as well. Furthermore, fixed fee is usually fixed but the exchange rate margin is tied to the amount sent. Nevertheless, if a migrant is aware of the exchange rate cost, then it too should exhibit negative elasticity of remittances with respect to exchange rate costs.

Proof:

Next, I will find a remittance quantity that maximizes the utility of the migrant that's a weighted average of his own utility and utility of the receiving household.

$$\begin{aligned} & \max \log(1 - \alpha) [W_r - pq_i^r] + \alpha \log [Y_h + q_i^r] \\ & \max \log [W_r - pq_i^r]^{1-\alpha} * [Y_h + q_i^r]^\alpha \end{aligned} \tag{2.2}$$

after monotonic transformation:

$$\max [W_r - pq_i^r]^{1-\alpha} * [Y_h + q_i^r]^\alpha \tag{2.3}$$

$$\frac{\partial U}{\partial q_i^r} = 0 \rightarrow (1-\alpha) [W_r - pq_i^r]^{-\alpha} * (-p) * [Y_h + q_i^r]^\alpha + [W_r - pq_i^r]^{1-\alpha} * \alpha [Y_h + q_i^r]^{\alpha-1} = 0$$

$$\rightarrow p(1-\alpha) [W_r - pq_i^r]^{-\alpha} [Y_h + q_i^r]^\alpha = \alpha [W_r - pq_i^r]^{1-\alpha} [Y_h + q_i^r]^{\alpha-1}$$

$$\rightarrow p \frac{[Y_h + q_i^r]^\alpha}{[Y_h + q_i^r]^{\alpha-1}} = \frac{\alpha}{1-\alpha} \frac{[W_r - pq_i^r]^{1-\alpha}}{[W_r - pq_i^r]^{-\alpha}}$$

$$\rightarrow p [Y_h + q_i^r] = \frac{\alpha}{1-\alpha} [W_r - pq_i^r]$$

$$\rightarrow pY_h + pq_i^r = \frac{\alpha}{1-\alpha} W_r - \frac{\alpha}{1-\alpha} pq_i^r$$

$$\rightarrow \left(1 + \frac{\alpha}{1-\alpha}\right) pq_i^r = \frac{\alpha}{1-\alpha} W_r - pY_h$$

$$\rightarrow \left(\frac{1}{1-\alpha}\right) pq_i^r = \frac{\alpha}{1-\alpha} W_r - pY_h$$

$$\rightarrow \left(\frac{p}{1-\alpha}\right) q_i^r = \frac{\alpha}{1-\alpha} W_r - pY_h$$

$$\rightarrow q_i^r = \left(\frac{1-\alpha}{p}\right) \frac{\alpha}{1-\alpha} [W_r - pY_h]$$

Finally, we get an equation (4) that defines the quantity of remittances sent

by the migrant. We can use this equation to derive important comparative statics:

$$\rightarrow q_i^r = \left(\frac{\alpha}{p}\right) [W_r - pY_h] \quad (2.4)$$

$$\frac{\partial q_i^r}{\partial W_r} = \frac{\alpha}{p} \quad (2.5)$$

$$\frac{\partial q_i^r}{\partial Y_h} = -\alpha \quad (2.6)$$

$$\frac{\partial q_i^r}{\partial p} = -\frac{\alpha W_r}{p^2} \quad (2.7)$$

$$\frac{\partial q_i^r}{\partial \alpha} = \frac{W_r - Y_h}{p} \quad (2.8)$$

These comparative statics are intuitive and prove the above propositions. They show that remittances increase with the increase in wage of a remitter and decrease with the increase in household income of those receiving remittances. Furthermore, remittances decrease with a remittance price increase, and remittances increase with an increase in altruism as captured by α .

2.2.2 Financial Institutions: Banks and MTOs

The banks and Money Transfer Operators (MTOs) are the two main intermediaries in the remittance market. In this section, I model the volume of remittances transmitted through each bank and a money transfer operators (MTO). When it comes to money transfer operators, Western Union dominates the market by far (14% of total remittance market share), but from the banks side JP Morgan (2% of total remittance market share), Bank of America (1.5% of total remittance market

share), and Wells Fargo (1% of total remittance market share) share the market. It is also important to acknowledge that there is a third actor in remittances market that I left out in this model and those are fintech startups. Among fintechs, Transferwise dominates the market by 7% of total market share. Banks generally charge higher fees than MTOs and the transfers take longer. However, the fees for both bank and MTOs have been on decline. MTOs are also more present in the remittance market than banks. The high fees also arise from anti-competitive behavior among other reasons. For example, state-run organizations are contractually obligated to use MTOs for single transfer payments. The existing research shows that transaction costs have a large effect on recorded remittance receipts—migrants either refraining from remitting money, or remit large amounts through lower-cost informal channels (Orozco 2002; Freund and Spatafora 2005; Freund and Spatafora 2008; El Qorchi, M, S, Maimbo, J. Wilson, 2003; Schiopu and Siegfried, 2006; Jack and Suri 2014; Kakhkharova, Akimovb , and Rohdeb, 2016; Gelb 2016).

In this section, I derive a one-period model in which banks and MTOs engage in Cournot competition. The Cournot competition is superior for this market over Bertrand competition. Banks and MTOs charge different fees and those depend on ability to dominate the remittance market, so they mostly compete on the quantity of remittances sent. Bertrand competition would result in perfect competition causing Bertrand paradox and ultimately driving prices to marginal cost which is not consistent with the remittance market. More realistically, firms have market power and they compete in quantities: each individual firm takes the quantity set by its rival as a given, then evaluates its residual demand, and then behaves as a monopoly. This would explain the high cost of remittances. One way to avoid a Bertrand paradox would be to use a differentiated Bertrand model in which firms have slightly differentiated products that gives them some market power.

Assumptions:

1. One representative bank and one representative MTO
2. Bank and MTO knows its own total cost of production, the competitor and the industry demand
3. One period model: the life of the industry lasts for one period
4. Identical products and cost

I start with the demand equation derived from the sender's problem in order to derive the inverse demand function:

$$q_i^r = \left(\frac{\alpha}{p}\right) [W_r - pY_h] \quad (2.9)$$

$$q_i^r = \frac{\alpha W_r}{p} - \frac{\alpha p Y_h}{p} \quad (2.10)$$

$$q_i^r = \frac{\alpha W_r}{p} - \alpha Y_h \quad (2.11)$$

$$\frac{\alpha W_r}{p} = q_i^r + \alpha Y_h \quad (2.12)$$

$$p [q_i^r + \alpha Y_h] = \alpha W_r \quad (2.13)$$

This equation gives us the price of the inverse demand function:

$$p = \frac{\alpha W_r}{q_i^r + \alpha Y_h} \quad (2.14)$$

$$\rightarrow p (q_b^r + q_{mto}^r) = \alpha W_r [q_b^r + q_{mto}^r + \alpha Y_h]^{-1} \quad (2.15)$$

Now suppose banks and MTOs have the same total cost function:

$$c_i(q_i^r) = c_i q_i^r \quad (2.16)$$

Also, suppose that Bank and MTOs engage in Cournot duopoly competition. This is a strategic game in which players, or firms in this example, have a set of possible outputs and the payoff of each firm is its profit. Bank and MTO set its output independently, and the price is determined by the market, where price is the inverse demand function. I first maximize bank's profit. Bank's response function gives us, for each output of MTO, the profit maximizing output of the bank.

In equilibrium, the volume of remittances transferred by the firm or MTO:

1. decreases with the increase in their cost
2. increases with the increase in their competitors cost

Proof:

Bank's profit maximizing output when MTO's output is q_{mto} is the output q_b that maximizes bank's profit:

$$\max \pi_b = q_b^r [p(Q^r) - c_b] \quad (2.17)$$

$$\max \pi_b = q_b^r [\alpha W_r[q_b^r + q_{mto}^r + \alpha Y_h]^{-1} - c_b] \quad (2.18)$$

$$\frac{\partial \pi_b}{\partial q_b} \rightarrow \frac{d}{dq_b} [q_b] (\alpha W_r[q_b^r + q_{mto}^r + \alpha Y_h]^{-1} - c_b) + q_b \frac{d}{dq_b} [\alpha W_r[q_b^r + q_{mto}^r + \alpha Y_h]^{-1} - c_b] = 0$$

$$1 \left(\frac{\alpha W_r}{q_b + q_{mto} + \alpha Y_h} - c_b \right) + q_b \cdot \left(a W_r \cdot \frac{d}{dq_b} \left[\frac{1}{q_b + q_{mto} + \alpha Y_h} \right] + \frac{d}{dq_b} [-c_b] \right) = 0$$

$$\frac{\alpha W_r}{q_b + q_{mto} + \alpha Y_h} + q_b \cdot \left(-\alpha W_r \cdot \frac{\frac{d}{dq_b} [q_b + q_{mto} + \alpha Y_h]}{(q_b + q_{mto} + \alpha Y_h)^2} + 0 \right) - c_b = 0$$

$$\frac{\alpha W_r}{q_b + q_{mto} + \alpha Y_h} - \frac{q_b \alpha W_r \cdot \left(\frac{d}{dq_b} [q_b] + \frac{d}{dq_b} [q_{mto}] + \frac{d}{dq_b} [\alpha Y_h] \right)}{(q_b + q_{mto} + \alpha Y_h)^2} - c_b = 0$$

$$\frac{\alpha W_r}{q_b + q_{mto} + \alpha Y_h} - \frac{q_b \alpha W_r \cdot (1 + 0 + 0)}{(q_b + q_{mto} + \alpha Y_h)^2} - c_b = 0$$

$$\frac{\alpha W_r}{q_b + q_{mto} + \alpha Y_h} - \frac{\alpha W_r q_b}{(q_b + q_{mto} + \alpha Y_h)^2} - c_b = 0$$

$$\frac{\alpha W_r (\alpha Y_h + q_{mto})}{(q_b + q_{mto} + \alpha Y_h)^2} - c_b = 0 \quad (2.19)$$

Roots/zeros found at:

$$q_b = \frac{\sqrt{\alpha c_b W_r q_{mto} + \alpha^2 c_b W_r Y_h} - c_b q_{mto} - \alpha c_b Y_h}{c_b}$$

$$q_b = \frac{\sqrt{\alpha c_b W_r q_{mto} + \alpha^2 c_b W_r Y_h} + c_b q_{mto} + \alpha c_b Y_h}{c_b}$$

The resulting quantities are too complicated to interpret. The model is going

to complicate further when I plug in the quantities to solve for them just in terms of cost and income. Instead, I want to show how the model would work out if I use an arbitrary demand function. Closed forms are not necessary for the current analysis, since the purpose of this exercise is to find signs of comparative statics. I will use that inverse demand function to portray the resulting Nash equilibrium quantities and profits.

Suppose the bank's inverse demand function looks like the following:

$$P(Q^r) = \alpha - Q^r \text{ where } Q^r = q_b^r + q_{mto}^r \quad (2.20)$$

The cost function for bank and MTO is identical:

$$c_i(q_i^r) = c_i q_i^r \quad (2.21)$$

$$\begin{aligned} \max \pi_b &= q_b^r [P(Q^r) - c_b] \\ \max \pi_b &= q_b^r [\alpha - q_b^r - q_{mto}^r - c_b] \end{aligned} \quad (2.22)$$

$$\frac{\partial \pi_b}{\partial q_b} = 0 \rightarrow \alpha - 2q_b^r - q_{mto}^r - c_b = 0$$

$$q_b^r = \frac{\alpha - q_{mto}^r - c_b}{2}$$

Therefore, the best response function for a bank and a MTO is as following:

$$b_b(q_{mto}^r) = \frac{\alpha - q_{mto}^r - c_b}{2} \quad (2.23)$$

$$b_{mto}(q_b^r) = \frac{\alpha - q_b^r - c_{mto}}{2} \quad (2.24)$$

Now, I need to find the pair of outputs with the property that:

$$q_b^r = b_b(q_{mto}^r)$$

$$q_{mto}^r = b_{mto}(q_b^r)$$

$$\text{in equilibrium: } q_{mto}^* = q_b^*$$

$$\begin{aligned} \alpha - 2q_b^r - q_{mto}^r - c_b &= 0 \rightarrow \alpha - 2q_b^r - q_{mto}^r = c_b \\ \alpha - 2q_{mto}^r - q_b^r - c_{mto} &= 0 \rightarrow \alpha - 2q_{mto}^r - q_b^r = c_{mto} \end{aligned} \quad (2.25)$$

$$\begin{aligned} \text{From (1)} \rightarrow q_{mto}^r &= \alpha - 2q_b^r - c_b \\ \text{Substitute into (2)} \rightarrow \alpha - 2(\alpha - 2q_b^r - c_b) - q_b^r + e &= c_{mto} \end{aligned} \quad (2.26)$$

$$\begin{aligned} \alpha - 2\alpha + 4q_b^r + 2c_b - q_b^r &= c_{mto} \\ -\alpha + 3q_b^r + 2c_b - c_{mto} &= 0 \\ 3q_b^r &= \alpha - 2c_b + c_{mto} = 0 \\ q_b^r &= \frac{\alpha - 2c_b + c_{mto}}{3} \\ \text{by symmetry: } q_{mto}^r &= \frac{\alpha - 2c_{mto} + c_b}{3} \end{aligned} \quad (2.27)$$

$$\frac{\partial q_b^r}{\partial c_b} = -\frac{2}{3} \quad (2.27)$$

$$\frac{\partial q_b^r}{\partial c_{mto}} = \frac{1}{3} \quad (2.27)$$

$$\frac{\partial q_{mto}^r}{\partial c_{mto}} = -\frac{2}{3} \quad (2.27)$$

$$\frac{\partial q_{mto}^r}{\partial c_b} = \frac{1}{3} \quad (2.27)$$

The comparative statics suggests that volume of remittances transferred by a bank or an MTO goes down when its cost increases, and volume increases when the cost of the competitor increases. In heterogeneous cost case quantities may differ, depending on the cost.

$$\text{Game has unique Nash Equilibrium } (q_b^*, q_{mto}^*) = \left(\frac{\alpha - 2c_b + c_{mto}}{3}, \frac{\alpha - 2c_{mto} + c_b}{3} \right) \quad (2.27)$$

At the equilibrium, bank and MTO's profit is:

$$\pi_b = q_b^r [\alpha - q_b^r - q_{mto}^r - c] \quad (2.27)$$

$$\pi_b = \frac{\alpha - 2c_b + c_{mto}}{3} \left[\alpha + \frac{\alpha - 2c_b + c_{mto}}{3} + \frac{\alpha - 2c_{mto} + c_b}{3} - c_b \right] \quad (2.28)$$

$$\pi_b = \frac{(\alpha - 2c_b + c_{mto})}{3} * \frac{(\alpha + c_b + c_{mto} - 3c_{mto})}{3} \quad (2.29)$$

$$\pi_b = \frac{(\alpha - 2c_b + c_{mto})(\alpha - 2c_b + c_{mto})}{9} \quad (2.30)$$

after multiplying and rearranging, we get the following expressions:

$$\pi_b = \frac{(\alpha - 2c_b + c_{mto})^2}{9}$$

$$\pi_{mto} = \frac{(\alpha - 2c_{mto} + c_b)^2}{9}$$

Total output $\frac{2(\alpha - 2c_b + c_{mto})}{3}$ will be between pure monopoly output $\frac{\alpha - 2c_b + c_{mto}}{2}$ and purely competitive output $\alpha - 2c_b + c_{mto}$

2.3 Model Extensions

There are several ways to extend the model I propose in this paper. First way that comes to mind is to also model the remittance receivers. For example, one can derive a one-period model in which receiver maximizes the utility with respect to C subject to budget constraint where receiving households allocates his income Y on remittances from this remitter, and average remitting income from other remitters in the family (since there can be multiple) on consumption.

$$\max U_h = \ln C_h \quad \text{s.t} \quad C_h = Y_h + q_i^r + q_i^r \bar{N} \quad (2.31)$$

Second way to extend this model would be to derive a differentiated duopoly with asymmetric costs (Singh and Vines, 1984; Amir and Jin, 2001; Zanchettin, 2004; Ledvina and Sircar, 2012). There could be a varied degree of cost asymmetry and product differentiation. For example, banks are the costlier channel for remittances due to higher costs faced by banks. Due to the compliance cost of anti-money laundering and counter-terrorism (AML/CTF) regulations, banks have stopped offering low-cost remittance services. Therefore, the heterogeneity in costs comes from complying with AML/CTF regulations. The fines for failing to comply with stringent KYC regulations are substantial. Even though the average cost of sending remittances is roughly 6.5% of the amount sent, for the cost of using banks for remittances

is 10.73%. Therefore, bank would be a high-cost firm and money transfer operator a low-cost firm. Similar to Zanchettin (2004), one can model a representative consumer's utility as a symmetric quadratic function of two products q_1 and q_2 . On the supply side, q_1 and q_2 are provided by bank and MTO respectively, and one can measure the degree of cost asymmetry between the two firms. Finally, we could then estimate firm's profit for a specific range of cost asymmetry. Another way to model this could be through differentiated Bertrand competition where instead of quantities, firms compete on price. In the remittance market, banks charge higher fees and the transaction takes longer than with a MTO. However, for large sums banks are preferable as costs are lower and banks have higher monetary caps. Therefore, this competition on prices can be modeled through Bertrand where each firm determines the price of its good given the price of the rival's good. In that case, each firm would respond to the rivals' price decision.

Final way to extend this model would be to include migration. One can model an extensive margin of remittances and how they affect migration decisions in the first place. Families see migration as investment, and remittances are then considered a return on that investment. Higher remittance prices could potentially discourage some migrants from moving broad.

2.4 Conclusion

Thousands of people make decisions to migrate every year. When household make migration decisions, remittances are an important factor. Remittances are important source of income for receiving households, so therefore migration can be seen as an investment decision. Remittances go directly to the receiving households. They can be a more important source of income to these households than the official development assistance coming to developing countries. However, even though it is

widely recognized that remittances are beneficial to developing countries, the fees to send remittances remain high. Banks, money transfer operators, and financial technology companies charge high fees to transfer money internationally. In order to understand the equilibrium in remittances, in this paper I model the behavior of remitters and financial intermediaries. Their decisions are interconnected and together affect worldwide flow of remittances. Senders maximize their own utility and utility of households left behind subject to the budget constraint. The comparative statics prove altruism as a motive and suggest that remittances increase with the increase in the wage of a remitter, and decrease with the increase in household income of those receiving remittances. Furthermore, migrant sends less when remitting cost increase. Remittances also increase with an increase in degree of altruism. Intermediaries take the demand for remittances from senders problem and use Cournot competition to determine the optimal volume of remittances sent. . They compete on quantities and set them simultaneously. It wasn't possible to obtain a closed-form solution using the demand from the senders problem but more importantly I was able to find useful comparative statics using arbitrary inverse demand curve. The comparative statics suggests that volume of remittances transferred by a bank or an MTO goes down when its cost increases, and volume increases when the cost of the competitor increases. There are several extensions to this model such as including remittance receivers, endogenizing migration, and allowing products to differentiate as well as cost curves. These model can guide empirical works on remittances.

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Chapter 3

DOES MONEY LAUNDERING ENFORCEMENT AFFECT BANKS?

3.1 Introduction

On January 15, 2021, the Financial Crimes Enforcement Network (FinCEN) fined Capital One bank \$390 million for a failure to comply with Anti-Money Laundering (AML) regulations and therefore violating the Bank Secrecy Act (BSA). FinCEN found thousands of suspicious transactions, made between 2008-2014, that were not reported in a timely and accurate manner. Despite the early assessments and warnings, Capital One allowed proceeds of financial crimes to enter the US financial system. FinCEN used the opportunity to send the message to other financial institutions that financial crimes are a national security threat and FinCEN will not hesitate to bring the appropriate enforcement actions to any violators. Violation of BSA by Capital One is just one example of strict AML enforcement penalties. In 2018, U.S. Bancorp paid \$613 million in penalties to both state and federal regulations because of "systemic deficiencies in its anti-laundering monitoring systems" (Berry, 2018). Furthermore, Goldman Sachs received its first ever AML-related fine. It had to pay \$2.9 billion in penalties and fees associated with its involvement in a Malaysian bribery scandal (Bogage, 2020). The USA has some of the world's toughest AML watchdogs and over the last decade, regulatory bodies have strengthened and toughened money laundering regulations enforcement. The increased inspections and penalties mean that AML enforcement is a high priority for regulators. When

the Bank Secrecy Act was first passed in 1970, and Know Your Customers (KYC) regulations further strengthened post 9/11 through the Patriot Act, initial fines were trivial. However, in the period after the 2008 financial crisis, banks started receiving great attention from the regulators. This increased scrutiny led to both the increase in the number of AML penalties, as well as their amount.

In my paper, I study the impact of the sudden increase in penalties and the size of fines associated with money laundering after the passage of Dodd-Frank Act of 2010, which also contained the Private Fund Act, on bank performance. I compare the financial performance of banking institutions located in the counties that are designated as "high-risk money laundering and related financial crime areas" with the control counties. Therefore, the source of exogenous variation is the passage of the Dodd-Frank Act that increased the AML penalties, with HIFCA counties being more affected. There are seven designated HIFCA regions identified by the Financial Crime Enforcement Network (HIFCA Regional Map n.d.). These areas were designed in 1988 by the Money Laundering and Financial Crimes Strategy Act. Dollar and Shughart (2011) perform similar analysis on California HIFCAs. In this paper, I expand the analysis to the entire country. I include the southwest Border HIFCAs located in all of Arizona's counties and Texas' counties along the border with Mexico. I also include all of the counties in New York, New Jersey, and Puerto Rico, each of which are designated as HIFCA. Finally, I use Chicago and Florida, where few counties are designated as HIFCAs. Unlike Dolar and Shughart, I use a balanced panel that also includes institution and year fixed effects. The emphasis on a risk-based approach by regulators requires banks to devote more attention and resources to the areas that present a higher risk for money laundering. If the regulators are following a risk-based approach, their efforts would be concentrated on monitoring institutions located in the high-risk areas. This asymmetrical compliance cost could

positively or negatively impact the financial performance of banks located within HIFCA. If banks in HIFCA counties are at a higher risk of money laundering and therefore face more stringent AML enforcement than one would see a decline in their financial performance post 2010 since regulators monitor these institutions more extensively.

My study is related to the Dollar and Shughart (2011) study which compared the financial performance of banking institutions located in counties inside and outside of HIFCAs after the passage of the Patriot Act. I am adding to this study by testing for the financial burden imposed by more strict and more frequent enforcement actions that occurred after the 2008 financial crisis and comparing that to the time period when the Patriot Act was initially passed. My paper will therefore focus on the sudden increase in frequency and severity of penalties associated with money laundering and terrorism financing. It is important to understand how the AML landscape has changed after the 2008 financial crisis which brought an unprecedented increase in the prosecution of banks and how that in turn affected the bank performance. As already noted, I expand the analysis to the entire county, and use a balanced panel with two-way fixed effects. I also perform event studies. My paper will add to the literature studying how regulations and particularly how AML regulations and penalties affect bank performance. The study will also add to the literature on understanding if AML regulations are significantly changing the financial landscape and affecting the growth of the financial sector.

Bank regulations are necessary for a well-functioning economy. These regulations exist in order to prevent excessive risk-taking by banks, as well as contribute to the effectiveness of the banking system. However, the effects of regulations on bank profit valuation and performance are mixed. Some studies show that regulations have a negative impact on a bank's operational effectiveness due to costly risk

mitigation strategies (Kaufmann and Scott, 2003; Naceur and Omran, 2011; Balani, 2019). The World Bank analysis showed that many countries are moving backwards when it comes to bank regulations. They are failing to enhance the ability and incentives of investors to scrutinize banks. Also the increased regulations and supervision had a negative effect on the development of the banking sector (Barth et al., 2012). Any regulations that restrict bank proprietary trading also lead to negative impact on banks (Madura and Premti). Whether regulations are correlated with a positive or negative impact can also depend on the size of the bank (Akhigbe and Whyte, 200; Demirguc-Kunt et al., 2003; Hakenes and Schanbel, 2011; Lu, 2014; Lotto 2018). One study estimated that the Patriot Act imposed a heavier burden on smaller banks than on larger ones, because the small banks saw a decline in their cost efficiency (Dolar and Shugart, 2012).

Others have also studied how anti-money laundering regulations themselves affect banks. The AML fines affect the banks financial performance through the effect on the overall net income due to these fines taking up a significant amount of their operational budget (Balani, 2019). One study found that the EU's 4th money laundering directive was associated with the decrease in systemic risks and had a positive valuation effects on banks. This effect was bigger on larger and more profitable banks, as well as the banks operating in countries with high GDP, high levels of corruption, and weak levels of corporate governance (Premti et al., 2021). Dollar and Shugart (2011) estimated that institutions located in the area that are more at risk for money laundering had better financial performances compared to other institutions outside of this area post Patriot Act. However, there are also studies that show negative effects on a bank's performance. The US case study showed that while the Money Laundering and Financial Crimes Strategy Act of 1988 had a positive impact on bank stock valuations, the USA Patriot Act, had a

negative impact on the bank's stock valuation (Balani, 2019). This negative effect is more significant on larger banks. This would suggest that the market views AML regulations as more harmful for large banks in terms of loss of profit and higher compliance burden. The earlier studies also estimated both positive and negative impacts on stock valuations resulting from AML regulations (Smith et al, 1986). While a case study in the United Arab Emirates showed that the degree of AML disclosure wasn't associated with a bank's performance (Nobanee and Ellili, 2018).

One HSBC's court case study concluded that even if a bank has proper AML protocols, isolated incidences of money laundering can lead to penalties. It is impossible to completely eradicate money laundering and prosecutors can hold banks liable even in instances when the same banks have sound and comprehensive anti-money laundering practices. However, the effectiveness of a bank's AML program plays a role in the assessment of penalties (Huang, 2015).

3.2 AML Regulations and Rise in Bank Penalties

The Patriot Act is one of the most consequential pieces of legislation for US banks in modern history. The Act was passed in response to the terrorist attacks on September 11 with the purpose of strengthening domestic security. The 9/11 terrorist acts highlighted the inefficiencies and inadequacies of existing laws to prevent money laundering and terrorism financing. Therefore, title III of the Patriot Act specifically spelled out provisions of prevention, detection, and prosecution of international money laundering and terrorism financing. For the AML fines to be imposed, state and federal prosecutors have to prove that the financial institution ignored and disregarded acts of money laundering or there was collective knowledge of such acts. This wasn't the first time US legislators have enacted AML regulations. The Bank Secrecy Act, passed in the 1970, obligates financial institutions

to take steps to help federal agencies in detecting and preventing money laundering. Furthermore, the Money Laundering Control Act of 1986 further criminalizes money laundering and requires financial institutions to set up AML programs as outlined by the Bank Secrecy Act while the 1994 Money Laundering Suppression Act requires registration of money service agents and diligent record keeping of its agents. However, the Patriot Act brought about strong changes in how the world was fighting money laundering and terrorism financing. The act increases the scope of institutions that are required to track and report suspicious transactions. The act is especially tough on commercial banks—part of this act focuses on Know Your Customer regulations that requires banks to verify clients identities and addresses together with engaging in risk assessments to predict and prevent suspicious accounts from transferring money abroad. They are responsible and ultimately fined if any of their clients including business accounts like money transfer operators are not properly risk assessed. This Act has brought about a considerable compliance cost to the banking industry (Mandell 2003).

The modern AML regulations follow a risk-based approach. The regulations maintain that financial institutions have to recognize and asses risk and then develop risk-mitigating strategies. Banks, therefore, have to devote more time and resources to high-risk transactions. Those high risk transactions require more extensive customer due diligence measures but it's up to institutions to identify risk pertinent to their business (Cooper and Walker, 2016). However, financial institutions have to explain and justify their risk mitigating strategies to supervisors and regulators: above mentioned enforcement cases show that regulators won't be reluctant to impose multi-million fines.

However, many studies exist that highlight the deficiencies of the current risk-based approach. The main problem identified in the literature is the lack of common

risk language and the clear ideas of how to measure such risk (Killick and Parody, 2007; Sathye and Islam, 2011; Simonova, 2011; Bello 2017). Since individual institutions can use different risk language, and sometimes even individuals within the same institutions, it is very challenging to properly mitigate risk at the global and even country level. Another problem is that the scale of the fines is forcing financial institutions and their managers to assume ambitious unreachable goals with inadequate knowledge of actual regulations and sometimes even a poor track record of compliance. Financial institutions have long been vocal about the need for specific and clear criteria against which money laundering risk will be assessed (Simonova, 2011). Some studies question the language used in these regulations about risk and uncertainty as not clearly defined and as a consequence it raised more questions than it answered (De Koker, 2009; Ross and Hannan, 2007; Pellegrina and Masciandaro, 2009; Simonova, 2011; Bello 2017). Such language led to an overflow of AML regulations that are not useful—for example, banks have been over-filing suspicious activity reports (SAR) in order to appear better at mitigating risk but that only led to more documents that regulators have to revise. Therefore, there is a higher probability that actual criminal activity might be missed (Pellegrina and Masciandaro, 2009; Takats 2011; Bello, 2017). It is unclear, however, to what extent is this regulatory ambiguity deliberate and optimal or meant to deter and preserve regulatory flexibility. Finally, many studies also show that the problem with the conceptualization of risk surrounding AML stems from the fact that the effect of money laundering is very difficult to quantify (Barone and Masciandaro, 2011; McCarthy et al. 2014; Bello, 2017). All of these arguments lead to the conclusion that the risk-based approach is difficult to implement and questions the effectiveness of the current risk-based approaches. This is especially true in the context of rising AML fines. Dollar and Shughart (2011) found that asymmetrical AML compliance cost cannot be explained

on the basis of differential risk posed by institutions located in the areas identified as higher risk for money laundering.

The Bloomberg law report highlights the recent increase in anti-money laundering enforcement actions. The legal authorities have been enforcing these regulations more stringently and these penalties have been occurring with greater frequency (Kim, 2017). The 2008 financial crisis emphasized the need for stricter regulations enforcement for banks who have previously engaged in excessive risk taking. Before the 2008 financial crisis, banks were rarely criminalized and prosecuted in the federal court. In the post crisis world there has been a remarkable and unprecedented increase in the number of bank prosecutions, as well as an even bigger increase in criminal penalties imposed on banks (Garett, 2016). Prosecutors saw the need to target banks more than ever before in order to protect the public from money laundering which brought about the increase in enforcement regulations. Post Dodd-Frank Act of 2010, bank regulations have increased in both reach and complexity (Garret, 2016; Ramachadran, 2016; Kim 2017). Ramachandran (2016) reports that in the period from 2010 to 2015, the number of penalties increased by 65 percent, with monetary value going from \$161 million to more than \$2.6 billion.

To understand why there was a sudden increase in AML fines and penalties in 2010, even though no new AML regulations were implemented, it is important to look at the 2008 financial crisis and the laws that followed. The Dodd-Frank Act together with the amendments to the Bank Secrecy Act significantly impacted AML compliance requirements for the US banks (Skeel, 2010; Reider-Gordon, 2011; Garrett 2016; Turki et al., 2020). In 2008, America was facing the worst financial crisis since the great depression. The crisis was in large part due to deregulations in the financial industry that allowed institutions to trade derivatives and issue more mortgages to

support the sale of those derivatives. With the signing of Dodd-Frank Act, President Obama tried to strengthen the previously inadequate regulatory framework that failed to oversee the largest financial institutions. Dodd-Frank Act had two important objectives and those were to limit the risks associated with using sophisticated financial instruments and to limit the damage caused by the failure of large financial institutions (Skeel, 2010). Within the act there was also the Private Fund Act that requires investment advisors to demonstrate that they have actively worked on and implemented new AML policies and monitoring programs (Reider-Gordon, 2011). Private Fun Act went into the effect in July 2011. Furthermore, Dodd-Frank Act merged The Office of Thrift Supervision with other federal agencies which increased compliance burdens and impacted the BSA AML exam structure and application. Apart from the Dodd-Frank Act, in February 2010, the Financial Crimes Enforcement Network (FinCEN) amended the relevant BSA information-sharing rules under which FinCEN and other state, local, and foreign law enforcement agencies can request information from financial institutions about significant money laundering and terrorist financing investigations. Then in April of 2010, FinCEN added mutual funds to the definition of financial institutions that have to comply with BSA. This required mutual funds to establish their own AML compliance programs (Reider-Gordon, 2011). These new policies added to the existing policies governing AML practices.

3.3 Data

I gathered the data from Statistics of Depository Institutions (SDI) by the Federal Deposit Insurance Corporation (FDIC). The FDIC is a USA's government corporation insuring deposits to clients of the U.S. commercial banks and savings banks—it collects data on financial performance of institutions insured by FDI. SDI

dataset contains comprehensive demographic and financial information for all FDIC-insured institutions. The data is available publicly on the FDIC website. Information is reported quarterly, however, I only use information for the last quarter of every year because for the years before 2000, data was only reported for the last quarter. Financial data contains information on assets and liabilities, performance and condition ratios, income and expenses, as well as information on loss-share agreements, fiduciary and related services, and bank assets sold and securitized. For the purpose of this research, I focus on the data collected on assets and liabilities, performance ratios, and demographics at the institution level. The sample contains the 5,697 annual observations on all institutions headquartered across the United States. The data covers the period from 1996 to 2020, and it covers 965 distinct institutions, though the panel data is unbalanced. Most institutions are missing observation for the entire 24-year period included in the sample. The data as provided by FDIC is at the bank branch level, however, for the purpose of my paper I collapse the data to the bank institution level. Working with unbalanced data would lead to certain endogeneity issues as banks that exit the dataset could be exiting due to events such as bank failures or mergers and acquisition both which are non-random events related to financial performance of the institution. In order to avoid having findings be confounded by compositional changes, I balance my panel by only including institutions present from 2005 to 2015 period (5 years before and after the event) in the analysis. I use a period of 10 years in order to preserve enough number of institutions in my dataset to make a meaningful analysis. For the same reason I keep those banks who have exited the dataset within that 10-year period and code their values as zero. I estimate the effects of the treatment on an indicator for still being in the sample. Another way to deal with banks entering and exiting the data, would be to explicitly model the entry and exit but this is beyond the scope of my paper.

The policy is assigned at the county/HIFCA level, so I cluster at the level of policy variation (Cameron and Miller, 2015). However, the policy also varies by time which would call for a two-way clustering. Another thing to note is that all the explanatory are at the institution level. For this reason, I report three different standard errors, clustered at the HIFCA level, county level, and finally the institution level.

HIFCAs were identified as areas where financial crimes and money laundering are highly likely to occur and therefore AML law enforcement efforts should be concentrated in those areas of the greatest risk. California contains 58 counties in total and out of them 21 are HIFCA designated counties.¹ The counties inside and outside of California HIFCAs are fairly evenly distributed. Southwest Border HIFCAs are located in all Arizona's counties. Texas HIFCA's are also part of the Southwest border area, but it only include counties along and adjacent to the border with Mexico. ² All counties in New York, New Jersey, Puerto Rico, and US Virgin Isle are designed as HIFCAs. While in Chicago and Florida, only a few counties are designated as HIFCAs. ³

On thing to note about HIFCAs is that even though area may be designated as high-risk area, the same risk profile doesn't apply to each individual customer. For

¹ California HIFCA counties: The Northern California District consists of the counties of Alameda, Contra Costa, Del Norte, Humboldt, Lake, Marin, Mendocino, Monterey, Napa, San Benito, San Francisco, San Mateo, Santa Cruz and Sonoma. The counties of Los Angeles, Orange, Riverside, San Bernardino, San Luis Obispo, Santa Barbara and Ventura are included in the Southern District

² Texas HIFCA counties: El Paso, Hudspeth, Jeff Davis, Presidio, Brewster, Terrell, Val Verde, Kinney, Maverick, Webb, Zapata, Starr, Hidalgo, Cameron, Culberson, Reeves, Pecos, Crockett, Sutton, Edwardsm Uvalde, Zavala, Dimmit, La Selle, McMullen, Duval, Jim Hogg, Brooks, Kennedy, Willacy.

³ Chicago HIFCA counties: Cook, McHenry, Dupage, Lake, Will, Kane. South Florida HIFCA counties: Broward, Miami-Dade, Indian River, Martin, Montroe, Okeechobee, Palm Beach, and St Lucie

example, the entire state of NY is part of a HIFCA program, but that does not imply that every customer within the NY state presents the same level of risk. The HIFCA program applies to federal, state, and local law enforcement agencies in locations across the United States (Cohen and Noonan, 2021). On the federal level, FinCEN is the enforcement agency which is a bureau of the US Department of the Treasury. However, the investigation can also be carried out by FBI, DEA, the US Secret Service, US Immigration and Customs Enforcement, the IRS Criminal Division, and the Postal Inspection Service. One of the most active state regulators is the New York Department of Financial Services (DFS). The penalties often involve civil money penalties but they can involve criminal prosecutions as well. The prosecution of ML crimes is the responsibility of the US department of Justice, specifically the Criminal division called the Money Laundering and Asset Recovery Section (MLARS). The Attorney Offices are also authorized to criminally prosecute those crimes but they have to be authorized by MLARS. However, most bank prosecutions involve violations of the BSA, and not the violations of the ML criminal offense, and therefore just carry civil penalties. The banks could also theoretically lose its charter of federal deposit insurance (Cohen and Noonan, 2021).

3.4 Identification

I use a dataset from the Statistics of Depository institutions (SDI) by FDIC, to compare the financial performance of banks with branches located inside High-Risk Money Laundering and Related Financial Crime Areas (HIFCAs) within California with the banks outside of HIFCA counties after the increase in AML penalties associated with the passage of Dodd-Frank Act in 2010. If regulators are following the risk-based approach, they should spend more resources in terms of time, personnel,

Table 3.1: Descriptive Statistics

		Mean	Std. Dev.	N/n/T-bar
Return on Assets	overall	.5320096	2.019668	5450
	between		2.093146	941
	within		1.254426	5.791711
Return on Equity	overall	5.646532	16.599	5450
	between		17.98374	941
	within		10.96066	5.791711
Asset per employee	overall	5.237212	3.908629	5449
	between		3.69369	941
	within		1.600155	5.790648
Net Income	overall	16,160.05	115,606.8	5450
	between		103,918.7	941
	within		54,136.98	5.791711
Asset	overall	1,831,103	1.02e+07	5479
	between		1.03e+07	948
	within		2,841,930	5.779536
Net Loans to net assets	overall	124.5618	704.9744	5456
	between		764.4135	947
	within		448.1366	5.761352
Core capital ratio	overall	11.65107	7.947777	5450
	between		8.581798	941
	within		4.311256	5.791711

[1] Note: Summary statistics is at the institution level. Based on the Statistics of Depository Institutions data. Total dollar values are in the thousands.

and money to the institutions located within HIFCa, when compared to other counties. The increase in the number of fines after the Dodd-Frank Act of 2010 should differentially affect the institutions with branches in HIFCA counties and if they follow a risk-based approach the increased enforcement should be associated with the negative indicators of financial performance. California is home to two of the seven HIFCAs in the United states. The increase in frequency and severity of AML fines should increase compliance costs on all banking institutions in California but regulators are supposed to pool resources and extensively monitor those counties that are within HIFCA where money laundering poses a much bigger threat. Therefore, the increases in AML fines and penalties should be more burdensome to HIFCA counties. When I compare the financial performance of institutions inside and outside of California's HIFCAs in the period pre and post 2010, it enables me to estimate if the stricter AML enforcement differentially affected these institutions and if indeed regulators have followed a risk-based approach. In traditional difference-in-difference models, we see treatment groups who were exposed to policy, and control groups who were not exposed to the policy studied. However, in this paper both HIFCA and non-HIFCA areas are subject to a change in AML regulations; however, banks in HIFCA areas are subject to a more strict regulatory scrutiny and therefore should have a higher treatment exposure.

It is important to discuss the anticipatory effects of AML regulations before I introduce the model. Research has shown that anticipation and expectations of future policy change matters (Romer and Romer 2004; Reif, 2015; Coglinese et al. 2016; Boskovic and Nostbakken, 2018). If increased enforcement is anticipated by banks, then banks may mitigate exposure to enforcement, by reducing and mitigating risk or hiring legal help. In that case, we would expect that banks respond heterogeneously—some for example give up business to reduce risk. In fact, this is

well document by account closures of remittance service providers who are seen as high-risk customers. Other banks plan on experiencing enforcement and prepare. In that case, the impact of enforcement penalties on profitability could just reflect timing. Furthermore, theory of liability predicts that in case that liability is fully anticipated, as a cost of doing business, then imposition of a penalty only has an accounting impact. If the debt and equity markets anticipate regulatory change or increase in penalties then they do not react at that time. There is also the issue of statistically anticipated liability: If liability is not fully anticipated, but the distribution is known, then ex-ante all firms will suffer some decline in equity prices, but when the penalty for a specific firm is announced equity markets will adjust for that firm. It is also possible that equity markets will adjust gradually as suspicion of a firm increases. Ex-ante adjustment for other firms would imply smaller relative adjustment of equity price for any firm that actually gets fined—and regressions with fixed effects will measure relative effects. Early research also finds that that equities exhibit short-term underreaction and long-term overreaction to information (DeBondt and Thaler 1985, 1987, 1990).

In order to test for differential financial performance, I use the following models:

$$\text{Return on Asset} = \beta \text{Post2010}_t * \text{HIFCA}_i + \delta \chi_{it} + \theta_i + \theta_t + \epsilon_{it} \quad (3.1)$$

$$\text{Return on Equity} = \beta \text{Post2010}_t * \text{HIFCA}_i + \delta \chi_{it} + \theta_i + \theta_t + \epsilon_{it} \quad (3.2)$$

$$\text{Total Asset per Employee} = \beta \text{Post2010}_t * \text{HIFCA}_i + \delta \chi_{it} + \theta_i + \theta_t + \epsilon_{it} \quad (3.3)$$

Where Return on Asset (ROA), Return on Equity (ROE), Total Asset per Employee are dependent variables showing specific financial outcomes. β is the coefficient of interest. It tells us whether the institutions operating in California's HIFCA, in the post 2010 period where we see an increase in enforcement actions, experienced poorer financial outcomes. Post2010 takes the value of one for observations including and after 2010. HIFCA takes the value of one when all of an institution's branches are located in one of California's HIFCA counties. Post2010*HIFCA captures the differential monetary burden AML penalties impose on a financial institution i at time t . It can also tell us if regulators are following a risk-based approach to AML regulations. $\delta \chi_t$ refers to institution level controls which are bank, multibank, ratio of net loans and leases to core deposits, and leverage (core capital) ratio. Asset variable corresponds to total assets of bank and is a proxy for a size of the institution. Larger institutions are typically more profitable and efficient than smaller institutions. Bank is a dummy variable equal to 1 when the observed institution is a commercial bank and 0 if it is a savings bank or thrift. I am using this control because commercial banks are generally more profitable than thrifts (Dollar and Shugart , 2011). Multibank controls for institutions owned by multi-bank holding company. Dollar and Shugart (2011) write that banks owned by a holding company have a lower cost of raising capital, and also have more means of raising capital compared to an independent bank. They can raise capital through issuing commons stocks more easily and also the issuance of trust preferred securities. However, Dollar and Shugart (2011) also note that a bank within a holding company is a subject to

a more stringent regulatory scrutiny than independent institutions and faces bigger operational costs such as administrative expenses. While in their analysis, Dolar and Shugart drop banks owned by multibank institutions, for sake of preserving data, I just control for the institutions owned by a multibank holding company. Next, the ratio of net loans and leases to core deposits controls for the credit risk of institutions and therefore the efficiency of the institution. An increase in the volume of net loans and leases relative to core deposits and earning assets is likely going to increase operational cost and decrease cost efficiency (Dolar and Shugart, 2012). Similarly, core capital ratio of institution allows me to capture the effects of capital risk on the cost efficiency, since an increase in capital with no change in assets would lead to decline of operational cost and lead to improvement of cost efficiency (Dolar and Shugart, 2012). I also include time and institution fixed effects. These two variables can impact the financial performance of the institution and therefore they are valuable controls. As discussed in the section, above, in order to not have findings be confounded by compositional changes, I balance my panel by only including institutions present from 2005 to 2015 period. I present the results with few different standard errors, clustered at the county level, HIFCA level, and the institution level. I also include time zero bank asset weights.

Financial outcomes of interest in this paper are return on assets, return on equity, and the total assets per employee. These financial outcomes serve as a proxy for overall financial performance of the bank. These ratios come from the performance and condition ratios part of SDI dataset. They are often used when evaluating the financial performance of banking institutions. Return on Asset and Return on Equity are common indicator used to indicate the profitability of the bank. Return on Assets is calculated as after-tax net income as a percentage of average total asset. It gives an indication of the return on the bank's overall activities. Since community

banks are big part of this analysis, it is worth noting that a community bank that has few branches typically has an easier time achieving an ROA ratio that exceeds those of large wholesale banks (FDIC, RMS Manual of Examination Policies). Return on Equity, calculated as a ratio of net income to shareholder's equity, measures how efficient is corporation at generating profit from money invested into their bank, so it is a good indication of earnings performance. Important thing to note is that generally during a recession, ROE for banks often falls. Asset per employee is a widely used indicator for operational efficiency. This indicator is generally useful when analyzing bank's past financial performance as well as when comparing it to the other banks in the industry.

3.5 Results

I am estimating the impact of the increase in the AML enforcement actions after the passage of 2010 Dodd-Frank Act, on the four different indicators of banks' financial performance. I use a quasi-experimental identification strategy where the sudden increase in penalties associated with AML serves as a natural experiment. Counties inside the HIFCAs are subject to the increased regulatory scrutiny, so I compare financial outcomes in counties in and out HIFCAs, after the increase in AML enforcement actions. I also use institutions and time fixed effects to account for possible omitted time-invariant and time-specific variables.

Table 3.2, ??, ?? show the estimates on the main effect on return on asset, where standard errors are clustered at the institution level, county level, and HIFCA level respectively. After the increase in enforcement actions in 2010, institutions operating in HIFCA counties see a 54 percentage point increase in return on assets. The results are stable across different ways of clustering. Table 3.5, 3.6, 3.7 show the main effect on return on asset, where standard errors are again clustered at

the institution level, county level, and HIFCA level respectively. We also see large and positive effects on return on equity. These results mean that the increase in enforcement action was actually associated with the positive financial outcome as measured by return on assets and return on equity. This means that regulators might not be following a risk-based approach in enforcing these regulations. The result isn't entirely surprising as there exists extensive literature pointing out the flaws in risk-based approach (De Koker, 2009; Ross and Hannan, 2007; Pellegrina and Masciandaro, 2009; Simonova, 2011; Bello 2017). Another point to make is that the compliance costs and technology associated with AML regulations are typically fixed costs for the banks (Hopkins, 1996). Regulations can change the cost structure of the industry, and therefore create winners and losers. As such, it is not entirely surprising that a regulatory increase causes an increase in observed performance when conditioning on surviving bank institutions. Also, I have restricted my panel to only follow banks 5 years after the passage of regulations, therefore, these increases in profits could also be a short-term phenomenon. It is possible that AML regulations do not matter in the short-run transitory rents. Furthermore, there is a large literature on the persistence of profit and regulations cost. Commercial banking industry involves insufficient competitive force, high information cost and information asymmetry, so regulations imposed by federal and state agencies can lead to persistent abnormal profits. This seems to be more common in banking than in other industries (Poland, 1997).

On the other hand, table 3.8, 3.9, and 3.10 show the effect on assets per employee. Here we again see a positive effect on the assets per employee—meaning that institutions operating in HICA counties see about a 60% increase in their financial performance after the sudden increase in AML penalties. However, the estimates are not statistically significant. Overall, it seems that AML regulations are not associated

with the change in operational efficiency. They do not systematically impact banks in high-risk areas differentially than in the control areas. Empirical evidence shown in these models could also inform us if differences in the way AML regulations are enforced can be explained by risk-based approach. The risk-based approach would guide regulators to focus their attention on the banks operating in high-risk areas. Such banks should bear the burden of AML regulations, but we see the opposite. The results imply that banks operating in HIFCA counties actually see an improved financial performance relative to the banks operating outside of HIFCA. The positive effects could also be explain by the fact that banks in HIFCA areas have already had necessary risk mitigating technology in place since they have historically been under increased scrutiny of regulators. As such, the increase in AML enforcement would make them better off than banks in non-HIFCA areas.

3.5.1 Event Studies

I show the event study plots using binned scatterplot. The binned scatterplot is a useful tool to analyze the dynamics of the post-treatment effects and similarity on pre-treatment outcomes between HIFCA and non-HIFCA counties. It graphs the time variable into equal-sized bins and computes the means of the time and outcome variables within each year. It then creates a scatterplot fo these data points and draws the population regression line. The dispersion of scatterpoints around the regression line indicates statistical significance. The event study plot shows that unsurprisingly around the 2008 financial crisis we see a decrease in return on asset and return on equity for banks in and our of HIFCAs. Also, it seems that in the pre-period banks in both areas had similar trends with somewhat wider dispersion around the regression line than in the post period. Post 2010 Dodd-Frank Act, we can see a discontinuity in population regression lines with banks in HIFCA areas

Table 3.2: Increase in AML Enforcement Actions and Banks' Financial Performance

	Return on Assets	
	(1)	(2)
Post*HIFCA	0.246*** (0.054)	0.543*** (0.200)
bank		-0.130 (0.110)
owned by multibank		0.147*** (0.047)
Net loans to net assets		-0.000 (0.000)
core capital ratio		-0.001* (0.001)
Observations	204204	88950
Controls	No	Yes
Institution FE	Yes	Yes
Time FE	Yes	Yes

Based on the Summary of Depository Institutions data by FDIC.

The dependent variable is return on asset.

Each column in each panel represents a separate regression.

Robust standard errors are clustered at the institution level.

Time-varying controls are included in the second column.

All regressions include time zero asset weights.

Full specification includes time and institution fixed effects.

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

Table 3.3: Increase in AML Enforcement Actions and Banks' Financial Performance

	Return on Assets	
	(1)	(2)
Post*HIFCA	0.553*** (0.204)	0.543*** (0.200)
bank		-0.130 (0.106)
owned by multibank		0.147*** (0.047)
Net loans to net assets		-0.000 (0.000)
core capital ratio		-0.001* (0.001)
Observations	89080	88950
Controls	No	Yes
Institution FE	Yes	Yes
Time FE	Yes	Yes

Based on the Summary of Depository Institutions data by FDIC.

The dependent variable is return on asset.

Each column in each panel represents a separate regression.

Robust standard errors are clustered at the county level.

Time-varying controls are included in the second column.

All regressions include time zero asset weights.

Full specification includes time and institution fixed effects.

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

Table 3.4: Increase in AML Enforcement Actions and Banks' Financial Performance

	Return on Assets	
	(1)	(2)
Post*HIFCA	0.246*** (0.000)	0.543** (0.018)
bank		-0.130 (0.022)
owned by multibank		0.147 (0.083)
Net loans to net assets		-0.000 (0.000)
core capital ratio		-0.001 (0.000)
Observations	204204	88950
Controls	No	Yes
Institution FE	Yes	Yes
Time FE	Yes	Yes

Based on the Summary of Depository Institutions data by FDIC.

The dependent variable is return on asset.

Each column in each panel represents a separate regression.

Robust standard errors are clustered at the HIFCA level.

Time-varying controls are included in the second column.

All regressions include time zero asset weights.

Full specification includes time and institution fixed effects.

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

Table 3.5: Increase in AML Enforcement Actions and Banks' Financial Performance

	Return on Equity	
	(1)	(2)
Post*HIFCA	1.662*** (0.223)	5.151** (2.283)
bank		-0.206 (0.796)
owned by multibank		0.880*** (0.278)
net loans to net assets		-0.000 (0.000)
core capital ratio		-0.002 (0.001)
Observations	204204	88950
Controls	No	Yes
Institution FE	Yes	Yes
Time FE	Yes	Yes

Based on the Summary of Depository Institutions data by FDIC.

The dependent variable is return on equity.

Each column in each panel represents a separate regression.

Robust standard errors are clustered at the institution level.

Time-varying controls are included in the second column.

All regressions include time zero asset weights.

Full specification includes time and institution fixed effects.

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

Table 3.6: Increase in AML Enforcement Actions and Banks' Financial Performance

	Return on Equity	
	(1)	(2)
Post*HIFCA	5.173** (2.273)	5.151** (2.272)
bank		-0.206 (0.783)
owned by multibank		0.880*** (0.277)
Net loans to net assets		-0.000 (0.000)
core capital ratio		-0.002 (0.001)
Observations	89080	88950
Controls	No	Yes
Institution FE	Yes	Yes
Time FE	Yes	Yes

Based on the Summary of Depository Institutions data by FDIC.

The dependent variable is return on equity.

Each column in each panel represents a separate regression.

Robust standard errors are clustered at the county level.

Time-varying controls are included in the second column.

All regressions include time zero asset weights.

Full specification includes time and institution fixed effects.

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

Table 3.7: Increase in AML Enforcement Actions and Banks' Financial Performance

	Return on Equity	
	(1)	(2)
Post*HIFCA	1.662*** (0.007)	5.151** (0.156)
bank		-0.206 (0.196)
owned by multibank		0.880* (0.069)
Net loans to net assets		-0.000 (0.000)
core capital ratio		-0.002 (0.000)
Observations	204204	88950
Controls	No	Yes
Institution FE	Yes	Yes
Time FE	Yes	Yes

Based on the Summary of Depository Institutions data by FDIC.

The dependent variable is return on equity.

Each column in each panel represents a separate regression.

Robust standard errors are clustered at the HIFCA level.

Time-varying controls are included in the second column.

All regressions include time zero asset weights.

Full specification includes time and institution fixed effects.

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

Table 3.8: AML Enforcement Actions and Banks' Financial Performance

	Assets per Employee	
	(1)	(2)
Post*HIFCA	-2.112 (6.138)	0.632 (0.467)
bank		-1.262** (0.633)
owned by multibank		-0.022 (0.345)
Net loans to net assets		-0.000 (0.000)
core capital ratio		-0.016 (0.014)
Observations	204204	88950
Controls	No	Yes
Institution FE	Yes	Yes
Time FE	Yes	Yes

Based on the Summary of Depository Institutions data by FDIC.

The dependent variable is asset per employee

Each column in each panel represents a separate regression.

Robust standard errors are clustered at the institution level.

Time-varying controls are included in the second column.

All regressions include time zero asset weights.

Full specification includes time and institution fixed effects.

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

Table 3.9: AML Enforcement Actions and Banks' Financial Performance

	Assets per Employee	
	(1)	(2)
Post*HIFCA	0.791* (0.417)	0.632 (0.460)
bank		-1.262* (0.648)
owned by multibank		-0.022 (0.395)
Net loans to net assets		-0.000 (0.000)
core capital ratio		-0.016 (0.014)
Observations	89080	88950
Controls	No	Yes
Institution FE	Yes	Yes
Time FE	Yes	Yes

Based on the Summary of Depository Institutions data by FDIC.

The dependent variable is asset per employee

Each column in each panel represents a separate regression.

Robust standard errors are clustered at the county level.

Time-varying controls are included in the second column.

All regressions include time zero asset weights.

Full specification includes time and institution fixed effects.

* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

Table 3.10: AML Enforcement Actions and Banks' Financial Performance

	Assets per Employee	
	(1)	(2)
Post*HIFCA	-2.112** (0.037)	0.632 (0.143)
bank		-1.262 (0.880)
owned by multibank		-0.022 (0.419)
Net loans to net assets		-0.000 (0.000)
core capital ratio		-0.016 (0.014)
Observations	204204	88950
Controls	No	Yes
Institution FE	Yes	Yes
Time FE	Yes	Yes

Based on the Summary of Depository Institutions data by FDIC.

The dependent variable is asset per employee

Each column in each panel represents a separate regression.

Robust standard errors are clustered at the HIFCA level.

Time-varying controls are included in the second column.

All regressions include time zero asset weights.

Full specification includes time and institution fixed effects.

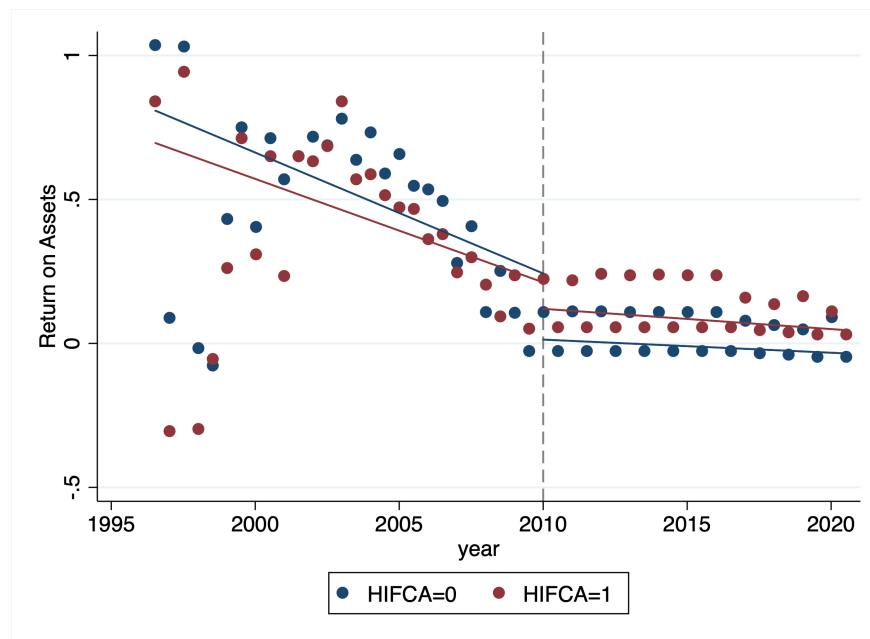
* Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

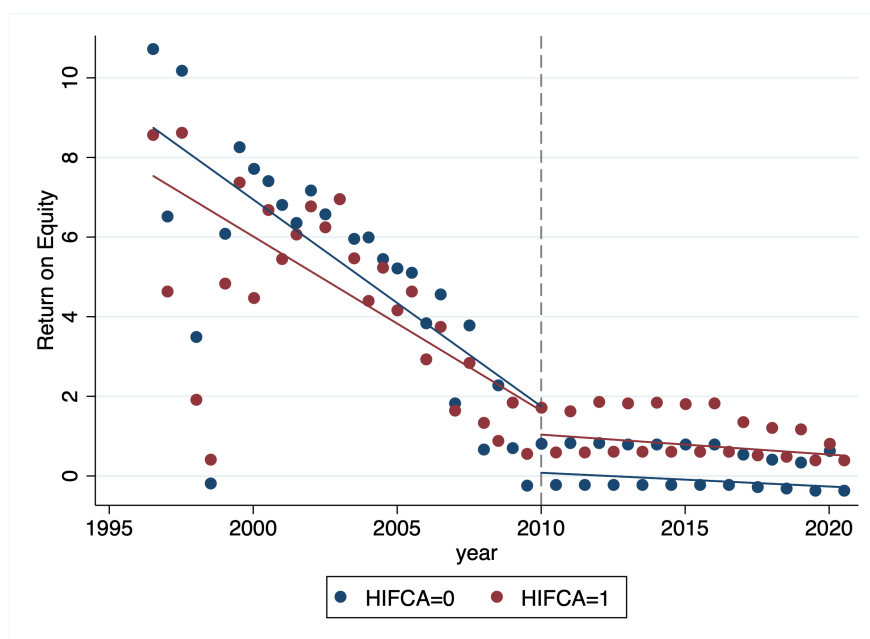
now have a higher level of return to asset, return on equity, and asset per employee population regression line. However, post-treatment those banks seem to still follow similar trends with downward sloping population regression line. The binned scatter plot for asset per employee shows that pre-treatment, the scatterpoints are again more dispersed around the regression line, with banks in both areas following similar downward trends, but notably less steep than in return on asset and return on equity graphs. However, post-treatment banks in HIFCA and non-HIFCA areas still follow similar trends.

Figure 3.1: Event Study Plot: Return on Asset



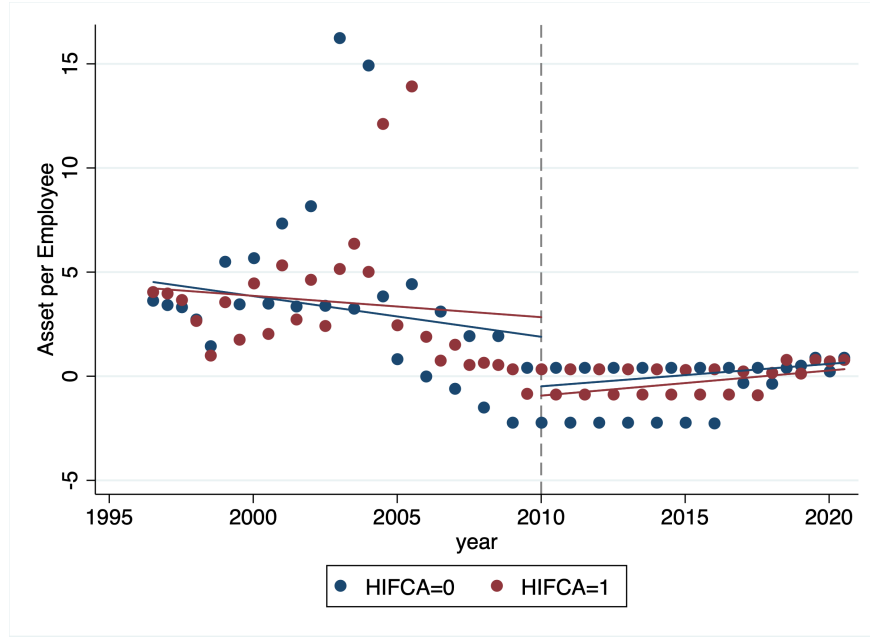
Note: Binned scatterplot created by the author based on the Summary of Depository Institutions data by FDIC. Specification includes country fixed effects. Standard errors are clustered at HIFCA level.

Figure 3.2: Event Study Plot: Return on Equity



Note: Binned scatterplot created by the author based on the Summary of Depository Institutions data by FDIC. Specification includes country fixed effects. Standard errors are clustered at HIFCA level.

Figure 3.3: Event Study Plot: Asset per Employee



Note: Binned scatterplot created by the author based on the Summary of Depository Institutions data by FDIC. Specification includes country fixed effects. Standard errors are clustered at HIFCA level.

3.5.2 Oster Coefficient Stability Test

The existing literature often makes a claim that if coefficients are stable after the inclusion of the observed variables, then omitted variable bias does not play a big role because of the idea that bias from observed controls is informative about bias from the unobserved factors. Oster (2017, 2019) showed that in order to make such an assumption, we need to understand how much of the outcome variance is explained by control's inclusion. It is necessary to also observe how much the R-squared changes once controls are added. In order to test for possibility that unobservables might be biasing the estimates, I run the Oster (2019) coefficient stability test. The test evaluates the possible degree of omitted variable bias under the assumption that the selection on the observed controls is proportional to the selection on the unobserved

controls. In other words, it tests how strong selection on unobservables has to be to explain away the estimated positive effect of the increase in AML regulations enforcement. The Oster test looks at coefficient stability by comparing movement of coefficients and R-squared in models with full set of controls relative to a model with restricted set of controls (Oster, 2019). As suggested by Attonji, Elder, and Taber (2005) and Oster (2019) I test robustness of my findings calculating the value of delta for which the main treatment effect would be zero. This is interpreted as the degree of selection on unobservables relative to observable that is necessary to explain the result. In the table below, I present the values of delta or the degree of proportionality between the observed and the unobserved variables. Delta calculates the importance of the unobservables relative to the observables in influencing the main effect. Delta equaling one would mean that the observed coefficients and the unobserved coefficients have an equally important effect on our coefficient of interest. For most of the controls, delta is negative. Oster (2019) derives that a negative delta means that if the observables are positively correlated with the treatment, the unobservables have to be negatively correlated with the treatment to render the effect of the variable of interest zero (zero treatment effect). One problematic value would be the estimates of delta for the bank control variable that is close to zero and it would mean that unobservables would need to be much less important than observables to render a treatment effect of zero.

3.6 Conclusion

The Patriot Act passed in 2001 was important piece of legislation that aimed to fight money laundering and terrorism financing. However, in the period between 2001 and 2010, banks were rarely criminalized on AML charges. However, after the

Table 3.11: Oster Coefficient Stability Test

	(1)
	Return on Asset
Post*HIFCA	0.543** (2.72)
bank	-0.130 (-1.23)
owned by multibank	0.147** (3.15)
Net loans to net assets	-0.00000107 (-0.73)
core capital ratio	-0.00100 (-1.72)
_cons	1.292*** (6.60)
delta1	0.0159
delta2	-1.330
delta3	-0.300
delta4	-0.286
r2	0.0109
N	88950

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: Robustness test on unobserved selection and coefficient stability by Oster (2019). Assumes that $R_{\max}=1$ and $\beta=0$. It calculates the value of δ for which $\beta=0$. δ calculates the degree of selection on unobservables relative to observables necessary to explain the result. Robust standard errors are clustered at the HIFCA level. Time-varying controls are included in the second column. All regressions include time zero asset weights. Full specification includes time and institution fixed effects. * Significant at the 10% level

** Significant at the 5% level

*** Significant at the 1% level

2008 financial crisis, we saw a remarkable increase in the number of bank prosecutions. Prosecutors saw an urgency to protect the public from the failures of large financial institutions to stop money laundering. Therefore, prosecutors started targeting banks as never before. A report found that in the period from 2010 to 2015, the number of penalties increased by 65 percent. Dodd-Frank Act included the Private Fund Act that requires investment advisors to demonstrate that they have actively worked on and implemented new AML policies and monitoring programs. Dodd-Frank Act also indirectly increased compliance burdens and impacted the BSA AML exam structure and application. In this paper, I examine the increase in AML penalties and the banks' financial performance. I summarize the reasons behind the increase in AML penalties as well as extensive literature on the AML regulations and their impact on the financial institutions. I used a dataset on all FDIC-insured banks headquartered in California, ranging between 1996 and 2020. California is a home of two counties located in HIFCA, so it serves for a good natural experiment allowing me to compare HIFCA counties, which should be a subject to increased monitoring, with those outside of HIFCA. The results show that, after the increase in AML enforcement, institutions located in HIFCA actually see improved profitability as measured by return on assets and net operating income to assets relative to the control group. If regulators indeed follow a risk-based approach then I would expect for HIFCA counties to experience higher burden of the high AML penalties and therefore see a decline in their financial performance. It seems that AML policies are, in fact, hurting banks who are at lower risk of money laundering. Dollar and Shugart (2011) explains that the reason we may see improved profitability is that HIFCA counties already had effective AML mechanisms in place given that they were subject to high regulatory scrutiny so they were able to take advantage of the existing policies and therefore perform better than the control group. Dollar

and Shugart also claims that that banks and thrifts located in the HIFCA counties could have been better acquainted with AML regulators allowing them to influence the way AML rules are enforced. I provide some other explanations in this paper. One is about the nature of fixed costs of regulations that conditional on surviving banks, could explain how survivors were able to take advantage of the cost asymmetry to be more profitable. Furthermore, these results could indicate certain failures in risk-based approach. Overall, regulations in banking industry seem to change the cost structure and profitability of institutions creating winners and losers and creating advantage for increase in profit and operational efficiency. Further research, can attempt to model the bank entry and exit, and perhaps derive synthetic controls in order to get more robust causal estimates.

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Appendix A

AML LAWS AND REMITTANCE FLOWS

Table A.1: Table of AML/CTF Laws by Country

Country	Effective Year	Regulation Name
Region=East Asia and Pacific		
AUSTRALIA	2006	The Anti-Money Laundering and Counter-Terrorism Financing Act (AML/CTF Act)
CHINA	2007	Anti-Money Laundering Law of the People's Republic of China
HONG KONG	2012	Anti-Money Laundering Law and Counter-Terrorist Financing
KOREA, REP.	2007	Act on Reporting and Using Specified Financial Transaction Information; Act on Prohibition against Financing of Terrorism and Proliferation of Weapons of Mass Destruction
INDONESIA	2012	Bank Indonesia Regulation No 14/27/PBI/2012 concerning Implementation of Anti Money Laundering and Combating the Financing of Terrorism Program for Commercial Banks
JAPAN	2008	The Act on Prevention of Transfer of Criminal Proceeds (the Act)
MALAYSIA	2002	The Anti-Money Laundering, Anti-Terrorism Financing and Proceeds of Unlawful Activities Act 2001
NEW ZEALAND	2013	The Anti-Money Laundering and Countering Financing of Terrorism Act
Continued on next page		

Table A.1 – continued from previous page

Country	Effective Year	Regulation Name
PHILIPPINES	2012	RA 10167, strengthening RA 9160 Republic Act 9160 or the Anti-Money Laundering Act (AMLA) of 2002
SINGAPORE	2007	Notice 626 Prevention of Money Laundering and Countering the Financing of Terrorism
TAIWAN	2017	Regulations Governing Bank Handling of Accounts with Suspicious or Unusual Transactions
THAILAND	2007	Measures on Anti-Money Laundering and Combating the Financing of Terrorism (AML/CFT) for Financial Institutions
VIETNAM	2005	Decree No.74/2005/ND-CP on Prevention and Combat of Money-laundering
Region=Europe and Central Asia		
AUSTRIA	2008	The Act on Preventing AML and terrorism financing
BELGIUM	2010	Third EU Directive was implemented through Statue modifying the Law on Prevention of the Use of the Financial System for the Purpose of Money Laundering and Terrorism Financing
BOSNIA AND HERZEGOVINA	2015	The new rulebook on the implementation of the law on the prevention of money laundering
CROATIA	2009	The Anti-Money Laundering and Terrorist Financing Act (AMLCFT Law) (1997) The EU's third Directive 2005/60/EC on the prevention of the use of the financial system for the purpose of money laundering and terrorist financing
CYPRUS	2007	Prevention and Suppression of Money Laundering and Terrorism Financing Law
CZECH REPUBLIC	2008	Anti-money laundering act - Act no. 253/2008 Coll. on selected measures against legitimization of proceeds of crime and financing of terrorism ("AML Act")
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Table A.1 – continued from previous page

Country	Effective Year	Regulation Name
DENMARK	2006	Danish Act on Measures to Prevent Money Laundering and Financing of Terrorism
ESTONIA	2007	The Money Laundering and Terrorist Financing Prevention Act 2007 implemented the Third EU Money Laundering Directive
FINLAND	2008	The Third Directive has been implemented by the Act on Preventing and Clearing Money Laundering and Funding of Terrorism (503/2008)
FRANCE	2009	The 3rd EU AML directive has been implemented by the Ordinance No. 2009-104 and Decree No. 2009-874 and Decree No. 2009-1087
GREECE	2008	Law No. 3691 implemented the Third EU Money Laundering Directive
GERMANY	2008	Third EU Money Laundering Directive implemented through the Amending Money Laundering and Terrorism Financing Prevention Law
HUNGARY	2007	Third Directive was implemented by new Act CXXXVI on the Prevention of Money Laundering and Terrorist Financing
IRELAND	2008	The Criminal Justice (Money Laundering and Terrorist Financing) Act 2010
ISLE OF MAN	2009	Proceeds of Crime Act
ITALY	2008	Legislative Decree no. 231/2007, (the AML Act)
KAZAKHSTAN	2009	Law of the Republic of Kazakhstan on Counteracting Legalization (Laundering) of Ill-gotten Proceeds and Terrorist Financing
LATVIA	2008	Law on the Prevention of Money Laundering and Terrorism Financing
LUXEMBOURG	2008	Implementation of the EU's third AML Directive
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Table A.1 – continued from previous page

Country	Effective Year	Regulation Name
MALTA	2008	Prevention of Money Laundering and Funding of Terrorism Regulations (Implemented EU's third directive)
NETHERLANDS	2008	The Third Directive was transposed into national law on 1 August 2008 when the Act on the Prevention of Money Laundering and Financing of Terrorism
NORWAY	2009	Circular No. 8/2009 published by the Financial Supervisory Authority of Norway
POLAND	2009	Third EU Money Laundering Directive has been incorporated into through the AML/CFT Act
PORTUGAL	2008	Law No. 25/2008 fully implements the Third EU AML Directive
ROMANIA	2008	The Third EU Directive was fully implemented by the Governmental Emergency ordinance no 53/2008
RUSSIAN FEDERATION	2002	The Federal Law on the Prevention of Legalization (laundering) of the Proceeds of Crime and Terrorist Financing
SERBIA	2018	Law on Prevention of Money Laundering and Financing Terrorism
SLOVAKIA	2008	Act no.297/2008 on Protection against Money Laundering and on Protection against Terrorist Financing and on Amendments and Supplements of Certain Acts
SLOVENIA	2007	Law on Prevention of Money Laundering and Terrorism Financing
SPAIN	2010	The third directive was implemented by the enactment of the new Law Act 10/2010 on the Prevention of Money Laundering and Financing of Terrorism
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Country	Effective Year	Regulation Name
SWEDEN	2009	The Third Directive was implemented in Sweden by the Act 2009:63 on the Measures to Prevent Money Laundering and Terrorist Financing
SWITZERLAND	2003	The Swiss Bankers Association's Due Diligence Agreement: stricter KYC rules
TURKEY	2006	Prevention of Laundering the Proceeds of Crime (Law No: 5549)
UKRAINE	2015	New Edition of the Law of Ukraine on Prevention and Counteraction to Legalization (Laundering) of the Proceeds of Crime or Terrorist Financing
UNITED KINGDOM	2007	Money Laundering Regulations 2007 replace the Money Laundering Regulations 2003
Region = Latin America and Caribbean		
ARGENTINA	2011	Law No 26,683 to combat the crimes of money laundering and terrorist financing
BOLIVIA	2012	Law 262 and created the National Council for Combating Legitimization of Proceeds from Crime and Terrorist Financing
BRAZIL	2012	Law 12,683
CAYMAN ISLANDS	2008	Proceeds of the Crime Law
CHILE	2003	Law N 19.913 creates the Financial Analysis Unit (UAF) and amends various provisions in money and other asset laundering
COLOMBIA	2006	Law 1121, 2006 established rules for the prevention, detection, investigation and sanctions of AML/CFT
COSTA RICA	2012	General Regulation against drug trafficking, money laundry, terrorism financing and organized crime
DOMINICAN REPUBLIC	2017	Law 155-17 Against Money Laundering and Terrorism Financing
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Country	Effective Year	Regulation Name
ECUADOR	2014	Standards to Prevent Money Laundering and Terrorism Financing
EL SALVADOR	2015	Reforms to the Law of Supervision and Regulation of the Financial System so that any entity sending or receiving systematic or substantial amounts of money falls under the jurisdiction of the Superintendence of the Financial System
GUATEMALA	2009	ML/FT Risk Management Guidelines for Banks
HONDURAS	2014	Special Anti-Money Laundering Law enacted and issued through Legislative Decree no. 144
JAMAICA	2007	Proceeds of Crime Act
MEXICO	2013	Mexico's Federal Law for the Prevention and Identification of Transactions with Resources of Illicit Origin
NICARAGUA	2018	Law No. 977, Anti-Money Laundering Law, Financing of Terrorism and Financing the Proliferation of Weapons of Mass Destruction
PANAMA	2011	The Law No. 23 adopted measures for the prevention of money laundering, terrorism financing and financing of Proliferation of weapons of mass destruction
PARAGUAY	2015	Resolution 345/15: Paraguayan banks, financial institutions, and insurance companies must abide by AML/CFT regulations to identify financial beneficiaries
PERU	2002	AML/CFT, Article 3 of Law No. 27693
URUGUAY	2009	Law 18.494 significantly upgrades Uruguay's AML efforts
Region=Middle East and North Africa		
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Country	Effective Year	Regulation Name
BAHRAIN	2006	The Policy Committee for The Prevention and Prohibition of Money Laundering And Terrorism Finance: As amended by Law No. (54) of 2006
EGYPT	2014	Presidential Decree-Law no. 36 expanded 2002 AML law and added CML
IRAQ	2015	Law No. (39) of 2015 Anti-Money Laundering and Counter-Terrorism Financing Law
ISRAEL	2014	The Anti Money Laundering Law
JORDAN	2007	The Anti-Money Laundering and Counter Terrorist Financing Law
KUWAIT	2013	Law 106 of 2013 Regarding the Combating of Money Laundering and Financing of Terrorism
LEBANON	2015	AML/CFT Law No. 44
OMAN	2010	Royal Decree 79/2010 promulgated the Law of Combating Money Laundering and Terrorism Financing Royal Decree No. 30/2016 Promulgating the Law on Combating Money Laundering and Terrorism Financing
QATAR	2010	The Combating Money Laundering and Terrorism Financing Law No (4) of Year 2010 and the Anti-Money
SAUDI ARABIA	2005	Anti-Money Laundering Law and Supplementary Guidance, under Royal Decree referenced M/39 dated 25/6/1424H corresponding to (24 Aug 2003) ratifying the Council of Ministers Decision 167 dated 20/6/1424H
UNITED ARAB EMIRATES	2014	Federal Law No. 7 of 2014 (CTC Law),
Region=North America		
CANADA	2002	Proceeds of Crime (Money Laundering) and Terrorist Financing Regulations SOR/2002-184
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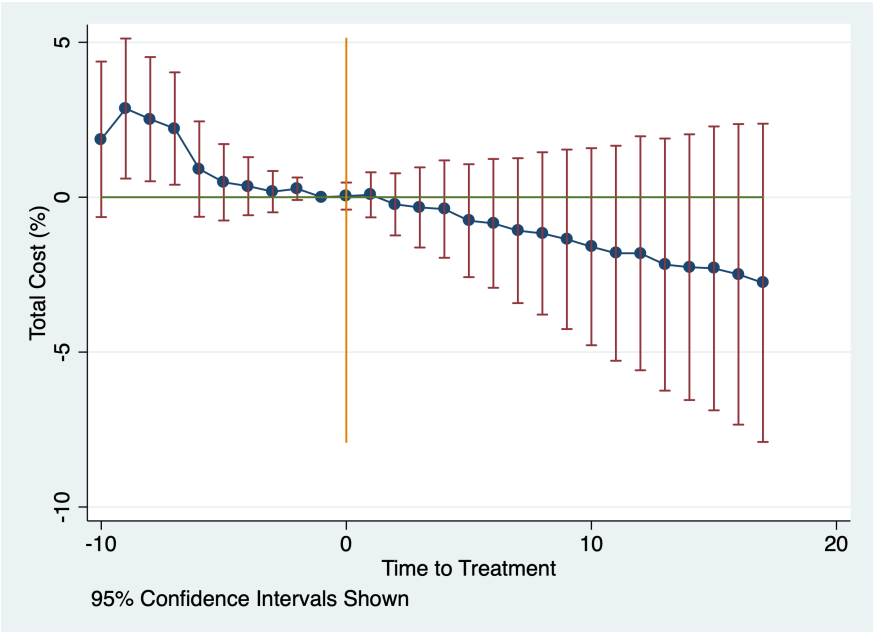
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Country	Effective Year	Regulation Name
UNITED STATES	2002	The U.S. Patriot Act of 2001 Made KYC mandatory for all banks in the United States. NOTE: The Patriot Act first defined KYC requirements and is a model that most countries apply today
Region=South Asia		
BANGLADESH	2008	Money Laundering Prevention Act
INDIA	2009	Prevention of Money Laundering Amendment Act, 2009 (significant amendment contained inclusion of Full Fledged Money Changers (FFMCs), Money Transfer Service Providers (MTSP), such as Western Union, and International Payment Gateways (IPG))
PAKISTAN	2010	The Law No. 23: measures for the prevention of money laundering, terrorism financing and financing of proliferation of weapons of mass destruction and other provision
Region=Sub-Saharan Africa		
ANGOLA	2014	Law No. 3 further criminalizes money laundering of offenses related to the financing of terrorism to comply with international regulations
CAMEROON	2005	Decree No. 2005/187
COTE D'IVOIRE	2005	National Assembly adopted the West African Economic and Monetary Union (WAEMU) common anti-money laundering (AML) law
ETHIOPIA	2009	Prevention and Suppression of Money Laundering and Financing of Terrorism proclamation
GABON	2005	The Crime of Money Laundering and Criminal Enforcement
GHANA	2011	Anti-Money Laundering Regulations, 2011 (L.I. 1987).
KENYA	2010	The Proceeds of Crime and Anti-Money Laundering Act 2009
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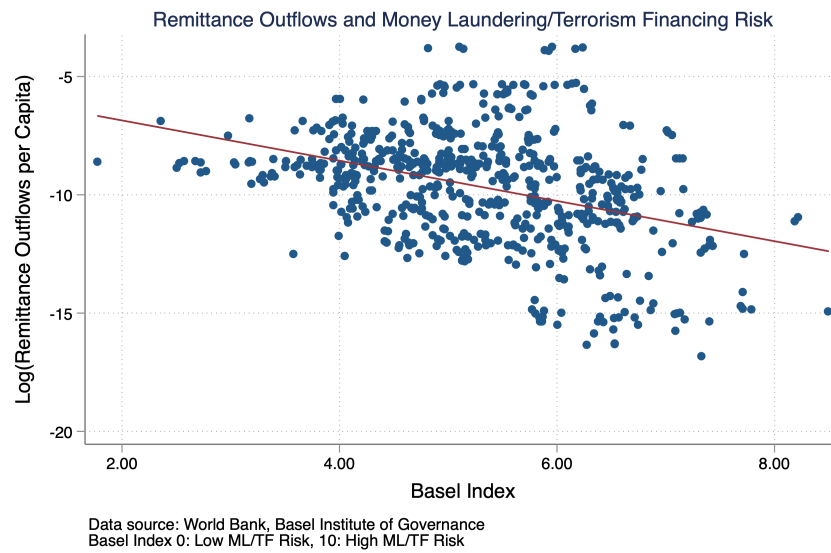
Country	Effective Year	Regulation Name
MAURITIUS	2002	The Financial Intelligence and Anti Money Laundering Act 2002 (FIAMLA)
NIGERIA	2011	The Money Laundering and Prohibition Act was enacted in 2004 was repealed by the Money Laundering (Prohibition) Act 2011
SOUTH AFRICA	2002	Financial Intelligence Center Act (FICA) (section 21 on KYC)
ZAMBIA	2010	(Prohibition Prevention of Money Laundering (Amendment) Act 44

Figure A.1: Event Study Plot: Remittance Prices (Destination Country)



Note: Note: Graph created by the author based on data from World Development Indications and Remittance Prices Worldwide from World Bank. Graph plots leads and lags on the number of years until or after the country received the treatment. The omitted category is the year before the treatment, so all coefficients are with respect to that year. Specification includes country and year fixed effects. The graph contains all lags and leads. The dependent variable is total cost of sending \$200 to a specific destination country.

Figure A.2: Remittance Flows and Basel Index



Note: Graph created by the author based on data from World Bank Development Indications and Basel AML Index from Basel Institute of Governance.

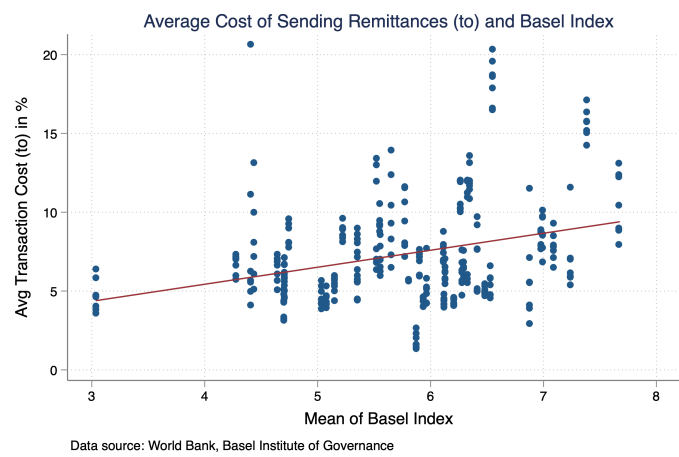
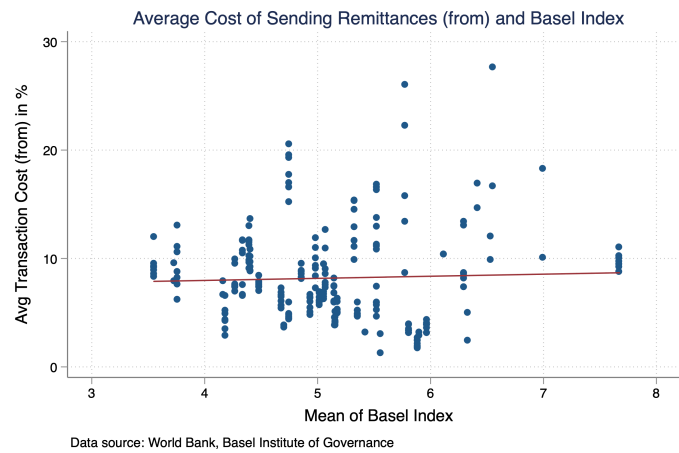


Figure A.3: Average transaction cost, as percent of amount remitted, and Basel Index

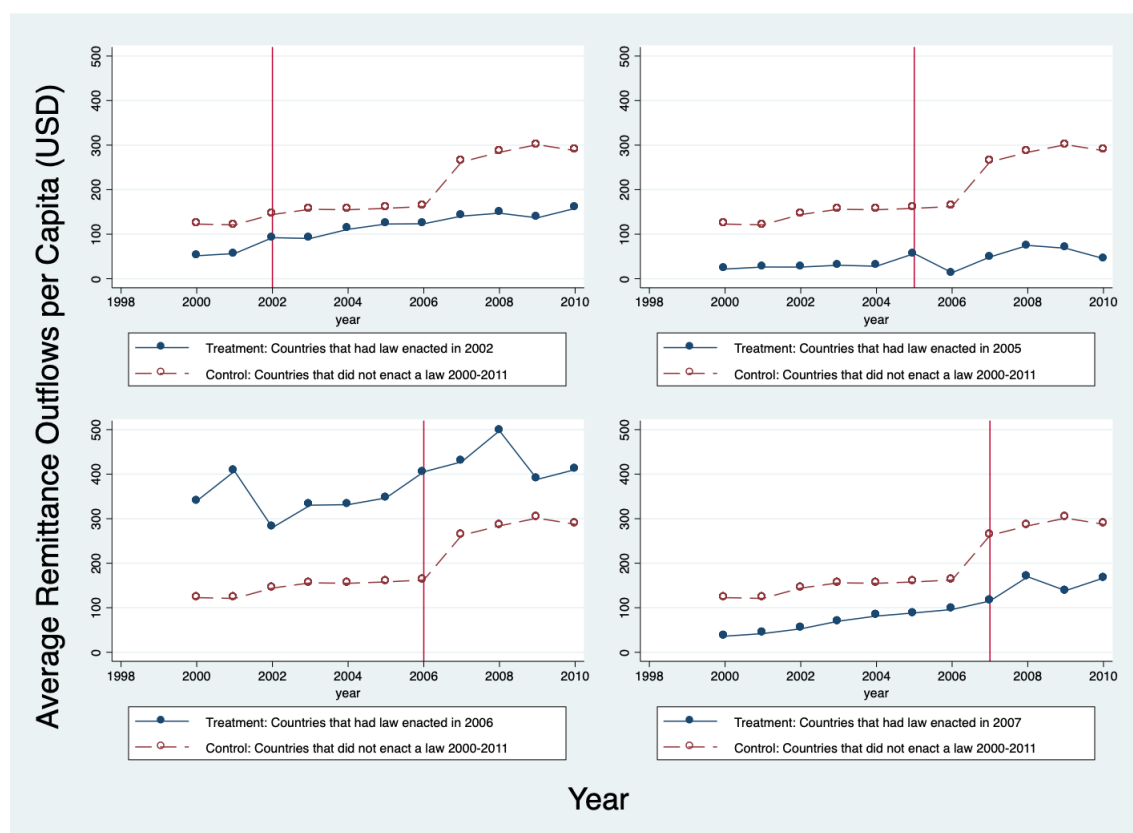


Figure A.4: Remittance Outflows for the Countries That Enacted AML/CFT Regulations in Specific Year Compared to Countries That Did Not Enact AML/CFT Regulations in a Specific Period

Note: Graph created by the author based on data from World Bank Development Indications and Basel AML Index from Basel Institute of Governance. All graphs have a common y-axis and common x-axis. Graph compares remittance outflows for countries that were treated in a specific year compared to a control group. The graphs have a common control group. The control group consists of countries that got treated only after 2011. Years were picked to have a good balance of treatment and control groups. 2002 was singled out because it's a year USA adopted the regulations.

Appendix B

HISTOGRAMS OF IMPORTANT VARIABLES

Figure B.1: Histogram of asset variable

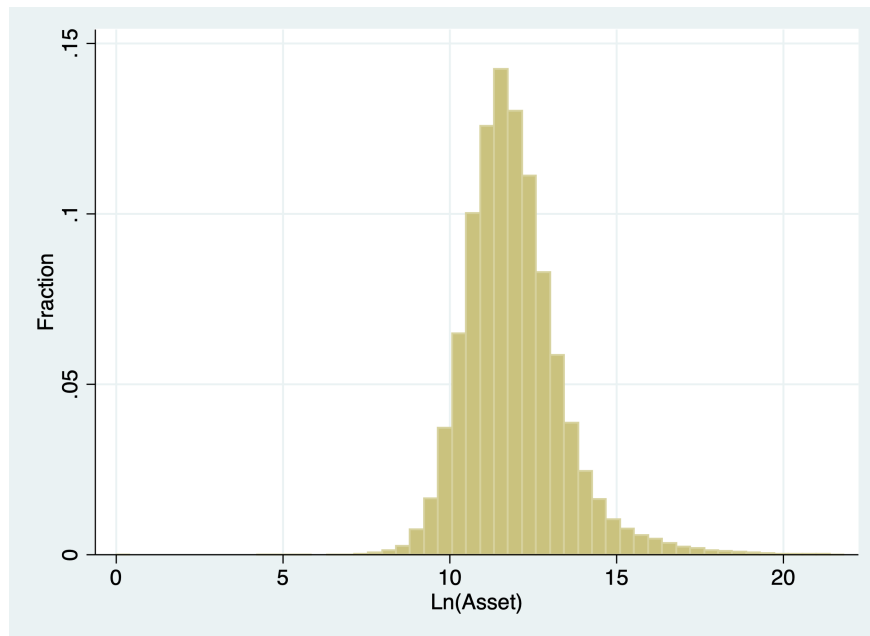


Figure B.2: Histogram of return on asset variable

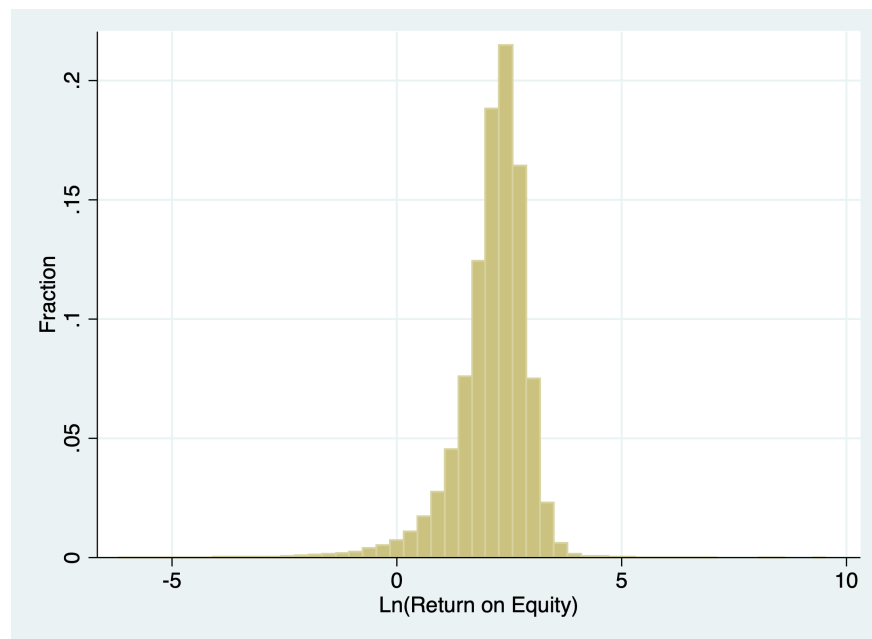


Figure B.3: Histogram of return on equity variable

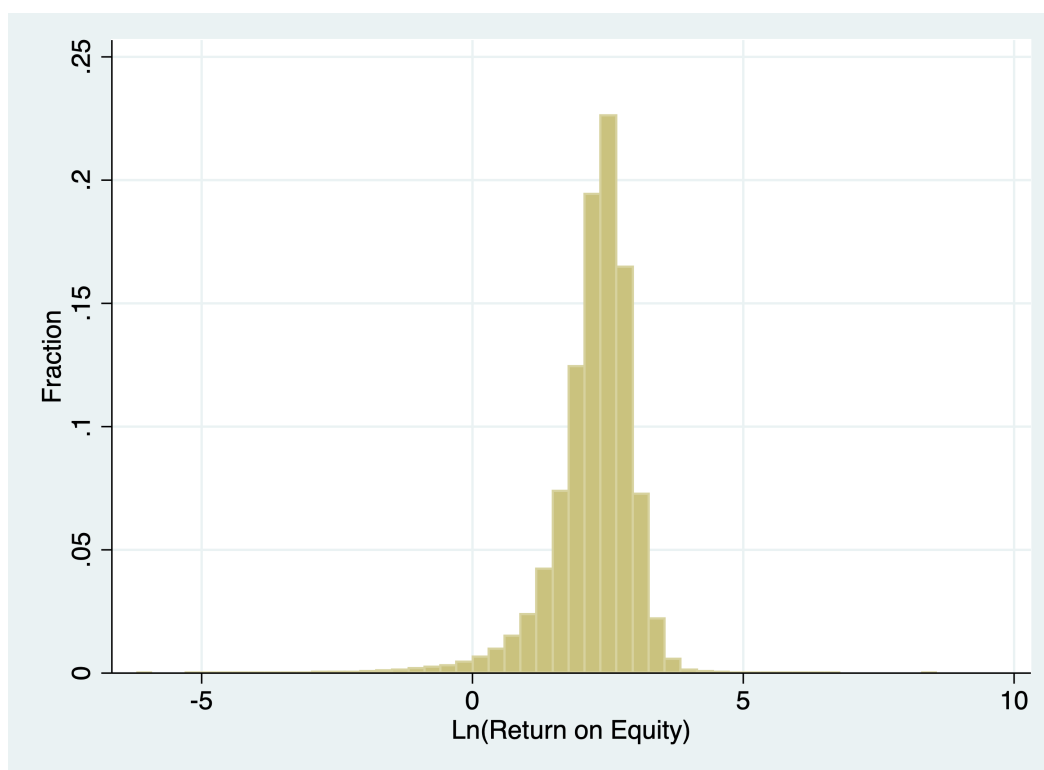


Figure B.4: Histogram of ratio of net loans and leases to core deposits

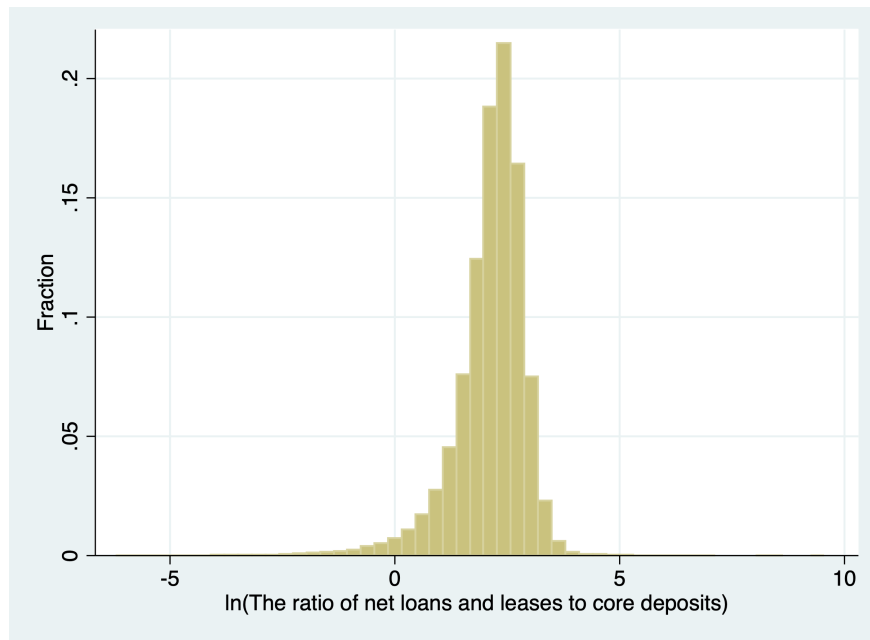


Figure B.5: Histogram of ratio of core deposits

