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The Inflation Situation of the Republic of Croatia from 1990 till 1999

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Zusammenfassung

Diese Arbeit untersucht die inflationären Dynamiken Kroatiens in den 1990er Jahren, einer Zeit, die durch den Heimatkrieg (kroatisch “domovinski rat) und den Übergang des Landes zur Marktwirtschaft geprägt war. Sie betrachtet, wie eine der größten Inflationsperioden in der kroatischen Geschichte verursacht wurde und warum. Ich verwende Lokale Projektionen (LPs) zur Schätzung von Impulsantworten, wobei sich die Studie auf den Krieg als zentrales Ereignis konzentriert, das für die Inflation von Bedeutung war. Die Ergebnisse zeigen, dass obwohl der Krieg einer der Hauptfaktoren war, auch das breitere wirtschaftliche Umfeld, welches Handelsunterbrechungen, geld- und fiskalpolitische Maßnahmen sowie die Schwierigkeiten bei der Umstellung auf eine Marktwirtschaft umfasst, einen wesentlichen Beitrag leistete. Trotz einiger Einschränkungen tragen diese Erkenntnisse zur bestehenden Literatur bei, indem sie eine transparente und detaillierte Analyse der Inflation während und nach dem Krieg durchführen und die Herausforderungen im Zusammenhang mit der wirtschaftlichen Stabilisierung in diesen Situationen hervorheben.

Abstract

This thesis looks into Croatia's inflationary dynamics in the 1990s, a time defined by the Homeland War and the nation's shift to a market economy. It looks at how one of the biggest periods of inflation in Croatian history was caused and why. I use Local Projections (LPs) for estimating impulse responses, while the study focuses on war as the key event that mattered for inflation. The

findings show that although war was one of the major factors, the larger economic environment which includes trade disruptions, monetary and fiscal policies and the difficulties of converting to a market economy also made a substantial contribution. Despite some limitations, these findings contribute to the existing literature by conducting a transparent and detailed analysis of inflation during and after the war, highlighting the challenges related to economic stabilization in these situations.

Acknowledgments

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1. Introduction

For a relatively young country like the Republic of Croatia (Republic of Croatia - 30 years since its foundation), the period of the 1990s represents extremely important years in the creation of a new sovereign state in which certain years were full of economic, political and ideological challenges.

Last couple of decades, Croatia was one of a couple of countries that were part Yugoslavia (Socialist Federal Republic of Yugoslavia - SFRY). Some other countries included Slovenia, Serbia, North Macedonia, Bosnia and Hercegovina and others. During those times, Yugoslavia had a problem with explicit inflation, but at the end of the 80s, this problem became unsustainable which then resulted in one of the biggest and longest inflations in history from 1992 to 1994. As mentioned, last couple of years in the 1980s, Yugoslavia had problems with high inflation and a difficult economic situation, where some of these problems spilled over to Croatia, such as the payment of foreign debt. At the beginning of 1991, Croatia ceased to be part of the of Yugoslavia. After secession, the Homeland War followed, which affected various factors, especially the economy of Croatia. The war in itself represents a very difficult and exhausting period for the country, especially a young one, in which Croatia was in this situation where a loss of human capital occurred, existing infrastructure was destroyed, population displacement, high inflation, etc. This was the case with Croatia, because the aforementioned war was fought on the territory of today's country, and parts of it were occupied for years making them particularly difficult for any development and progress.

The goal of this thesis is to research and discuss important economic topics that happened in those years but to put inflation in the foreground and see what was the significance of inflation during the formation of the new state. The key question that this thesis will answer is “What were the key driving factors in promoting inflation in Croatia through the 1990s? “The main effort is to identify specific events that might have been driving inflation (their effect and comparing different time periods).

The subject of this work is often the subject of discussion in Croatian academic and professional circles, as well as in the public. This thesis consists of six chapters in which all aspects of Croatia in that period are covered. Hence, after the introduction, in the second chapter, we touch on the literature review where we analyze the existing literature on this topic, from inflation and Croatian inflation to the method we use for this research. The third chapter gives insights into the complex Croatian situation in the 90s, such as the Croatian history through the last couple of decades, the role of Croatia in the former state, the Homeland War that followed and the problems and consequences that followed after it are explained in more detail. Furthermore, the fourth chapter presents the data that was used for the purpose of research and creation of this thesis, as well as an explanation and description of the methodology and model that I used. The fifth chapter characterizes the results that were obtained in order to more easily explain the movement of inflation at that time, but also what impact the war had on inflation and all other economic variables. The discussion part where I give shortcomings of the paper, critics to the academics and some suggestions to future researchers is the seventh chapter. The last chapter touches on the difficult situation created from social and economic aspects in which the Croatia found itself, what

role inflation played in it, and a comment on the main recommendations and conclusions of this paper and its results.

2. Literature review

In this chapter, I give an overview of the previous literature. The first part deals with the literature on inflation and its impact. The second part deals with the literature that analyzes and discusses the economic situation and inflation in Croatia in the mentioned years, while the third part deals with the literature on local projections, the method that has been used for this research.

2.1 Inflation-Hyperinflation

There is a variety of research available on measuring inflation dynamics. One part of the literature focuses on how external factors, like war, play a crucial part in hyperinflation. This view was noted by Solimano (1990), who deals with inflation stabilization when high inflation occurs in cases of different countries where external factors play a very important role. This gives information to my research because I specifically observe how the war (external shock) plays a role in inflation, but also whether the Croatian government at that time was leading a good stabilization policy towards inflation. On the other hand, when we talk about the causes of the acceleration of inflation in hyperinflation, the literature is rich and offers several reasons explaining it. Firstly, large government spending that results from printing money and fiscal unsustainability leads to hyperinflation. Such an idea was confirmed by Sargent (2017) in his research on four major hyperinflations that occurred after the First World War. Moreover, monetary expansion and a decline in confidence in the currency also lead to an acceleration of inflation, and the need to finance the war and political instability only aggravate the situation investigated by Dornbusch et Fisher (1986) in their work on the German hyperinflation. Reinhart and Rogoff (2009) supported this thinking of possible causes by explaining that hyperinflation mostly recurs when countries experience significant economic combinations due to a combination of fiscal crises and the

aforementioned monetary expansion. All these reasons create a self-reflecting spiral where inflation rises steeply and the domestic value of currency depreciates. This gives significant insight for my research as I am focused on knowing the key drivers of inflation and their role.

Likewise, the dynamics and causes of contemporary hyperinflations, with a primary focus on external shocks such as war or political instability, loss of monetary control, and fiscal imbalances, are shown by Fischer et al. (2002). The study emphasizes how governments' use of money creation to finance significant deficits usually causes hyperinflations and spiraling inflation. It motivates my paper and gives me insight into how it is possible that the war played a crucial role in inflation, mainly to finance it and the deficits that arise with it. I will touch more on this topic in the next chapter

2.2 Croatian Inflation

The issues of Croatian inflation in the 90s have a wide literature of Croatian experts and academics who dealt with this important topic. The literature on inflation in Croatia during the 1990s and the first part of the 2000s emphasizes how many interrelated factors affect the dynamics of inflation in the nation. The period in which high inflation prevailed in Croatia as an independent country refers to the years between 1990 and 1995, while after that it gradually fell. Inflation began to rise sharply at the beginning of 1992 and the beginning of the war, and it reached its high point in 1993 when it reached its peak of 1486 percent in a year. It should be noted that Croatia had high inflation in the 1980s when it was part of Yugoslavia because that former country was going through some challenging economic and political times. The first argument Croatian economists believe is that supply-side and exchange rate fluctuations have a greater significance on inflation than domestic monetary factors in Croatia in the 1990s. This view is supported by Vizek & Broz (2007) who

highlight the importance of exchange rate and supply side factors that are crucial for behaving of inflation, while Botrić and Cota (2006) emphasize that external crisis factors – shocks, have a greater impact on the inflation creation process than monetary shocks which are significantly correlated with terms of trade and balance of payments shocks. This is additionally found in a study by Zdunic (2003), where institutional and structural shifts that occurred during the transition era had the significance of wage-setting processes and exchange rate regulations in determining inflation.

Furthermore, this paper contributes to the literature dealing with high inflation in Croatia in the 1990s in different aspects. Although numerous experts have dealt with the mentioned literature, there have been no new studies conducted on this topic in the last few years. My study contributes to the aforementioned literature by identifying the most important events that influenced high inflation in the years of war and transition years, primarily referring to the war and other consequences and difficulties that come with it. Also, it should be noted that most of the studies were done in the early 2000s, right after a difficult period when some methodologies of this type of research were not yet available. The only study that has tried to concentrate on the symmetry between advancement and regression offers a fair-minded viewpoint, recognizing both the successes and the failures that marked Croatia's economic development between 1950 and 1990 is Družić (2005). This makes his research especially significant because it provides a thorough narrative that is rarely explored in such detail by other academics.

Although the goal of this study is not to examine the Republic of Croatia's and the central bank's taking measures to control excessive inflation, in the chapter “Complex situation of Croatia” I will

discuss the stabilization policies that Croatia had to implement in order to contain inflation. Most of the discussion of this came from Kobsa (2008), who noted that because of the reason behind the new issues that have emerged in the Croatian economy, it was critical to observe how political action was taken through the aforementioned stabilization programs and their implementation. Furthermore, in his other scholarly work, Zdunić (2004) examines how economic policies and financial programs were formed in Croatia in the years after independence and what role the leading financial pillars, main institutions like the World Bank and the International Monetary Fund, contribute to them.

2.3 Impulse Responses

This paper additionally makes a contribution to the growing literature Local Projections (LPs), a more flexible method than structural vector autoregression (VAR) models, and which is used for estimating impulse responses, especially when state-dependent effects are of relevance, when nonlinearities exist, or when the underlying model may be misspecified.

The difference between Local Projects and VAR, that is, why LPs are better, lies in the fact that they provide more flexibility when evaluating impulse responses explained by Jordà (2023), and the entire system does not need to be precisely specified, which is not the case with VAR. Namely, with VAR, there must be a dynamic structure throughout all horizons, which can cause a problem of bias if it turns out that the model was made incorrectly. On the other hand, local projections are easier to adapt to changes and non-linear settings, but also each horizon can be treated separately and is more resistant to possible non-linearities. Principally, LPs directly estimate impulses for every time horizon in a way that the relevant variable is regressed on a shock and control variables

for other time periods. This serves as a “shortcut” because with this step-by-step approach it is possible to bypass the already mentioned need to do dynamics of the whole system like for VARs. Jordà (2005) wrote a seminal paper in econometrics that introduces the local projections method of impulse response estimation. Jordà’s paper is central to LPs literature as well as it provides the methodological backbone for my study by emphasizing local projections robustness to model misspecification and their adaptability to nonlinear dynamics.

LPs are used to explore how pandemic effects affect trend inflation and how the government and economy adjust to it by Bonam and Smadu (2021), which serves as another source of motivation for my paper. As someone who studies the effects of war on trend inflation, I find this to be a useful indicator. In addition to this, paper is mostly motivated by LPs literature, in particular, Ramey and Zubairy (2018) paper, which has estimated the shocks' dynamic effects (government expenditure on economic production) under different economic states, such as slack or the zero lower bound. The ability of local projections to accurately estimate state-dependent impulse responses is what is similar to their and mine studies and enables them to capture the unique consequences of shocks. Specifically, I use the new package 'lpfris' in R by Adämmer (2019) which has recently gained increasing popularity among researchers who use LP.

Local projections are a good fit for my research question and data because they offer the possibility to evaluate the results of war on inflation in a flexible way without having to fully specify the entire economic system, which is crucial for quarterly data. This empirical strategy allows for direct simulation of the impact of the war on inflation across various time horizons and effectively handles any potential structural changes brought on by the conflict.

3. Historical background on the complex situation in Croatia

3.1 Independence of Croatia and the breakup of Yugoslavia

The Yugoslav economic crisis at the end of the 1980s was further complicated and worsened by political disunity over the resolution of key issues and the future of the common state. The political elites of Slovenia and Croatia supported a confederal structure for the state, whereas Serbia wished to uphold majoritarianism and abolish the status of autonomous provinces. Opinion differences made the already unstable economic position much worse. There were no notable changes in spite of many adjustments and the introduction of packages of economic measures; inflation persisted, adverse economic flows grew stronger, production and exports declined, and the market was affected by new disturbances. It is noteworthy to observe that Croatia was part of seven countries/republics from 1900 till its independence which demonstrates how multifaceted the political and economic situation was.

At the end of the 1980s, the federal government and Yugoslavia were struggling with a severe economic crisis. Ante Marković, a new prime minister, asserted himself in public as a possible savior of the heated situation, guided by the idea of defeating hyperinflation and the Western European type of economy by hiring American economist Jeffrey Sachs. In the six months that he held office since taking over, he managed to reduce triple-digit inflation and external debt. Yugoslavia suddenly found itself at the very center of attention of world politics, because the conditions became significantly tougher, first due to the wider European crisis caused by the fall

of the communist system in Eastern Europe and widely known with Berlin Wall fall, and all of this caused the collapse of Prime Minister Markovic's economic program. The Yugoslav state was badly shaken by nationalism and inter-ethnic conflicts, therefore it soon experienced its political and economic collapse, especially with the arrival of Slobodan Milosevic at the head of the political elite in Serbia, when all the disintegration processes accelerated significantly.

The media fought a propaganda campaign, promoting the patriotic homogenization and existential threat of the Serbian people, and Croats were consistently accused of crimes from World War II. While Serbian nationalism was on the rise, Croatian nationalism developed in reaction to Belgrade's aggressive actions, where Slovenia strongly opposed Serbian efforts to slowly and irreversibly lead the country into a state of war through rallies and protests.

The first free elections were organized, and referendums confirmed the plebiscite support of the people for independence in May 1990, while the following year, in 1991, a war broke out that would last until 1995, when Croatia liberated almost one-third of the territory that was occupied by Serbian rebels supported by the Yugoslav Army. All of these caused the previous state to break up more quickly and gave rise to new sovereign states in this region of Europe. For the Western partners, the political dynamics of the political and economic events in Yugoslavia were crucial, but their economic and geostrategic objectives took priority.

3.2 Croatia in 1990s and war/transition period

In the initial stages of the war, the Croatian economy operated under conditions of very high inflation, which was a continuation of the process from the Yugoslav economy of the 80s and early 90s of the last century, and inflation was brought under control only in 1994 during the government of Prime Minister Nikica Valentić. The Croatian economy was not doing well in the 1990s, more specifically, not since the proclamation of independence of Croatia. The reason was explained with the consequences of the war, which inevitably left a mark on the economic development of the country, as well as the stagnation in economic relations and the fall of the internal Yugoslav market, which previously was relatively well-established.

After the establishment of a multi-party parliament and the holding of the democratic elections and referendums in 1990 and independence in 1991, Croatia had to implement monetary reforms because it was in a severe economic crisis. In addition to monetary reforms serving to improve the economic situation at the beginning of the 90s, they also helped Croatia to prove itself as a stable country in the international context, because it was clear that a decisive transition from the old socialist system led by the communist party was needed; transition to a (open market) market economy and democracy, it takes time, adaptation and major reforms. It should be noted that the international community encouraged Croatia to implement the aforementioned reforms and helped implement them. It is also interesting to compare Croatia's situation and conduct of monetary policy with other transition countries such as Slovenia and Hungary.

Simultaneously, a large part of the state budget relates to military needs, because due to the escalation of war conflicts in neighboring Bosnia and Herzegovina, Croatia continued to arm itself

intensively and borrow, even though the usual financial institutions denied credits. As a result, a significant number of financial resources were obtained through the numerous Croatian diasporas.

3.2.1 Implementing reforms and policies

Given that during that period Croatia was dealing with high inflation and other economic difficulties, the Croatian government and the central bank consequently introduced "Stabilization Programs" aimed at establishing macroeconomic measures that would bring greater employment, stabilize prices and stimulate industrial production, thereby strengthening the economy. Likewise, the policy of exchange and economic relations with other countries in the context of stabilization should not be neglected. Namely, the first program was introduced at the end of 1992 and served to stabilize the economy. The second was introduced in October 1993 and was intended to be implemented in three phases. The first and most important phase was a rigorous anti-inflationary policy (monetary policy and exchange rate policy), which would lead to a reduction in prices and return inflation to normal values. The second phase served to rehabilitate the banks and solve the insolvency that Croatia was facing, but also the problem of debts taken over from Yugoslavia, such as large infrastructure projects (roads, bridges, etc.). In fact, there was the privatization and reconstruction of important companies and attempts to improve the fiscal situation, i.e., stabilization of the state budget. The last and third phase included controlling inflation to low levels in the long term and establishing the convertibility of the national currency.

The work of Anušić et al. (1995) issued by the Croatian Government served as a supplement to the program and aimed to explain the overall economic picture of Croatia and offer solutions. Furthermore, the implementation of the nominal exchange rate policy was of great importance. At

that time, the Croatian transitional currency (dinar) was tied to the most important European currency, the German mark (ERM), and that exchange rate was the main factor for the implementation of the nominal exchange rate policy. CNB – national central bank tried to limit the growth of money in circulation by harmonizing the rate of primary money, along with changing the nominal exchange rate. Furthermore, government and financial institutions decided to increase state reserves in order to be ready for all possible external shocks in the future. The financial policies of the time wanted a stable domestic currency with an appropriate exchange rate.

After the implemented stabilization programs, the Croatian economy found itself on the right track (increase in employment, growth in exports and imports, growth in GDP), but only in the latter years of the 1990s and the beginning of the 2000s, this could be seen significantly. The use of the aforementioned monetary policies greatly contributed to the normalization of Croatian market positive trends in the export economic environment and the strengthening of economic indicators.

Although Croatia recently entered the eurozone and replaced its national currency with the euro, in the 90s there were various divisions regarding the currency aspect. Namely, as an independent country, Croatia introduced the Croatian Dinar (HKD) at the end of 1991 as a replacement for the Yugoslav Dinar that had been used in Yugoslavia for many decades. The Croatian dinar was introduced in Croatia to serve as a temporary currency and could be exchanged at a 1:1 ratio with the Yugoslav dinar. Beginning in early 1992, there was significant devaluation of the recently introduced Croatian dinar (HRD) in Croatia which again gave a strong boost to inflation, which at times assumed a hyperinflationary character.

May 30 represents the Statehood Day of the Republic of Croatia, and on that date in 1994, the Croatian kuna (HRK) was introduced, which had been in circulation for over 25 years and was replaced in a ratio of 1:1000 with the previous currency. Introducing your national currency is important for several reasons. First, the introduction of a local currency serves as an incentive to the general public to restore confidence in the currency by encouraging more investment and savings. Furthermore, by doing so, Croatia was able to implement a clear monetary policy that was restrictive, control inflation and lay the foundation for further development and long-term stability. Last but not least, the introduction of the kuna symbolizes Croatia's independence and national identity, which helped create the population's support for the currency. The significant name of the currency is interesting, and it originates from the history when mink fur was traded.

Additionally, one of the most important policies carried out in 90s was privatization, since social ownership dominated in the former state. The core principle of the implemented privatization is that private ownership is more efficient than state or social ownership. This is also the main premise of the market economy. The main issue of Croatian privatization within the stabilization policy is that it has become an end in itself, which is why it has made its other goals, such as investment in the modernization of production, increasing employment, education of the workforce, development, etc. During the conversion of old companies, the abilities and knowledge of new customers, i.e., economic entities that came into the privileged position of privatization, were not measured and checked, and their poor efficiency consequently greatly affected the entire economy.

Significant missteps in political choices, favoritism of specific individuals, or conversion were recognized. In order to guarantee stronger control over the process, some economists think that the privatization itself should be delayed and wait until the war is over. A big psychological problem was caused by the privatization, that is, the rehabilitation of the banks, which immediately after the rehabilitation passed into the hands of foreigners, and the sale of the banks generated USD 3.9 billion. Additionally, many stakeholders, experts, and political observers in the financial market were surprised by the decision of two Croatian governments in the early 2000s to sell gold, or rather their gold reserves, 15.5 tons.

Given these points, academics at Croatian universities and economic institutes disagree about how privatization has affected inflation. This is because the majority of them think that Croatian inflation is not unusual, either in its origins or in the way it has shown up. This is because Croatia went through a period of war, which is comparable to the category of inflation brought on by structural changes, such as socioeconomic upheaval, or a transition marked by extremely turbulent political and economic conditions. That's precisely how the Homeland War and the recession were. Croatia independently stepped into the transition process but with the simultaneous loss of foreign exchange reserves, which put the state and the central bank in a unique position compared to other transition countries. Some economists believe that the inflation of this period cannot be explained by the classic model of inflation, and they show this by analyzing the relationship between inflation and some economic indicators of that period. This strengthens the early 1990s argument regarding the unique characteristics of Croatian inflation. Obviously, the psychological effects of war and the war environment were higher compared to the effects of inflation, but even in this case, it can

be noted that there are not numerous studies or publications that have been conducted regarding the period in question.

To further illustrate, considering the comparison with other transition countries that are in the neighborhood of Croatia, as I mentioned earlier, their transition paths are quite different. Although Slovenia was also in the SFRY system, it was then the most developed republic of the former state, was not involved in the war, had closer ties with foreign markets, which resulted in earlier entry into the European Union (EU), and therefore had a successful transition using numerous reforms like industrialization and social protection of workers. Moreover, Hungary focused predominantly on an open economy that encouraged foreign investment in the transition period but eventually faced the problems of high indebtedness and high unemployment. As already mentioned, Croatia experienced a rather turbulent transition. Although it is mentioned a couple of times in this thesis, the war played a significant role in the formation of the economic environment at that time, and it is important to emphasize that. Slow reforms and high public debt also contributed to a slower transition compared to neighboring Slovenia and Hungary, which resulted in Croatia joining the EU the latest. The literature suggests that inflation in Croatia during the 1990s was the result of several factors. While the war is often cited as an important driver, many authors emphasize the importance of economic policy, inherited problems from the Yugoslav period and the challenges of transition.

Part of the literature considers that the war was the main reason for inflation creation. It is understood that in the context of the beginning of the war, the war itself stimulated the emergence of this economic process, which became increasingly visible as the conflict spread. Logically, in

the context that the Homeland War is an important driver, it means all the consequences that come with the conflict. The devastation of the Homeland war, the financing of the military and large military operations, and the loss of population have triggered shocks in supply chains.

However, there are a few economists who claim that weak management could create monetary and financial crises, i.e., inadequate policies can also be a key reason for inflationary pressures. Although it is emphasized that the war caused the initial shock, they criticize the leadership of the Croatian monetary system for the conduct of the monetary policy, and at the time, the main result of this bad policy - excessive printing of money Poor governance was often criticized by Santini (2006), who focuses on the lack of coordination between monetary and fiscal measures, that is, on the way they responded to inflation, and characterizes this as the main factor that caused inflation to be prolonged.

One of the significant drivers is the problematic inflation situation, which has its roots in the late 80s of the last century during the turbulent years in Yugoslavia, which resulted in its disintegration, and how the war only made it worse. Guided by this, Bičanić and Franičević (2003) show that hyperinflation from SFRY spilled over into Croatia, and also state that the war played an important role.

The last driver suggested by the literature is the transition to the modern market, which was a huge leap, but also a shock to the economy, primarily because there was a lack of local people in Croatia who were highly educated (especially managers) and who were ready for the new market compared to socialism. The emergence of capitalism and the move away from socialism, which was

characterized by high employment and social protection, were significant developments that contributed to economic hardship at this time, according to Jurčić and Vojnić (2011).

4.Methodology

4.1 Data

The data used for this research contains quarterly inflation and quarterly GDP from 1990 to 2019, including the war years. Marked are the quarters/years in which there was a war with 1, and the quarters in which there was no war with 0, like Barro (1991).

The mentioned data for inflation were taken using documents made available by the Croatian Bureau of Statistics and their website (STATISTICAL BUREAU - REPUBLIC OF CROATIA, n.d.). Also, part of the GDP of the first 5 years was taken from the IMF document (1996), which deals with the economic situation of Croatia in the early 90s. The data for other years also came from the same official document published by the Croatian Bureau of Statistics. Considering inflation in Croatia, until the end of 1997, the calculation was based on the retail price index, and from the beginning of 1998, based on the consumer price index.

When explaining the particular situations that occurred during the war and that could affect inflation, but also the overall economic picture of Croatia at that time, 6 key events are identified. First, the beginning of the war (1991 Q2) brought war conflict and economic instability. Second, the fall of Vukovar (1991 Q4) marks an event that is part of a major psychological and infrastructural shock, showing further escalation of the conflict. Furthermore, the international recognition of Croatia (1992 Q1) brings a sudden shift in legitimacy, expectations, and policy stance. The introduction of the kuna (1994 Q1) brings a currency reform that has a direct impact

on inflation and monetary credibility. Operation Flash (1995 Q2) was the first military action of the Croatian army as an indicator of the return of border control. The last event is Operation Storm, which was the largest military operation and de facto represents the end of the war, which brings post-war economic changes and consequences.

Although inflation in Croatia was at its highest level in 1993, the identified war-related events were in 1991 and 1992 and 1995. This shows that the main political and war problems/disruptions appeared earlier, and the high inflation in 1993 is a consequence of the joint effects of war-induced fiscal and monetary instability. The inclusion of the 1993 Q1 currency reform as a shock helps isolate the economic regime shift that followed these disruptions.

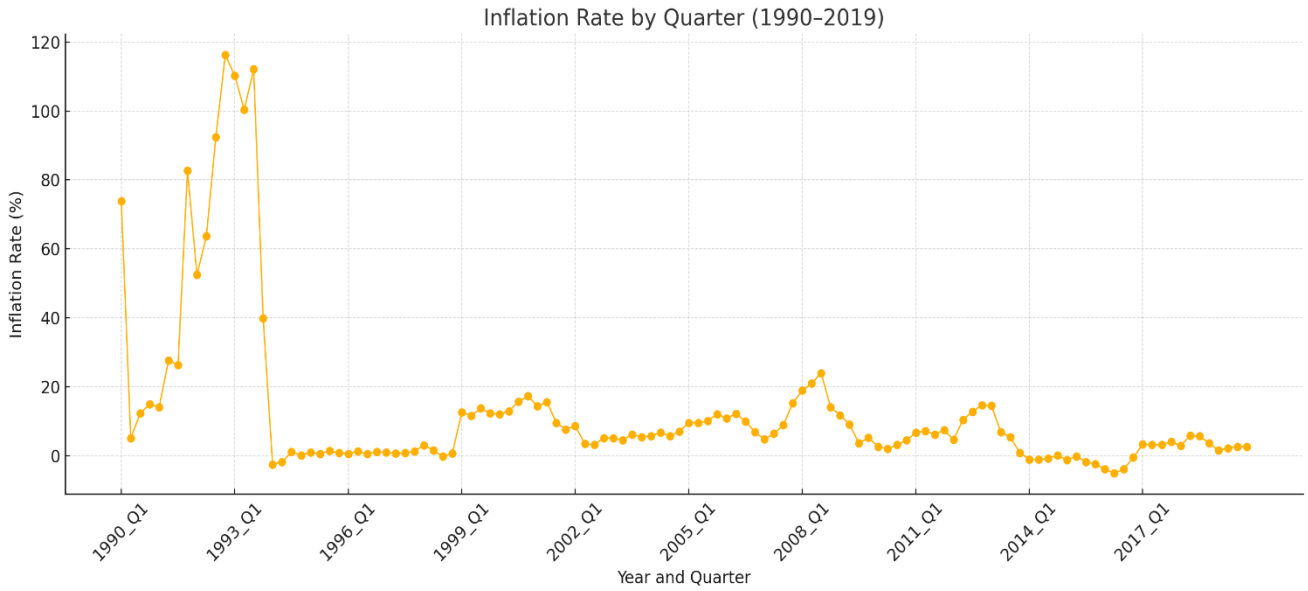

Figure 1: Quarterly inflation in Croatia over time (1990-2019) taken from the CBS - Croatian Bureau of Statistics

As illustrated in Figure 1, the first 10-15 quarters in Croatia were dominated by high inflation, with the highest quarterly inflation rate of 116.3% in the last quarter of 1992, during the war. Furthermore, the graph also shows a short period: 1990, when Croatia was part of Yugoslavia, which shows high inflation on the territory of Croatia, as during that period Yugoslavia experienced one of the highest inflation rates ever recorded in history.

After the war years, inflation remained stable on average, and two cases when it was again elevated were at the beginning of the 21st century due to the dot-com crisis, which was caused by the rapid growth of technology companies that were overvalued on the financial market. Furthermore, the period of the 2008 global financial crisis in the USA, caused by the crash of the housing market, i.e., the bursting of the subprime mortgage bubble, which affected many influential markets and left consequences that are still felt today.

The reason for excluding the remaining years from 2019 onwards is the biggest health crisis in modern times, caused by the so-called pandemic COVID-19, but also rising geopolitical and geostrategic problems in the southeastern region and an important strategic step of Croatia - entry into the Eurozone. All these things together made it so that Croatia has one of the highest inflation rates in the European Union in the last couple of years until today, and that would have too much influence on the results of the research.

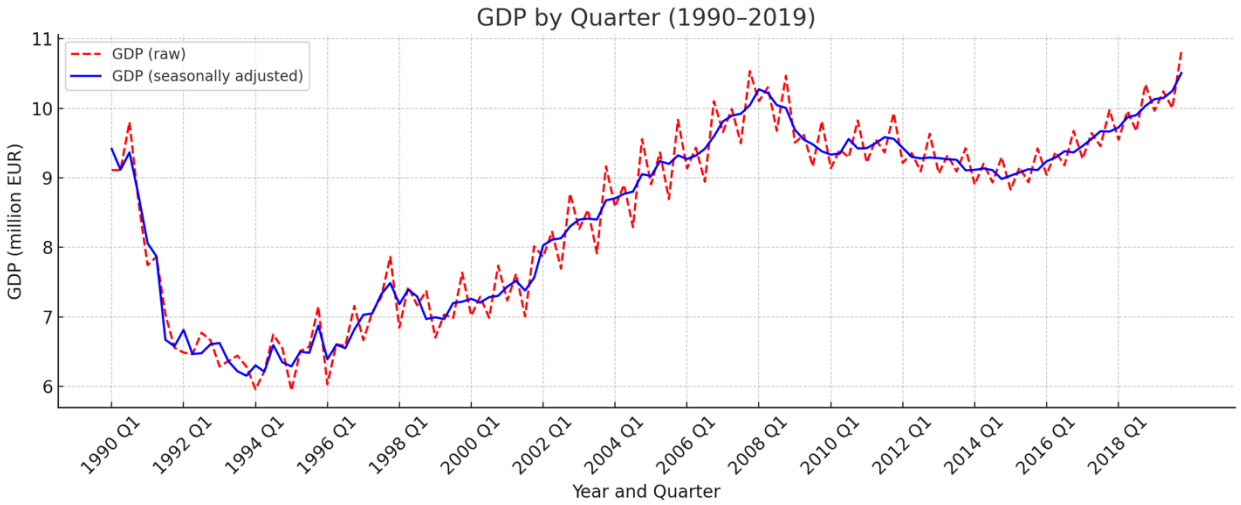

Figure 2: Quarterly GDP (raw and seasonally adjusted) in Croatia over time (1990-2019) taken Croatian Bureau of Statistics and IMF document

Figure 2. contains quarterly GDP data from 1990 to 2019, both raw (red line) and seasonally adjusted (blue line). This graph depicts three main periods: a sharp fall during the war years (1991–1995), a slowdown in growth in the late 1990s, and a prolonged period of expansion after 2000 that was halted by the global financial crisis. Seasonal adjustment reveals the underlying macroeconomic direction and smooths out short-term variations. While the prolonged recovery period reflects the long-term actual economic consequences of conflict, the GDP drop in the early 1990s closely matches the war shock examined in the empirical model.

There are several reasons for this: the difficult economic period in Yugoslavia during the breakup of the state, which was transferred to Croatia; Croatia is a young state with newly established institutions and banks that took over a significant part of the debts of infrastructure projects from

Yugoslavia. Furthermore, Croatia, as a newly formed state, had problems initiating international trade, encouraging foreign investment, and establishing international cooperation with other Western countries.

However, during the war, Croatia also sought international financial assistance in order to withstand the massive attacks from the aggressors. It is estimated by Miškulin et al. (2016) that the war devastation cost Croatia over 40 billion US dollars, which includes property damage, costs of waging the war, damage from the destruction of national wealth, demographic losses, etc. Over 12,500 people were lost on the Croatian side, and over 183,000 residential buildings were damaged (Croatian Encyclopedia, 2025). After the war, there was a period of constant GDP growth until the aforementioned 2008, when the global financial crisis hit Croatia. After that, GDP growth continued, driven by foreign investment and Croatia's entry into the EU.

Importantly, regarding the data quality before 1990, there are issues. Data collection techniques were less advanced and standardized in the Yugoslav era than they are now. It is possible that different record-keeping procedures resulted in inconsistent data. Furthermore, the emphasis placed on gathering economic data may have varied among Yugoslavia's regions, including Croatia. This could have led to gaps or inaccuracies, such as inflation figures, which were probably aggregated at the national rather than republic (regional) level, making it challenging to separate data that was unique to Croatia. Equally, there might have been political reasons to display economic data in a particular way, which could have resulted in results that were biased or distorted. To preserve a steady and favorable image, governments throughout this time, especially

those in socialist republics, may have had an incentive to underreport inflation or other economic challenges.

4.2 Model estimation – Impulses Responses (IRF) with Local Projections

As I stated in the Literature review chapter, local projections are an alternative to VAR because of their resilience to misspecified models and their flexibility in dealing with nonlinear processes.

The original Jordà (2005) equation for local projections using linear impulses with identified shock, a model can be estimated from Ramey and Zubairy (2018) as Adämmer (2019) outlined

$$x_{t+h}=\alpha_h+\psi_{t+h}+\beta_h shock_t+\varepsilon_{t+h,}$$

h= 0, 1,…. H -1

x_{t+h} the response variable at the time $t+h$, α_h is a constant, while ψ_h is a control variable that contains GDP, β_h coefficient of interest(gives the response of x at $t + h$ to the shock at time t) representing the impulse response of inflation to the war shock at horizon H, $shock_t$ is recognized at time t, and ε_{t+h} is error term.

There are several important events that have had implications for inflation that I have identified. Definitely, the first was the war, which brought with it significant financial losses, disrupted trade relations, but also significantly disturbed the supply chain, which led to shortages. As inflation

reached its peak in 1992, when there was not too much war, Croatia gave significant financial injections to the army in order to prepare for the liberation of part of the occupied territory. From this, it can be concluded that the beginning of the war that started in 1991 and that brought with it all the problems mentioned above led to an increase in inflation and is one of the key events. Of course, the currency change that took place in 1992 also played an important role in impacting inflation, because instabilities and uncertainties can arise when changing a currency and applying a new one. Especially, when the currency changed twice, first from the Yugoslav dinar to the Croatian dinar in 1991, and then from the Croatian dinar to the Croatian kuna in 1994, which has already been described in the theoretical part of the paper. The last event that was identified, which had an important impact on inflation, is the stabilization programs or anti-inflationary programs that the Croatian government introduced with the help of the central bank from 1993 to 1995, which is also described in detail in the theoretical work. From how the programs were introduced and implemented, what was their goal and finally what they brought.

Furthermore, war serves as a shock variable in the model. It is presented as a binary variable, with 0 indicating the quarters when there was no war, and 1 indicating the quarters of main events I identified during the war. The shock variable starts in 1991 and ends in 1995, which corresponds to the conflict period. I think it is the best representation of the impact of war on inflation because there aren't many years that are covered by war, but there is also no more detailed data to use other types of metrics. Moreover, most of the literature that uses LPs refers to shocks (war, epidemic, etc.) in this way. It is expected that the shock that followed in the 90s will affect inflation through several different aspects. First, there was economic disruption due to trade difficulties leading to

price increases. Second, the country spent and allocated more capital to finance the war, which led to pressure on fiscal policy.

5. Results

5.1 Shock on inflation

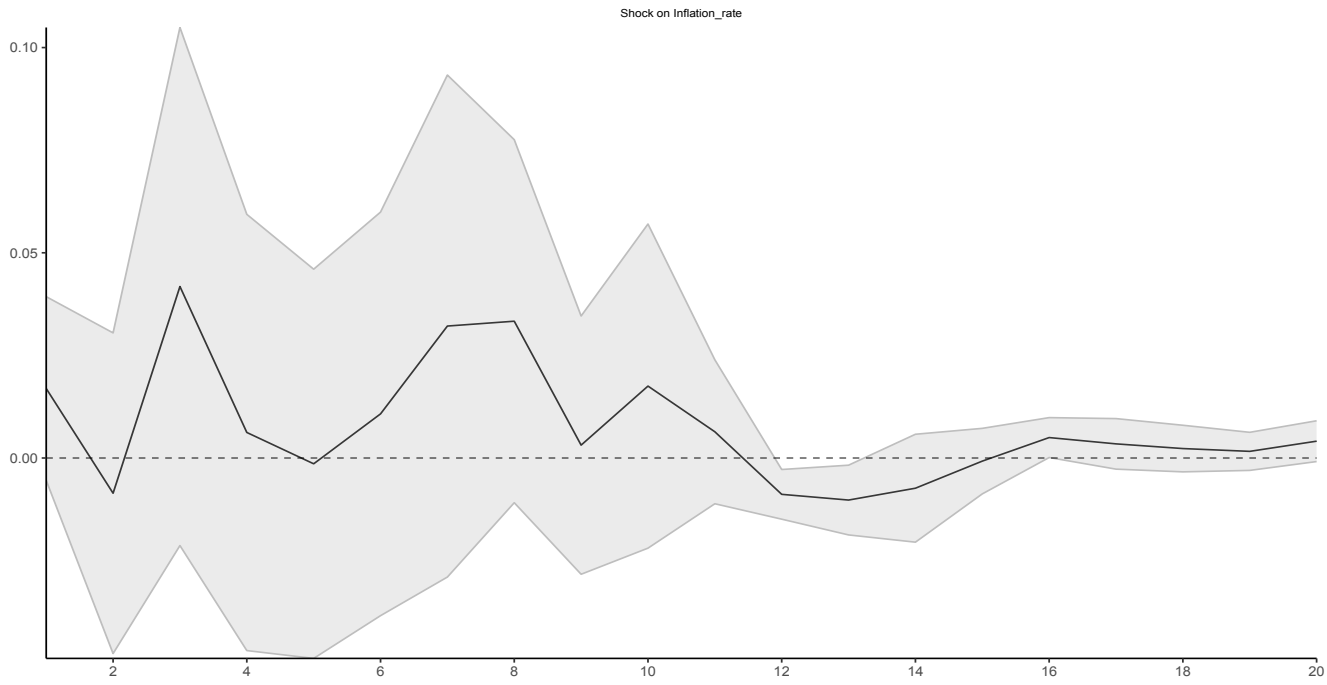

Figure 3: Response of inflation on shock

The graph of IRF illustrates how inflation reacted to the war shock in Figure 3. The x-axis displays the % difference, and on the other (y) axis shows quarters (horizons) following the shock. The graph shows the inflation response to the war shock, with inflation rapidly growing in the first three years after the war, peaking after 2 years and it goes back to normal 5 years after the war. This is consistent with historical events of monetary instability, but the raccoon supports subsequent policies that have successfully targeted inflationary expectations.

The initial growth coincided with the breakup of Yugoslavia and the homeland war, which led to the displacement of the population, fiscal deficit and disruption in the supply chain. Namely, the shock was caused by the introduction of the new own currency - Croatian dinar at the end of 1991, a currency whose rapid depreciation contributed to high inflation in the period 1992 and 1993. However, the drop in inflation after the third year after the war coincided with the implementation of the stabilization program and the introduction of the Croatian kuna in 1994, which restored monetary credibility.

Appendix Table C1 presents local projections of the 20-year inflation reaction to the war shock. The specified data demonstrate a considerable and statistically significant inflationary surge soon following the shock. The positive benefits are consistent with monetary and fiscal instability during the war years (1991-1995), which included the introduction of the Croatian dinar, deficit monetization, and disruptions to supply chains. After year 5, the inflation effect becomes less consistent and less precisely calculated, with some coefficients going negative, most likely due to the effects of the stabilization program (1993-1995) and the introduction of the kuna in 1994, which helped restore monetary stability. R-squared values and F-statistics demonstrate strong model fit at early horizons but decrease after h = 10, commensurate with the broader confidence ranges seen in Figure 2.

Moreover, Bonam and Smidu (2021) confirm this by stating that historically, wars cause continuing growth in underlying inflation. Namely, otherwise conflicts reduce aggregate supply by destroying physical capital, which stimulates investment demand after the war. However, this

also increases the aggregate demand for the debt with which the renewal costs are financed and the war itself Daly and Chankova (2021). Shown are 95% confidence bands per Newey and West (1987) standard errors.

The given findings are consistent with the research of Družić and Maras (2023) and Babić (1998), who state that the war, along with the past economic legacy of Yugoslavia and war destruction, played one of the original main roles in the formation of high inflation. However, with the obtained results, it cannot be said with certainty that the war played a decisive role as the main driver of inflation in that period in Croatia.

Furthermore, Operation Flash (May 1995) and Operation Storm (August 1995), two significant military operations in 1995, signaled the end of the war and gave the government back control of the majority of Croatian land. Despite the fact that these operations had important military and political ramifications, it seems that they had little direct macroeconomic impact on inflation. By this time, inflation had started to drop and the government had already put in place a stabilization program (1993–1995). Nevertheless, by preserving territorial integrity, lowering uncertainty, and facilitating post-war reconstruction, these actions indirectly contributed in the stability process. Although the chronology indicates their influence was more symbolic than causal in macroeconomic terms, this might have helped sustain ongoing disinflation in the second half of the 1990s.

5.2 Shock on GDP

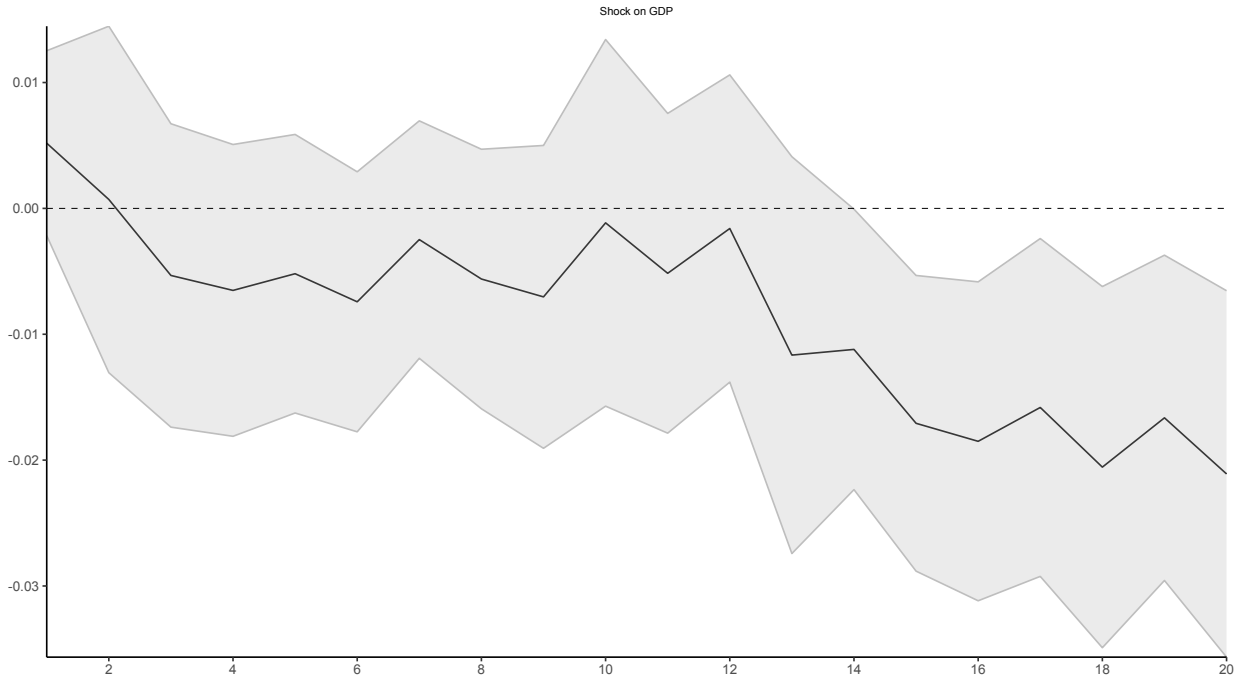

Figure 4: Response of GDP to shock

Figure 4 shows the GDP response to the shock, where the X-axis shows the % change, while the y-axis shows the quarters (horizons) following the shock, the same as in Figure 3. The above graph shows how GDP behaves or responds to the war shock, p about 0.02 percent between years t+2 and t+5, with the impulse response remaining below zero for almost the entire forecast horizon. This suggests a prolonged decline in productive capacity, likely caused by direct war damage and structural economic disruption.

This result is consistent with historical data. The war years caused significant damage to physical infrastructure, reduced labor force participation through conscription and displacement, and disrupted trade within and outside the former Yugoslav republics. Even after inflation was brought under control, output remained low, reflecting the time needed for reconstruction, market

liberalization, and the reestablishment of international economic ties. The persistence of the GDP shock also reflects a broader pattern in post-conflict economies: inflation often declines faster than output recovers. The effects of war on production are more lasting and statistically more robust. Shown are 95% confidence bands per Newey and West (1987) standard errors.

This conclusion is comparable to findings from literature such as Novta and Pugacheva (2020), where it is shown that war actually affects GDP and GDP per capita negatively. In this case, in resasonable period of ten years after the conflict began, GDP per capita has dropped significantly. Moreover, my results align with Chupilkin and Koczan (2021) research, which finds that, in the year after a war ends, a nation's GDP per capita declines for a notable amount when compared to a synthetic control.

The computed local projection factors for the GDP response to the war shock over a 20-year horizon are shown in Appendix Table C2. The estimated effects are consistently negative and statistically significant throughout. The magnitudes gradually increase, indicating a deepening and prolonged post-war decrease in output. The robust and accurate estimation of the negative GDP reaction is confirmed by the continuously low p-values across all horizons. These results provide support to the theory that the Croatian economy took a while to recover from the war shock, and that the loss of human capital, investment collapse, and infrastructure destruction had long-term effects on output.

5.3 Robustness checks

The results of my IRF research survive several robustness checks. Modifying the specification, by modifying the lag structure, removing probable outliers, or extending the projection horizon, has no significant effect on the qualitative pattern of outcomes. The inflation response stays short-lived and positive, whereas the GDP effect is continuously negative and long-term. These findings remain even when extreme values in the inflation and GDP series are excluded. Furthermore, the findings hold up across different lag lengths and remain focused on the dynamics of the first few years after the shock, which is the primary period of concern. Following literature recommendations, 95% confidence intervals are calculated using standard errors (Newey and West, 1987), which shows for both autocorrelation and heteroskedasticity in the residuals and strengthens.

6. Discussion

The findings offer empirical evidence that the Croatian War of Independence had two distinct effects on the economy: a brief increase in inflation and a sustained drop in real GDP. These results are in line with economic theories that attribute conflict to capital stock destruction, fiscal monetization, and supply-side limitations (Dornbusch and Fischer, 1986; Sargent, 2017).

Moreover, there are several reasons why Croatia in that period is interesting to observe in terms of economic analysis and research, as stated in the theoretical part. First, Croatia moved from a socialist economy (Yugoslavia) to a free market, which brought useful learning about inflation dynamics. Secondly, Croatia is going through a period of long-term war that brings destruction and the collapse of old and the formation of new institutions, international agreements, and the setting of a different monetary policy. There is a possibility that this led to an inflationary spiral that arose due to the caution of citizens and companies due to the uncertain future, or rather, the psychological component. In particular, did the public at that time believe that Croatia would survive the war economically and as a newly formed state? At the same time, there were more savings and trust issues and this influenced future inflation. Cagan (1956) has shown that hyperinflation occurs when beliefs become detached, and the situation around inflation becomes more difficult to control. Even more importantly, one can argue that there was questionable faith and support in the newly formed government, the newly formed institutions, and the monetary policy that was conducted. This view is supported by Labonte (2011) as if firms and workers do not believe in central banks, inflation will be spiral, and if they already expect inflation, it becomes self-fulfilling. Moreover, it is captivating to see how Croatia coped with inflation at that time by

implementing inflation stabilization policies and introducing new currencies. The newly established central bank and insufficiently developed fiscal and financial policy could not solve the problem of high inflation and stabilize the macroeconomic situation immediately. Lastly, the economic aid and advice that came from the EU and the IMF can serve as a good indicator for the future. However, the help of international institutions probably played a double role. On the one hand, advising on how Croatia should behave, such as conducting restrictive fiscal measures. Depending on how Croatia acts, this could lead to a crowding-in effect, by boosting private sector involvement and reviving investor confidence, or a crowding-out effect, by restricting domestic fiscal flexibility. Nevertheless, helping it to build an international economic reputation, which in 2025 resulted in an A- credit rating, which, for many analysts, is surprising since the country ended war activities 30 years ago.

Croatia's inflation trajectory in comparison has some similarities and differences with other countries of the former Yugoslavia (Slovenia, Serbia, etc.). Considering that Croatia's path had a greater inflationary dynamic with countries that had a war (Bosnia and Herzegovina, Serbia) or with countries that experienced a sudden economic transition (Slovenia, Poland, etc.). A comparative perspective suggests that Croatia is war-ravaged with transitional challenges. Croatia could not immediately focus on the necessary reforms for the crucial economic transition but had to engage in the war conflict, which prolonged inflation and the introduction of a new system. Conversely, although the war had such an impact on inflation, reform implementation, external support, and institutional behavior and resilience have their roots in the duration and depth of this inflation.

While this study predominantly addresses inflation feedback to the war shock, a constellation of economic and political variables may offer a nuanced interpretative framework that can explain observed phenomena. One perspective that deserves to be mentioned is the uneven inflation across all economic sectors. The price increases mostly relate to food, housing and other essentials, while the rest is not taken into account as much. It is possible that official data underestimate the economic impact on households, especially knowing that at that time there was a lot of trading on the black market or informal trade. Furthermore, a controversial view is that inflation in the 1990s of the last century could have served as a financing tool to finance Croatia through monetary expansion. Likewise, the change in currencies, the volatility of these exchange rates and the depreciation that occurred during the war years most likely contributed to the creation of high inflation through import pressures on prices. Croatia was dependent on imports of things such as energy, food, and war equipment, which affected inflation. As a final consideration, when looking at the political economy on Croatia's path to stabilization, it is interesting to take into account political coordination and the financial sector. The change in political will, the role of the elites of the time, from politicians to bankers, as well as the involvement of the international community, helped create Croatia's credibility as a stable partner.

The combination of these additional explanations shows that inflation at that time should not be fully explained only by macroeconomic aggregates. On the contrary, the problem at that time arose as a result of a couple of things: political factors, fiscal policy and sectoral differences at the time of already weak institutions. By identifying the mentioned reasons, this adds another view of the econometric results and gives a new dimension to the view of the then complex situation.

Furthermore, there are several shortcomings of this study. The first and most important is the limitation of the number of days, especially during wartime, when economic indicators may be underreported or politically influenced. Furthermore, working with a limited data set, it is difficult to isolate inflation more precisely, as one would with macroeconomic variables such as exchange rate volatility, money supply, etc. Similarly, although the aim of this paper is to show the short-term dynamics of inflation and GDP changes due to a few years of war. However, over a longer period of time, the described movements can be viewed as structural effects a longer time period could be considered to see the structural effects. Finally, Croatia's transitional position is unique historically, so the findings should not be related to other post-war economies, especially those that did not go through a transition period.

Additionally, there are some criticisms to be made. Croatia, having gained independence more than 30 years ago, ought to have made an effort to study economic history and related topics because doing so is crucial to Croatia's understanding of its economic growth, the direction of current policy, the advancement of academic study, the promotion of national identity, the ease of cross-border comparisons, and the improvement of data quality. It should be in the best interest of the Croatian academic community, economists, and politicians to make available data to enable more concrete and significant research on the economy of Croatia throughout history. This all-encompassing method not only enhances knowledge of Croatia's economic history but also fortifies its forthcoming economic plans and initiatives. There is a slight possibility that the data set exists, and one of the parties does not want it to be publicly available, but the purpose of this paper is not to enter into politics.

Likewise, there are some suggestions and possible solutions to this problem. One of the solutions to the problem could be the method of backcasting. It is used in several studies that are missing some data. Without a doubt, backcasting has several issues and is controversial in economics. The base year problem when calculating GDP is studied by Balke & Gordon (1989). In honor of American economic scholar Alexander Gerschenkron, this phenomenon is also known as the Gerschenkron effect. In his research, Gerschenkron (1953) found that when prices from various time periods are included, the data he studied perform similarly. According to him, if the base year is chosen later, the growth rate will be lower, and vice versa. While in Croatian literature, Tica (2004) has examined the GNP of Croatia from 1910 to 1989 by using the backcasting method.
A useful strategy would also be to observe research that contains panel data for countries that went through the war in the area of the former Yugoslavia and to see how the war affected economic indicators, for example, inflation and GDP as in this research, and to compare the obtained results and see if there are similarities but this is beyond the scope of this paper. Help from the international community and world-renowned experts can serve as a great start and a lot can be learned from them.

In fact, as already mentioned, there is no consensus among Croatian economists about what was the main cause of inflation in the 90s; that is, it cannot be said with certainty that there was one, but rather, each of them thinks that there were different drivers or a combination of different drivers**.** However, all economists agree that the role of the war was one of the most significant in the behavior of inflation, and it was mentioned in all research. It is possible to conclude from this that the war was, in fact, an indispensable driver of inflation, but to say that it was the only important factor would be frivolous. Croatia likely found itself in a period and situation where

several different factors came together and resulted in the culmination of high inflation immediately in the first few years after its establishment. This is one of the reasons why Croatia needed more time to harmonize policies, introduce the necessary reforms and ensure the long-term growth and development we are witnessing now, both economically and socially.

The Croatian academic and political community needs to understand how much more difficult it is to make effective policies in the absence of dependable and easily available data. Building a solid data infrastructure to support ongoing and future research is in the best interests of the country. There is a need to create a modern series and analyze data from Yugoslavia, but also from the countries that Croatia was previously part of. Croatia can progress in areas such as data-driven economic research and policy innovation by strengthening institutional capacity and encouraging cross-sector collaboration. In addition to improving academic work, encouraging future scholars to build on these advancements would guarantee that Croatia's economic policies are grounded in facts, future-focused, and equipped to tackle the challenges of the 21st century.

7.Conclusion

In this paper, the main intention was to investigate what was the main driver of high inflation in the Republic of Croatia at the end of the 20th century, focusing especially on the years of the Homeland War, emphasizing how the war played a key role. The results provide insight into the complex relationship between inflation, economic policy, and warfare in a recently founded state such as Croatia, despite their complexity and limitations due to data constraints.

Furthermore, the results are in accordance with a part of the literature Babić (1998) which states that the war played substantial role in inflation at that time in that area, but looking at the results obtained in this research, it cannot be concluded with certainty that the war was the main trigger in the emergence of inflation, but a combination of the legacy of macroeconomic instability and the behavior of newly created institutions. Namely, a detailed analysis should be made that would include other economic factors cited in the literature as the main drivers of inflation, such as: the transition of inflation from Yugoslavia to Croatia Bičanić and Franičević (2003), the transition from socialism to a modern economic environment Jurčić and Vojnić (2011) and the lack of foreign exchange reserves Šonje (2018), in order to obtain a clear picture and determine inflation trends. Nevertheless, this goes beyond the scope of my research and could serve as a future dissertation.

My research contributes to the Croatian literature that dealt with this burning issue, especially considering that to my knowledge, there has been little or no similar research on this topic in the last few years at all. This is the first study that used the local projections method to see how much

the shock affected inflation and GDP in that period in that area. One of the most important conclusions of this thesis is the very important solution to the data problem that Croatia needs to solve. To improve identification, future research might make use of regional variance or higher-frequency data. It would also be interesting to see research that takes a larger time period from Yugoslavia and see the situation at that time on a quarterly basis. Finally, this paper shows that although price stability was eventually attained, the example of Croatia portrays that recovery from war-induced inflation needs more than simple economic support. Inevitable structural reforms, fiscal and monetary policy that is transparent and the credibility of institutions are very important elements of stable economic sustainability. Nonetheless, by applying local projections to a specific national situation, this paper contributes to the literature, providing information on the comparative effectiveness of post-conflict stabilization. A relatively unexplored topic is the macroeconomic costs of the mentioned war, therefore the possible contribution of this paper is also focused on the links between inflation trends and the calculation of war costs. The Croatian story highlights a more general lesson that war's economic devastation lasts for much longer than monetary stability, which can be restored in a matter of years.

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APPENDIX

A) List of abbservations

CBS – Croatian Bureau of Statistics

CNB – Croatian National Bank

DIN – Yugoslav dinar

EUR- Euro

GDP – Gross Domestic Product

HRD – Croatian dinar

HRK – Croatian kuna

IMF – International Monetary Fund

IRF – Impulse Response Functions

LP – Local Projections

SFRY – Social Federal Republic of Yugoslavia

B) Figures

C) Regression tables

C1) Inflation table

	Horizon	Coefficient	Std..Error	R.Squared	Adj..R.Squared	F.Statistic	P.Value
h 1	0	0.0169265528	0.011419847	0.8757612	0.8626206	66.645246	5.632559e-42
h 2	1	-0.0085811650	0.019929775	0.6960266	0.6635634	21.440496	5.750079e-22
h 3	2	0.0417792353	0.032201079	0.6207187	0.5798158	15.175423	4.848952e-17
h 4	3	0.0062234333	0.027114351	0.5847527	0.5395277	12.929867	5.653068e-15
h 5	4	-0.0014121589	0.024190890	0.6060674	0.5627349	13.986415	7.051791e-16
h 6	5	0.0107507417	0.025083596	0.6186391	0.5762657	14.599696	2.364621e-16
h 7	6	0.0321506813	0.031201340	0.5865035	0.5400906	12.636655	1.532871e-14
h 8	7	0.0333302309	0.022564313	0.4978928	0.4409528	8.744168	1.382518e-10
h 9	8	0.0031362647	0.016051339	0.2889764	0.2075050	3.546965	3.334916e-04
h 10	9	0.0175225333	0.020145782	0.2072598	0.1154688	2.257954	1.723140e-02
h 11	10	0.0063918456	0.008947529	0.2371654	0.1478975	2.656783	5.234500e-03
h 12	11	-0.0088528006	0.003087519	0.1958790	0.1007679	2.059476	3.109582e-02
h 13	12	-0.0102459061	0.004334927	0.2449522	0.1546747	2.713326	4.484288e-03
h 14	13	-0.0073594092	0.006707569	0.2338009	0.1411835	2.524372	7.982843e-03
h 15	14	-0.0007596595	0.004073465	0.2353195	0.1418586	2.517838	8.200876e-03
h 16	15	0.0049795072	0.002480349	0.2684643	0.1780498	2.969260	2.131443e-03
h 17	16	0.0034442530	0.003141763	0.2879354	0.1989274	3.234936	9.687532e-04
h 18	17	0.0023013692	0.002897554	0.3142565	0.2275533	3.624509	3.057780e-04
h 19	18	0.0016195871	0.002367323	0.3238917	0.2374128	3.745324	2.174593e-04
h 20	19	0.0041018290	0.002535162	0.3583241	0.2752837	4.315057	4.169294e-05

C2) GDP table

	Horizon	Coefficient	Std..Error	R.Squared	Adj..R.Squared	F.Statistic	P.Value
h 1	0	0.0051806055	0.003746616	0.9767292	0.9742678	396.82861	1.356522e-79
h 2	1	0.0007098712	0.007022100	0.9599768	0.9557025	224.59146	1.062199e-66
h 3	2	-0.0053280486	0.006149456	0.9412279	0.9348897	148.50148	1.510167e-57
h 4	3	-0.0065161958	0.005914099	0.9247548	0.9165598	112.84346	1.450189e-51
h 5	4	-0.0051907958	0.005645461	0.9110506	0.9012661	93.11222	2.039048e-47
h 6	5	-0.0074228197	0.005269837	0.8887950	0.8764389	71.93163	3.711677e-42
h 7	6	-0.0024785472	0.004812768	0.8873800	0.8747390	70.19843	1.966925e-41
h 8	7	-0.0056109585	0.005259943	0.8671079	0.8520377	57.53777	1.553387e-37
h 9	8	-0.0070314107	0.006138138	0.8524159	0.8355053	50.40698	5.804399e-35
h 10	9	-0.0011489532	0.007430871	0.8342184	0.8150226	43.45845	3.291699e-32
h 11	10	-0.0051571468	0.006480557	0.8185120	0.7972740	38.54005	5.007514e-30
h 12	11	-0.0015984123	0.006227089	0.8018083	0.7783662	34.20387	6.156737e-28
h 13	12	-0.0116568682	0.008042656	0.7952898	0.7708136	32.49235	5.648313e-27
h 14	13	-0.0112044822	0.005683983	0.7887800	0.7632479	30.89368	4.778405e-26
h 15	14	-0.0170758239	0.005992903	0.7755707	0.7481405	28.27429	1.412845e-24
h 16	15	-0.0185064936	0.006463796	0.7435442	0.7118475	23.45804	8.956338e-22
h 17	16	-0.0158164104	0.006847666	0.7340865	0.7008473	22.08497	7.848058e-21
h 18	17	-0.0205571626	0.007319934	0.7514945	0.7200743	23.91754	8.449689e-22
h 19	18	-0.0166406978	0.006592832	0.7461626	0.7136950	22.98178	3.899803e-21
h 20	19	-0.0210977752	0.007426422	0.7409496	0.7074254	22.10195	1.695884e-20