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# Mobile Money: an instrument of Financial Development to reduce violent conflicts?

Alfred Michel NANDNABA\*

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## Abstract

Mobile money has become an important financial tool in many developing countries where access to traditional banking services is limited. Its introduction has helped to reduce poverty, unemployment and inequality, and has increased remittances, thus helping to mitigate conflict factors in developing countries. This article uses a conceptual framework based on capability approach and the impact analysis method called Entropy Balancing to examine the optimistic impact of mobile money adoption on armed conflict in 103 developing countries over the period 2000-2020. The results show that mobile money significantly reduces armed conflict by about 1.79 percentage points. The results are robust to several robustness tests, including alternative specifications and methods. Heterogeneity analysis shows that the effect may vary by type of mobile money, level of development, duration of conflict, financial development, and geographic area. Finally, income, unemployment, inequality and consumption volatility are the main channels through which mobile money can reduce violent conflicts.

**Key words** : Violent Conflicts, Mobile Money, Capability Approach, Entropy Balancing, Developing countries.

**JEL Classification** : D74 ; E26 ; F36 ; O11 ; O32

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# 1 Introduction

Armed conflict is a devastating phenomenon that shakes the world, leaving a trail of destruction, suffering and devastation in its wake. It affects virtually every country in the world, but has gained momentum in the developing world in recent years. In 2017, nearly 500,000 people were victims of homicide, resulting in more than 89,000 deaths<sup>1</sup>, especially in developing countries. These nations, often already grappling with complex socio-economic challenges, are particularly vulnerable to the devastating consequences of war. Armed conflicts in the developing world are rarely the result of simple factors. They are often fueled by a complex combination of ethnic tensions, political rivalries, power struggles, disputed natural resources, and sometimes even foreign interference. These conflicts may have deep historical roots, exacerbated by contemporary problems such as poverty, social injustice, penalizes the energy transition(NANDNABA, 2024) and the marginalization of ethnic or religious groups. This is a very dynamic field of research (VERWIMP et al., 2019). One of the most tragic consequences of armed conflict in developing countries is its impact on the civilian population (BALCELLS et STANTON, 2021). Civilians are often caught in the crossfire, subjected to indiscriminate violence, forced displacement and flagrant human rights violations. Women and children are particularly vulnerable, facing increased risks of sexual violence, forced recruitment into militias, and other forms of exploitation (BUVINIC et al., 2013). Armed conflicts also have devastating humanitarian and socio-economic consequences in developing countries. Essential infrastructure such as hospitals, schools, and water systems are often destroyed or severely damaged, reducing access to basic services and exacerbating already precarious living conditions (SAING et KAZIANGA, 2020). Local economies are often crippled, natural resources plundered, and communities torn apart by division and mistrust.

To effectively address the challenges posed by armed conflict in developing countries, it is imperative to adopt a multidimensional approach. This requires a firm commitment to conflict prevention, respect for international humanitarian law, the protection of human rights, and the promotion of social justice and reconciliation. Solutions to reduce this scourge must therefore focus on the determinants of armed conflict. In recent years, one of the solutions

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1. <https://fr.statista.com/infographie/28298/evolution-du-nombre-de-morts-causes-par-des-conflits-armes-et-guerres-dans-le-monde-par-region/>

to reduce poverty and inequality and increase investment has been financial development through the adoption of mobile money.

Mobile money refers to an electronic payment system that allows users to store, transfer and receive money using their mobile phones. Unlike traditional banking services, mobile money does not require the use of formal bank accounts. Instead, transactions are made through secure mobile platforms, often managed by mobile operators or financial institutions. In an increasingly connected world, financial development through mobile money is emerging as a major catalyst for financial inclusion in developing countries. This technological revolution is transforming the way people manage their money, conduct transactions and access financial services. In recent years, mobile money has grown exponentially around the world, following its adoption in the Philippines in 2001 and its success in Kenya in 2007 with M-PESA (BURNS, 2015). According to the Global System for Mobile Communications (GSMA), the world's association of mobile operators, the total number of mobile money accounts worldwide has passed the impressive threshold of 1 billion. There has also been an increase of 13% of the number of accounts worldwide, and 22% and 15% of transaction value and volume, respectively, from financial development APETI et EDOH (2023). This rapid expansion is being fueled by a number of factors, including the growing adoption of smartphones, the increased availability of digital financial services, and growing consumer demand for convenient, accessible payment solutions. Its adoption has thus mitigated the factors driving conflict in developing countries by reducing inequality (ASONGU, 2015), unemployment by creating jobs (DE GASPERIN et al., 2019; MAWEJJE et LAKUMA, 2017) and promoting entrepreneurship (NGONO, 2021), increasing business performance (ISLAM et al., 2018) thus helping to increase household consumption and the receipt of remittances for their projects (MUNYEGERA et MATSUMOTO, 2016). Its adoption also boosts government revenues and thus promotes economic growth in the countries (AHMAD et al., 2023).

In this context, our article is primarily motivated by three points. First, mobile money services can help reduce poverty by facilitating access to financial services for disadvantaged populations, potentially reducing the economic tensions that fuel armed conflict. Second, by promoting financial inclusion and strengthening financial systems, mobile money services can help increase economic stability, which in turn can reduce the risk of armed conflict

in affected countries. In addition, electronic payments through mobile money services can reduce corruption by making transactions more transparent and reducing the circulation of cash, which can help weaken criminal networks and armed groups that finance themselves through illicit activities. Finally, by facilitating commercial transactions and stimulating local economic activity, mobile money services can contribute to the economic development of regions affected by armed conflict, which in turn can reduce tensions and the motivation to engage in violent activities. Of course, mobile money can also be expected to contribute to the financing of armed groups (MOGAJI et NGUYEN, 2022; AL-SUWAIDI et NOBANE, 2021), but we suspect that the positive effect will dominate.

Our article uses a sample of developing countries to analyze the impact of mobile money adoption on armed conflict for several reasons. First, the spread of mobile money has occurred primarily in developing countries. Second, developing countries generally have lower levels of financial inclusion than developed countries. Consequently, the potential impact of mobile money services on financial inclusion and economic stability may be more beneficial for these regions. Second, developing countries often face significant structural constraints, such as a lack of traditional financial infrastructure. Mobile money services represent an innovative solution to overcome these challenges and can have a transformative impact on economic development and stability in these regions. In addition, remittances, particularly those sent by migrant workers, are often vital to many developing economies. Mobile money services can offer more efficient and less costly ways to make these transfers, which can have a positive impact on economic and social conditions in these countries. Finally, because mobile money services can be more easily adopted by low-income and marginalized populations, they offer an opportunity to promote more inclusive economic development and reduce the inequalities that are at the root of many conflicts in these diverse countries.

Our article therefore analyzes the economic impact of mobile money adoption on armed conflict in developing countries over the period 2000-2020. Our paper makes three main contributions to the economic literature. First, to our knowledge, our paper is the first to analyze the impact of financial development through mobile money on armed conflict in developing countries. Second, the economic literature has already attempted to establish

the link between armed conflict and financial development<sup>2</sup>(see ADDISON et al. (2002) et BLUMENSTOCK et al. (2021), but does not mention the inverse relationship that may exist<sup>3</sup>. Finally, our article deals with a critical issue that penalizes the development of countries in the South and provides recommendations that can be used to combat armed conflicts and promote the financial and economic development of these countries.

To estimate the impact of mobile money, we start from a conceptual framework based on the capability approach developed by SEN (1993) to show the beneficial effects of adopting this type of technology (mobile money) and then use an empirical method to confirm this framework. The empirical method is based on Entropy Balancing. This is an impact analysis method developed by HAINMUELLER (2012). It accounts for endogeneity and helps correct for selection bias, thereby improving comparisons between treated and untreated groups in empirical studies. It is particularly useful in the context of impact evaluations where, as in our case, there may be systematic differences between groups that can bias the results of the analysis.

Using a sample of 103 developing countries over the period 2000-2020, we show that the adoption of mobile money significantly reduces armed conflict in developing countries over the period 2000-2020. Our results are robust to several alternative tests. First, we use two alternative specifications for our dependent and explanatory variables. Our results show that mobile money adoption reduces violent conflict by reducing the number of deaths resulting from such conflict. We then conduct two placebo tests, falsifying our treatment data and using another variable that captures the number of deaths from cardiovascular disease. The result remains the same, clearly showing that the adoption of mobile money reduces violent conflict. We also use three alternative methods, adding additional control variables, using terrorism and the number of violent conflicts as alternative dependent variables, and separating the potential confounding effect of mobile money and mobile phone. The results still show that the adoption of mobile money significantly reduces armed conflicts. With respect to heterogeneity, we consider the effect of all types of mobile money on violent conflict. We also consider heterogeneity due to the income levels of the countries in our sample, dividing our sample

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2. Look at the effect of armed conflict on financial development

3. In this framework, we use an impact analysis method that allows for endogeneity and therefore takes this double causality into account

into two according to the International Monetary Fund’s (IMF) classification of emerging and low-income countries. As a final heterogeneity, we split our sample in two and look at the effect in sub-Saharan Africa<sup>4</sup> and the rest of our sample. We also examine the effect of mobile money according to countries’ level of financial development and exclude countries in permanent conflict. The results confirm our main intuitions. Finally, we test the effect of mobile money adoption on GDP per capita, the level of inequality, the unemployment rate, and consumption volatility, representing our four main transmission channels through which mobile money adoption can act to reduce armed conflict. The results of these various tests confirm that the effect of mobile money on violent conflict does indeed pass through these channels.

Our article is organized as follows. Section 2 presents the conceptual framework based on the capability approach, a literature review on the determinants of armed conflict, and the economic impact of mobile money. Section 3 describes the empirical methodology we follow and the data we use. Section 4 presents the empirical results and implications of our study. Section 5 presents the results of the robustness tests we use. In Sections 6 and 7, we present the heterogeneity results and test our different transmission channels, respectively. Finally, we provide a conclusion in Section 8.

## 2 Background

In this section, we first present our conceptual framework based on the capability approach developed by SEN (1993), the determinants of armed conflict and mobile money economic impacts discussed in the literature.

### 2.1 Conceptual Framework : Capability Approach

In the field of socio-economic development, an innovative approach is gaining popularity : the SEN Capacities approach. This approach, popularized by philosopher and economist Amartya Sen, emphasizes the importance of strengthening individual and collective capabili-

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4. Area with the most armed conflicts in recent years according to the Armed Conflict Location & Event Data Project (ACLED)

ties to promote individual well-being and sustainable community development. Based on the work of Amartya SEN (SEN, 1993), it starts from the premise that development can be seen as an extension of people's perceived freedom. Indeed, this approach recognizes that development is measured not only in terms of economic growth, but also in terms of the freedom and opportunities people have to live the lives they desire. This approach is a perfect framework for assessing the well-being that an individual can derive from a resource or policy (ALKIRE, 2016). Three key concepts emerge from this approach.

The first is the functioning aspect. It represents what an individual can be and do. Thanks to mobile money, an individual can easily send and receive money, pay bills, and have easy access to credit for investments.

The second concept is capabilities. It refers to the real, ongoing opportunities that the individual can derive from the service. It is a combination of functions. Receiving money via mobile money will enable the unemployed individual to start projects and thus become self-employed (reducing the unemployment rate). This combination of functions will also bring the "poor" individual closer to the "rich" individual, thus reducing inequalities.

The third concept is freedom of choice. It represents empowerment and the ability to use a service. Mobile money offers individuals greater freedom to manage their finances. Rather than relying on traditional financial institutions, which may be inaccessible or inconvenient for many people in rural or marginalized areas, mobile money enables people to control their own financial resources through their mobile phones. This facilitates the use of funds for investment and savings. By facilitating financial transactions and reducing dependence on cash, mobile money can help reduce sources of tension related to the control and circulation of money in communities, thereby fostering a more peaceful and stable environment.

In light of these three main aspects, mobile money will increase people's incomes, reduce inequalities by enabling individuals to strengthen their economic autonomy and "capacity" to provide for themselves, and reduce their vulnerability to exploitation and oppression. Finally, it would create jobs and reduce unemployment.



## 2.2 Determinants of Armed Conflicts

The determinants of armed conflict have long been discussed in the economic literature (MIGUEL et al., 2004; DUBE et VARGAS, 2013). These determinants range from the economic (BESLEY et PERSSON, 2011; COLLIER et al., 2000; COLLIER et HOFFLER, 1998) to the socio-institutional (DANZELL et al., 2019; CALDEIRA et HOLSTON, 1999; YIEW et al., 2016) to physico-geographic factors (HSIANG et al., 2013; BURKE et al., 2015; THEISEN et al., 2013).

The main economic factors are income, unemployment, income inequality and natural resource rents. The first factor, which has long been mentioned, is income, generally measured by GDP per capita. Indeed, several studies have shown that an increase in income leads to a reduction in armed conflict (CARUSO et SCHNEIDER, 2011; HAZRA et CUI, 2018). SUN et al. (2022) show in a panel study over the period 2006-2018 that per capita income significantly reduces armed conflict in 14 Asian developing countries. In another study on the socio-economic determinants of armed conflict in Colombia, COTTE POVEDA (2012) shows that GDP per capita is negatively and significantly associated with homicide rates per city. In another study focusing on European countries, CARUSO et SCHNEIDER (2011) show that an increase in GDP per capita significantly reduces the number of terrorist incidents by 3.5% over the period 1994-2007. In Africa, TAHIR et al. (2019) show that GDP per capita is negatively associated with terrorist incidents over the period 2005-2016 in 29 sub-Saharan countries.

The second economic factor is unemployment. Several authors agree that an increase in the unemployment rate leads to an increase in armed conflict (EVANS et KELIKUME, 2019; CARUSO et GAVRILOVA, 2012). Indeed, AJAEGBU (2012) shows that the unemployment rate is the main driver of armed conflict in Nigeria. Using a global sample over the period 1996-2015, ADELAJA et GEORGE (2020) show that there is a positive and significant relationship between youth unemployment rates and terrorism-related armed conflict (TAPSOBA et al., 2024).

A third economic factor is income inequality. In several articles, authors have shown that unequal income distribution is positively associated with armed conflict (WEEDE, 1981; AJIDE et ALIM, 2021). ELGAR et AITKEN (2011) corroborates this hypothesis by showing

that there is a positive and significant relationship between unequal income distribution and homicide rates in 33 countries by deteriorating social capital and spending on health and education infrastructure.

Finally, another factor is natural resources. Long mentioned in the economic literature (HUMPHREYS, 2005; KOUBI et al., 2014; SINI et al., 2021), it's impossible to discuss the determinants of armed conflict without mentioning them. In a study of Indonesia using satellite data, LU et YAMAZAKI (2023) show that natural wealth, such as fish stocks, increases the likelihood of violent conflict. Using a sample of African countries over the period 1997-2010, BERMAN et al. (2017) show that mining increases the likelihood of conflict.

Socio-institutional factors include ethnic and religious fragmentation, governance, and the institutional quality of countries. These factors play an important role in a country's stability. WIG et TOLLEFSEN (2016) shows, using geo-referenced data over time in Africa, that areas with the highest institutional quality are less likely to experience armed conflict. PIERSKALLA et SACKS (2017) corroborates these facts by showing that governance style can have an impact on violence in Indonesia over the period 2000-2010.

As for social factors, several authors agree that ethnic, linguistic, and religious fragmentation is a factor in conflict. FLEMING et al. (2022) show for 130 countries over the period 2001-2018, the positive effect that the degree of ethnic fragmentation can have on the number of terrorist attacks. These facts are confirmed by MONTALVO et REYNAL-QUEROL (2005).

Physical-geographic factors include climatic variations (HARARI et FERRARA, 2018), population size and structure, and migration. These factors also influence armed conflicts around the world. HENDRIX et SALEHYAN (2012), using a database of 6,000 conflicts over a 20-year period, show that there is a positive and significant relationship between reduced rainfall and violent events in developing African countries. These facts have also been confirmed by VAN WEEZEL (2020), COUTTENIER et SOUBEYRAN (2014) et MCGUIRK et NUNN (2020). Population has also long been a factor in conflict in the economic literature (ACEMOGLU et al., 2020). ØSTBY et al. (2011) focus on Indonesian provinces over the period 1990-2003, then show that provinces with high population growth are more exposed to armed conflict. Other factors include Official Development Assistance (NIELSEN et al., 2011), migration (FELDMEYER, 2009; LIGHT et MILLER, 2018) and military spending (MEULEWAETER,

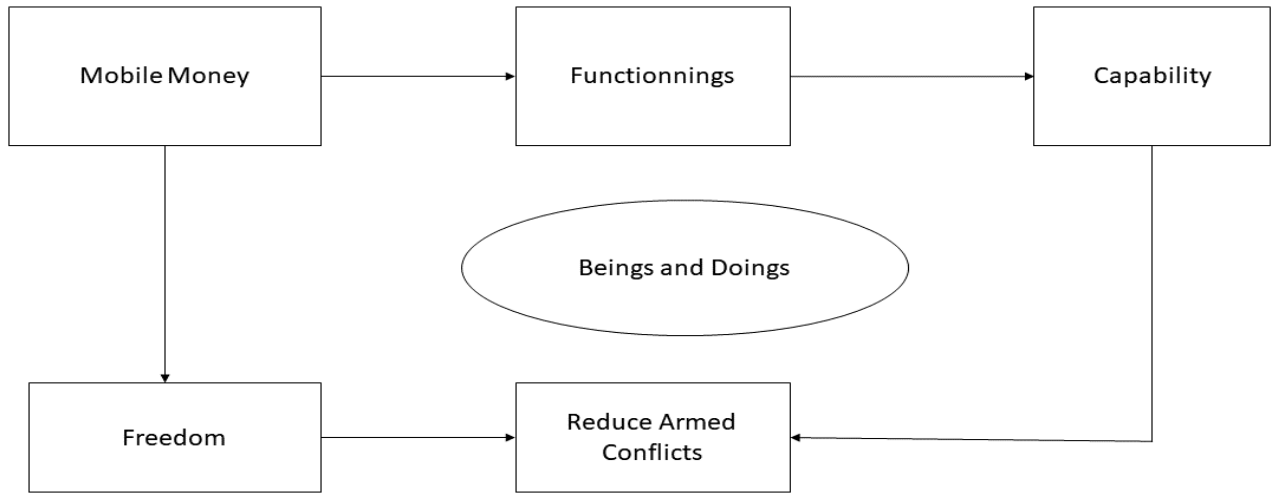
2020).

## 2.3 Mobile Money

Mobile money has been the subject of much discussion in the economic literature in recent years (ARON (2018) et SURI (2017)). Evoked as a tool for financial development through financial inclusion (DONOVAN, 2012), the impacts of this type of telecommunication are no less significant. These impacts range from the macroeconomic to the microeconomic, by improving the volatility of household consumption. In addition to formalizing the economic sector, mobile money contributes to improving macroeconomic performance. It has also helped to reduce inequalities (ASONGU, 2015), a factor of conflict. ASONGU et ODHIAMBO (2019) show on a sample of 93 developing countries in 2011 that mobile significantly reduces inequalities and thus reduces armed conflict. On a sample of 42 Sub-Saharan African countries, ASONGU et al. (2024) confirms these facts, showing that mobile money significantly reduces inequalities over the period 1980-2019. Mobile money also provides access to credit for investments (ISLAM et al., 2018; JACOLIN et al., 2021) by households, enabling them to increase their consumption and income (RILEY, 2018). KIKULWE et al. (2014) uses survey data from Kenya to show that mobile money increases household income and reduces poverty, a historical driver of conflict. Use a sample of 194,000 households, SURI et JACK (2016) show that mobile money increases long-term consumption in the poorest households and helps reduce the number of households living in extreme poverty. ABIONA et KOPPENSTEINER (2022) shows that in Tanzania, the adoption of mobile money helps to mitigate the effects of shocks related to climate variability, thereby reducing poverty. These facts were also confirmed by DJAHINI-AFAWOUBO et al. (2023), which showed that mobile money helps to reduce multidimensional poverty in Togo in 2016.

Another conflict factor mitigated by mobile money is unemployment. Mobile money helps reduce unemployment by creating jobs and promoting self-employment. In a study in sub-Saharan Africa over the period 2004-2018, ASONGU et ODHIAMBO (2023) show that mobile money helps create jobs by facilitating women's entrepreneurship. KOOMSON et al. (2023) corroborates these facts by showing that mobile money users are 24.4 percentage points more likely to be self-employed, thereby reducing the unemployment rate. APETI et al. (2023a)

FIGURE 1 – Capability Approach



Source : Author

agrees with this point, showing on a panel of developing countries the positive and significant effect of mobile money on unemployment through entrepreneurship.

Mobile money is a channel for sending remittances. In fact, it has made it possible to increase remittances (ALHASSAN et al., 2021) at lower cost. MUNYEGERA et MATSUMOTO (2016) shows that mobile money increases household wealth by promoting and facilitating remittances. In addition to these multiple benefits of mobile money, it also increases tax revenues and improves the quality of services by limiting fraud, thus helping to improve economic services and reduce conflict.

In light of these multiple benefits, we expect that mobile money will reduce armed conflict through four main channels : poverty, inequality, unemployment and volatility of consumption.

## 3 Methodology and data

In this section, we present our empirical method, and the data we use in this study.

### 3.1 Method

Our paper aims to examine the impact of the adoption of mobile money on armed conflicts. To this end, we use a program evaluation method based on estimating the average treatment effect on the treated (ATT). The choice of this method is mainly based on the fact that the adoption of mobile money is not a random event, but depends on a number of factors, in particular the level of economic development, the quality of institutions, the population and the access to financial services. These different factors may also be affected by armed conflict, making the adoption of mobile money endogenous due to selection bias. To address this issue, we felt it was more than necessary to use the Entropy Balancing impact assessment method developed by HAINMUELLER (2012). This method has been used several times in the literature and has been cited in numerous articles. While APETI et al. (2023b) uses it to analyze the impact of tax rules on the efficiency of public spending in a macroeconomic study, MUNYEGERA et MATSUMOTO (2016) uses a similar approach in a microeconomic study to assess the impact of mobile money on the welfare of rural households in Uganda. Other studies have also used it (JACOLIN et al., 2021). This is an econometric method used to balance the distributions of control variables between treated and untreated groups in an empirical study, particularly in the context of impact evaluations and causal analyses. The goal is to improve comparability between treatment and control groups by reducing potential bias due to differences in observed characteristics.

This method allows us to identify the unbiased causal effect of mobile money adoption by comparing countries that received the treatment (mobile money) with countries that did not receive the treatment. These countries have significant differences, so we take care to add fixed effects. This method has three main advantages over other matching methods, but also double differences. First, it allows us to create a synthetic group that is very close to the treatment group, with a very high level of equilibrium. Second, it doesn't require the specification of an econometric model, so we can avoid or rather limit multicollinearity

problems (APETI et EDOH, 2023). Finally, it allows us to take full advantage of the panel data aspect and thus to control for fixed effects (time and country) in the second stage.

A country's adoption of mobile money is our treatment variable, while the number of deaths due to armed conflict is our dependent variable. The unit of observation is the country-year. We now define the average treatment effect on contracts using the following specification :

$$ATT = E[ Y_{(1)} | T=1 ] - E[ Y_{(0)} | T = 1 ]$$

$Y(.)$  is the number of deaths as a result of the armed conflict.  $T$  is a binary variable that takes the value 1 if the country has adopted mobile money and 0 otherwise.  $E[ Y_{(1)} | T = 1 ]$  is the average value of deaths resulting from armed conflict in a country that has adopted mobile money, while  $E[ Y_{(0)} | T = 1 ]$  is the number of deaths in the counterfactual. However, there may be a problem with our control group. Indeed, it cannot be excluded that the number of deaths in the control group decreases as in the treated group, mainly due to the various factors mentioned above<sup>5</sup>. This could bias our results, as the treatment allocation is no longer random. To this end, the matching procedure will reproduce a situation where our observation units are randomly affected by the treatment. These units are then matched with those not exposed to the treatment, taking into account characteristics and similarities. Thus, we can rewrite the new specification as follows :

$$ATT = E[ Y_{(1)} | T=1, X=x ] - E[ Y_{(0)} | T = 0, X = x ]$$

$X=x$  represents a vector of variables that can affect both the adoption of mobile money and the number of deaths. The entropy balancing method we have chosen is performed in two steps. On the one hand, we have to calculate the weights of our control groups with the presented control variables, which we have carefully selected based on the economic literature. These different weights must satisfy certain equilibrium constraints. We'll use the first-order moment constraint, which allows us to agree that the control group will have untreated units very close to the treated group, thanks to the difference in means. On the other hand, we will

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5. level of economic development, the quality of institutions, the population and the access to financial services

use the previously calculated weights to estimate a regression where our dependent variable is the armed conflict characterized by the number of deaths and our variable of interest is the adoption of mobile money.

Entropy balancing is our main method, but we will also use three other methods to check that the entropy treatment accounts for endogeneity, to capture dynamic effects, and to account for the spatial correlation of armed conflicts. We will also vary the left-hand and treatment variables to ensure that our estimates are robust.

## 3.2 Data

To assess the impact of mobile money on armed conflict, we use a panel of 103 developing countries over the period 2000-2020. Since mobile money is specific to developing countries, we focus on a sample of developing countries.

Our dependent variable is armed conflict. It is characterized by the number of deaths resulting from these violent conflicts. The data come from the [ACLED](#) website<sup>6</sup>. This database gives us the number of deaths resulting from violent events in several countries. Its main advantage is that it gives us geolocalized information on these events, which allows us to use spatial regression for robustness. It has long been used in the economic literature (eg BERMAN et al. (2017), GEORGE et al. (2020) et TADESSE (2023)). Figure 2 shows the evolution of violent conflicts in recent years. As we can see, there has been a significant increase in conflicts in recent years. It is therefore imperative to find alternatives to counter this scourge.

Our variable of interest is the adoption of mobile money. We measure this through a binary variable that takes the value 1 if the country has adopted mobile money and 0 otherwise. It has long been used in the economic literature (see MUNYEGERA et MATSUMOTO (2016) et APETI et al. (2023a)). Data come from [GSMA](#). Among other things, we note the existence of one billion accounts with more than \$2 billion in transactions per day (APETI et EDOH, 2023) in 2019. These statistics have grown to over 1.6 billion accounts with a transaction value of over \$1.26 trillion and 400 mobile money services by 2022<sup>7</sup>.

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6. We consider all sources of violent conflict, regardless of their origin. We therefore have no reason to suspect a heterogeneous effect of mobile money depending on the type of conflict.

7. <https://www.gsma.com/mobilefordevelopment/wp-content/uploads/2023/04/GSMA-SOTIR-2023<sub>Web</sub> - 1.pdf>

Our main control variables were chosen according to the economic literature on the determinants of armed conflict and mobile money adoption. They are : GDP per capita (APETI et EDOH, 2023), military expenditure (MEULEWAETER, 2020), migration (FELDMEYER, 2009), ethnic fragmentation(Very little variation over time), unemployment rate (EVANS et KELIKUME, 2019), population(ACEMOGLU et al., 2020), foreign direct investment and official development assistance (NIELSEN et al., 2011), rents, and institutional quality(WIG et TOLLEFSEN, 2016) captured by the democracy variable.<sup>8</sup> We lag these variables by one period to account for reverse causality<sup>9</sup>. Sources and definitions of these variables are provided in the appendix.

Descriptive statistics for our variables before entropy weighting are presented in Table 1.

TABLE 1 – Descriptive statistics before weighting

	No mobile money	Mobile Money	Difference
Lag GDP-Per-Capita	8.573	8.659	-.087**
Lag Military-spending	79.02	47.27	31.75***
Lag Migration	-20826	-64862	44036**
Lag Ethno-fractionalization	.5169	.5751	-0.0582***
Lag Unemployment rate	7.826	7.135	.691***
Lag Population	16.41	16.75	-.34***
Lag Foreign Direct Investment	4.052	4.152	-.1**
Lag Official Development Assistance	19.52	20.26	-.74***
Lag Natural resources Rents	1.365	1.448	-0.083***
Lag Institutionnal Quality	3.07	4.139	-1.069***
Observations	1,036	526	

\*\*\* $P < 0.01$ , \*\* $P < 0.05$ , \* $P < 0.1$

## 4 Empirical Results

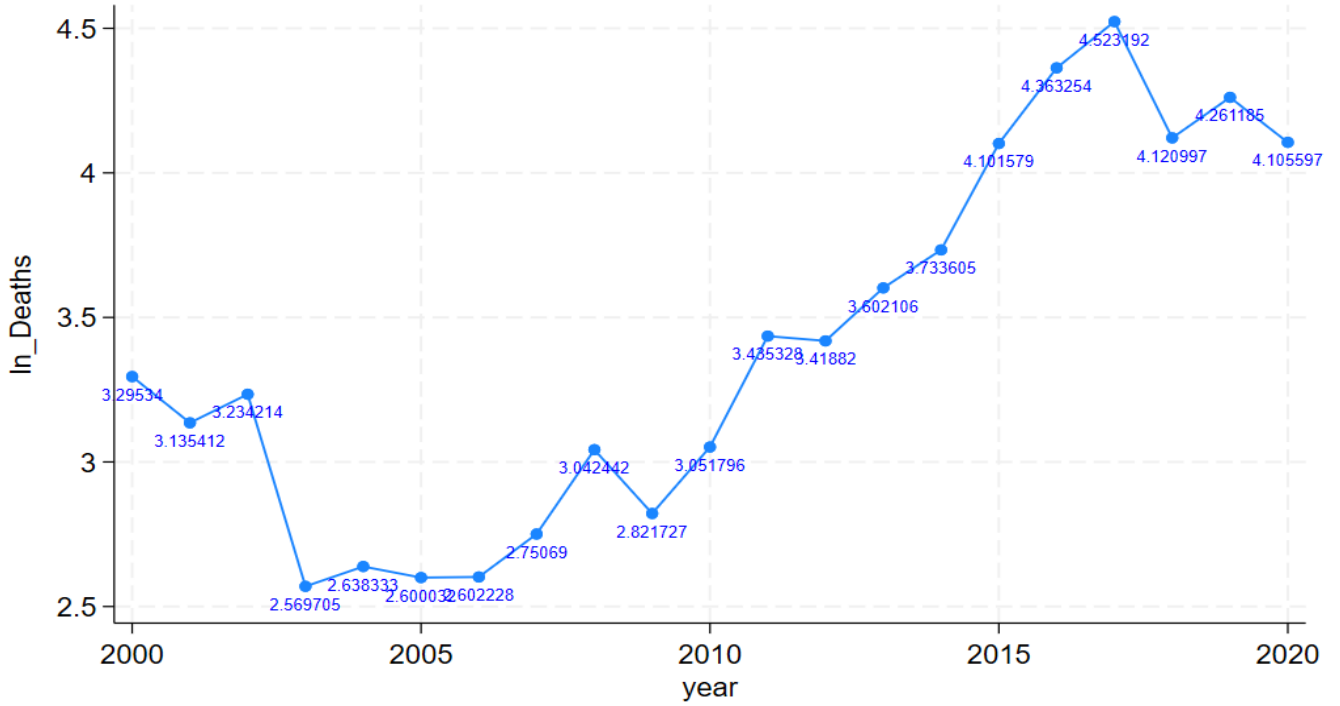
The statistics after weighting by the Entropy Balancing method are shown in Table 2. As we can see, the differences in the means are no longer significant. Therefore, we can

8. We choose as many variables as possible to make our treatment and control groups similar while being careful not to over-control

9. Several articles have highlighted the impact of armed conflict on the development of mobile money. eg BLUMENSTOCK et al. (2024) et BROUWER (2019)



FIGURE 2 – Armed Conflicts Trend

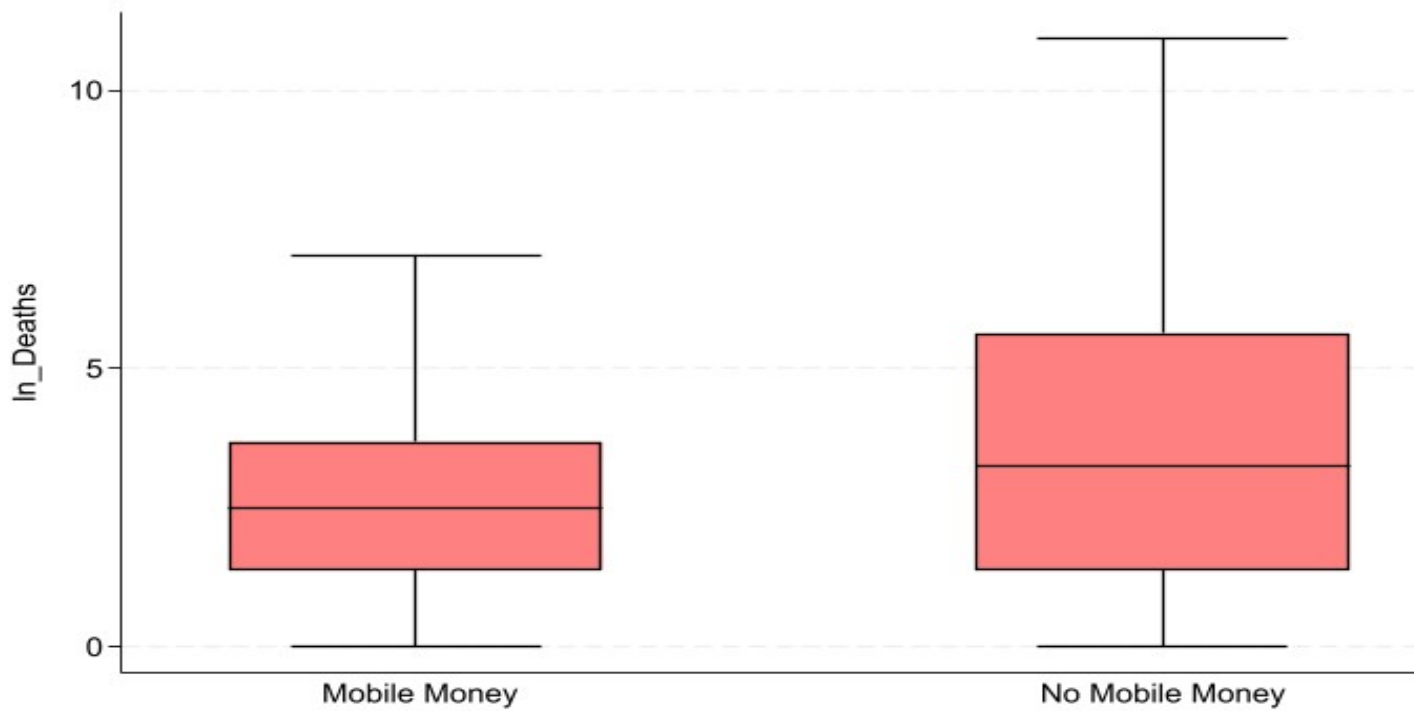


Source : Author

perform the impact analysis test based on the weighted regression. The results are shown in Table 3. "In\_Deaths" represents our dependent variable and is the logarithm of deaths caused by violent conflicts. "Mobile Money" represent our treatment. It takes value 1 if country has adopted mobile money and 0 otherwise. Columns 1 to 4 show the impact of mobile money on armed conflict depending on whether we add the fixed effects and the covariates( GDP\_Per\_Capita, Military spending, Migration, Unemployment rate, Population, Foreign Direct Investment, Official Development Assistance, Natural resources Rents, Institutional Quality) used in the weighting as controls or not. The fixed effects allow us to account for differences over time and across countries. Including the covariates used in the weighting as controls also gives us a better fit and more consistent results.

We show that the adoption of mobile money significantly reduces the number of deaths due to armed conflict by 1%. The magnitude of the effect ranges from 0.76 to 2.83 percentage points. With an average effect of 1.79, the adoption of mobile money significantly reduces the number of deaths from armed conflict in treated countries by 1.79 percentage points

FIGURE 3 – Deaths by Mobile Money adoption



Source : Author

compared to untreated countries. Economically, it means that the adoption of mobile money will enable untreated countries to reduce the number of deaths resulting from these conflicts by about 27% (from 3.988927 to 3.131833).

## 5 Robustness

In this section, we test the validity of our main results. To do so, we use two alternative specifications, three alternative methods, two placebo tests, and then add additional control variables in the second stage of entropy balancing.

### 5.1 Alternative specifications

In this section we use two types of specifications. The first consists in changing the dependent variable and the second in changing the treatment variable.

In the first specification, we change our dependent variable from the number of deaths

TABLE 2 – Descriptive statistics after weighting

	No mobile money	Mobile Money	Difference
Lag GDP-Per-Capita	8.659	8.659	0.000
Lag Military-spending	47.26	47.27	-0.01
Lag Migration	-64993	-64862	-131
Lag Ethno-fractionalization	.5751	.5751	0.000
Lag Unemployment rate	7.134	7.1359	-.001
Lag Population	16.75	16.75	0.000
Lag Foreign Direct Investment	4.152	4.152	0.000
Lag Official Development Assistance	20.26	20.26	0.000
Lag Natural resources Rents	1.448	1.448	0.000
Lag Institutionnal Quality	4.137	4.139	-.002
Observations	526	526	

\*\*\* $P < 0.01$ , \*\* $P < 0.05$ , \* $P < 0.1$

TABLE 3 – Mobile Money and Armed Conflicts

VARIABLES	(1) ln_Deaths	(2) ln_Deaths	(3) ln_Deaths	(4) ln_Deaths
Mobile Money	-2.476699*** (0.6198)	-0.7813*** (0.2810)	-2.3462*** (0.4163)	-0.8496*** (0.2753)
Observations	775	775	775	775
R-squared	0.1851	0.9070	0.4918	0.9134
Fixed Effects	NO	YES	NO	YES
Main Covariates	NO	NO	YES	YES

Robust standard errors in parentheses

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

to the number of deaths per capita. The idea here is to control for country size. In fact, using the number of deaths alone does not allow us to capture the size of countries, which are by no means identical in our sample of developing countries. In order to also take into account the multiple debates around the Uppsala Conflict Data Program-Peace Research Institute in OSLO (UCDP-PRIO) and ACLED databases (ECK, 2012), data were extracted from the UCDP-PRIO website and compared to the main method data. The results of this specification are presented in the Table 13. Column 1 presents results without fixed effects and main covariates at the second stage. In column 2 we present results without main covariates but with fixed effects. Column 3 take into account main covariates only. In the last column, we added main covariates and fixed effects.

As a second specification, we change our treatment variable to mobile money adoption. We use the number of active mobile money accounts. This allows us to account for adoption and intensity, which are not captured by our binary variable (APETI et EDOH, 2023). Entropy balancing doesn't currently allow us to use a continuous treatment variable. We, therefore, use the two-step system-GMM (BLUNDELL et BOND, 1998) to account for endogeneity. The results are shown in column 2 of Table 16. The results of these two specifications confirm our basic findings and show that mobile money significantly reduces the number of deaths due to armed conflicts.

## 5.2 Alternative Methods

In this section, we use three methods to check the robustness of our results. The methods have different rationales.

### 5.2.1 Two-step system GMM

This method developed by BLUNDELL et BOND (1998), allows us to take endogeneity into account and presents us with the dynamic effects of our panel. It also allows us to include the lagged variable of our dependent variable (number of deaths) as an additional control variable, while capturing the effect of the high inertia of armed conflict. This method has the advantage of combining level and difference equations as one system. A final advantage is that we can control for the Nickell bias that arises when we estimate a dynamic panel

with fixed effects by resolving the lack of valid external instruments. The results are shown in the first column of Table 16. The results clearly show that the adoption of mobile money significantly reduces the number of deaths in armed conflicts.

### 5.2.2 Local Projections Difference-in-Differences

There are several methods of impact analysis in the economic literature<sup>10</sup>. However, few have the ability to combine the local projections method with the double differences method to capture the impact of mobile money adoption over time. In this paper, we use a new dynamic double differences method based on local projections developed by DUBE et al. (2023). It has the advantage of capturing the dynamic heterogeneous treatment effects of mobile money adoption on armed conflict. In contrast to entropy balancing, it allows us to use as controls countries that never adopted mobile money during the entire study period. Thus, by combining local projection and difference-in-differences approaches, we are able to capture the impact of mobile money adoption on the number of deaths from armed conflict over time. The results of this estimation are shown in Table 17. As we can see, results based on this method show that mobile money adoption reduce significantly violent conflicts and the coefficient differs very little from our main results.

### 5.2.3 Spatial Regression

Armed conflicts can be influenced by factors that spread across geographic borders, such as contagion effects or interactions between neighboring countries, especially in neighboring countries like our current sample. They can also have effects that spread across space, affecting geographically adjacent areas (ELHORST et al., 2014). In this framework, we use Moran’s test to test for these spillover effects and then construct a weighting matrix based on inverse distance and then apply the autoregressive spatial model to see the effect of mobile money adoption on armed conflict<sup>11</sup>. The results based on two estimators (Maximum likelihood

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10. see (CALLAWAY et al., 2024; DE CHAISEMARTIN et D’HAULTFOEUILLE, 2024; DE CHAISEMARTIN et D’HAULTFOEUILLE, 2020)

11. The weighting matrix assigns weights to pairs of observations according to their spatial proximity. In our case of armed conflict, we construct the inverse distance weighting matrix to capture the distance-based neighbourhood effect of the countries in our sample

and generalized spatial two-stage least squares) are shown in Table 18 and show that mobile money adoption reduces significantly number of deaths due to violent conflicts.

### 5.3 Placebo Tests

The placebo test is a technique for evaluating the effectiveness of an intervention or treatment by simulating a fictitious treatment date with a control group. This group is treated in the same way as the actual treatment group, except that they do not actually receive any treatment. By comparing the results between the actual treatment group and the placebo group, we can isolate the causal effect of the treatment under study and better assess its impact without possible selection bias or estimation error. We therefore perform two placebo tests to check the sensitivity of our results.

The first test involves falsifying the treatment period. We randomly recalculate treatment dates and assign them to countries.

The second test uses the number of deaths from cardiovascular disease after the falsification. Both tests allow us to see whether the effect found in the main results is really due to the adoption of mobile money, and at the same time to check whether it is specific to the number of deaths from armed conflict or to some other number of deaths. The entropy-based results presented in Table 14 and 15 show the absence of a significant negative effect. This confirms our basic hypothesis that the treatment is specific to the number of armed conflict deaths.

### 5.4 Additional control variables

In this section, we are careful to include control variables from the economic literature to check the sensitivity of our results : institutional quality, remittances, climate variables and agricultural rents.

First, we include a variable for institutional quality. Indeed, a country's institutional quality can play a crucial role in preventing armed conflict by promoting political stability, ensuring social and economic equity, and providing effective mechanisms for conflict resolution. Conversely, weak, corrupt, or repressive institutions can exacerbate tensions and divisions,

increasing the risk of armed conflict (HEGRE et NYGÅRD, 2015; YIEW et al., 2016). To capture this institutional variable, we use principal component analysis to construct a new indicator that combines the six governance variables from the [Worldwide Governance Indicators](#) database which are : Control of Corruption, Government Effectiveness, Political Stability and Absence of Violence, Regulatory Quality, Rule of Law.

Next, we include another variable that captures remittances. Indeed, remittances from migrants to their families at home can help reduce poverty by providing direct financial support to households. By helping families meet basic needs such as food, housing, and education, remittances can alleviate the economic pressures that might otherwise contribute to social tensions and conflict.

We also include climate factors. Climate change, such as drought, flooding or desertification, can put pressure on vital natural resources such as water and arable land. This can intensify competition for these resources, particularly in regions where they are already scarce, and trigger conflicts between rival groups over their control and access (BRECKNER et SUNDE, 2019; THEISEN et al., 2013). To this end, we include temperature and precipitation as additional control variables.

Finally, we include a variable that captures agricultural and livestock rents. Conflicts between herders and farmers are very common in developing countries. Herders and farmers often depend on the same natural resources for their activities, such as arable land, water, and pasture. Competition for these resources can lead to conflict, especially in regions where they are scarce or becoming scarcer. The results of the addition of these various additional control variables are shown in the table 12 and show that mobile money adoption reduce significantly number of deaths due to armed conflicts.

## 5.5 Additional robustness

In this section, we conduct three additional robustness tests. First, we look at the effect of mobile money adoption on terrorism. Indeed, mobile money could also contribute to the financing of terrorism and conflicts (VLCEK, 2011; AL-SUWAIDI et NOBANEE, 2021; MOGAJI et NGUYEN, 2022). So in this section we want to test the pessimistic side of mobile money's impact. In this section, we look at the effect of mobile

money adoption on the number of deaths caused by terrorism assassinations. Data come from [Global Terrorism Database](#). The results are shown in Table 8. As we can see, the adoption of mobile money reduce significantly the number of deaths caused by terrorism assassination.

Second, we want to isolate the effect of mobile money from that of the mobile phone in order to separate out any possible confounding effects. To do this, we remove from our counterfactual those countries whose mobile phone subscription rate is higher than the median of our sample. In our results presented in Table 7, we still find a significant (and much larger) reduction in the number of violent conflict deaths, confirming that the effect is indeed due to mobile money and not to mobile phones.

Finally, we use another alternative specification of the number of violent conflict deaths. We use the number of violent conflicts recorded by a country in a given year. The results of this alternative entropy-based specification, presented in Table 5, show that mobile money significantly reduces the number of violent conflicts.

## 6 Heterogeneity

In this section, we conduct three tests of heterogeneity, each with different characteristics. First, we look at the effects for all types of mobile money, then for different levels of development, and finally for sub-Saharan Africa, where conflicts have multiplied in recent years.

### 6.1 Type of Mobile Money

The GSMA provides several disaggregated mobile money variables. There are eight types of mobile money in this database. These are Person-to-government(P2G) transfers, Government-to-Person( G2P) transfers, bill payments, Person-to-Person(P2P) transfers, airtime transactions, bulk payments, merchant payments and international remittances. We expect all these types of mobile money to contribute to conflict reduction, despite their differences. The results are shown in Table 21 and confirm our intuition.



## 6.2 IMF Classifications

Our study focuses on developing countries. However, these different countries have very different characteristics of underdevelopment. With this in mind, we split our sample in two and look at the effects in low-income and emerging developing countries. We expect our results to be the same for all countries in our sample, regardless of their level of development. The results are presented in the first two columns of Table 11. They clearly show that the adoption of mobile money significantly reduces the number of deaths due to armed conflict in all types of countries.

## 6.3 Sub-Saharan Africa Vs Rest of sample

To again capture the intensity of armed conflict, we look at the effect of mobile money adoption in developing countries in sub-Saharan Africa and in the rest of our sample. Our intuition is that the effect of mobile money adoption on armed conflict would be much larger in countries with the most armed conflicts during our study period. Indeed, the effect is significant at the 1% level in Sub-Saharan Africa, while it is significant at the 5% level in the rest of our sample. The results presented in the last two columns of Table 11 confirm our hypothesis.

## 6.4 Financial Development

In this section, we examine the effect of mobile money on violent conflict as a function of countries' level of financial development. Indeed, we would expect the effect of mobile money introduction to be smaller in countries with a high financial development index than in countries with a low financial development index. Thus, there would be a substitution effect from conventional finance to mobile money. To do this, we distinguish between countries with low and high financial development in terms of the median value of financial development in our sample. The results in Table 10 show that the effect of mobile money adoption is insignificant in countries with high financial development, while it is negative and significant in countries with low financial development, confirming our hypothesis.

## 6.5 Exclusion of countries in permanent conflict

In this section, we exclude countries that are in permanent conflict. Our intuition is to show that excluding these countries would increase the impact of mobile money. To do this, we refer to ACLED’s basic conflict index (MARIVOET et al., 2024). This index, developed by ACLED in 2023, ranks countries according to a past conflict index and four other indicators : lethality, danger, diffusion, and fragmentation. Using this index, we were able to exclude 13 countries classified as extreme : Syria, Mexico, Nigeria, Brazil, Colombia, Haiti, Yemen, Sudan, Somalia, Iraq, Pakistan, Mali and Ukraine. The results in Table 9 show that the effect of mobile money adoption is amplified compared to the main results. We go from an average effect of 1.79 percentage points for the main results to an average effect of 1.81 percentage points excluding these countries.

## 7 Channels

Our main results show that mobile money adoption significantly reduces armed conflict. In this section, we want to test our main channels through which mobile money adoption can reduce armed conflict. As mentioned above, we first expect mobile money adoption to reduce poverty and increase household purchasing power. Second, mobile money adoption can reduce unemployment by facilitating entrepreneurship and business performance. Finally, we expect mobile money adoption to reduce inequality, which is also an ancient source of armed conflict. As a result of these three main channels, mobile money could also have the effect of reducing consumption volatility<sup>12</sup>. We use entropy balancing to test these four different channels. The results are shown in Table 4. The results clearly show that the effects of mobile money adoption on violent conflict do indeed pass through these transmission channels.

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12. Consumption volatility is measured by the standard deviation of the growth rate of real household consumption per capita, estimated over a 5-year moving window.

TABLE 4 – Channels

VARIABLES	(1) Log_GDP-Per-Capita	(2) Log_Unemployment	(3) GINI	(4) Consumption Volatility
Treatment	0.252*** (0.0564)	-0.212*** (0.0683)	-3.084*** (0.719)	-.0014772*** (.0001)
Constant	8.408*** (0.0376)	1.753*** (0.0930)	44.04*** (0.523)	0.0034*** (0.0001)
Main Covariates	YES	YES	YES	YES
Observations	1,562	1,578	1,528	1,578
Fixed Effects	YES	YES	YES	YES

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

## 8 Conclusion

This article analyzes the impact of financial development through the adoption of mobile money on armed conflict in 103 developing countries over the period 2000-2020. It uses a method of impact analysis that is appropriate to the problem and takes endogeneity into account. According to this method, the results show that the adoption of mobile money significantly reduces armed conflict in developing countries, with an average effect of 1.79 percentage points. Regarding heterogeneity, we run three tests, all with different characteristics. These tests take into account the economic development of the countries, the type of mobile money, financial development, countries in permanent conflicts and also the intensity of armed conflict, with a focus on sub-Saharan Africa. All of these tests confirm our initial hypothesis and show that the adoption of mobile money significantly reduces armed conflicts.

Our results are robust to different specifications, alternative methods, and placebo tests. First, as an alternative specification, we change the dependent variable to death per capita to capture the size of different countries and also number of conflicts and terrorism. We also use another treatment variable, the number of active mobile money accounts. The idea here is to capture the intensity of the treatment, which is not captured by the binary variable. We then use three alternative treatment methods. Each has its own specificity. First, we use the two-step system GMM method to control for endogeneity and to capture the global dynamic effect. Then, we use a new impact analysis method, Difference-in-Differences based on local

projections. This method allows us to capture dynamics heterogeneous treatment effects, mainly due to the fact that not all of our countries were treated at the same time, which are dynamic over our study period. Finally, we use spatial regression to capture spillovers from armed conflicts. As a final robustness test, we conduct placebo tests by falsifying our treatment data and using the number of deaths from cardiovascular diseases instead of the number of deaths from armed conflict. All of these tests confirm that the adoption of mobile money significantly reduces armed conflicts by reducing poverty, unemployment, inequality and volatility of consumption.

The main contributions of this paper is to make political and economic recommendations to help the countries of the South to develop while controlling the phenomenon of armed conflicts.

First, we need to promote financial development through the adoption of mobile money. Indeed, we need to encourage the governments of these various countries to promote the adoption of mobile money and other innovative financial technologies to expand access to financial services in areas affected by armed conflict. This could help reduce the reliance on informal networks and illicit financial flows that often fuel conflict and poverty in these countries. Second, once such services are in place, we need to work with mobile service providers and regulators to strengthen the security of mobile transactions by implementing privacy measures and anti-fraud protocols. This can help reduce the risks associated with using mobile money in potentially unstable contexts. In countries that have already adopted them, investments in telecommunications infrastructure and digital payment networks should be increased to expand mobile network coverage and improve connectivity in regions affected by armed conflict. This can help address the challenges of accessibility and interoperability of mobile financial services. Finally, our study shows that there is a spatial correlation between these conflicts. Strong regional and international cooperation on infrastructure and armed conflict mitigation is therefore needed to address these key spillovers.

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TABLE 5 – Mobile Money effect on Number of conflicts

VARIABLES	(1) ln_nombre_conflicts	(2) ln_nombre_conflicts	(3) ln_nombre_conflicts	(4) ln_nombre_conflicts
Treatment	-1.245*** (0.412)	-0.353* (0.190)	-1.171*** (0.304)	-0.464*** (0.165)
Constant	6.043*** (0.400)	1.117** (0.511)	-4.958* (2.947)	4.345 (4.049)
Observations	747	747	747	747
Fixed Effects	NO	YES	NO	YES
Main Covariates	NO	NO	YES	YES
R-squared	0.092	0.915	0.410	0.919

Robust standard errors in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

## Appendix

TABLE 6 – Exclusion of Mobile Phone effects

VARIABLES	(1) ln_Deaths	(2) ln_Deaths	(3) ln_Deaths	(4) ln_Deaths
Treatment	-2.248** (0.877)	-0.927** (0.364)	-2.821*** (0.431)	-0.923** (0.407)
Constant	6.391*** (0.858)	9.731*** (1.165)	-7.107* (4.253)	4.809 (10.94)
Observations	522	522	522	522
Fixed Effects	NO	YES	NO	YES
Main Covariates	NO	NO	YES	YES
R-squared	0.168	0.894	0.595	0.914

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

TABLE 7 – Exclusion of Mobile Phone effects

VARIABLES	(1) ln_Deaths	(2) ln_Deaths	(3) ln_Deaths	(4) ln_Deaths
Treatment	-2.248** (0.877)	-0.927** (0.364)	-2.821*** (0.431)	-0.923** (0.407)
Constant	6.391*** (0.858)	9.731*** (1.165)	-7.107* (4.253)	4.809 (10.94)
Observations	522	522	522	522
Fixed Effects	NO	YES	NO	YES
Main Covariates	NO	NO	YES	YES
R-squared	0.168	0.894	0.595	0.914

Robust standard errors in parentheses

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

TABLE 8 – Effect of Mobile Money on Terrorism

VARIABLES	(1) ln_Deaths	(2) ln_Deaths	(3) ln_Deaths	(4) ln_Deaths
Treatment	-0.00282 (0.178)	-0.285*** (0.0826)	-0.000706 (0.133)	-0.284*** (0.0846)
Constant	0.750*** (0.168)	4.719*** (0.171)	-1.565 (1.526)	-1.447 (2.451)
Observations	1,562	1,562	1,562	1,562
Fixed Effects	NO	YES	NO	YES
Main Covariates	NO	NO	YES	YES
R-squared	0.002	0.855	0.293	0.860

Robust standard errors in parentheses

\*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$



TABLE 9 – Exclusion of countries in permanent conflict

VARIABLES	(1) ln_Deaths	(2) ln_Deaths	(3) ln_Deaths	(4) ln_Deaths
Treatment	-2.924*** (0.641)	-0.788*** (0.285)	-2.689*** (0.397)	-0.791*** (0.271)
Constant	6.320*** (0.631)	9.780*** (0.280)	-6.387** (3.251)	14.14*** (4.906)
Observations	714	714	714	714
Fixed Effects	NO	YES	NO	YES
Main Covariates	NO	NO	YES	YES
R-squared	0.280	0.899	0.533	0.906

Robust standard errors in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

TABLE 10 – Financial Development

VARIABLES	(HIGH) ln_Deaths	(LOW) ln_Deaths	(HIGH) ln_Deaths	(LOW) ln_Deaths	(HIGH) ln_Deaths	(LOW) ln_Deaths
Treatment	-0.490 (0.572)	-3.369*** (0.647)	0.00635 (0.553)	-1.109*** (0.285)	-0.190 (0.530)	-1.090*** (0.320)
Constant	5.045*** (0.520)	6.595*** (0.634)	0.527 (0.349)	2.865* (1.531)	20.89*** (7.152)	-70.92** (29.75)
Observations	204	544	204	544	204	544
Fixed Effects	NO	NO	YES	YES	YES	YES
Main covariates	NO	NO	NO	NO	YES	YES
R-squared	0.005	0.384	0.952	0.894	0.958	0.904

Robust standard errors in parentheses

\*\*\* p&lt;0.01, \*\* p&lt;0.05, \* p&lt;0.1

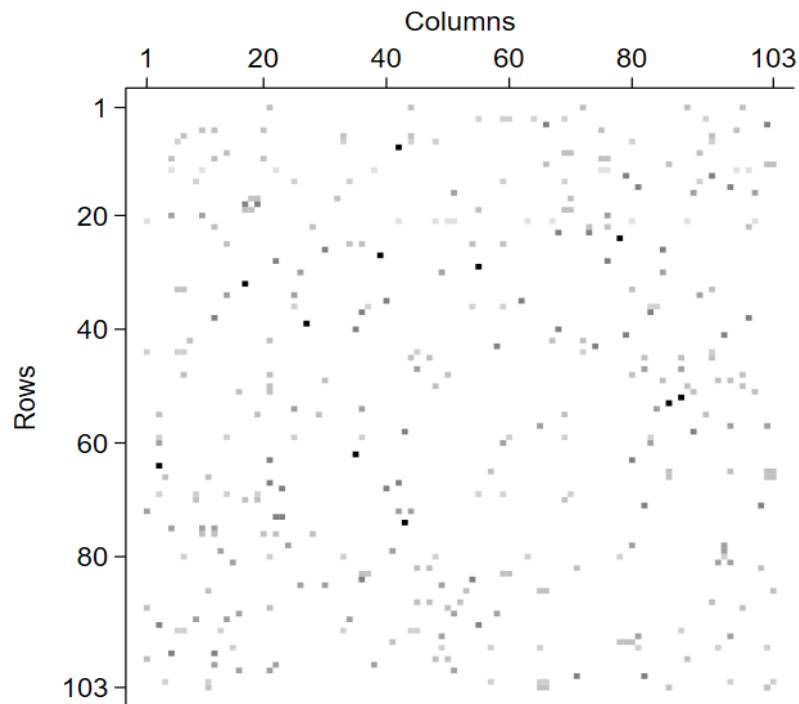
TABLE 11 – Heterogeneity 2 and 3

VARIABLES	Emerging Countries ln_Deaths	Low-income Countries ln_Deaths	SSA ln_Deaths	Other Countries ln_Deaths
Treatment	-1.703*** (0.454)	-2.963*** (0.960)	-3.112*** (0.977)	-1.232** (0.587)
Constant	-11.05*** (0.412)	-9.950*** (0.951)	-9.771*** (0.970)	-11.60*** (0.546)
Observations	198	465	486	177
Fixed Effects	YES	YES	YES	YES
Main Covariates	YES	YES	YES	YES

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

FIGURE 4 – Spatial Matrix



Source : Author

TABLE 12 – Additionnal Control Variables

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	ln_Deaths	ln_Deaths	ln_Deaths	ln_Deaths	ln_Deaths	ln_Deaths	ln_Deaths
Treatment	-0.862*** (0.287)	-0.851*** (0.266)	-0.840*** (0.312)	-0.812*** (0.310)	-0.818*** (0.311)	-0.901*** (0.315)	-0.901*** (0.315)
GDP-Per-Capita	-1.410** (0.587)	-1.163** (0.516)	-0.930* (0.514)	-0.938* (0.513)	-0.942* (0.514)	-0.822 (0.551)	-0.822 (0.551)
Military_Spending	-0.0154*** (0.00497)	-0.0144*** (0.00525)	-0.0145*** (0.00514)	-0.0138*** (0.00523)	-0.0136** (0.00529)	-0.0133** (0.00525)	-0.0133** (0.00525)
Migration	3.51e-07 (3.38e-07)	3.18e-07 (3.27e-07)	4.22e-07 (2.87e-07)	4.73e-07 (3.59e-07)	4.76e-07 (3.60e-07)	5.01e-07 (3.71e-07)	5.01e-07 (3.71e-07)
Unemployment	-0.0691 (0.0704)	-0.111* (0.0660)	-0.113* (0.0654)	-0.0900 (0.0661)	-0.0872 (0.0662)	-0.0853 (0.0661)	-0.0853 (0.0661)
Population	1.13e-08 (1.70e-08)	3.17e-08* (1.62e-08)	2.99e-08* (1.63e-08)	3.57e-08** (1.65e-08)	3.51e-08** (1.64e-08)	4.05e-08** (1.72e-08)	4.05e-08** (1.72e-08)
Foreign Direct Investment	0.00353 (0.00645)	0.00447 (0.00594)	0.00385 (0.00607)	0.00451 (0.00608)	0.00444 (0.00622)	0.000487 (0.00659)	0.000487 (0.00659)
ODA	0.251* (0.147)	0.162 (0.145)	0.260* (0.144)	0.201 (0.128)	0.199 (0.128)	0.188 (0.131)	0.188 (0.131)
Rents	-0.0377 (0.147)	-0.0659 (0.142)	-0.100 (0.138)	-0.119 (0.133)	-0.115 (0.132)	-0.0918 (0.132)	-0.0918 (0.132)
Democracy	0.00787 (0.0358)						
Institutionnal Quality		-1.140*** (0.158)	-1.137*** (0.170)	-1.115*** (0.169)	-1.119*** (0.169)	-1.127*** (0.171)	-1.127*** (0.171)
Remittances			-0.0246 (0.0267)	-0.0285 (0.0268)	-0.0330 (0.0267)	-0.0491 (0.0378)	-0.0491 (0.0378)
Temperature				-0.283 (0.204)	-0.340 (0.215)	-0.361* (0.215)	-0.361* (0.215)
Precipitation					-9.969 (12.02)	-10.94 (12.18)	-10.94 (12.18)
Agriculture& Livestock rents						0.0436* (0.0250)	0.0436* (0.0250)
Constant	0.933 (5.025)	-0.808 (4.694)	-3.879 (4.557)	6.070 (7.727)	8.386 (8.210)	9.018 (8.366)	9.018 (8.366)
Observations	775	742	692	683	683	668	668
R-squared	0.913	0.923	0.914	0.911	0.911	0.909	0.909
Fixed Effects	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

TABLE 13 – Alternative dependent variable with Deaths per capita

VARIABLES	(1) ln_Deaths_percapita	(2) ln_Deaths_percapita	(3) ln_Deaths_percapita	(4) ln_Deaths_percapita
Mobile Money	-2.746863*** (0.8329)	-0.7611274*** (0.2916395)	-2.836731*** (0.4999515)	-0.8227312*** (0.2839845)
Observations	663	663	663	663
R-squared	0.2823	0.8940	0.4367	0.8997
Fixed Effects	NO	YES	NO	YES
Main Covariates	NO	NO	YES	YES

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

TABLE 14 – Placebo Test 1

VARIABLES	(1) ln_Deaths	(2) ln_Deaths	(3) ln_Deaths	(4) ln_Deaths
Treatment	-0.492 (0.415)	-0.0874 (0.189)	-0.420 (0.331)	-0.181 (0.194)
Constant	3.902*** (0.137)	11.02*** (0.217)	-14.06*** (3.113)	4.741 (5.531)
Observations	375	375	375	375
Fixed Effects	NO	YES	NO	YES
Main Covariates	NO	NO	YES	YES
R-squared	0.004	0.869	0.317	0.879

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

TABLE 15 – Placebo Test 2

VARIABLES	(1) Deaths_CVC	(2) Deaths_CVC	(3) Deaths_CVC	(4) Deaths_CVC
Treatment	-0.712 (1.017)	0.0590 (0.126)	-0.284 (0.835)	0.0756 (0.124)
Constant	23.55*** (0.293)	38.30	39.43*** (5.577)	31.90*** (3.131)
Observations	522	522	522	522
Fixed Effects	NO	YES	NO	YES
Main Covariates	NO	NO	YES	YES
R-squared	0.001	0.990	0.287	0.991

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

TABLE 16 – Two-step System-GMM

VARIABLES	(1) ln_Deaths	(2) ln_Deaths
Lag ln_Deaths	0.4489*** (0.0427)	0.2297** (0.1141)
Mobile Money	-0.9585*** (0.2795)	
Mobile Money accounts		-0.3983*** (0.0938)
Main Controls	YES	YES
Hansen test	0.870	0.905
Number of instruments/countries	78/81	40/42
AR(1)/AR(2)	0.000/0.154	0.014/0.161
Fixed Effects	YES	YES
Observations	847	794

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

TABLE 17 – Local Projections Diff-in-Diff Pooled Estimates<sup>13</sup>

VARIABLES	(1) ln_Deaths	(2) ln_Deaths
Pre-Treatment	0.2420145 (0.2847)	
Post-Treatment		-0.5967*** ( 0.1546)
T0		-0.3358 (0.2239)
T1		-0.851546*** (0.2795)
T2		-0.5725** ( 0.3946)
T3		-0.6273254** ( 0.3946)
Observations	390	342

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Posttreatment : mean of dynamic effects ; T0 : instantaneous effect ; T1 : effect after one year ; T2 : effect after two years ; T3 : effect after three years

TABLE 18 – Spatial Regression

VARIABLES	GS2SLS ln_Deaths Results	Maximum Likelihood ln_Deaths Results
Mobile Money	-0.7792*** (0.2527)	-0.7756*** (0.2529)
Main Covariates	YES	YES
Pseudo R-squared	0.4147	0.4137
Observations	916	916

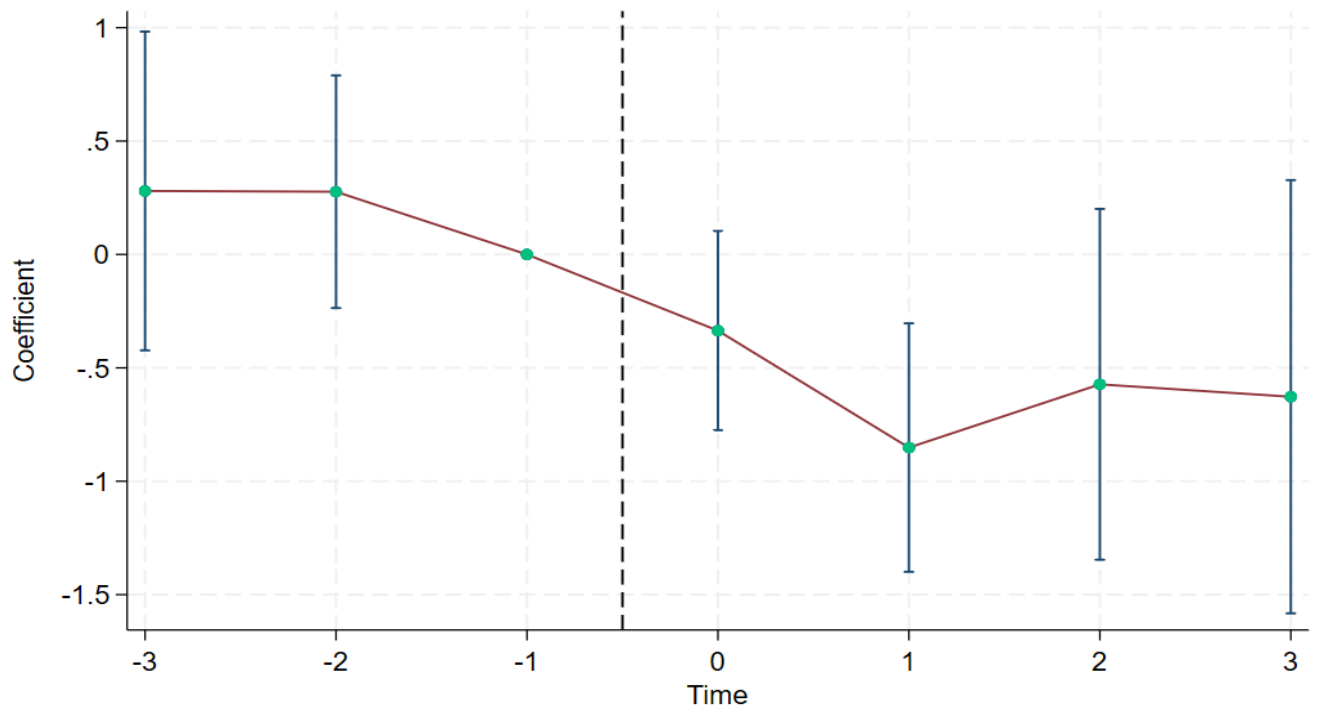
Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

TABLE 19 – Data

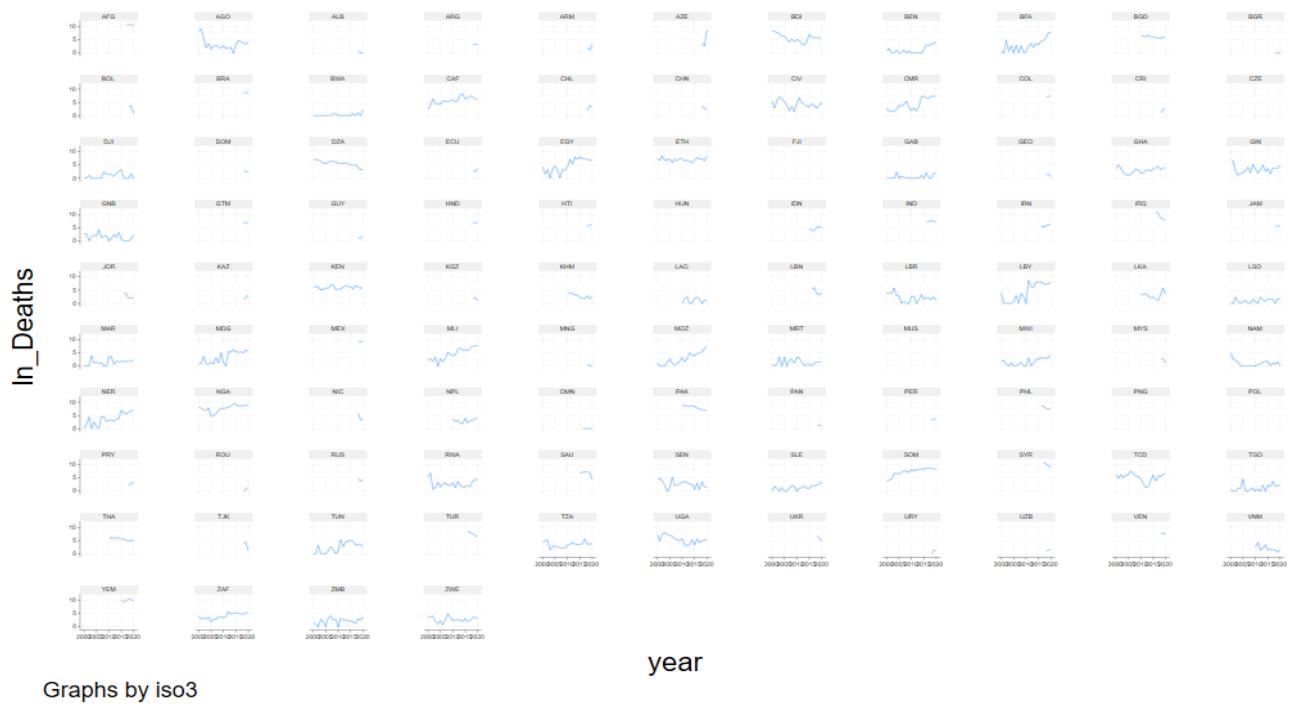
Name	Definition	Source
Mobile Money	Dummy variable taking 1 if country adopt mobile money and 0 otherwise	<a href="https://www.gsma.com/get-involved/working-groups/terminal-steering-group/imei-database">https://www.gsma.com/get-involved/working-groups/terminal-steering-group/imei-database</a>
Deaths	Number of deaths due to armed conflicts	<a href="https://ucdp.uu.se/downloads/">https://ucdp.uu.se/downloads/</a>
Temperature	Normalized Temperature in degree celcius	<a href="https://databank.worldbank.org/source/world-development-indicators">https://databank.worldbank.org/source/world-development-indicators</a>
Precipitation	Normalized rainfall in mm	<a href="https://gpm.nasa.gov/data">https://gpm.nasa.gov/data</a>
GINI	0 represents perfect equality, while an index of 100 implies perfect inequality	<a href="https://databank.worldbank.org/source/world-development-indicators">https://databank.worldbank.org/source/world-development-indicators</a>
Unemployment	Unemployment refers to the share of the labor force that is without work but available for and seeking employment	<a href="https://databank.worldbank.org/source/world-development-indicators">https://databank.worldbank.org/source/world-development-indicators</a>
Natural Resources rents	Total natural resources rents are the sum of oil rents, natural gas rents, coal rents (hard and soft), mineral rents, and forest rents	<a href="https://databank.worldbank.org/source/world-development-indicators">https://databank.worldbank.org/source/world-development-indicators</a>
GDP Per capita	GDP per capita, PPP (constant 2017 international \$)	<a href="https://databank.worldbank.org/source/world-development-indicators">https://databank.worldbank.org/source/world-development-indicators</a>
Remittances	Personal remittances, received (current US\$)	<a href="https://databank.worldbank.org/source/world-development-indicators">https://databank.worldbank.org/source/world-development-indicators</a>
Deaths	Number of deaths due to armed conflicts	<a href="https://acleddata.com/">https://acleddata.com/</a>
Institutional Quality	Control of Corruption, Government Effectiveness, Political Stability and Absence of Violence, Regulatory Quality, Rule of Law.	<a href="https://databank.worldbank.org/source/world-development-indicators">https://databank.worldbank.org/source/world-development-indicators</a>
FDI	Foreign direct investment, net inflows (% of GDP)	<a href="https://databank.worldbank.org/source/world-development-indicators">https://databank.worldbank.org/source/world-development-indicators</a>
Official Development Assistance	Net official development assistance and official aid received (current US)	<a href="https://databank.worldbank.org/source/world-development-indicators">https://databank.worldbank.org/source/world-development-indicators</a>
Population	Total population is based on the de facto definition of population, which counts all residents regardless of legal status or citizenship.	<a href="https://databank.worldbank.org/source/world-development-indicators">https://databank.worldbank.org/source/world-development-indicators</a>
Military Expenditure	Military spending in current \$	<a href="https://www.sipri.org/databases">https://www.sipri.org/databases</a>
Number of accounts Mobile Money	Number of active mobile money accounts	<a href="https://data.imf.org/?sk=e5dcab7e-a5ca-4892-a6ea-598b5463a34c">https://data.imf.org/?sk=e5dcab7e-a5ca-4892-a6ea-598b5463a34c</a>
Mobile cellular subscriptions	Mobile cellular subscriptions(per 100 people)	<a href="https://databank.worldbank.org/source/world-development-indicators">https://databank.worldbank.org/source/world-development-indicators</a>
Agriculture rents	Agriculture, forestry, and fishing, value added (% of GDP)	<a href="https://databank.worldbank.org/source/world-development-indicators">https://databank.worldbank.org/source/world-development-indicators</a>
Financial Development	Index	<a href="https://data.imf.org/?sk=e5dcab7e-a5ca-4892-a6ea-598b5463a34c">https://data.imf.org/?sk=e5dcab7e-a5ca-4892-a6ea-598b5463a34c</a>

FIGURE 5 – Local Projections Diff-in-Diff Pooled estimates



Source : Author

FIGURE 6 – Armed Conflicts Trend



Source : Author



TABLE 20 – Countries list

Afghanistan  
Angola Albania  
Argentina Armenia Azerbaijan Burundi  
Benin Burkina Faso Bangladesh Bulgaria  
Bolivia Brazil Botswana Central African Republic Chile China  
Ivoiry-Coast Cameroon Colombia Costa Rica Czech Republic  
Djibouti Dominican Republic Algeria Ecuador  
Egypt Ethiopia Fiji Gabon Georgia  
Ghana Guinea Guinea-Bissau  
Guatemala Guyana Honduras  
Haiti Hungary Indonesia India  
Iran Iraq Jamaica Jordan  
Kazakhstan Kenya Kyrgyzstan  
Cambodia Lao People’s Democratic Republic Lebanon Liberia  
Libyan Arab Jamahiriya Sri Lanka  
Lesotho Morocco Madagascar  
Mexico Mali Mongolia  
Mozambique Mauritania  
Mauritius Malawi Malaysia Namibia  
Niger Nigeria Nicaragua  
Nepal Oman Pakistan  
Panama Peru Philippines Papua  
New Guinea Poland Paraguay  
Romania Russian Federation  
Rwanda Saudi Arabia  
Senegal Sierra Leone Somalia  
Syrian Arab Republic Chad Togo  
Thailand Tajikistan Tunisia Turkey  
United Republic of Tanzania  
Uganda Ukraine Uruguay  
Uzbekistan Venezuela Vietnam  
Yemen South-Africa Zambia  
Zimbabwe

TABLE 21 – Type of Mobile Money

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	ln_Deaths	ln_Deaths	ln_Deaths	ln_Deaths	ln_Deaths	ln_Deaths	ln_Deaths	ln_Deaths
P2G2	-1.233*** (0.380)							
G2P2		-0.165* (0.374)						
Billpayment2			-1.751*** (0.426)					
P2TransferDomestic2				-2.325*** (0.415)				
AirtimeToUp2					-2.128*** (0.426)			
OtherBulkpayment2						-1.044** (0.430)		
MerchantPayment2							-1.602*** (0.406)	
Internationalremittances2								-1.328*** (0.377)
Constant	3.666*** (0.586)	3.666*** (0.586)	3.666*** (0.586)	3.666*** (0.586)	3.666*** (0.586)	3.666*** (0.586)	3.666*** (0.586)	3.666*** (0.586)
Observations	775	775	775	775	775	775	775	775
Fixed Effects	YES	YES	YES	YES	YES	YES	YES	YES
Main covariates	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1