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Ulrich Eydam
Florian Leupold

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University of Potsdam
August-Bebel-Straße 89, 14482 Potsdam
Tel.: +49 331 977-3225
Fax: +49 331 977-3210
E-Mail: dp-cepa@uni-potsdam.de

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Ulrich Eydam
University of Potsdam
Florian Leupold
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ABSTRACT

Military conflicts and wars affect a country's development in various dimensions. Rising inflation rates are a potentially important economic effect associated with conflict. High inflation can undermine investment, weigh on private consumption, and threaten macroeconomic stability. Furthermore, these effects are not necessarily restricted to the locality of the conflict, but can also spill over to other countries. Therefore, to understand how conflict affects the economy and to make a more comprehensive assessment of the costs of armed conflict, it is important to take inflationary effects into account. To disentangle the conflict-inflation-nexus and to quantify this relationship, we conduct a panel analysis for 175 countries over the period 1950–2019. To capture indirect inflationary effects, we construct a distance based spillover index. In general, the results of our analysis confirm a statistically significant positive direct association between conflicts and inflation rates. This finding is robust across various model specifications. Moreover, our results indicate that conflict induced inflation is not solely driven by increasing money supply. Furthermore, we document a statistically significant positive indirect association between conflicts and inflation rates in uninvolved countries.

Keywords: inflation, wars, military conflicts, spillover effects, dynamic panel estimation
JEL Codes: E00, E31, H56, F51

Corresponding author:
Ulrich Eydam
University of Potsdam
Faculty of Economics and Social Sciences
August-Bebel-Str. 89
14482 Potsdam, Germany
Email: ulrich.eydam@uni-potsdam.de

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1 Introduction

Military conflicts and wars can have a major impact on societies in several ways. One aspect is the potentially large impact of armed conflicts on a country's economic system. Clearly, understanding this impact is of strategic importance to policymakers and contributes to effective decision making. Because conflicts are recurring events, a clear understanding of the impact of conflicts is also important for understanding economic development as a whole. Consequently, the topic has been examined from various perspectives and several channels through which military conflicts and wars affect the economy have been identified. In this context, the present study focuses on conflict-related price dynamics, i.e. the relationship between military conflicts and inflation. The interest in the relationship between military conflicts and inflation dynamics is directly motivated by the welfare costs associated with inflation. As summarized by Lucas (2000), inflation appears to be associated with welfare costs. Even if these costs might appear relatively moderate, the economic costs of inflation episodes or hyperinflation are potentially much larger (cf. Fischer et al. (2002)). The costs of inflation are also reflected in the results of Barro (2013) and manifest itself in a non-negligible decline in long-term economic growth.

As summarized by Collier (1999), wars affect the economy through various channels. The potential destruction or flight of physical capital, human capital, and the reduction of the labour force are often accompanied by increased military spending and reduced infrastructure investments of governments. The empirical studies of Barro (1991) and Barro and Lee (1993) point towards an adverse overall effect of conflicts and political instability on economic growth. Only relatively few studies focus explicitly on the relationship between military conflicts and inflation. As laid out in a broad historical account by Hamilton (1977) the relationship between inflation and military conflicts has changed over time. While early episodes of armed conflicts in Europe did not accelerate price dynamics, modern conflicts, and in particular the First World War, were associated with significantly rising inflation rates. In a similar vein Rockoff (2015) provides a more detailed analysis on the relationship between wars and inflation for the United States. Both studies emphasize that the inflationary pressure from wars likely results from financing wars via money creation and excessive increases in government debt. Moreover, besides the direct inflationary effects of conflicts on the involved countries, conflicts can also have indirect economic effects on third countries. One example for this are the spillover effects of conflicts on economic growth of neighbouring countries documented by de Groot (2010). These indirect effects are determined by the intensity of economic interaction between uninvolved and involved countries. In the context of inflation spillover effects, these likely result from the disruption of international value chains and the reduced availability of natural resources in international markets. As of today, there exists no comprehensive empirical

study of the direct and indirect relationship between conflicts and inflation rates.

The present study contributes to the literature on the economic impact of conflicts and addresses this gap in the literature by providing a systematic empirical analysis of the conflict-inflation nexus. Using panel data for up to 175 countries over the period 1950–2019, we estimate the effects of military conflicts on inflation rates. In order to capture the indirect spillover effects of conflicts on inflation rates in uninvolved countries, we construct an *Armed Conflict Spillover Index* (ACSI) based on geographic distances to conflicts. The panel structure allows us to control for global events, country specific characteristics, and individual time trends in inflation rates. In addition, we control for various time-varying macroeconomic factors, including interest rate developments, institutional quality, and growth in monetary aggregates. Furthermore, we also use instrumental variable estimation via the General Method of Moments (GMM), a dynamic panel estimation procedure, to account for possible reversed causality between inflation and conflicts.

Across different model specifications, our results confirm a robust, statistically significant positive direct association between conflicts and inflation rates. According to our baseline specification, conflicts are associated with a 30 percent higher inflation rate on average. Interestingly, the relationship between conflict and inflation remains statistically significant at comparable magnitudes when we control for broad money growth. This suggests that conflict-induced inflation is not due to increases in the money supply alone. Moreover, our results also confirm a statistically significant association between conflicts and inflation rates in uninvolved countries. In the baseline specification, we find that, on average a one standard deviation increase in the ACSI is associated with a 20 percent increase in inflation rates. Overall, these results show that inflation is an important factor through which conflicts have an economic impact. Among other costs associated with military conflicts, these costs should therefore not be neglected. Furthermore, the results could serve as a quantitative benchmark for existing case studies on this topic and as a reference point for policymakers dealing with conflict-related price dynamics.

The remainder of this paper is structured as follows. The second section provides an overview on the literature about the economic effects of military conflicts with a specific focus on the relationship between conflicts and inflation. The third section explains the data used in the present study and presents the corresponding descriptive statistics. This is followed by a discussion of the empirical strategy and a systematic account of the estimation results. Lastly, the fourth section concludes.

2 Theory and Literature

Unfortunately, wars and conflicts are phenomena that have haunted mankind since ancient times and before until today. In addition to the means of warfare, which have changed over time (Neiberg, 2001), the reasons for wars and conflicts also differ throughout history. Ethnic and religious reasons (Jackson and Morelli, 2007), unequal balance of powers (Levy, 1998), lack of economic opportunities as well as inequality (Holtermann, 2012; Koubi and Böhmelt, 2014) are discussed in literature among other possible motivations for armed conflict. From an economic perspective, it seems reasonable to focus on the severity of conflicts, as all of these types of confrontations are expected to affect the economy and result in various economic consequences for the countries. The severity and intensity of a conflict can be determined by several factors such as the number of people and the amount of resources devoted to the military engagement, the size of the area affected by the conflict, and the number of battles or casualties resulting from the armed conflict (Lacina, 2006). The literature emphasizes the number of battle-related deaths as the most appropriate and accurate measure of conflict intensity (Lacina and Gleditsch, 2005). With the goal of providing the most comprehensive analysis possible, we adopt this rather broad definition of conflict, which relies on the number of battle-related fatalities to determine whether or not an armed conflict exists. Another distinction that is commonly applied is based on the Correlates of War database (Sarkees et al., 2003), which takes into account the spatial dimension, already used by Kende (1978) and the conflicting parties. Although this definition has been extended to comprise more recent military conflicts (Chojnacki, 2006), a classification based only on these factors is hardly possible (Valeriano and Vasquez, 2010). It remains for future research to test our results against a further differentiated notion of armed conflicts.[1]

In general, the economic impacts of conflict can be either direct or indirect, affecting the economy through a variety of channels. Because armed conflicts are ubiquitous phenomena, wide areas of social interaction are affected. Thompson (1993) documents that military conflicts accelerate mortality rates in affected countries and also affect other demographic factors such as marriage and birth rates. Furthermore, lower life expectancy, higher infant mortality, and impaired access to water are other consequences of armed conflict that adversely affect economies through their effects on the labor force (Gates et al., 2012). Other genuine economic factors are directly influenced by armed conflicts. Armed confrontations can lead to flight or destruction of physical capital and infrastructure (Collier, 1999). Furthermore, the development of the capital stock is directly linked to investment, which depends crucially on risk and uncertainty about potential returns. Hence, even if capital in a country is unaffected, investment may be redirected towards a less productive war economy (Koubi,

[1]The terms armed conflicts, armed confrontations and military conflicts are used interchangeably throughout this paper.

2005). Variables such as trade volume (Anderton and Carter, 2001), foreign direct investments (Hayakawa et al., 2013; Jensen, 2008), the efficiency of public expenditures (Isham et al., 1995) and economic growth (Barro, 1991) are also adversely affected. Although some studies emphasize the growth-enhancing potential of military conflict, Sambanis (2002) has documented a robust negative relationship in a meta-analysis. Despite the channels through which conflict can affect the economic system, the link between conflict and inflation has been largely neglected.

The relationship between conflicts and inflation mainly operates via two channels – through additional money creation to finance wars and armed conflicts (Melman, 1978) and via the disruption of value creation resulting from the destruction of existing goods, the withdrawal of consumption goods (Conybeare, 1990), and the destruction of supply chains leading to shortages of intermediate and final goods (Estrada and Koutronas, 2022). However, most of the existing evidence on the link between conflict and inflation comes from historical studies, most of which refer to inflationary episodes during World War II or before. The results of these studies are based on either qualitative or descriptive evidence.

One such historical study is by Hamilton (1977), who examines the Revolutionary War in the United States. He argues that printing paper money was the only practical solution to cover the expenses of military conflicts, but led to a significant increase in the price level. Likewise Rockoff (2015) reviews the history of the United States and assesses the relationship between armed conflict and inflation, but extends the analysis to modern conflicts. According to him, money creation, i.e., increasing the money supply, is mainly used in armed conflicts where opponents are perceived as powerful. Whether increasing the money supply is a socially beneficial strategy can be questioned (Carter et al., 2021). Financing warfare through taxes could be another strategy that does not stimulate price dynamics. However, it can lead to opposition among its own population, which undermines its use by governments (Kriner et al., 2018). The study of Ohanian (1997), which compares the Korean War and World War II in terms of inflation rates in both countries, points in this direction. He compares the two instruments of war financing and finds that taxation promotes price dynamics to a lesser extent than money creation. As argued by Broz (1998), central bank independence and a country's financial reputation on capital markets can further accelerate price dynamics (Bordo and White, 1991). As indicated above, rising military spending is not the only driver of inflation during conflict (Lin et al., 2012). Goods used to produce a particular product may not be available during wartime, either because of adjustment to the wartime economy or because of barriers to procurement (LaBelle and Santacreu, 2022). Constraints in firms' supply chains may therefore also lead to higher prices for final goods.

3 Empirical Analysis

3.1 Data

To empirically investigate the relationship between military conflict and inflation rates, we construct a panel data set covering up to 175 countries over the period 1950–2019. The underlying raw data have an annual frequency and stem from various sources. In the following analysis, we use the year-to-year changes in the consumer price index (CPI) obtained from the International Monetary Fund (IMF) as the main measure of inflation. The CPI is a broad measure of inflation that reflects price changes in a wide range of goods and is often used in empirical studies. Compared with other measures of inflation, CPI inflation has the best coverage, both in terms of the number of countries and the number of years. To account for periods of decreasing prices, e.g. deflation, we set inflation rates to zero and apply a log-transformation on CPI inflation that is commonly used in the finance literature (cf. Arcand et al. (2015)).[2] The number of observations and countries covered by the transformed variable is by definition equal to that of the level inflation rate.[3]

In order to capture the occurrence of military conflicts we rely on data from the Uppsala Conflict Data Program (UCDP) provided by Gleditsch et al. (2002) and Davies et al. (2022). We use the available information on conflicts between 1950–2019 to construct a dummy variable $conflict_{i,t}$ which takes on the value one if a country i is engaged in a military conflict in a given period t. Following the definition from UCDP, confrontations are classified as a military conflict if at least 25 battle related deaths occur within one year. In order to utilize all available information and take into account conflict specific characteristics, data from the Major Episodes of political violence and conflict regions project is used to construct a variable measuring the $intensity_{i,t}$ of armed conflicts (Marshall, 2019).[4] War intensity is the sum of interstate and societal major episodes of war. These categories are themselves sums of episodes of war that are measured on a ten-point scale. Here, a value of 1 constitutes sporadic or expressive political violence, usually associated with less than 2000 deaths, whereas 10 points are attributed to extermination and annihilation of societies (Marshall, 2019).

As a proxy to capture the indirect inflationary effects of conflicts, we follow the approach of de Groot (2010) and construct the *ACSI* variable that reflects the proximity of countries to ongoing conflicts. To this end, we use the distance data provided by Mayer and Zignago (2011). To construct

[2] A robustness check is conducted using the level inflation rate in the baseline panel specification. Results are reported in Appendix C.1. Further an inverse hyperbolic sine transformation is applied. The results are provided in Appendix C.2 and C.3.

[3] A detailed overview of the variables and data sources and more details on the precise transformation are provided in Appendix A.

[4] The variable $intensity_{i,t}$ is used as dependent variable in a robustness check reported in appendix C.4.

the index we compute the country-specific distance $\text{dist}_{i,j}$ between each country $i = 1,2,3,...$ and each conflict $j = 1,2,3,...,J$ divided by the largest distance of a country to each conflict $\max(\text{dist}_{i',j})$. We standardize the index between 0 and 1 by subtracting the ratio from 1. To account for cases of multiple simultaneous conflicts, we divide the index value by the number of conflicts within a period. Formally, the index is constructed as:

$$ACSI_{i,t} = \frac{1}{J}\sum_{j=1}^{J}\left(1 - \frac{\text{dist}_{i,j}}{\max(\text{dist}_{i',j})}\right). \tag{1}$$

Hence, we have $\text{ACSI}_{i,t} \in [0,1]$. By construction, the index value increases with proximity to conflicts. The underlying assumption is that conflicts that are geographically close to a country have a greater impact on its economy, i.e. are associated with stronger spillover effects. Clearly, the assumption that geographic proximity determines the spillover effects on inflation rates deserves additional explanations. According to the literature on international trade and gravity models (cf. Tinbergen (1962) or Wheeler (2005)), geographic distance is a major predictor for bilateral trade flows and overall economic interaction. Thus, the index captures the intensity of conflict induced distortions in trade flows between countries. Since these distortions reflect potential scarcities in terms of resources and intermediate goods, the index should be a viable proxy for economic spillovers of conflicts.

Furthermore, to isolate the inflationary effects of armed conflicts, we include several control variables in our analysis. To account for differences in inflation rates driven by different stages of economic development (López-Villavicencio and Mignon, 2011), we include the logarithm of real per capita GDP. We also include the growth rate of real GDP per capita to control for the effects of contemporaneous variations in economic performance. Both variables are based on the data from the Penn World Tables (PWT) as explained in Feenstra et al. (2015). Next, to capture possible effects of international trade on inflation rates, we include the trade share relative to GDP, as a measure for the trade openness of a country. The data is obtained from PWT as well.[5] As emphasized by Fama (1981), higher rates of inflation can reduce the return on capital, so we also include a measure of the real rate of return as a control variable.

Besides the macroeconomic control variables, we also include several measures that should help to identify the channels through which conflicts affect inflation dynamics. As discussed above, according to Hamilton (1977), conflicts are often accompanied by increases in military expenditures.

[5]To account for the fact that trade openness might not pick up the whole effect of armed conflicts on international trade, we use the Global Sanctions Data Base (Felbermayr et al., 2020) to construct the dummy variable $trade\ sanctions_{i,t}$ being 1 if a trade sanction in a given year was employed. The results where we include trade sanctions are presented in Appendix C.5.

To capture the effects of military spending, we include the ratio of military expenditures over GDP in our analysis. The data are taken from the Stockholm International Peace Research Institute (SIPRI). Furthermore, as argued by Rockoff (2015), military conflicts can be costly, and to finance the additional spending, governments frequently resort to money creation, i.e. an increase in the money supply. Hence, we use a measure of broad money growth to capture the inflationary effects of additional money creation during conflicts. The data is obtained from the World Development Indicators (WDI) provided by the World Bank. Related to increasing money creation, the government could also finance additional expenditures by issuing government bonds. Therefore, we also include a measure of central government debt, from the IMF, as a control variable.

Clearly, the way the government finances military spending and the associated potential inflationary effects are related to a country's overall institutional framework. Since the institutional quality and characteristics of the political system are often considered important macroeconomic determinants, we also include the Polity V score (Marshall and Gurr, 2020) into the regression equation, measuring whether a political system is democratic or autocratic on a continuous scale. The range of -10 to -6 points is ascribed to autocracies, while the range of 6 to 10 reflects democratic government systems. In the context of inflation rates, the design and conduct of monetary policy plays a crucial role. Specifically, as Brumm (2000) points out, the independence of the central bank from the general government appears to be an important determinant of inflation dynamics. To capture changes in the design and conduct of monetary policy, we employ the *Central Bank Independence Index* (CBI) constructed by Romelli (2022).

Table 1 presents the summary statistics for the variables used in the present analysis. The full data set comprises 175 countries with 4059 observations. The mean of the armed conflict dummy indicates that 13.6 percentage of 4059 observations are actually reporting armed conflicts. The distribution of the number of conflicts over time varies considerably. In particular, few conflicts are reported for the period from 1950 to 1970, partly due to lower data collection for these years. The ACSI variable builds up on the armed conflict dummy by construction and therefore reports the same number of observations and countries.

VARIABLES	(1) Mean	(2) Stand. Dev.	(3) Min	(4) Max	(5) N. of Obs.	(6) N. of Countries
Conflict Dummy	0.136	0.343	0	1	4,059	175
ACSI	0.589	0.141	0.144	0.809	4,059	175
War Intensity	0.501	1.443	0	10	2,585	143
Inflation Rate	13.35	88.77	-7.634	2,948	4,059	175
Log Inflation Rate	2.115	1.173	0	8.682	4,059	175
Log GDP	11.71	2.083	4.283	16.84	4,050	175
GDP Growth Rate	4.162	6.234	-60.84	49.28	4,045	175
Trade Openness	0.616	0.532	0.0329	6.882	4,050	175
Rate of Return	0.0999	0.0650	0.0100	0.624	3,523	135
Mili. Exp. Growth	0.0237	0.0220	0.0006	0.305	3,519	149
Broad Money Growth	20.94	100.2	-45.47	3,281	2,909	151
Government Debt	44.70	32.54	0.821	393.8	3,506	150
Polity V Index	6.050	5.638	-10	10	3,499	151
CBI	0.591	0.199	0.0985	0.929	2,930	145

Table 1: Summary statistics for dependent and independent variables.

War intensity takes on a maximum value of 60 and minimum value of 0 indicating no episode of conflicts. This variable is a sum of two other variables, which can be further differentiated into episodes of war, each ranging from 1-10. The requirements for evaluating a certain conflict with the maximum value of 10 are rather strict. This is reflected in the values of the war intensity measure, which range only from 0 to 10. Unfortunately, the broad data coverage of the armed conflict dummy or the ACSI cannot be maintained for this variable. Corresponding to the number of observations on armed conflicts, data on inflation rates are available for the entire sample. The highest value of 2948 percent dates from 1990 in Brazil and reflects a financial crisis. There are several episodes of exceptionally high inflation rates or even hyperinflation. According to the standard definition of Cagan (1956), a price increase of 50 percent per month constitutes a hyperinflation. Fischer et al. (2002) further distinguish episodes of very high price increases using the common boundary of 100 percent of the twelve-month inflation, although he does not call them hyperinflation.[6] Despite of

[6]In order to address the potentially confounding effects of outliers, we carry out a robustness exercise, where we remove countries with very high inflation rates, which exceed the threshold of 100 percent on the twelve-month basis according to Fischer et al. (2002). The results are reported in Appendix C.6 and show no qualitative differences compared to the results of the main specification.

these outliers, the number of extreme points in the data set is small and includes 9 observations with inflation rates above 1000 percent per year. Considering the first set of explanatory variables which are used for the baseline regression, the data coverage for log GDP as well as for trade openness is extensive. The remaining variables are used as further regressors as part of a robustness check, as they could make a significant contribution to the regression. Similar to the high inflation rates, exceptionally high growth rates of broad money are reported, again reflecting the challenging financial situation of Brazil around 1990.

Before turning to the empirical model, it is worthwhile to take a more detailed look at the unconditional relationship between conflicts and inflation. Figure 1 provides two perspectives on the relationship between the inflation rate and the number of conflicts or conflict periods.

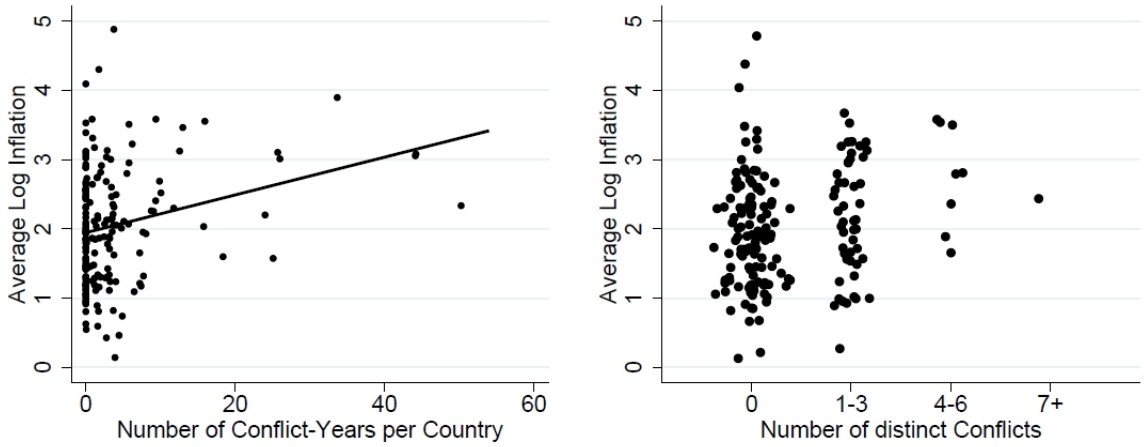

Figure 1: Scatter plot of the sample averages for the number of conflict periods by country and the average log inflation rate.

The left panel shows the unconditional linear relationship between the average inflation rate and the number of years of armed conflict for all countries.[7] It can be observed that countries with a relatively large number of conflict years have a higher average inflation rate compared to countries with fewer years of conflicts. By fitting a linear relationship, this positive correlation between the number of conflict years and average inflation is directly apparent. While countries with more than ten years of conflict show mainly high average inflation rates, the range of inflation for countries that have been engaged in conflict for ten or fewer years during the sample period is very volatile and includes not only high but also low average inflation rates. Consistent with this observation, countries that have been involved in conflict for 30 years or more report only relatively high inflation rates.

[7]A plot showing the spatial distribution of the number of years at conflict is provided in Appendix B.

The countries with the most years of armed conflicts are India with 54 years, Colombia with 48 years, and Israel with 45 years. In total, from the 554 observations of conflicts in the sample, approximately 26% can be attributed to India, Colombia, and Israel. It is important to note that the number of years of conflict does not necessarily correspond to a high number of different confrontations. This is relevant for the underlying results, as the impact of an armed conflict in the first year on the price level might be different from the impact of a 20-year lasting conflict. The right panel shows the average inflation rate and the number of distinct conflicts by country. It confirms the impression that emerges from the left panel. Countries that were engaged in more distinct conflicts between 1950–2019 have a higher average inflation rate than countries that were engaged in fewer conflicts. Within the sample, the total number of distinct armed conflicts amounts to 112. Again, India is the country with the highest number, with 13 different armed conflicts. Interestingly, Colombia, the country with the second most years of conflict, was only engaged in one specific conflict, reflecting the long duration of the inner tension between the government and the revolutionary armed forces of the FARC-EP. This underscores the importance of distinguishing between the number of years of conflict and the number of individual conflicts.

One aspect that is not taken into account when looking at average values of inflation rates are potential time trends. A time trend could correspond to a higher or lower number of armed conflicts in the world and therefore be the reason for the correlation. In this case, causal inference would not be possible. To understand whether inflation rates exhibit time trends, Figure 2 explores the relation of average inflation and the number of countries engaging in armed conflicts from 1960 to 2019.

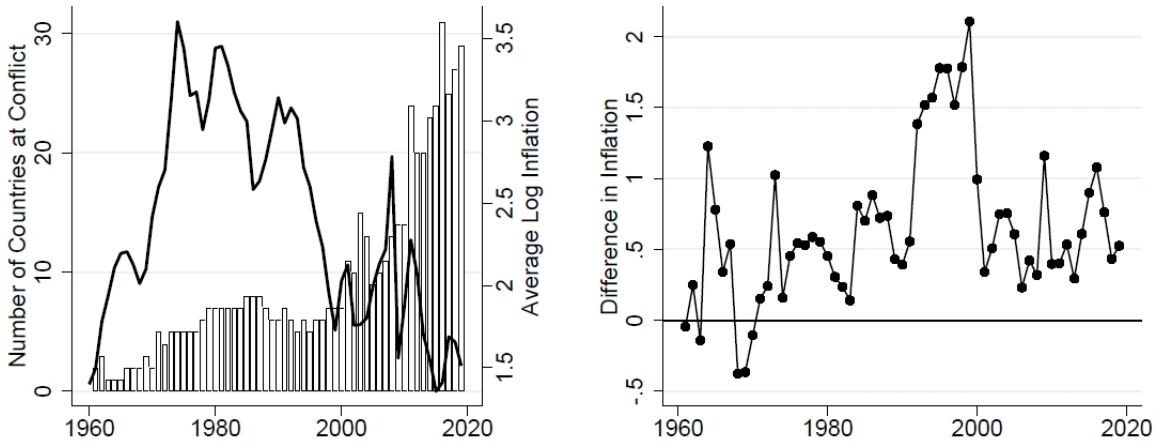

Figure 2: Relation of number of armed conflicts and average inflation rate through time.

The left panel shows the number of countries engaging in armed conflicts in a given year (bars) and the average annual inflation rate over all countries. In the period from 1960–2000, fewer than 10 countries are engaged in armed conflicts. In 2016, the number peaks at 32 countries. This does not reflect a period of peace across the world, but rather a partial lack of data and less data collection in these earlier years. The average inflation rate has been rising sharply since 1960, peaking in 1974, followed by a second peak in the 1980s. These fluctuations may reflect disruptions in oil supply that led to the two oil crises of 1973 and 1980 (Baumeister and Kilian, 2016). In the period following these crises, the inflation rate declines, reaches another peak around 1990 and then declines again. The peak in 2008 might reflect high energy prices in 2007-08 (Hamilton, 2009). However, the general development since 1974 is pointing towards lower inflation rates in recent years following a certain time trend.

The presence of time trends in consumer price developments is also confirmed by the right panel of Figure 2. It illustrates the difference in average inflation rates between countries engaging in armed conflicts and countries without a confrontation. A value above the threshold at 0 therefore implies higher inflation rates in countries with conflicts. The graph shows values above the threshold, except for 5 years at the beginning of the interval. Together with Figure 1, this indicates a positive relationship between inflation rates and armed conflicts. Moreover, these figures suggest the relevance of time trends. To avoid the reliance on potential confounding factors it is important to take these trends into account. The next section describes the empirical strategy used to uncover this relation while taking into account country- and time-specific effects.

3.2 Estimation

The descriptive statistics clearly hint towards a positive association between inflation rates and armed conflicts. However, given all the potential confounders discussed above, the figures presented are likely to be biased, and the observed statistically significant relationship between inflation and armed conflict may be a spurious one. Hence, to obtain more accurate and robust estimates of the association between the two, we proceed with a multivariate panel analysis.

3.2.1 Baseline Panel Estimation

Inflation dynamics depend on many factors that are often not directly observable. Thus, in the present context the main obstacle to a robust identification of the effect of conflicts on inflation rates is omitted variable bias. To isolate the direct and indirect effects of armed conflicts, we include an armed conflict dummy and a conflict spillover index in the empirical model. To tackle the problem of

omitted variable bias, we conduct multiple panel regressions where we include a broad set of control variables. Furthermore, the panel structure allows us to employ country- and time-fixed-effects, to control for time-invariant country characteristics and common effects of global events, such as the number of distinct armed conflicts in a given year.[8] Besides, we account for country-specific time-trends. Another potential problem could be the presence of reversed causality between inflation and conflicts. Thus, in addition to our benchmark analysis, we also estimate a dynamic panel model with lagged depended variable via difference GMM using instrumental variable estimation. Formally, our benchmark model translates into following estimation equation:

$$\pi_{i,t} = \alpha_0 + \alpha_1 Conflict_{i,t} + \alpha_2 ACSI_{i,t} + \mathbf{X}_{i,t}\beta + \gamma_{i,t} + \mu_i + \delta_t + \varepsilon_{i,t} \tag{2}$$

where $\pi_{i,t}$ denotes the logarithm of the inflation rate, $\text{conflict}_{i,t}$ denotes the conflict indicator, $\text{ACSI}_{i,t}$ denotes the armed conflict spillovers, $X_{i,t}$ denotes the matrix of control variables, $\gamma_{i,t}$ denotes country-specific time-trends, δ_t denotes time dummies, η_i denotes country dummies, and $\varepsilon_{i,t}$ represents the idiosyncratic errors. In the main specification, the matrix of control variables includes the logarithm of real GDP, the growth rate of GDP, and the degree of trade openness. The specification is further extended by a second set of explanatory variables, including central bank independence, the internal rate of return, military expenditure growth, broad money growth, government debt, and the Polity V index.

As can be inferred from Table 1 many important control variables are not available for all countries over the entire sample period. Thus, we begin with the estimation of a parsimonious baseline specification based on the largest available number of observations. In this baseline model, we only include frequently employed macroeconomic control variables that are available for the full sample. In particular, in the baseline specification, we include the logarithm of real GDP, the growth rate of GDP, and the degree of trade openness as control variables. In addition, we include country- and year-fixed-effects, as well as the interaction term that captures country specific time trends. Hence, this baseline specification provides a first idea of the conditional relationship between conflicts and inflation and serves as a transparent reference point to interpret the results of the subsequent estimations.

[8]The choice of a fixed-effects model instead of a random effects model is based on the results of a Hausman test.

VARIABLES	(1) Inflation	(2) Inflation	(3) Inflation	(4) Inflation	(5) Inflation	(6) Inflation
Conflict Dummy	0.254***		0.296***	0.299***	0.265***	0.265***
	(0.0914)		(0.0974)	(0.0991)	(0.0960)	(0.0960)
ACSI		0.677	1.456*	1.431*	1.368*	1.367*
		(0.801)	(0.797)	(0.790)	(0.798)	(0.797)
Log GDP				0.446*	0.626**	0.624**
				(0.251)	(0.265)	(0.283)
GDP Growth Rate					-0.0230***	-0.0230***
					(0.0039)	(0.0039)
Trade Openness						-0.0081
						(0.121)
Constant	4.147***	3.636***	3.158***	-0.108	-0.0745	-0.0575
	(0.767)	(0.900)	(0.858)	(2.122)	(2.255)	(2.349)
Observations	4,059	4,059	4,059	4,050	4,045	4,045
R-squared	0.724	0.722	0.724	0.725	0.733	0.733
N. of Countries	175	175	175	175	175	175
Standard Errors	Clustered	Clustered	Clustered	Clustered	Clustered	Clustered
Fixed Effects	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Country Trends	YES	YES	YES	YES	YES	YES

Cluster-robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2: Panel and GLS regression with log inflation rate as dependent variable. The conflict dummy and index are used as main explanatory variables for determining the direct and indirect effect of armed conflicts.

Table 2 shows the estimation results for the baseline specification. Column (1) and (2) show the results when we only include the conflict dummy or the ACSI, respectively. The model presented in column (3) comprises both variables, the conflict dummy and the ACSI. Overall, the estimated coefficient of the conflict dummy is positive and statistically significant at the 1% level. Throughout all specifications, the point estimate remains statistically significant at this level, varying in magnitude between 0.25 and 0.3. Although the coefficient estimate on the ACSI is positive as well, it is not statistically significant, when viewed in isolation. However, as can be inferred from column (3), if we control for the direct effects of conflicts, the magnitude of the estimated coefficient increases to around 1.4 and the association between the ACSI and inflation rates becomes statistically significant at the 10% level throughout all further regression specifications. At a first glance, these findings

support the idea that conflicts are directly and indirectly associated with inflation dynamics.

In column (4)–(6), we successively include the other control variables into the model. As explained by Anderton and Carter (2001) and Sevastianova (2009) the level of GDP and GDP growth should be related to observed inflation rates. The results presented in column (4) show that there is a positive and statistically significant association between real GDP and inflation rates at the 10% level. Furthermore, the inclusion of real GDP does not alter the statistical significance of the coefficients for the conflict variables. From column (5) it can be inferred that there is a negative association between GDP growth and inflation rates. The estimated coefficient is statistically significant at the 1% level. Lastly, column (6) shows the estimation results for the full baseline specification, including trade openness as additional control variable. Here, we do not observe a statistically significant association between the degree of trade openness and inflation rates. Furthermore, the results presented in column (6) confirm that there is a statistically significant direct and indirect association between conflicts and inflation rates when controlling for standard macroeconomic factors.

To put our baseline results regarding the association between conflicts and inflation rates into perspective, its is helpful to carefully quantify the size of the estimated coefficients. To this end, we focus on the full baseline specification presented in column (6), where we observe an estimated coefficient of 0.26 on the armed conflict dummy. This implies that, on average, engaging in a military conflict is associated with an increase in inflation of about 30%. Given the average inflation rate of 13.35 over the sample period, this amounts to an average increase in the inflation rate of around 4 percentage points. As seen in figure 2, the average inflation rate has substantially declined since the 1980s. Thus, taking the average inflation rate of 4.26% in 2015 as a reference point, engaging in an armed conflict would on average lead to an increase in the inflation rate of 1.29 percentage points. For comparison, the highest inflation rate of 121% reported by Venezuela in 2015, would imply an increase by around 37 percentage points. Furthermore, column (6) reports a coefficient estimate of 1.36 for the ACSI. This implies that a one standard deviation increase in the ACSI is on average associated with an increase in inflation rates of around 21%. Again, taking the average in 2015 as a reference point, this corresponds to an increase in inflation rates of around 0.9 percentage points. Overall, these figures show that the direct and indirect relationship between conflicts and inflation rates is not only statistically significant, but also of an economically relevant magnitude.

VARIABLES	(1) Inflation	(2) Inflation	(3) Inflation	(4) Inflation	(5) Inflation	(6) Inflation	(7) Inflation
Conflict Dummy	0.372***	0.247**	0.298***	0.284***	0.230**	0.274***	0.360***
	(0.111)	(0.107)	(0.0904)	(0.103)	(0.111)	(0.0902)	(0.115)
ACSI	2.693**	1.635**	1.593*	2.222**	1.306	1.700**	2.937**
	(1.053)	(0.794)	(0.861)	(1.038)	(0.826)	(0.787)	(1.123)
CBI	0.730						-0.428
	(0.493)						(0.606)
Rate of Return		-4.020**					-6.738***
		(1.571)					(1.976)
Mili. Exp. Share			-7.332**				-15.44**
			(3.572)				(6.701)
Broad Money Growth				0.0019***			0.0016***
				(0.0004)			(0.0002)
Government Debt					0.0004		0.0012
					(0.0021)		(0.0028)
Polity V Index						0.0368**	0.0077
						(0.0152)	(0.0129)
Constant	184.4***	269.8***	211.1***	67.82**	164.3***	173.6***	157.6**
	(37.55)	(58.64)	(30.49)	(33.68)	(32.41)	(35.81)	(68.88)
Observations	2,930	3,518	3,516	2,909	3,504	3,495	1,539
R-squared	0.774	0.735	0.740	0.751	0.740	0.739	0.801
N. of Countries	145	135	149	151	150	151	79
Standard Errors	Clustered	Clustered	Clustered	Clustered	Clustered	Clustered	Clustered
Fixed Effects	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES
Country Trends	YES	YES	YES	YES	YES	YES	YES

Cluster-robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 3: Panel regression with log inflation rate as dependent variable and additional explanatory variables. The conflict dummy and index are used as main explanatory variables for determining the direct and indirect effect of armed conflicts.

Of course, the results are influenced by the specific set of explanatory variables. To limit the relevance of the selected variables, we add other potentially important covariates. As discussed above, the conduct of monetary policy and military spending are potentially important drivers of the relationship between conflicts and inflation. Furthermore, to a large extent inflation dynamics depend on a country's institutional framework (Aisen and Veiga, 2006). One particularly important characteristics of institutional quality in this regards is the independence of central banks (Hielscher and Markwardt, 2012). Constraining the use of monetary policy by political authorities through the introduction of independent central banks reduces price volatility and increases price stability (Aisen and Veiga, 2008). Moreover, in the current context, the quality of the institutional framework could

also play a role in the occurrence of armed conflicts. Well-developed political institutions can defuse political conflicts and potentially help prevent intra- and interstate conflicts. Finally, the quality of institutions is also a crucial factor in overall economic development (Acemoglu et al., 2001). To control for these confounding factors and to shed light on the channels, through which conflicts affect inflation, we extend the baseline specification as reported in column (6) of Table 2.[9] For reasons of transparency, we successively add the additional variables to the model. The results of the extended model estimation are presented in Table 3.

The inclusion of additional explanatory variables supports the idea that conflict is directly and indirectly associated with inflation rates. The conflict dummy measuring the direct effect remains positive and statistically significant at the 1% level throughout all specifications with the only exception in column (2) and column (5), where the internal rate of return and government debt are included as additional control variables, respectively. The coefficient estimates vary between 0.23–0.37, indicating that the inclusion of explanatory variables is relevant for the size of the association. Similarly, the point estimates of the ACSI, vary between 1.3–2.9 across the different specifications. The positive association between the ACSI and inflation is statistically significant at the 5% level in all specifications expect in column (3), where military expenditure growth is included, and in column (5), where government debt is added as a control variable. In column (1), the central bank independence index extends the regression specification. However, the estimated coefficient on the CBI is not statistically significant. This finding is inline with the studies of Temple (1998) and Brumm (2000). The results in column (2) show a negative and statistically significant association between the internal rate of return and inflation. This adds to model based approaches, arguing that inflation will lead to lower returns to capital (Gillman et al., 2004). Interestingly, the results presented in column (3) suggest a statistically significant negative association between military expenditure growth and inflation rates. From columns (4), it can be inferred that broad money growth has a positive and statistically significant association with inflation at the 1% level. This finding is in line with the reasoning of the existing literature, arguing that excessive money creation is one, or even the most important driver of inflation during conflicts. The finding generally supports the classical quantity theory of money, i.e. higher growth in aggregate money supply is ceteris paribus associated with higher average inflation rates. Moreover, since the inclusion of broad money growth has only a minor impact on the magnitude and statistical significance of the estimated conflict coefficient, this result implies that the inflationary impact of conflict cannot be attributed solely to the growth of monetary aggregates. Thus, the real economic effects of conflicts directly matter for inflation dynamics. Although government debt is not statistically significant as additional control variable

[9] Clearly, it would be preferable to directly include the additional variables into the main specification. However, due to limitations in data availability for these variables, this would come at the costs of a non-negligible reduction in sample size.

in column (5), it considerably reduces the magnitude of the point estimate of the conflict dummy. The results in column (6) show that the Polity V index has a positive and statistically significant association with inflation rates. The estimated coefficient is significant at the 5% level. As discussed above, the coefficient should be interpreted with caution due to the potential link between institutional quality and conflicts. However, the results show that the relationship between conflict and inflation rates remains unchanged when controlling for the effects of institutional quality.

Lastly, column (7) provides the results for the regression comprising the broadest set of explanatory variables.[10] For the armed conflict dummy, we observe a coefficient estimate of 0.36, which implies that engaging in a conflict is associated with an increase in the inflation rate of roughly 43% on average. Again, taking the average inflation rate of 4.26% in 2015 as a reference point, this would imply an increase in average inflation of roughly 1.85 percentage points. For the indirect effect, captured by the ACSI, we observe a coefficient of around 2.9. This implies that a one standard deviation increase in the ACSI translates into an increase of inflation rates of about 51%. Both direct involvement in armed conflicts and the indirect inflationary effects of conflicts are therefore important explanatory variables that should be taken into account to understand inflation dynamics.[11] Although the results presented in Table 3 are based on a much broader set of control variables, there is still the valid concern about reversed causality.

3.2.2 Dynamic Panel Estimation

In the present context, the problem of reverse causality might arise in situations where high inflation rates lead to military conflict. As Hendrix and Haggard (2015) and Smith (2014) argue, high inflation rates can lead to social unrest that eventually culminates in armed conflict. Both studies focus on food price inflation in Asia and Africa and document a statistically significant relationship towards conflicts. In contrast, Bertocchi and Guerzoni (2012) find no statistical association between inflation and a state fragility index. Still, according to the definition of conflicts used in this paper, social unrest potentially translates into an armed conflict, conditional on the number of battle related deaths. Hence, we cannot exclude the presence of reversed causality.

In the absence of external instruments the common way to address the potential problem of reversed causality is to employ lagged values as internal instruments. However, using the basic regression specification with an additional lagged dependent variable leads to dynamic panel bias

[10] Note that due to the inclusion of the additional control variables, the results in column (7) are based on an estimation for 79 countries with 1539 observations.

[11] The armed conflict dummy includes any conflict with at least 25 battle-related fatalities. Following the UCDP definition, a war is defined as a conflict with 1000 or more battle-related fatalities. Appendix C.7 contains the full panel specification using a war dummy to measure the direct impact of wars on the inflation rate. The point estimates are statistically significant and larger than the point estimates for the armed conflict dummy.

(Nickell, 1981). Because of the correlation between the lagged error term and the lagged dependent variable, this leads to upwardly biased coefficient estimates (Blundell and Bond, 1998). To avoid dynamic panel bias, we use a GMM and instrumental variable estimation, which is widely applied in macroeconomic research (Hayakawa et al., 2019). Specifically, we follow Arellano and Bond (1991) and use lagged values of the dependent variable as internal instruments for the model rewritten in first differences.[12] Since the model is estimated on differenced data, it is not necessary to explicitly control for time-invariant country specific effects, as individual effects are removed. Formally, our dynamic model translates into following estimation equation:

$$\Delta\pi_{i,t} = \alpha_1\Delta\pi_{i,t-1} + \alpha_2\Delta Conflict_{i,t} + \alpha_3\Delta ACSI_{i,t} + \Delta\mathbf{x}'_{i,t}\beta + \Delta\gamma_{i,t} + \Delta\delta_t + \Delta\varepsilon_{i,t} \tag{3}$$

where Δ denotes the difference between year t and year $t-1$.

To assess the validity of the GMM specification, we conduct various tests. One important aspect here is the choice of the set of internal instruments. Using all available lags as instruments will increase the number of instruments considerably, as the sample of countries contains up to 68 observations. According to Roodman (2009) too many instruments potentially cause instrument proliferation expressed by the p-value of the Hansen-Test that takes a value of 1. We therefore use instruments lagged up to 17 periods. In this way, a robust Hansen-Test is obtained, which reduces the problem of instrument proliferation and supports the validity of the dynamic panel model. Furthermore, we apply the Arellano-Bond test for first and second order autocorrelation. As expected, the test statistics indicate the presence of first-order autocorrelation. More importantly, the null-hypothesis for second-order autocorrelation cannot be rejected, that is that no second-order autocorrelation is present (Arellano and Bond, 1991). Consequently, second lagged variables can be used as internal instruments. Summarizing, the Hansen-Test as well as the first-order and second-order autocorrelation indicate a valid dynamic panel model.

[12] We use the usual procedure and estimate a fixed effects model and a pooled OLS model. The results suggest that a difference GMM model rather than a system GMM model should be used. However, the results are robust for both estimation methods.

VARIABLES	(1) Inflation	(2) Inflation	(3) Inflation	(4) Inflation	(5) Inflation	(6) Inflation	(7) Inflation
Lagged Inflation Rate	0.675***	0.718***	0.717***	0.625***	0.720***	0.727***	0.610***
	(0.048)	(0.043)	(0.045)	(0.048)	(0.053)	(0.090)	(0.056)
Conflict Dummy	0.115*	0.122*	0.143**	0.150**	0.138**	0.147**	0.163**
	(0.064)	(0.064)	(0.061)	(0.071)	(0.064)	(0.070)	(0.071)
ACSI	1.706***	1.715***	1.601***	1.712***	1.664***	1.574***	1.559***
	(0.497)	(0.524)	(0.593)	(0.542)	(0.515)	(0.571)	(0.568)
CBI	-0.082						-0.214
	(0.124)						(0.208)
Rate of Return		0.609					-0.516
		(0.674)					(0.817)
Mili. Exp. Share			-4.641*				-6.583**
			(2.484)				(3.097)
Broad Money Growth				0.001***			0.001***
				(0.000)			(0.000)
Government Debt					-0.001		0.000
					(0.001)		(0.001)
Polity V Index						0.001	-0.003
						(0.004)	(0.007)
Observations	2,677	2,361	2,213	1,520	2,049	1,409	1,409
Number of countries	143	111	105	86	97	78	78
Standard Errors	Robust	Robust	Robust	Robust	Robust	Robust	Robust
Year FE	YES	YES	YES	YES	YES	YES	YES
AR(1) p-value	0	0	0	0	0	0	0
AR(2) p-value	0.378	0.322	0.265	0.735	0.750	0.163	0.605
Hansen p-value	0.216	0.0897	0.191	0.498	0.155	0.637	0.865

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 4: Difference GMM estimation with the full set of explanatory variables including lagged inflation. Robustness checks include reported p-values of the first and second order autocorrelated error term and the Hansen test for instrument validity.

Table 4 reports the results for the full regression specification using lagged inflation rate as additional explanatory variable.[13] All regressions use robust standard errors and a collapsed instrument matrix. By restricting the number of lags of the internal instruments, it is possible to construct a valid dynamic panel model, as shown by the Hansen test p-values in all regression specifications. As expected, lagged inflation is an important predictor of current inflation, which is statistically significant at the 1% level in all specifications. Analogous to the full specification presented above, we include all control variables of the base specification and successively add additional explanatory

[13]The results of the baseline specification using the difference GMM estimation is provided in Appendix C.8.

variables to the model. Column (1) provides the results for the dynamic model including the binary conflict dummy, the armed conflict spillover variable, and the CBI, as well as the full set of covariates used in Table 2. As can be inferred, the CBI is not statistically significant. The estimated coefficient on the conflict dummy has a smaller magnitude, compared to the previous models, but remains statistically significant at the 10% level. The estimated coefficient on the ACSI also shows a smaller magnitude, but it remains statistically significant at the 1% level. A similar pattern can be observed in column (2), where the real rate of return is added as additional explanatory variable. In column (3), the share of military spending is included in the model. As before, a negative relationship can be observed between military spending and inflation rates, and the estimated coefficient is statistically significant at the 10% level. In contrast to the previous results, we note that the size of the armed conflict dummy increases slightly and the coefficient is now statistically significant at the 5% level.

The results shown in column (4) are based on a model that includes broad money growth. Consistent with the results of the baseline regression and theoretical considerations, broad money growth has a positive association with the inflation rate. Furthermore, the estimated coefficient on money growth is statistically significant at the 1% level. Again, the estimated coefficients on the conflict dummy and the ACSI remain stable in magnitude and statistically significant. In column (5) government debt is added to the model. This does not affect the relationship between the conflict indicators and inflation rates. As before, the estimated coefficient on government debt is not statistically significant. The results presented in column (6) refer to a model where the Polity V score is included as an indicator of institutional quality. In contrast to the fixed-effects model, no statistically significant correlation between the Polity V score and inflation rates can be found in the dynamic model. The results regarding the conflict indicators remain largely unaffected by the inclusion of the Polity V score. Lastly, column (7) reports the results for the dynamic model including all explanatory variables. Compared to the previous results, the magnitude of the estimated coefficients for the conflict dummy and the ACSI has decreased, but both indicators are statistically significant at the 5% and 1% level, respectively.

In summary, the dynamic model specification confirms the results of the basic panel data regression. The conflict dummy has a positive and statistically significant relationship with inflation rates. Although the point estimate decreases slightly compared to the baseline regression, it remains significant for all dynamic model specifications, including the full set of explanatory variables. The point estimate of the ACSI decreases by adding additional regressors and remains statistically significant throughout all specifications of the difference GMM estimation. As laid out, the dynamic panel model using instrumental variable estimation has the advantage that we can account for potential reversed causality. Thus, the finding that results of the static panel model remain qualitatively unchanged is evidence of a direct and indirect causal effect of conflict on inflation.

4 Conclusion

During the period 1950–2019, armed conflicts occurred repeatedly almost everywhere in the world. It is clear that armed conflicts affect societies in a variety of ways. The economic impact is an important aspect that has been studied in numerous works. However, to date, the relationship between military conflict and inflation has mostly been examined from a historical perspective in various case studies. To complement these studies and the existing literature on the general impact of armed conflicts on the economic system, this study provides a systematic empirical analysis of the relationship between conflicts and inflation. Moreover, economies around the world are interdependent and can be affected by conflict-related disputes. Therefore, we not only focus on the direct effects of conflict on inflation rates in the affected countries, but also examine spillover effects of conflict on inflation rates in other countries. Given the negative impact of inflation, and in particular episodes of high inflation, on economic conditions and long-term development, our results are not only relevant from an academic perspective, but could also help policymakers make informed decisions.

We conduct a panel analysis for up to 175 countries during 1950–2019, using comprehensive data on military conflicts and inflation rates. To estimate the isolated effects of armed conflicts on inflation, we control for the effects of important macroeconomic factors, as well as country specific characteristics, common global events, and individual time-trends. Overall, the results of our main specification confirm a statistically significant positive association between military conflicts and inflation rates. According to our baseline estimates, countries directly involved experience on average a 30 percent higher rate of inflation. Besides direct participation, the indirect effect shows how price dynamics are transmitted to countries not engaging in armed conflicts. On average a one standard deviation increase in the ACSI is associated with a 21 percent increase in the inflation rate. These findings are robust across several model specifications. In accordance with previous studies of the topic, we find that expansions in money supply have a statistically significant positive association with inflation rates. Nevertheless, our results suggest that the inflationary effects of conflicts cannot solely be attributed to these changes in money supply. This finding highlights that there are additional conflict-related real economic effects, which lead to increasing inflation in times of conflicts.

Overall, our results clearly indicate that conflict is closely linked to inflation, either through direct effects on the countries involved or through indirect effects on other countries. Thus, policymakers should be aware of this link and take it into consideration, when conducting monetary policy or implementing stabilization measures in response to ongoing conflicts. Given the nature of the present analysis, however, it is important to emphasize that our results reflect the average inflationary impact of conflict. Thus, our results provide a benchmark for previous studies, but ignore the fact that each conflict may have very specific characteristics. Moreover, because we focus on the average impact

of conflict on inflation rates, we largely ignore potentially important aspects of this relationship. First, as highlighted in the existing literature, the specific nature of the conflict could matter for the intensity of the relationship between conflict and inflation. Distinguishing conflicts could add to the extensive literature on interstate conflict that has recently been highlighted. In addition to using a dummy variable to shed light on the impact of armed conflict on inflation, it might also be fruitful to use other measures of conflict. Second, the inflationary effects of conflict may vary over time and are likely to diminish over time. These are at least two important aspects that should be considered and that we envisage for future research.

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A Data Details

Variable	Description	Source
Inflation Rate	Deflationary periods are set to 0 and a log transformation of the increase of the Consumer Price Index is applied: $ln(inflation_{i,t}) = ln(inflation_{i,t} + \sqrt{((inflation_{i,t})^2 + 1)}$	International Monetary Fund
Conflict Indicator	Dummy Variable being 1 if the number of battle related deaths within a year is exceeding 25 (= conflict) and 0 otherwise	Uppsala Conflict Data Program
Armed Conflict Spillover	$ACSI_{i,t} = \frac{1}{J}\sum_{j=1}^{J}\left(1 - \frac{\text{dist}_{i,j}}{\max(\text{dist}_{i',j})}\right)$	Uppsala Conflict Data Program
Political System	Continuous scale in the range of -10 to 10 Extreme points being -10 = autocracy and 10 = democracy	Polity V Data Set
Mili. Exp. Share	Military expenditures as share of GDP	SIPRI
Broad Money Growth	Annual growth rate of broad money aggregate	World Development Indicators
Government Debt	Central government debt as share of GDP	International Monetary Fund
War Intensity	Magnitude of episodes of warfare as sum of international violence, international warfare, civil violence, civil warfare, ethnic violence and ethnic warfare each ranging from 0, no episode of political violence of war, to 10, the highest intensity	Major Episodes of War Data
Trade Sanctions	Dummy variable indicating whether trade sanctions, dummy variable = 1 if trade sanction and 0 otherwise have been enacted	Global Sanctions Database
Log GDP	Log of output-side real GDP at chained PPPs (in mil. 2017US$)	PWT 10.0
GDP Growth Rate	Annual growth rate of output-side real GDP at chained PPPs (in mil. 2017US$)	PWT 10.0
Trade Openness	Sum of Exports measured as share of merchandise exports at current PPPs of expenditure-side real GDP at chained PPPs (in mil. 2017US$) and Imports measured as share of merchandise imports at current PPPs of expenditure-side real GDP at chained PPPs(in mil. 2017US$) over expenditure-side real GDP at chained PPPs (in mil. 2017US$)	PWT 10.0
Rate of Return	Real internal rate of return measured as income flowing to capital as nominal GDP minus labor income and natural resource rents	PWT 10.0
Real TFP	Total factor productivity at constant national prices (2017 = 1)	PWT 10.0
CBI	Central bank independence index measured by a continuous scale between 0 and 1	Romelli (2022)

Table A.1: Variables and data sources.

B Spatial Distribution of Armed Conflicts

Figure B.1 can be used to illustrate the number of years a country is at conflict. In general countries such as India, the United States and Russia report high numbers of armed conflict years. Countries engaging in comparably few armed conflicts but with a long duration are Colombia, Turkey and Indonesia. Europe and Australia remain continents with low duration of conflict. Contrary, parts of Asia and Africa are afflicted by a comparably high number of conflict years.

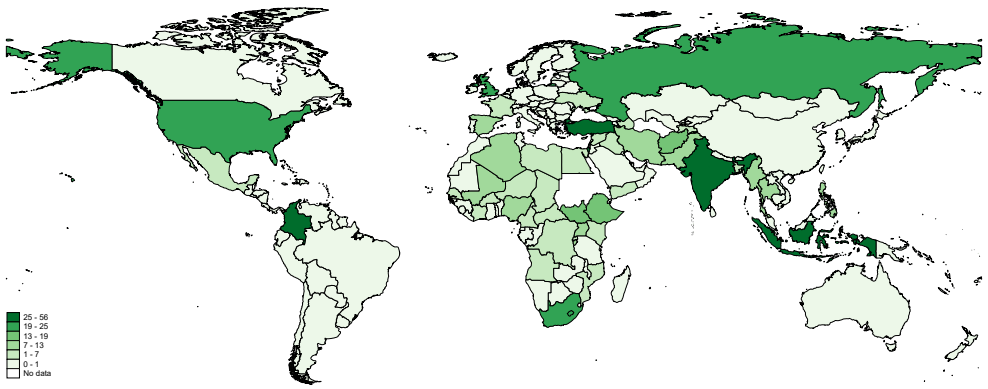

Figure B.1: Spatial distribution of number of conflict periods. The map measures the number of years a country is engaging in one or more armed conflicts from 1950-2019. It does not necessarily indicate the location of the armed conflict.

C Robustness Analysis

C.1 Baseline Specification - Alternative Dependent Variable

Table C.1 uses the inflation rate as the level variable in comparison with the basic regression with a logarithmic transformation. Further, inflation rates above 100% are removed as these outliers might confound the results. Consistent with the results in Table 2, the coefficient estimates for the conflict dummy and the ACSI are positive and statistically significant at the 10% level with exception of specifications only including dummy and index respectively. According to the full specification in column (6), participation in armed conflict leads to an increase in the inflation rate of 3.44 percentage points. A one standard deviation increase in the ACSI translates into an increase of the inflation rate by 3.09 percentage points.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Inflation	Inflation	Inflation	Inflation	Inflation	Inflation
Conflict Dummy	3.046*		3.689**	3.751**	3.456**	3.438**
	(1.681)		(1.630)	(1.612)	(1.589)	(1.579)
ACSI		12.51	22.19**	23.19**	22.18**	21.88**
		(12.12)	(10.73)	(10.66)	(10.78)	(10.77)
Log GDP				-0.438	1.082	0.403
				(2.635)	(2.660)	(2.952)
GDP Growth Rate					-0.169***	-0.167***
					(0.0360)	(0.0356)
Trade Openness						-2.026
						(1.503)
Constant	18.82***	9.626	3.787	5.078	5.847	10.39
	(6.774)	(9.039)	(8.192)	(23.29)	(23.62)	(25.35)
Observations	4,007	4,007	4,007	4,001	3,997	3,997
R-squared	0.571	0.569	0.573	0.568	0.574	0.575
N. of Countries	175	175	175	175	175	175
Standard Errors	Clustered	Clustered	Clustered	Clustered	Clustered	Clustered
Fixed Effects	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Country Trends	YES	YES	YES	YES	YES	YES

Cluster-robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table C.1: Baseline panel regression with level inflation rate as dependent variable.

C.2 Baseline Specification - Inverse Hyperbolic Sine Transformation

VARIABLES	(1) Inflation	(2) Inflation	(3) Inflation	(4) Inflation	(5) Inflation	(6) Inflation
Conflict Dummy	0.271***		0.310***	0.313***	0.276**	0.276**
	(0.103)		(0.110)	(0.111)	(0.109)	(0.109)
ACSI		0.531	1.345	1.307	1.233	1.231
		(0.870)	(0.873)	(0.862)	(0.884)	(0.882)
Log GDP				0.526*	0.712**	0.708**
				(0.277)	(0.292)	(0.309)
GDP Growth Rate					-0.0238***	-0.0238***
					(0.0042)	(0.0042)
Trade Openness						-0.0129
						(0.132)
Constant	4.466***	4.053***	3.553***	-0.295	-0.293	-0.266
	(0.839)	(0.983)	(0.945)	(2.402)	(2.550)	(2.633)
Observations	4,059	4,059	4,059	4,050	4,045	4,045
R-squared	0.695	0.693	0.695	0.695	0.703	0.703
N. of countries	175	175	175	175	175	175
Standard Errors	Clustered	Clustered	Clustered	Clustered	Clustered	Clustered
Fixed Effects	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Country Trends	YES	YES	YES	YES	YES	YES

Cluster-robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table C.2: Baseline panel regression with inverse hyperbolic sine transformed inflation rate as dependent variable. The conflict dummy and index are used as main explanatory variables for determining the direct and indirect effect of armed conflicts.

C.3 Complete Regression - Inverse Hyperbolic Sine Transformation

VARIABLES	(1) Inflation	(2) Inflation	(3) Inflation	(4) Inflation	(5) Inflation	(6) Inflation	(7) Inflation
Conflict Dummy	0.396***	0.258**	0.312***	0.308***	0.236*	0.290***	0.385***
	(0.118)	(0.121)	(0.104)	(0.117)	(0.126)	(0.103)	(0.120)
ACSI	2.733**	1.578*	1.414	2.167*	0.966	1.640*	2.921**
	(1.155)	(0.881)	(0.926)	(1.133)	(0.898)	(0.833)	(1.140)
CBI	0.875*						-0.374
	(0.511)						(0.607)
Rate of Return		-3.920**					-6.869***
		(1.628)					(1.992)
Mili. Exp. Share			-8.025**				-18.61**
			(3.918)				(7.616)
Broad Money Growth				0.0018***			0.0016***
				(0.0004)			(0.0002)
Government Debt					-0.0003		0.0005
					(0.0023)		(0.003)
Polity V Index						0.0384**	0.00748
						(0.0156)	(0.0141)
Constant	210.0***	278.6***	231.7***	79.75**	180.5***	196.3***	130.3*
	(40.05)	(61.89)	(31.82)	(34.67)	(34.60)	(37.29)	(72.87)
Observations	2,930	3,518	3,516	2,909	3,504	3,495	1,539
R-squared	0.751	0.706	0.710	0.719	0.709	0.712	0.779
N. of countries	145	135	149	151	150	151	79
Standard Errors	Clustered	Clustered	Clustered	Clustered	Clustered	Clustered	Clustered
Fixed Effects	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES
Country Trends	YES	YES	YES	YES	YES	YES	YES

Cluster-robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table C.3: Complete panel regression with inverse hyperbolic sine transformed inflation rate as dependent variable and more explanatory variables as main explanatory variable.

C.4 Baseline Specification - Alternative Conflict Variable

Table C.4 reports the empirical analysis using a different main explanatory variable. Contrary to the analysis that applied a dummy variable for armed conflict reported by Table 2, a measure of the intensity of armed conflicts is used. In contrary to the baseline regression of Table 2, no statistically significant coefficient estimate is reported for war intensity. However, the armed conflict spillover is positive and statistically significant for columns (3), (4), (5) and (6). Using the war intensity variable will reduce the number of observations and countries covered.

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Inflation	Inflation	Inflation	Inflation	Inflation	Inflation
War Intensity	0.0698		0.0794	0.0777	0.0682	0.0682
	(0.0612)		(0.0609)	(0.0623)	(0.0609)	(0.0610)
ACSI		0.677	2.000***	1.989***	1.877**	1.880**
		(0.801)	(0.731)	(0.710)	(0.730)	(0.731)
Log GDP				0.454	0.705**	0.709**
				(0.292)	(0.299)	(0.324)
GDP Growth Rate					-0.0274***	-0.0275***
					(0.0056)	(0.0057)
Trade Openness						0.0233
						(0.252)
Constant	1.810	3.636***	10.45	66.12	247.4***	248.0***
	(1.196)	(0.900)	(38.49)	(56.50)	(66.27)	(68.81)
Observations	2,585	4,059	2,585	2,585	2,581	2,581
R-squared	0.726	0.722	0.728	0.729	0.739	0.739
N. of countries	143	175	143	143	143	143
Standard Errors	Clustered	Clustered	Clustered	Clustered	Clustered	Clustered
Fixed Effects	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Country Trends	YES	YES	YES	YES	YES	YES

Cluster-robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table C.4: Baseline panel regression with log inflation rate as dependent variable. Main explanatory variable is the intensity of wars.

C.5 Baseline Specification - Trade Sanctions

VARIABLES	(1) Inflation	(2) Inflation	(3) Inflation	(4) Inflation	(5) Inflation	(6) Inflation	(7) Inflation
Conflict Dummy	0.254***		0.296***	0.308***	0.308***	0.274***	0.274***
	(0.0914)		(0.0974)	(0.0940)	(0.0956)	(0.0933)	(0.0933)
ACSI		0.677	1.456*	1.428*	1.411*	1.348*	1.346*
		(0.801)	(0.797)	(0.803)	(0.796)	(0.803)	(0.802)
Trade Sanctions				-0.140	-0.111	-0.111	-0.112
				(0.151)	(0.137)	(0.127)	(0.127)
Log GDP					0.429*	0.609**	0.605**
					(0.250)	(0.265)	(0.283)
GDP Growth Rate						-0.0230***	-0.0230***
						(0.0039)	(0.0039)
Trade Openness							-0.0129
							(0.122)
Constant	4.147***	3.636***	3.158***	3.235***	0.0797	0.113	0.140
	(0.767)	(0.900)	(0.858)	(0.870)	(2.110)	(2.248)	(2.348)
Observations	4,059	4,059	4,059	4,059	4,050	4,045	4,045
R-squared	0.724	0.722	0.724	0.725	0.725	0.733	0.733
N. of Countries	175	175	175	175	175	175	175
Standard Errors	Clustered	Clustered	Clustered	Clustered	Clustered	Clustered	Clustered
Fixed Effects	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES
Country Trends	YES	YES	YES	YES	YES	YES	YES

Cluster-robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table C.5: Complete panel regression with log inflation rate as dependent variable (just using the simple log transformation).

C.6 Baseline Specification - Restricted Sample

The empirical results from Table C.6 are robust with respect to the exclusion of observations with unusual high inflation rates. Though, the coefficient estimate of the conflict dummy is slightly lower through all specifications, it remains positive and statistically significant. This can potentially be ascribed to the low number of observations that is excluded by the threshold of 100 percentage and the use of the logarithmic transformation, thereby putting less weight on extreme values. Though the spillover variable remains statistically significant in column (3) and (4) that changes for columns (5) and (6).

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	Inflation	Inflation	Inflation	Inflation	Inflation	Inflation
Conflict Dummy	0.216**		0.253***	0.258***	0.239**	0.238**
	(0.0886)		(0.0942)	(0.0953)	(0.0946)	(0.0944)
ACSI		0.602	1.266*	1.208*	1.146	1.135
		(0.723)	(0.712)	(0.713)	(0.731)	(0.730)
Log GDP				0.351	0.511**	0.487*
				(0.238)	(0.253)	(0.271)
GDP Growth Rate					-0.0173***	-0.0173***
					(0.0033)	(0.0033)
Trade Openness						-0.0708
						(0.121)
Constant	3.485***	3.028***	2.627***	0.0950	0.248	0.407
	(0.693)	(0.809)	(0.775)	(2.051)	(2.181)	(2.274)
Observations	4,007	4,007	4,007	4,001	3,997	3,997
R-squared	0.714	0.713	0.714	0.714	0.719	0.719
N. of countries	175	175	175	175	175	175
Standard Errors	Clustered	Clustered	Clustered	Clustered	Clustered	Clustered
Fixed Effects	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
Country Trends	YES	YES	YES	YES	YES	YES

Cluster-robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table C.6: Baseline panel regression with level inflation rate as dependent variable. Inflation rates higher than 100 percentage are removed from the data.

C.7 Complete Specification - War Dummy as main Explanatory Variable

Table C.7 provides the estimates of the full specification of the panel model using a war dummy. According to the definition, the war dummy is 1 if a conflict is associated with more than 1000 battle related deaths. Throughout all specifications the war dummy reports a positive and statistically significant point estimate at the 5% and 1% level. The size of the war dummy is greater than the size of the armed conflict dummy for all specifications. This indicates that the severity of the conflicts might play a role for the inflation dynamics. Military conflicts with a greater severity measures by battle related deaths are therefore on average associated with a stronger, positive impact on the inflation rate.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	Inflation	Inflation	Inflation	Inflation	Inflation	Inflation	Inflation
War Dummy	0.376**	0.376**	0.407***	0.393***	0.416***	0.344**	0.402**
	(0.152)	(0.150)	(0.125)	(0.140)	(0.143)	(0.133)	(0.153)
ACSI	1.533	1.362	1.210	1.289	0.982	1.281	1.550
	(1.067)	(1.032)	(1.123)	(1.043)	(1.088)	(1.051)	(1.151)
CBI	0.705						-0.475
	(0.486)						(0.595)
Rate of Return		-4.273**					-6.533***
		(1.812)					(1.986)
Mili. Exp. Share			-7.020*				-15.62**
			(3.648)				(6.566)
Broad Money Growth				0.0019***			0.0016***
				(0.0004)			(0.0002)
Government Debt					0.0006		0.0021
					(0.0022)		(0.0030)
Polity V Index						0.0410***	0.0131
						(0.0139)	(0.0138)
Constant	172.9***	195.3***	133.6***	63.65*	111.2***	105.4***	156.6**
	(39.62)	(66.78)	(33.70)	(34.16)	(32.37)	(37.15)	(72.30)
Observations	2,930	3,412	3,430	2,909	3,434	3,393	1,539
R-squared	0.773	0.740	0.745	0.750	0.745	0.744	0.800
N. of countries	145	135	149	151	150	151	79
Standard Errors	Clustered	Clustered	Clustered	Clustered	Clustered	Clustered	Clustered
Fixed Effects	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES
Country Trends	YES	YES	YES	YES	YES	YES	YES

Cluster-robust standard errors in parentheses

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

Table C.7: Complete panel regression using a war dummy to measure direct the direct effect on the inflation rates.

C.8 Baseline Specification - Difference GMM

VARIABLES	(1) Inflation	(2) Inflation	(3) Inflation	(4) Inflation	(5) Inflation	(6) Inflation
Lagged Inflation	0.610***	0.609***	0.609***	0.602***	0.594***	0.592***
	(0.042)	(0.042)	(0.042)	(0.040)	(0.041)	(0.041)
Conflict Dummy	0.127*		0.153**	0.162**	0.157**	0.158**
	(0.065)		(0.069)	(0.068)	(0.069)	(0.067)
ACSI		0.639	0.959*	1.175**	1.241**	1.280***
		(0.490)	(0.493)	(0.474)	(0.485)	(0.481)
Log GDP				0.057	0.094	0.056
				(0.078)	(0.087)	(0.082)
GDP Growth Rate					-0.013***	-0.013***
					(0.003)	(0.003)
Trade Openness						-0.134**
						(0.061)
Observations	3,705	3,705	3,705	3,697	3,696	3,696
Number of country	172	172	172	172	172	172
Standard Errors	Robust	Robust	Robust	Robust	Robust	Robust
Year FE	YES	YES	YES	YES	YES	YES
AR(1) p-value	0	0	0	0	0	0
AR(2) p-value	0.715	0.681	0.748	0.801	0.832	0.818
Hansen p-value	0.591	0.411	0.582	0.459	0.716	0.816

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table C.8: Difference GMM estimation with baseline specification of regressors including lagged inflation. AR(1) and AR(2) p-values and the Hansen-Test are used to check the validity of the model.