
INFLATION AND PUBLIC DEBT: A BIBLIOMETRIC ANALYSIS

Tânia Raquel Faria Pinto

Dissertation

Master in Economics

Supervised by

Ana Paula Ribeiro

Vitor Carvalho

13th September 2024

Abstract:

The bidirectional dynamics between public debt and inflation have always gathered great attention within the economic field, and the pandemic and geopolitical events verified since the end of 2019 have revived this interest. These recent events had a massive impact on the global economic context, with high inflation rates and a substantial increase in the public-to-GDP debt ratios. This dissertation provides a comprehensive literature review of the channels through which inflation and public debt affect each other. Complementarily, and focusing on the literature published from 1951 until 2023, we elaborate a bibliometric analysis that characterizes the research on the public debt and inflation bidirectional dynamics. We conclude that most studies focus on the impact of public debt in inflation and reveal a positive relation. The most relevant mechanism for this relation is the money supply, while the impact of inflation in public debt – usually negative - is primarily marked by the erosion of the real value of public debt and interest rate mechanisms. The number of articles published concerning this subject has been increasing, which may stimulate the study of the less considered mechanisms and their dependence on the geographic and economic area.

JEL codes: C19, E31, H63**Keywords:** Inflation, Public Debt, Bibliometric analysis

Table of Contents

1. Introduction	1
2. Inflation and public debt: mechanisms underlying the relationship	4
2.1 How does inflation impact on public debt?	8
2.2 How does public debt impact on inflation?	12
3. Methodology	18
3.1 Bibliometric and performance analysis overview	18
3.2 Data collection	18
4. Analysis of results	21
4.1 General overview of articles on public debt and inflation interconnections	21
4.2 Detailed analysis of inflation → public debt (I-PD) literature	26
4.3 Detailed analysis of public debt → inflation (PD-I) literature	36
5. Conclusions	43

List of Figures

Figure 1: Debt-to-GDP and inflation rate in Europe, Euro Area and US, between 1997 and 2023	6
Figure 2: Number of articles that explore inflation's impact on the public debt (I-PD) and public debt's impact on inflation (PD-I), 1951-2023	21
Figure 3: Number of published articles (in number) per year, 1951 - 2023.....	22
Figure 4: Deviation from average of published articles (in number) per year, 1959 - 2023.	23
Figure 5: Collected articles, per year, per relation, 1951 – 2023 (number of papers).....	24
Figure 6: Distribution of collected articles per methodology	25
Figure 7: Distribution of articles regarding the I-PD relation per mechanism, 1951-2023..	27
Figure 8: Evolution of articles on the I-PD relation per mechanism, per decade, 1951-2023 (in number of papers)	28
Figure 9: Evolution of articles on the I-PD relation per methodology, per decade, 1951-2023 (in number of papers).....	29
Figure 10: Distribution of articles on the I-PD relation by mechanism and methodology, 1951-2023	30
Figure 11: Sign of I-PD relation verified in the articles collected, 1951-2023.....	32
Figure 12: Distribution of articles regarding the PD-I relation per mechanism, 1951-2023	37
Figure 13: Evolution of articles on the PD-I relation per mechanism, per decade, 1951-2023 (in number of papers).....	38
Figure 14: Distribution of articles on the PD-I relation by mechanism and methodology, 1951-2023	39
Figure 15: Sign of PD-I relation verified in the articles collected, 1951-2023.....	40

1. Introduction

The economic and social panorama lived after the COVID pandemic and the Russian invasion of Ukraine in February 2022 drew the attention of several authors and economists for the variation of macroeconomic variables that resulted from the geopolitical uncertainty, the high and rising inflation rate, and the restrictive economic conditions.

The high inflation rate gathered a major concern as it registered in the Euro Area (EA) the highest value since created: 10.6%¹ in October 2022, more than double the value observed at the beginning of the global financial crisis of 2007-2008. This highly contrasts with the precedent period, between 2013 and 2019, when the EA was challenged by low inflation levels that resulted from the economic slack and the inflation expectations less anchored to the European Central Bank's (ECB) target (Koester et al., 2021). The scenario was identical across most of the advanced economies: in October 2022, the annual variation of the Headline Consumer Price Index reached 7.7% in the United States of America (US), 3.8% in Japan, and 9.6% in the United Kingdom (UK)².

This recent period is also marked by a rising distress in the fiscal scenario: the mean value of the government debt to gross domestic product (GDP) ratio for the countries of the EA increased from 80.5% at the end of 2009 to 94.5% at the end of 2021³. In the US, this ratio peaked at 126.4%⁴ in 2020, 50 percentage points above the value registered in 2009. Moreover, the government debt to GDP ratio was expected to increase in the post-pandemic years because of the fiscal efforts to recover economic activity (Hauptmeier & Kamps, 2022).

The research and analysis of the economic events that impact the debt burden of the governments is not a new matter in the economic and social fields. The concern to reduce and to stabilize the debt-to-GDP ratio to avoid the public insolvency always gathered

¹ EUROSTAT database, "HICP - monthly data (annual rate of change)". Retrieved on November 2022 (https://ec.europa.eu/eurostat/databrowser/view/PRC_HICP_MANR/default/table?lang=en).

² The World Bank database, "A Global Database of Inflation". Retrieved on January 2023 (<https://www.worldbank.org/en/research/brief/inflation-database>).

³ EUROSTAT database, "Quarterly government debt". Retrieved on January 2023 (https://ec.europa.eu/eurostat/databrowser/view/gov_10q_ggdebt/default/table?lang=en&category=gov.gov_gfs10.gov_10q).

⁴ The World Bank database, "Central government debt, total (% of GDP) - United States". Retrieved on January 2023 (<https://data.worldbank.org/indicator/GC.DOD.TOTL.GD.ZS?end=2020&locations=US&start=2002>).

significant attention from the markets and the public (Escolano, 2010). An equivalent level of interest was dedicated to studying the influence and impact of the inflation rate for governments and analyzing the mutual dynamic between public debt and inflation. Several contributions were provided on this matter to identify the main drivers and mechanisms through which the public debt impacts the inflation rate (e.g., Bilan & Roman, 2014; Khan et al., 2020) and to qualify the impact on the price level increase for the government solvency (e.g., Aizenman & Marion, 2009; Krause & Moyen, 2013; Berkovich et al., 2021).

Some assertions were presented over the last decades regarding this bilateral dynamic and still prevail in this research discussion: an increase in the inflation rate implies a decrease in the real value of debt and, thus, reduces the financial liabilities, but it may also contribute to increasing the government debt when public debt is raised to reduce the consumption distortions caused by the impact of inflation in consumption (Martin, 2009). High inflation rates can also negatively impact government revenues due to the lags in tax payments (Tanzi, 1977). On the other hand, public indebtedness can lead to an increase in money supply and, consequently, increasing inflation (Bilan & Roman, 2014).

It is, thus, crucial for policymakers to consider this bilateral dynamic to diminish the adverse implications of these variables and implement fiscal policies accordingly, as to adopt non-inflation-sensitive instruments when higher inflation is expected (Levine & Mandilaras, 2001) and the undesirable impact of inflation on public debt overcomes.

There is extensive literature regarding inflation and public debt dynamics, and the objective of this dissertation is to analyze how these dynamics work and describe how the main channels through which their effects are spread are evolving and can be applied in future approaches. It is proposed to answer the following questions: What is the impact of inflation on public debt? What is the impact of public debt on inflation? How are mutual effects transmitted, and through which transmission channels? How has the study of these channels evolved over the last few decades?

To answer these questions, this dissertation first presents a theoretical literature review to compile the main mechanisms through which inflation and public debt are mutually impacted. Following this review, we carry out a bibliometric analysis. The aim is to compile and understand how studies in the literature have been exploring the two-way relationship between inflation and public debt. We use publication and dissemination metrics for this purpose; in addition, we offer an examination of the relative significance attributed to each

mechanism by the current body of literature. The analysis developed in the present dissertation pretends to complement the existing literature with a renewed bibliometric analysis encompassing the dynamics and mechanisms explored over the last decades, highlighting the main stylized results and caveats.

This dissertation is organized as follows. After the Introduction, section 2 explores the main mechanisms explaining the two-way relationship between the two variables. Section 3 details the methodology adopted and the parameters of the data collection and section 4 presents the analysis of the results (for the total group of articles collected and per type of relation). Section 5 presents the main conclusions.

2. Inflation and public debt: mechanisms underlying the relationship

The bidirectional relationship between public debt and inflation has been gathering the attention of economists and academics over time, and the economic and financial constraints faced during the last two major contractions reinforced the importance of understanding these dynamics for, among others, fiscal policy conducting and monetary policy strategy.

In the periods during and after the great economic slowdowns, inflation and public debt registered large changes, as was visible in the aftermath of the Great Recession that began in 2007 in the US and was spread around the world; recently, after the COVID pandemic emerged in China and the beginning of the war in Ukraine, which effects were felt, not only in these regions but across the globe, inflation kept accelerating while several countries registered major public debt increases.

The financial deregulation, the subprime housing market, and the overvalued financial derivatives turned the Great Recession into one of the deepest depressions in the post-war era for many countries (European Commission, 2010), mainly for the US and the European countries: it caused major contractions in investment, consumption, and output, which sharply raised unemployment rates and government expenditures. Fiscal entities were entitled to guarantee the solvency of financial institutions to prevent a dramatic impact on the economy. Central banks focused their efforts on providing liquidity for institutions and households as the subprime crisis in the US turned into a financial, economic, and sovereign crisis in Europe.

The measures adopted contributed with negative impacts on the debt-to-GDP ratio in the economic blocks: the ratio increased by almost 30 percentage points in the US between 2007 and 2010⁵, and almost 20 percentage points, on average, in the Euro Area (EA) during the same period, reaching near to 85%, on average, in both economies. Contrasting with this increasing trend, the inflation rate in the US registered a major decrease in 2010, picking -0.4%⁶, while in the EA the minimum value registered during the Great Recession was verified

⁵ The World Bank database, “Central government debt, total (% of GDP) - United States”. Retrieved on January 2023 (<https://data.worldbank.org/indicator/GC.DOD.TOTL.GD.ZS?end=2020&locations=US&start=2002>).

⁶ The World Bank database, “Inflation, consumer prices (annual %) - United States”. Retrieved on January 2023 (<https://data.worldbank.org/indicator/FP.CPI.TOTL.ZG?locations=US>).

in 2009 (0.4%)⁷. These low values resulted from the low commodity prices that impacted mainly on advanced economies (IMF, 2010).

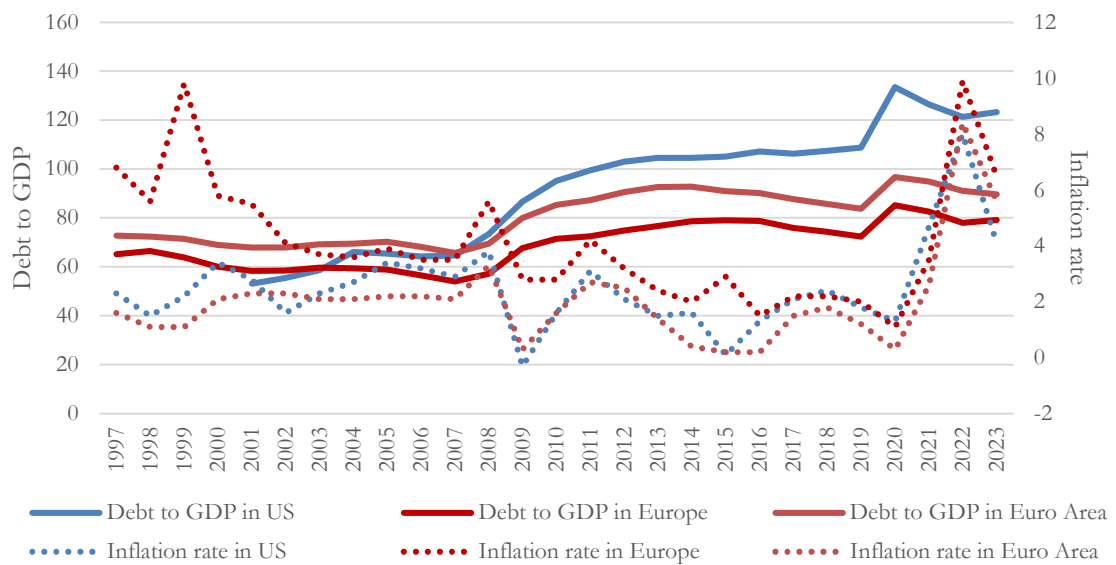
The economic turndown verified in 2020 was caused, not by systemic risk as the Great Recession, but by a virus pandemic that provoked a massive and sudden lockdown. The restrictions applied had a major impact on the debt-to-GDP ratio verified in advanced and open economies, with the denominator of this ratio assuming a negative world annual growth rate of 3,12%⁸ in 2020. While during the Great Recession, the worsening of the government's solvency was mainly a reflection of the fragile public balances, the output contractions caused by the COVID pandemic assumed a crucial role in the deterioration of the government's solvency during the recent crisis.

In **Error! Reference source not found.** is represented the debt-to-GDP ratio in countries from Europe, in the EA, and in the US, and the inflation rate for these regions over the last 25 years. It is visible that there have been two major debt-to-GDP increases since 1998, during the Great Recession and the COVID crises; however, we cannot define a standard path for inflation. While during the 2008-2011 and 2019-2021 periods inflation decreased in the regions analyzed, in 2003-2004, when were also registered major positive variations in the debt-to-GDP ratio for the US but the inflation rate remained fairly constant.

⁷ The World Bank database, "Inflation, consumer prices (annual %) - Euro area". Retrieved on January 2023 (<https://data.worldbank.org/indicator/FP.CPI.TOTL.ZG?locations=XC>).

⁸ The World Bank database, "GDP (constant 2015 US\$)". Retrieved on January 2023 (<https://databank.worldbank.org/reports.aspx?source=2&series=NY.GDP.MKTP.KD.NV.AGR.TOTL.KD.NV.IND.TOTL.KD.NV.IND.MANF.KD.NV.SRV.TETC.KD.NV.SRV.TOTL.KD#>).

FIGURE 1: DEBT-TO-GDP AND INFLATION RATE IN EUROPE, EURO AREA AND US, BETWEEN 1997 AND 2023



Source: IMF⁹

Despite the distinct causes of the last large economic turndowns, both were preceded by periods of low interest rates, and the response of the monetary authorities was similar. In the US, the Federal Reserve (FED) initiated Quantitative Easing programs to inject liquidity into the market during the Great Recession. During and after the COVID-19 pandemic, FED reinforced asset purchases and lent money to banks. In the EA, the ECB adopted unconventional measures during the Great Recession to encourage banks to grant loans to households, namely, Targeted Longer-Term Refinancing Operations (TLTROs) and the Long-Term Refinancing Operation (LTRO) (Alonzo et al., 2022). When the COVID pandemic arrived, the ECB reinforced the measures adopted, aiming to maintain liquidity injections. Similar approaches were adopted in Japan and China.

However, differently from the Great Recession, the rise of energy prices, the supply shortages, and the geopolitical conflict in Ukraine that followed the COVID-19 pandemic threatened economic growth and implied pressures to generalized price increases in 2022. It

⁹ IMF database, “Inflation rate, average consumer prices”. Retrieved on August 2024
(<https://www.imf.org/external/datamapper/PCPIPCH@WEO/OEMDC/ADVEC/WEOWORLD>).

IMF database, “General government gross debt”. Retrieved on August 2024
(https://www.imf.org/external/datamapper/GGXWDG_NGDP@WEO/OEMDC/ADVEC/WEOWORLD).

led the monetary authorities to adjust the measures implemented to prioritize price stability, reducing both consumption and output, by increasing interest rates.

The control of inflation is conventionally attributable to central banks as they take price stability as a key objective. This institutional framework has been followed by several countries that delegate monetary policy to such authorities; however, the effectiveness of monetary policy alone to control inflation has raised some concerns over time, leading some critics to point to the need for a fiscal policy driven towards inflation stability as well, due to its potential impact on the money supply (Lyziak & Mackiewicz-Lyziak, 2020) and the willingness of fiscal authorities to reduce public debt through inflation (Bilan & Roman, 2014). In this context, it is reasonable to ask if public debt contributes to changes in the inflation rate and to the joint role of fiscal and monetary authorities in shaping the public debt-inflation relationship.

Incompatibilities between monetary and fiscal policies may arise when fiscal imbalances are larger, and the monetary authority's credibility is weaker, making it harder for monetary authorities to stabilize inflation: an increase in the interest rates to diminish inflation promotes recession and increases the debt-to-GDP ratio (Bainchi & Melosi, 2022). If the fiscal policy authorities do not properly address public debt increases, it can lead to growing inflationary pressure, trapping the economies in a vicious circle.

Nevertheless, price stability has been the main objective of several central banks since the middle 1980s, when monetary rules started being replaced by inflation targets, and they are willing to keep this objective (Lagoa et al., 2019). However, "A central bank cannot by itself stop an ongoing inflation against the will of a fiscal policy authority determined to run persistent budget deficits." (Sargent, 2013, p. 264). If the central bank starts the journey against inflation alone, it can achieve temporary gains but, in the long run, the inflation rate can be worse since the central bank forces the fiscal authorities to issue increasing quantities of interest-bearing debt, which will, eventually, generate more inflation. On the other hand, fiscal authorities try to keep the debt-to-GDP ratio within reasonable values, and are willing to use inflation to get their goals.

Given this, it is reasonable to ask: how can inflation impact public debt? Is public debt able to impact inflation through specific mechanisms?

2.1 How does inflation impact on public debt?

Public debt, a consequence of recurrent (non-cycle determined) public deficits, has been a matter of interest for several authors who analyze the reasons behind major public debt increases as being traditionally motivated by global economic turndowns, such as the Great Depression in the US in the 1930s, the Great Recession between 2007 and 2009, by local affairs, such as wars and natural disasters, and by unstable political guidance.

Historically, debt-to-GDP ratios have been reduced through five, not mutually exclusive channels: economic growth, austerity plans and/or substantial fiscal adjustments, explicit default, surprise inflation, and financial repressions accompanied by inflation (Reinhart & Sbrancia, 2011). Since deficit reductions through expenditure cuts and/or tax increases are commonly unpopular, surprise inflation becomes a more agreeable alternative.

Inflation can help reduce public debt through two main channels: the erosion of the real value of the debt and the increase in tax revenues. A government's real debt is obtained by dividing its nominal value by a price deflator, whereby the higher the price level, the lower the real public debt under new inflation expectations, which encourages investment and reduces capital crowd-out. Moreover, if tax codes are not automatically adjusted with inflation, the tax liability increases with nominal income to taxpayers since, due to inflation, their real income does not grow in the same proportion as nominal income. Similarly, a higher real tax burden is applied to capital income since taxes are commonly levied over nominal returns on investment (Berkovich et al., 2021).

The erosion of real public debt through inflation was visible particularly in Spain broadly since the First World War (Comín, 2012), in the 1940s and 1950s in the US (Aizenman & Marion, 2009) and during the 1970s for many industrial countries (IMF, 2023). Its effectiveness is determined by several factors: the response to long-term inflation expectations, the credibility of central banks, the maturity structure of public debt, the share of debt denominated in national currency, the use of political instruments indexed to inflation, the share of debt detained by foreign and domestic investors, among others (Aizenman & Marion, 2009; Krause & Moyer, 2013; Bilan & Roman, 2014; Reinhart et al., 2015).

Inflation expectations affect inflation through forward-looking price guidance and affect long-term nominal interest rates through the cost of newly issued debt. Expectations evolution, on its side, will depend on the central bank's inflation target and credibility. If the

central bank keeps its inflation target, decreases or increases in the observed inflation will not impact long-term expectations based on the central bank's credibility and engagement with the monetary policies and objectives established (Krause & Moyen, 2013). Central banks' independence from the government also has a major influence on inflation expectations: if the independence of central banks is guaranteed, the risk of promoting inflation to reduce the debt burden is considerably reduced; otherwise, cash holders anticipate interest rates increase when public debt ratios are in a highway path and demand higher compensation when lending money to banks. Thereby, the expectation of a price increase in the future diminishes the positive effect of inflation on public debt (Bilan & Roman, 2014).

The opposite effect can occur when the observed inflation rate is higher than expected and results in an increase in real economic activity, leading the unemployment rate to a lower record than its natural level and producing a more efficient allocation of government's resources (Barro & Gordon, 1983). The effect of surprise inflation is reflected in the depreciation of the real value of debt and the decrease of the government's expenditures on interests and repayment of the principal. However, these benefits are suppressed when households and firms have rational expectations and anticipate a general price increase (Barro & Gordon, 1983).

The maturity structure of the public debt significantly affects how inflation decreases the real value of public debt. The maturity structure determines the portion of outstanding debt priced under the long-term inflation expectations. When the maturity is longer, the timeframe to repay debt under nominal interest rates established during low inflation periods is also longer. This situation often leads to a heightened temptation to inflate (Krause & Moyen, 2013). Even in periods with no financial repression, longer maturities avoid the rise in interest costs, a scenario verified if short-maturity debt is to be rolled over (Reinhart & Sbrancia, 2011). Aizenman and Marion (2009) go further, arguing that, in the extreme case of zero maturity, governments are unable to use inflation to reduce their debt burdens. On the other hand, the holders of the existing debt suffer losses in real value with unexpected inflation, which turns surprise inflation non-effective for a long-term policy (Berkovich et al., 2021).

In their study about how effective inflation can be in reducing debt to GDP ratio in the US, Aizenman and Marion (2009) claim that the portion of debt detained by foreign investors

also has a significant impact. Even though the average maturity of the US debt has become shorter in the last decades – from 113 months in 1947 to 47 months in 2009 –, the percentage of public debt detained by foreign investors registered the opposite path: until the early 1960s, this percentage was essentially null while in 2008 it represented almost half of the total debt (48%). While during periods typically marked by longer debt's maturity and non-existing foreign debt holders a 5% inflation increase would have resulted in a decline in the debt to GDP ratio of 45%, in 2009, the same increase in the inflation rate would have decreased the debt ratio by only about 20%. While shorter maturities of a more recently issued debt reduce the temptation to inflate, the larger percentage of debt detained by foreign creditors acts oppositely, as the effects of inflation are shared almost equally between domestic and foreign debt holders.

The rising portions of public debt detained by foreign investors bring additional constraints. Not only are investors subject to the same regulations and restrictions – that force residents to hold government debt, for example – but when a large share of debt is held by foreign investors and in foreign currency, governments face a rollover risk more pronounced than when debt is issued in domestic currency; in the latter case, governments can inflate away their debt by printing new money – compromising the inflation target – and are less exposed to forex market turbulence (Reinhart et al., 2015). Thus, when a substantial share of public debt is expressed in national currency, an erosion of public debt through inflation becomes an option: when inflation rises, it impacts the currency of the issuer government, the purchasing power of the debt holders is reduced, and the government has an incentive to inflate away its debt. This incentive is lower if public debt is issued in foreign currency, as principal and debt service payments rise with domestic currency depreciation, making negligible the inflation impact on the debt (Bilan & Roman, 2014; Aizenman & Marion, 2009). Also, when debt is issued in foreign currency, as it happens for many emerging markets and developing economies, the central bank may not have access to sufficient foreign currency liquidity, preventing the central bank from acting as a lender of last resort in the event of a crisis (Willems & Zettelmeyer, 2022).

Concerning the instruments adopted by fiscal authorities to manage their financial liabilities, these should not be designed to protect investors against inflation, otherwise inflation's impact on public debt is eroded. This is visible when debt instruments are linked to price level, such as inflation-linked bonds, debt instruments linked to exchange rates as currency

bonds, or floating rate debt instruments, like floating-rate notes (Bilan & Roman, 2014). For example, in the US, the large majority of the outstanding debt is fixed in nominal terms – inflation-linked bonds only represented 7.5% of the debt issued in 2021 – and the income received by debt holders lost real power with inflation hikes, making the wealth being transferred from debt holders to government. This is only possible because both the principal and the non-indexed debt coupons are paid according to the terms agreed upon at the time of debt issuance, i.e., these payments are not adjusted for unexpected inflation until the debt reaches maturity (Berkovich et al., 2021).

The second key channel presented through which inflation impacts public debt is through the tax revenues, both through its composition and its amount. It is possible due to the “bracket creep”, which implies the existence of non-indexed components in the tax code, and due to the increase in the tax burden applied to capital earnings (Berkovich et al., 2021).

“Bracket creep” is a general fiscal phenomenon verified in periods of high inflation whereby wage income is pushed to higher tax brackets due to price-unindexed tax limits in a progressive tax system. Even though there is no real increase in disposable income, this results in additional tax revenue collected by governments (Baert, 2022). This phenomenon is reported to affect mainly the lower- and middle-income brackets, particularly notorious in countries with progressive income tax systems where tax rates are increased as workers’ income increases, without adjusting for inflation, as is the case in most EU member states and is also present in some features of the US individual tax income (Baert, 2022; Berkovich et al., 2021).

The role of Value Added Tax (VAT) on public finances in times of high inflation is similarly pointed out in literature since any increase in the price level pushes up VAT receipts automatically. Even though VAT has always been one of the main sources of public revenue, the impact of inflation has been quite visible, recently, with increases of 12% in Spain, 14% in Germany, and 18% in France in VAT revenues, between the first half of 2021 and the first half of 2022 (Baert, 2022).

Inflation affects tax revenues not only through changes in the purchasing power of nominal labour income but also through capital income, such as capital gains. This occurs when the tax code imposes a tax liability for assets sold for a higher nominal price than its purchase price. Since the purchase price – cost basis – is not indexed to inflation, inflation reduces the real value of the sale since it only impacts the selling price, making the difference between

the sales price and the cost basis increase faster than the inflation rate, thus increasing the capital gains tax liability in real terms (Berkovich et al., 2021).

The impact of inflation is extended when, under the tax code, firms recover, through tax deductions, the cost of buying long-term assets by claiming depreciation deductions over a specific time period. However, since the deductions are expressed in nominal terms, inflation erodes its real tax benefit, making the deductions less valuable to the firms in terms of reducing their tax liability. Similarly, firms' loss carryforward also positive impacts in terms of tax revenues for governments since the value of nominal losses is not adjusted for inflation, and the real value of these losses is eroded over time in the presence of inflation (Berkovich et al., 2021).

It is also worth mentioning that inflation can significantly impact how interest revenues and expenditures are treated for tax purposes. As per Fisher's effect, nominal rates of return follow the inflation trend to compensate investors for the expected inflation, and considering that, in general, interest income is taxable in nominal terms, this leads to a higher tax burden in periods of high inflation. However, when households and investors pay interest on loans and borrow money, they may benefit from inflation since debt service is partially deductible, and the deduction is applied against a larger nominal amount of interest paid (Berkovich et al., 2021).

These effects impact not only the preexisting debt amount but also the amount of debt to be issued: the higher the increase in the price level, the lesser the need to issue new government debt, as inflation tax becomes a major source of government revenues (Claessens et al., 2007).

Given the channels presented, fiscal authorities face both benefits and costs from inflation to public debt: on the one hand, inflation reduces the real value of the public debt but, on the other hand, it also discourages consumption due to the loss of purchasing power and, consequently, reduces the tax base and the tax revenues (Niemann et al., 2011).

2.2. How does public debt impact on inflation?

For a long time, inflation was widely accepted as a monetary phenomenon, solely depending on progressive growth and demand for liquid assets (Mehmeti & Deda, 2022). The monetarist theory of price level determination argues that the interaction of active monetary

policies with passive fiscal policies within a Ricardian framework allows monetary authorities to have the entire control over price level (Erdogdu, 2002). This school of thought is based on a classic perspective that assumes that interest rates are a direct function of monetary policy and that government bonds are not seen as net assets. It establishes that public debt does not significantly impact the price level and that fiscal policies do not create wealth effects.

Opponents of this theory defend that inflation rate is determined, not only by monetary policies, but also by fiscal matters (Mehmeti & Deda, 2022). This non-Ricardian view, the Fiscal Theory of Price Level, supports that fiscal disturbances are responsible for price level variations due to the wealth effect produced on private consumption (Aimola & Odhiambo, 2021). According to this theory, the price level is determined by fiscal components such as debt, revenues, spending, and deficit; monetary policy plays a secondary, or no role, in the process. To establish the links between public debt and inflation it is crucial to consider fiscal and monetary policy interactions (Sargent & Wallace, 1981; Leeper, 1991; Aimola & Odhiambo, 2021).

Aimola and Odhiambo (2021) reviewed the theoretical and empirical literature on the linkage between government debt and inflation encompassing country-specific and multi-countries outlooks and found a positive relationship in most of the studies, although no consensus exists. The positive relation implies the need for effective fiscal policy guidance to control inflation pressures, especially for developing countries that traditionally present a weak financial market, a prevalent fiscal regime, and high public debt levels.

As a result of fiscal-monetary policy interactions, Kwon et al. (2006) mention in their study the two main channels through which public debt impacts inflation: monetization (seigniorage financing) and the wealth effect.

The impact of public debt on inflation through the money supply gathers strong support for the well-known equation of the Quantity Theory of Money¹⁰. This equation directly relates the money supply and the price level. It allows us to infer that the inflation level is given by the sum of the money supply growth and the variation in the velocity of money minus the output growth. In the long run, the velocity of money is assumed constant or given, and

¹⁰ $MV=PY$; M=Money supply; V= Velocity of money; P= Price level; Y= Real GDP

inflation is determined by the difference between the growth of the money supply and the potential output. Thus, the larger the growth rate of the money supply, the higher the inflation rate for a given growth rate of trend output.

According to the fiscal-monetary approach, the impact of government deficits on the money supply is recognized as the primary factor for an inflation process. This approach relies on the government's "inflation tax" used to fund expenditures, and its success depends on the central bank's credibility regarding the government control over budgetary expenditure (Burdekin & Burkett, 1996).

Bilan and Roman (2014) focus on internal channels that explain this relation and present two scenarios under which the debt-money supply can impact inflation: when governments finance their short-term liabilities from the central bank or when they get financing from banks or other financial institutions. When governments issue debt to finance deficits, it is usually done directly on the financial markets with long maturities, and the money supply is not impacted; however, to finance treasury deficits, governments contract short-term loans from central banks. This will cause a discrepancy between monetary and financial flows and the real ones applied in the economy since the money supply issued will not have a corresponding increase in goods and services, resulting in inflation. In this context, in many economies, the finance of long-term liabilities through money issuing and the governments' direct access to short-term debt resources from the central bank are not allowed.

The money supply is also expected to grow when debt is financed from other monetary institutions. This is because these institutions not only have the power to generate book money, but also engage in refinancing activities with central banks. The change in the amount of money in the economy will depend on whether public debt securities add or substitute for the existing bank's assets: if the liquidity coverage ratio is unchanged, there is no change in the money supply since the bank is prioritizing government debt over private obligations. However, when government securities are added to the bank portfolio without replacing private debt, both the bank's assets and liabilities are impacted, and the broad money supply growth pressures prices upward. This effect is amplified when, after subscribing public debt, banks reduce their lending funds and refinance their operations with the central bank. Refinancing operations can raise liquidity within the banking system and determine money supply increases (Bilan & Roman, 2014).

The effects of the money supply on inflation are also influenced by the type of currency used for issuing debt, as well as the existing exchange rate system. When governments issue debt denominated in foreign currency and the central bank is committed to a fixed exchange rate regime, the central bank will buy foreign currency to keep the exchange rate stable. Giving the domestic currency as an exchange for the transaction will result in a larger offer of domestic currency in the economy, and an increase in the price level is expected (Bilan & Roman, 2014). On the other hand, when a floating exchange rate regime is in place, the central bank will not take any measure to affect the money supply and, on the contrary, an appreciation of the domestic currency can be verified with negative impacts on external accounts (Bilan & Roman, 2014).

Assuming an increase in the money supply, it can lead to inflationary effects in the first instance; however, the permanent effect is not guaranteed. If firms and companies take the opportunity of money surplus to increase the quantity of goods and services available in the market and the government's loan resources are used to promote an increase in production, a similar increase in the demand for money will emerge (Bilan & Roman, 2014). The final impact on inflation will then depend on how effectively government funds are used since an increase in output growth may not be enough to compensate for the money supply growth and, consequently, the financing activity is inflationary.

The money supply mechanism is also straightly connected with the central bank independence, since an independent central bank will not monetize debt. In this case, fiscal authorities are not able to use debt paths to affect monetary policy, and inflation levels follow the monetary authority target (Martin, 2015).

The interaction between fiscal and monetary policies gains particular interest when public imbalances are characterized by unsustainable debt growth and fiscal authorities are not perceived as the single responsible for sustaining it. Under these circumstances, the private sector may expect a deviation from the long-term inflation target to sustain government accounts (Bianchi & Melosi, 2022).

Bianchi and Melosi (2022) defend that changes in the inflation rate are due, not only to fiscal shocks, but also to changes in the policy mix. This assumption is based on the evidence verified in the 1960s and 1970s in the US when large public spending was observed, and the credibility of the FED was low due to its lack of commitment to stabilize inflation. During the 1980s, policymakers adopted monetary-led policies, with the fiscal authorities being

firmly committed to keeping debt ratios sustainable and the central bank strongly reacting to inflation's deviations from its target, with a significant decline in the inflation rate in the Volcker period.

More recently, after the COVID pandemic, the perception changed since cost-push shocks assumed an important role in the inflation rate's deviation from the target, alongside fiscal imbalances. Cost-push shocks strongly impacted inflation, even though their effects on inflation are transitory, independently from the policies adopted. In turn, fiscal imbalances acquire a long-term impact on inflation, demanding a joint response of monetary and fiscal policies (Bianchi & Melosi, 2022).

Bhattarai et al. (2012) analyze the response of inflation to different combinations of active and passive monetary and fiscal policies and conclude that when monetary policy is active – high response of interest rate to inflation – and fiscal policy is passive – high response of taxes to outstanding public debt –, inflation follows closely the inflation target, and fiscal policy plays no role in determining inflation rate. However, when passive monetary policy and active fiscal policy coexist, fiscal policy matters for inflation dynamics. Inflation now moves in the opposite direction from the inflation target, and the stronger the systematic reaction of monetary policy, the more accentuated the difference verified between the inflation rate and inflation target, the higher the response of inflation to non-policy shocks, and inflation's volatility is higher. The weaker the response of taxes to public debt – active fiscal policy –, the weaker the impact of non-policy shocks on inflation.

In the first scenario (active monetary policies and passive fiscal policies), the systematic response of interest rates to inflation is greater than one, but an increase in the interest rate leads to an increase of the government debt to cover for the debt service, which leads to wealth effects for those holding government debt. This is perceived as an increase in their wealth since the tax rate does not respond immediately to the debt increase; it is expected that the consumption and spending of bondholders will increase, which will promote inflation (Bhattarai et al., 2012).

In the traditional open economy models, an increase in the real interest rate results in a decrease in the inflation rate due to two main channels: aggregate demand and real exchange rate.

The most straightforward impact of an increase in real interest rate in aggregate demand is a negative effect; however, an increase in interest rate can lead to an increase in inflation, as

already shown. The impact on the exchange rate may not be the expected real appreciation of domestic currency when certain conditions are verified (Blanchard, 2004).

In the presence of long-term debt, higher nominal interest rates imply lower nominal bond prices. The nominal market value of outstanding public debt decreases, and investors become more willing to buy government bonds instead of goods and services. The aggregate demand will then decline and cause inflation to fall until the real value of nominal government debt matches the real value of the primary surplus (Blanchard, 2004).

A similar outcome is achieved in the long-term when government buys back long-term debt, reducing the amount to pay in the future, if there is no change in the expected surpluses. The extra money works as an inflation stimulus today; however, the higher inflation rate verified in the present and the lower levels expected in the future will result in a lower long-term interest rate (Blanchard, 2004).

If the interest rate rise is persistent, it is needed a fiscal adjustment to control inflation, otherwise, inflation is temporarily lowered but, in the long-term, it will eventually rise. The impact of a change in interest rates will then depend on the fiscal policy adopted since more long-term debt is reflected in an enhanced effect of interest rates on inflation (Cochrane, 2017). Also, when fiscal conditions are not appropriate – a high portion of the debt is denominated in foreign currency, the debt burden is high, and the risk aversion of investors becomes larger – an increase in the interest rate is more likely to lead to a depreciation than to an appreciation of domestic currency, resulting in inflation increase (Blanchard, 2004).

The aim to decrease the public debt can lead governments to adopt one of two policy strategies: expansionary or contractionary. Both can lead to inflationary pressures through different channels: an effort to reduce the government debt can be achieved by raising taxes, which increases the production costs; these production costs are transmitted to the economy through increase in prices (supply-side) (Khan et al., 2020); on the other hand, adopting expansionary policies, the governments allow to increment of the level of income, which will lead to an increase in the price level due to the higher demand (Emmanuel, 2016). A higher aggregate demand will lead to an increase in the price level, not only through the mentioned fiscal wealth effect, but also through an increase in the money supply, raised to support the fiscal burden (Khan et al., 2020).

3. Methodology

In this section, we introduce a bibliometric analysis to explore how the research has dealt with the specific interconnections between public debt and inflation, both the impact of inflation on the real value of public debt and the influence of public indebtedness on the inflation rate.

3.1 Bibliometric and performance analysis overview

Bibliometric analysis “is useful for deciphering and mapping the cumulative scientific knowledge and evolutionary nuances of well-established fields by making sense of large volumes of unstructured data in rigorous ways” (Donthu et al., 2021, p.1). It is extensively used to explore the rational structure of a particular domain in literature and to discover emerging trends when the scope of review is broad. We performed a bibliometric analysis, both qualitative and interpretative, to provide an overview of the evolution in the literature of public debt and inflation interconnections.

We adopted a performance analysis, a technique of descriptive nature, to examine the contributions of the different research constituents, using the total number of publications as a publication-related metric and the total number of citations as citation-related metrics, aiming to measure the productivity, impact, and influence of the authors, institutions, and countries analyzed. We also summarize how the literature supports the bidirectional relation between inflation and public debt and the corresponding mechanisms.

3.2. Data collection

The data required for this study was gathered from Scopus, the world’s largest citation and abstract database of peer-reviewed literature. It compiles searching tools to track, analyze and visualize research of a wide range of documents from scientific journals, books and conference proceedings.

The search was instructed using keywords “public debt”, “public indebtedness” and “government debt” combined with “inflation” and “price level” in the “article title, abstract and keywords” fields. Considering the scope of the present dissertation, the search was filtered by subject areas “Economics, Econometrics and Finance” and “Social Sciences” and

was restricted to documents written in English. This search yielded 1819 documents (as of May 2023).

In the resulting extraction were considered solely articles, conference papers, short surveys and reviews and were removed all the duplicates, resulting in 1324 documents. These documents were submitted to an initial screening, where the title and abstract were reviewed as to confirm the adequacy of the study to our finality (the relationship between public debt and inflation), leading to the exclusion of 796 documents as they did not focus on the sought public debt-inflation interconnections, exploring rather matters related with banking, credit for households, financial sustainability, among others.

The 528 documents obtained during the first stage were submitted to a further screening through Chatpdf, a web-based platform that analyses PDF files, summarizes relevant information, and answers questions about the document submitted. The adequacy of the 514 articles (14 were disregarded due to lack of access) was checked as if they explore the dynamics of public-debt and inflation. 283 pertinent documents were selected, published between 1951 and 2023: 268 articles, 5 conference papers, and 10 reviews. These 283 documents encompass 76 describing the impact of inflation on public debt, 154 describing the effect of public debt on inflation, and 53 that study the bidirectional relation. For the analysis's purpose, it will be considered a total of 129 documents describing the impact of public debt on inflation and 207 documents describing the symmetric relation (we're considering the 53 documents that study the bidirectional relation in both analysis groups).

These publications were classified by type of methodologies based on the distinction proposed by Nelson and Winter (1982): "formal", "appreciative", "empirical", "formal and empirical", "appreciative and empirical" and "survey". The theoretical arguments were categorized as "formal" when they include a mathematical logic or an analytical framework and as "appreciative" when critiques, judgments, or appraisals are integrated into an intuitive form. If the publications also present tests to the models or theoretical insights using data, they were classified as "formal and empirical" and "appreciative and empirical", respectively. When solely or substantially are considered statistical or econometric tests of the data, the documents were classified as "empirical", and "surveys" was applied when the documents overview publications on this particular topic.

The classification of the documents concerning the mechanisms used to present/describe the interconnections between public debt and inflation was elaborated based on the

contributions presented in the literature review. Documents that describe the impact of inflation on public debt were categorized into one of six categories: “erosion of the real value of public debt”, “inflation tax”, “interest rate”, “debt structure”, “exchange rate” and “others”. When the main focus of a document is to describe and/or characterize the erosion effect of inflation on government debt, it was considered under “erosion of the real value of public debt” mechanism, as described in the literature review section; “inflation tax” was applied when the document analyzed focus on the impact of inflation in the tax revenues collected by governments; “interest rate” was attributed to documents that describe the influence of inflation on interest rates, that ending impacting public debt; “debt structure” was applied on documents whose impact of inflation on public debt depends on the governments’ debt structure (e.g., maturity, indexed or non-indexed debt); “exchange rate” encompasses the literature that describe the impact of inflation rate on exchange rates, and consequently, on public debt; finally, the category “others” includes the remaining mechanisms identified in the literature that influence how inflation impacts public debt, namely, public debt’s level, surprise (unexpected) inflation, and government’s risk of default.

The mechanisms through which public debt impacts inflation were similarly categorized into four categories: “money supply”, “wealth effects”, “interactions between fiscal and monetary policies” and “others”. The “money supply” mechanism encompasses all the documents that mention the increase in the money supply, or the money growth implemented to beneficiate the fiscal burden; the “wealth effects” includes the documents focused on analyzing and testing the fiscal theory of the price level, mentioning the impact of interest rates, government’s spending and taxes decisions, among others; the “interactions between fiscal and monetary policies” was applied to the documents that contemplate how the interactions between fiscal and monetary policies influence the impact of public debt on inflation; the “others” category groups the remaining mechanisms, such as inflation expectations, public debt expectations, foreign versus domestic debt, government commitment, exchange rate and time (in)consistency of the issued debt.

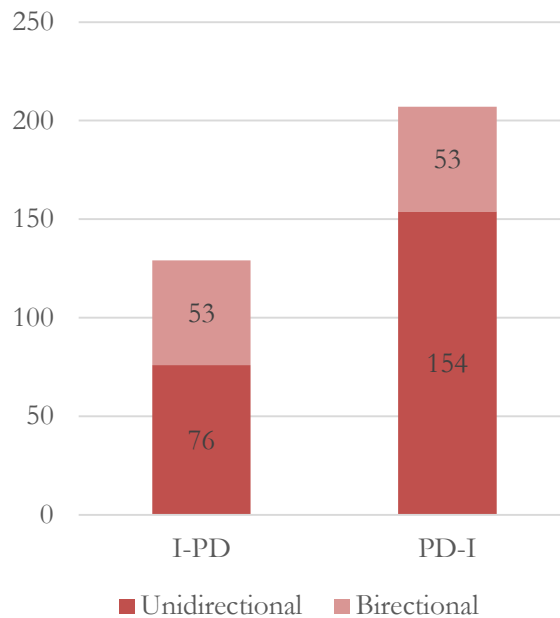
4. Analysis of results

4.1 General overview of documents on public debt and inflation interconnections

Figure 2 shows the result of the classification of the documents obtained in our search by directional relation studied between the variables: inflation on public debt (I-PD) and public debt on inflation (PD-I). Since 53 documents analyze both the impact of inflation on public debt and the impact of public debt on inflation, they were considered in both relations and are labelled in the figure as “Bidirectional”. This latter group represents 19% of the total number of documents. The “Unidirectional” category encompasses the publications focused on analyzing the impact of inflation on public debt (76 documents) and the impact of public debt on inflation (154 documents). These two groups represent 27% and 54% of all the documents gathered, respectively.

The two categories provide a total of 129 documents under the I-PD group and 207 documents concerning the impact of public debt on inflation.

FIGURE 2: NUMBER OF DOCUMENTS THAT EXPLORE INFLATION’S IMPACT ON THE PUBLIC DEBT (I-PD) AND PUBLIC DEBT’S IMPACT ON INFLATION (PD-I), 1951-2023



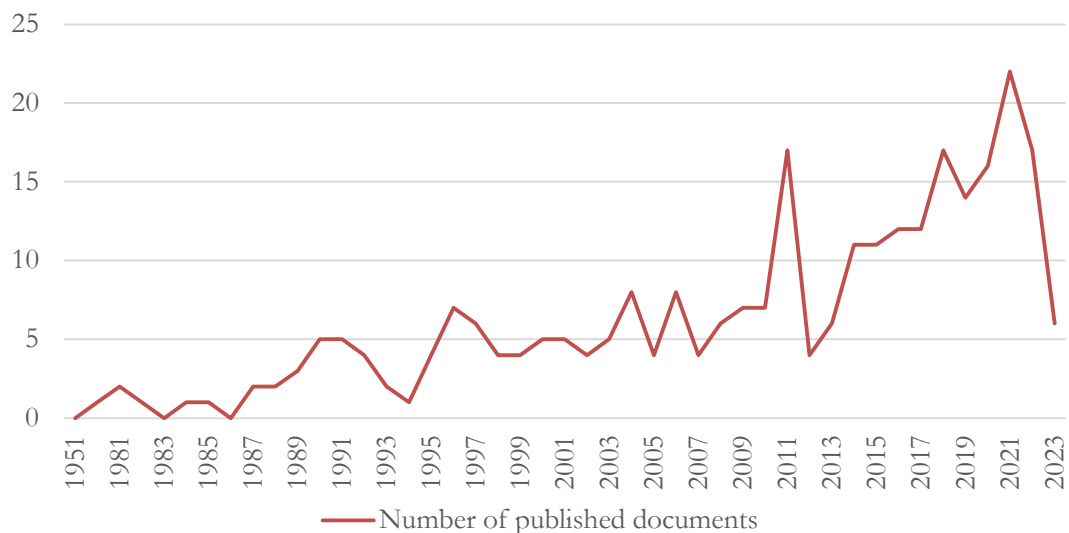
Source: own calculations.

Error! Reference source not found. shows the time distribution of the documents in our sample, published between 1951 and 2023. Most of the documents considered (80%) were

published after 2000, and the highest number of documents published per year was reached in 2021: 22 documents.

The increasing trend of published documents in this field of study is visible in **Error! Reference source not found.**: 42 documents (15%) were published between 1990 and 1999; 56 documents, representing almost 20% of the total number of documents gathered in the sample, were between 2000 and 2009; between 2010 and 2019 was registered the highest number of 111 published documents, which represents almost 40% of our sample; and between 2020 and 2023 61 documents were published (around 21% of the gathered documents).

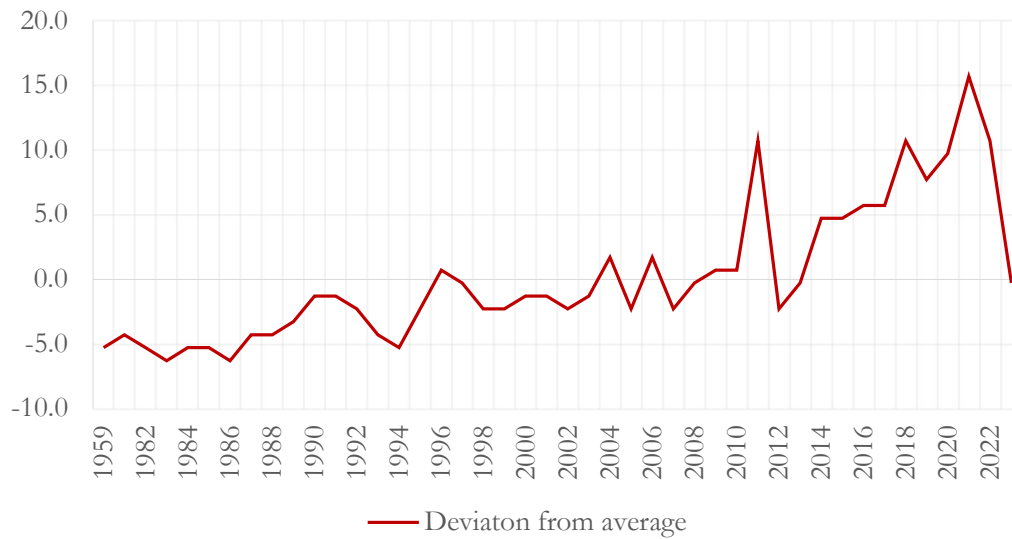
FIGURE 3: NUMBER OF PUBLISHED DOCUMENTS PER YEAR, 1951 - 2023



Source: own calculations.

To better understand the evolution of the number of documents published per year concerning the dynamics analyzed, it is represented in Figure 4 the deviation from the average number of documents published per year between 1959 and 2023 – 6.3 documents per year. The peaks in the figure below indicate the years in which the number of documents published is highly prominent from the average. As expected, research intensity is driven by actual outcomes: strong intensity of annual paper production lags slightly behind (due to study and publication lags) the largest increases in the public debt, observed as a consequence of the Great Recession and the COVID crisis.

FIGURE 4: DEVIATION FROM AVERAGE OF PUBLISHED DOCUMENTS (IN NUMBER) PER YEAR, 1959 - 2023



Source: own calculations.

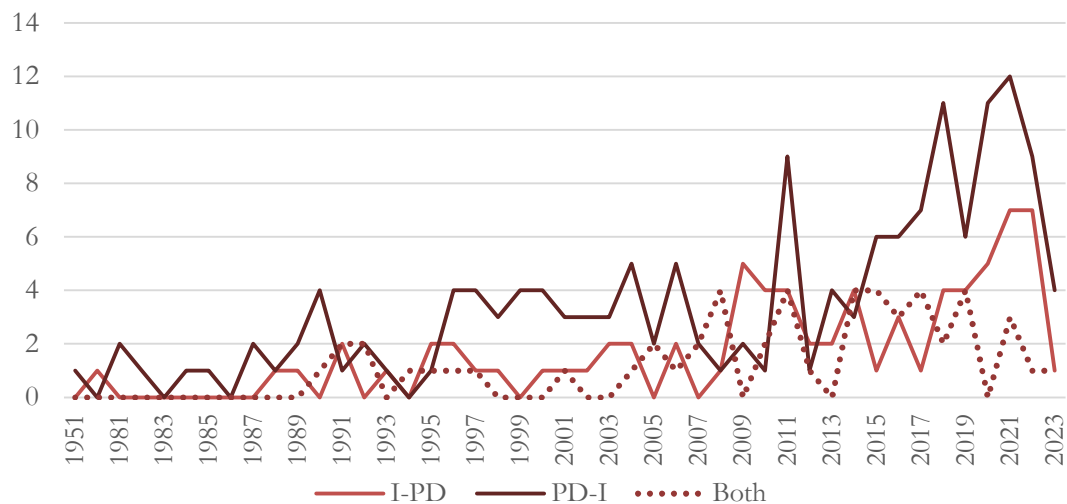
When considering the number of documents by type of direction (inflation → public debt; public debt → inflation; and both directions), the trends are quite similar: 41% of the documents on mechanisms through which inflation impacts public debt were published after 2008 and 37% of the articles describing the impact of public debt on inflation were also published after the same year. 38% of the documents that analyze both types of relations were also published after 2008. These records are presented in Figure 5. The maximum number of documents published presenting an unidirectional relation was recorded in 2021: 7 for the impact of inflation on public debt (I-PD) and 12 for the impact of public debt on inflation (PD-I). For studies covering both directions, the maximum number of records was achieved in 2008, 2011, 2014, 2015 and 2019, with 4 published documents.

The distribution per decade is equivalent for the three categories analyzed: the 2010-2019 decade gathers 38% (I-PD), 35% (PD-I) and 53% (both) of the published documents in each category, and the three groups reflect an increasing tendency per decade between 1990 and 2020.

The predominance of the PD-I category on the total number of selected documents is clear when looking to the average per year: 3.44 documents, versus 1.68 for I-PD category and 1.18 documents for “Both”. Apparently, the concern is typically on the relation on how public debt shapes inflation, even since the 1980s, while the reverse causation only became

representative during the 1990s and in the last decade, when inflation recorded abnormally low (zero lower bound periods) and high (after COVID and the start of the Russia-Ukraine conflict) levels.

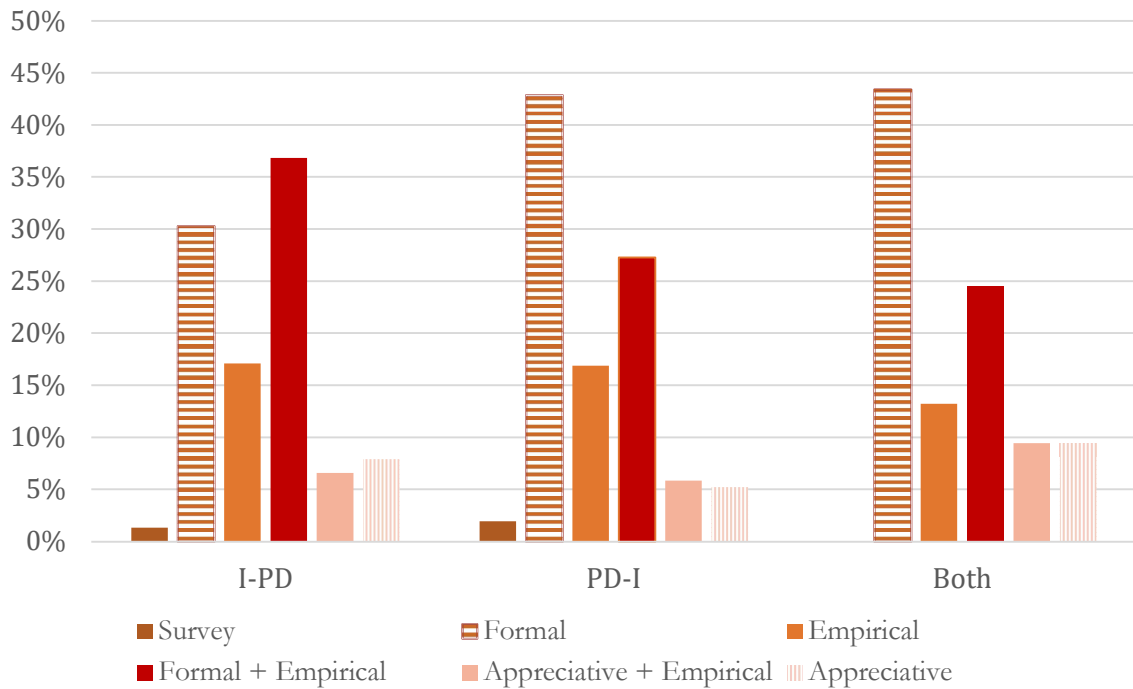
FIGURE 5: COLLECTED DOCUMENTS, PER YEAR, PER RELATION, 1951 – 2023 (NUMBER OF DOCUMENTS)



Source: own calculations.

The distribution of the documents collected by methodology is presented in Figure 6.

FIGURE 6: DISTRIBUTION OF COLLECTED DOCUMENTS PER METHODOLOGY



Source: own calculations.

Overall, the “Formal” category encompasses 40% of the gathered documents, followed by the “Formal + Empirical” category, which represents 30% of the total number of collected documents. The “Empirical” category also plays an important role, scoring third place with 15% of the literature collected, while “Appreciative” and “Appreciative + Empirical” both represent 7%; the “Survey” category only represents 1% of the documents. Except for the category “Both”, empirical applications dominate, showing the need for a quantitative assessment of the produced effects.

Among the I-PD literature, the 28 documents found under the “Formal + Empirical” category characterize the most representative share (37%), followed by the “Formal” category with 23 documents (30%) and the “Empirical” comprising 13 documents (17%). “Appreciative” and “Appreciative + Empirical” methodologies were found in 6 and 5 documents, respectively, while only one document is a “Survey”.

PD-I literature has a similar distribution, but the largest slice corresponds to the “Formal” category (66 documents translated in a 43% share), followed by “Formal + Empirical” with 42 documents (27%). Similar to I-PD literature, the third place is occupied by the “Empirical” category, with 26 documents (17%), and “Appreciative” and “Appreciative +

Empirical”, with 8 and 9 documents, respectively, representing together a share of 11%. “Survey” represents 2%, with 3 publications in this category.

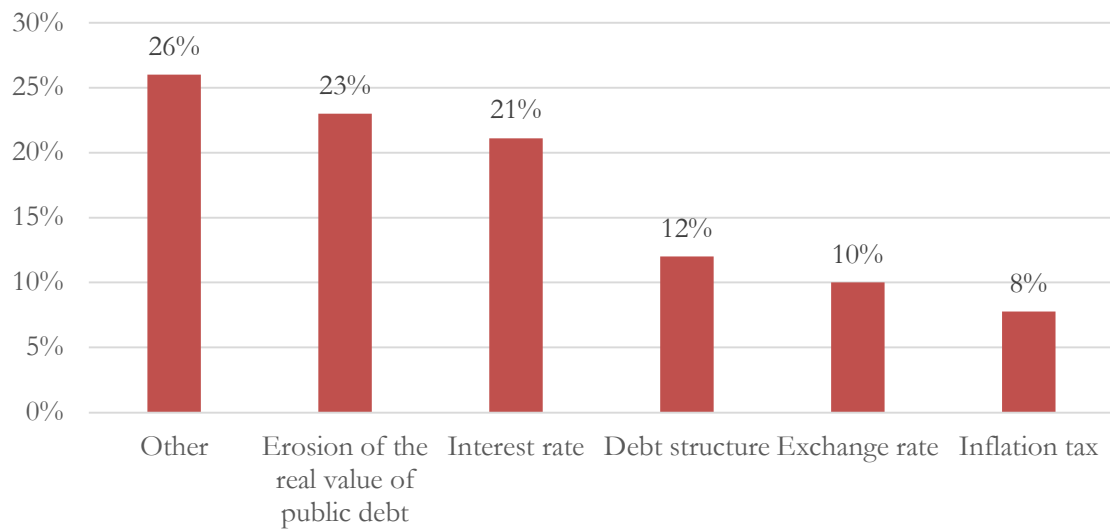
4.2 Detailed analysis of inflation → public debt (I-PD) literature

In this subsection, we detail the production of studies on I-PD through the 129 documents collected (76 documents included in the I-PD category, plus the 53 documents classified simultaneously in I-PD and PD-I literature, since the latter analyzes and describes both relations).

To analyze the mechanisms through which inflation impacts government debt, 5 documents were excluded, leaving a total of 124 pertinent documents, since no mechanisms are identified: the impact of inflation is merely empirically demonstrated without a discussion of the mechanisms involved.

Figure 7 shows the mechanisms identified in the literature, with a predominance of the “erosion of the real value of public debt” category present in 23% of the documents, followed by the “interest rate” category (21%). The “inflation tax”, “exchange rate”, and “debt structure” presented a relatively minor relevance in the literature analyzed, compared with the two previously mentioned categories. It is appropriate to notice that, even though the “Others” category is represented in 26% of the articles, it includes several distinct mechanisms, all of them with less representativeness than the five main mechanisms.

FIGURE 7: DISTRIBUTION OF DOCUMENTS REGARDING THE I-PD RELATION PER MECHANISM, 1951-2023

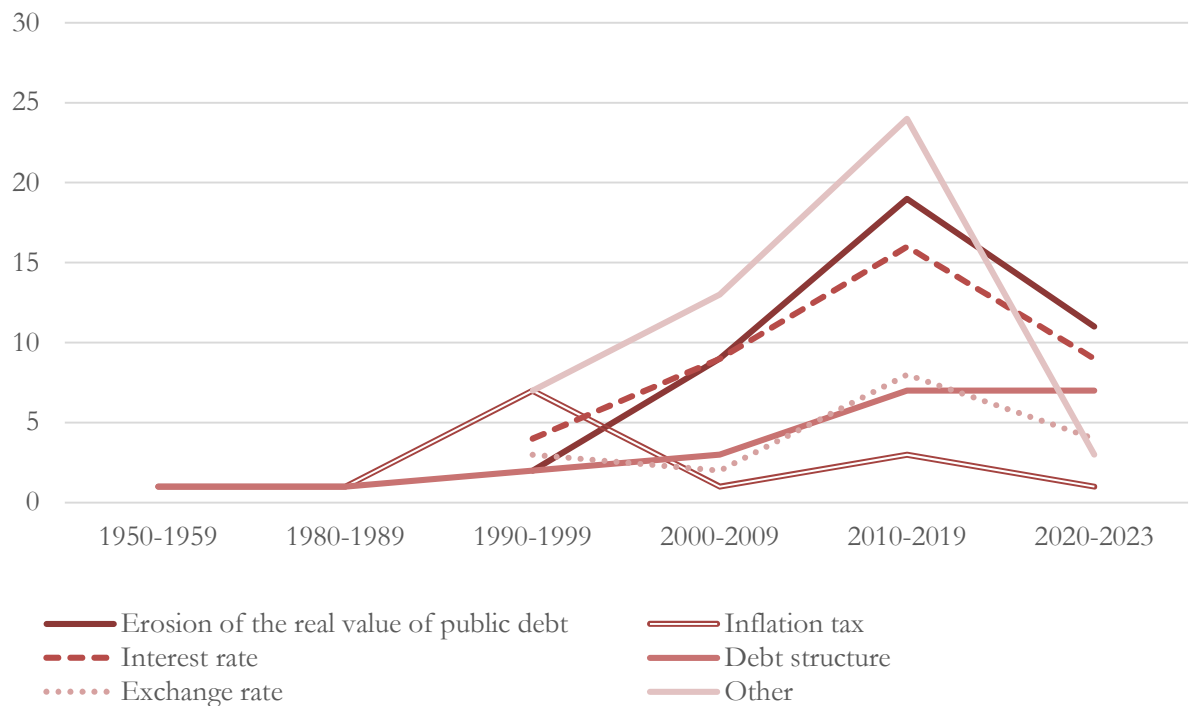


Source: own calculations.

When considering the evolution pattern of these mechanisms per decade, Figure 8 presents the dominance of the “erosion of the real value of public debt” mechanism in the literature since 2000, reaching the peak of 19 articles during the 2010-2019 decade. Also, the “interest rate” mechanism plays an important role, with a maximum of 16 documents per decade between 2010 and 2019. The “debt structure” and “exchange rate” followed similar paths, disputing the third and fourth places since 1990-1999 decade, with close numbers: 2 and 3 documents referred to these mechanisms, respectively, in the 1990-1999 decade, 3 and 2 documents mentioned them during the following decade and between 2010 and 2019.

In turn, “Inflation tax” dominated the literature during the 1990-1999 decade (7 documents mentioned this mechanism). However, its relative weight decreased in the following decades, being, currently, the mechanism less representative across literature. Indeed, “inflation tax” and “debt structure” were the only competing mechanisms in the literature up to the 1990s; all the other mechanisms were only identified from then onwards.

FIGURE 8: EVOLUTION OF DOCUMENTS ON THE I-PD RELATION PER MECHANISM, PER DECADE, 1951-2023 (IN NUMBER OF DOCUMENTS)

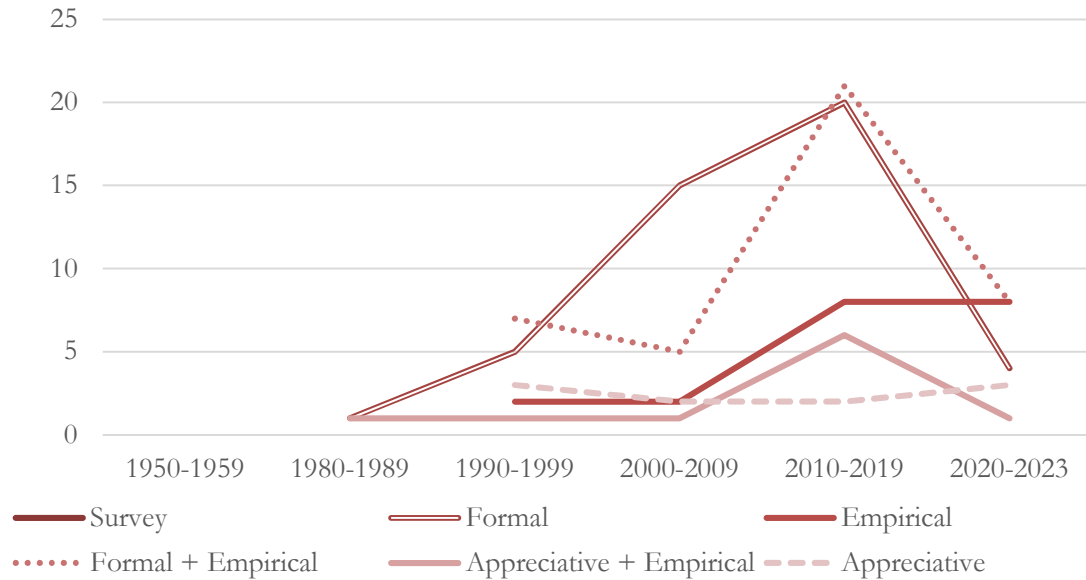


Source: own calculations.

Regarding the evolution pattern of the methodologies in the published documents, the “formal” category was mainly predominant, except for the 2010-2019 decade when the number of documents with “formal + empirical” methodology reached 21 documents, one more than the “formal” category. Up to 2023, the “formal” category also dominated.

It is possible to induce an increasing trend in the number of publications concerning the impact of inflation on public debt based on Figure 9 for the four main categories “formal”, “formal + empirical”, “empirical”, and “appreciative + empirical” until 2019. This trend is predictable to be reinforced since the average number of documents published per year between 2020 and 2023 is superior to the one verified between 2010 and 2019 (6 documents per year versus 5.7 documents per year).

FIGURE 9: EVOLUTION OF DOCUMENTS ON THE I-PD RELATION PER METHODOLOGY, PER DECADE, 1951-2023 (IN NUMBER OF DOCUMENTS)

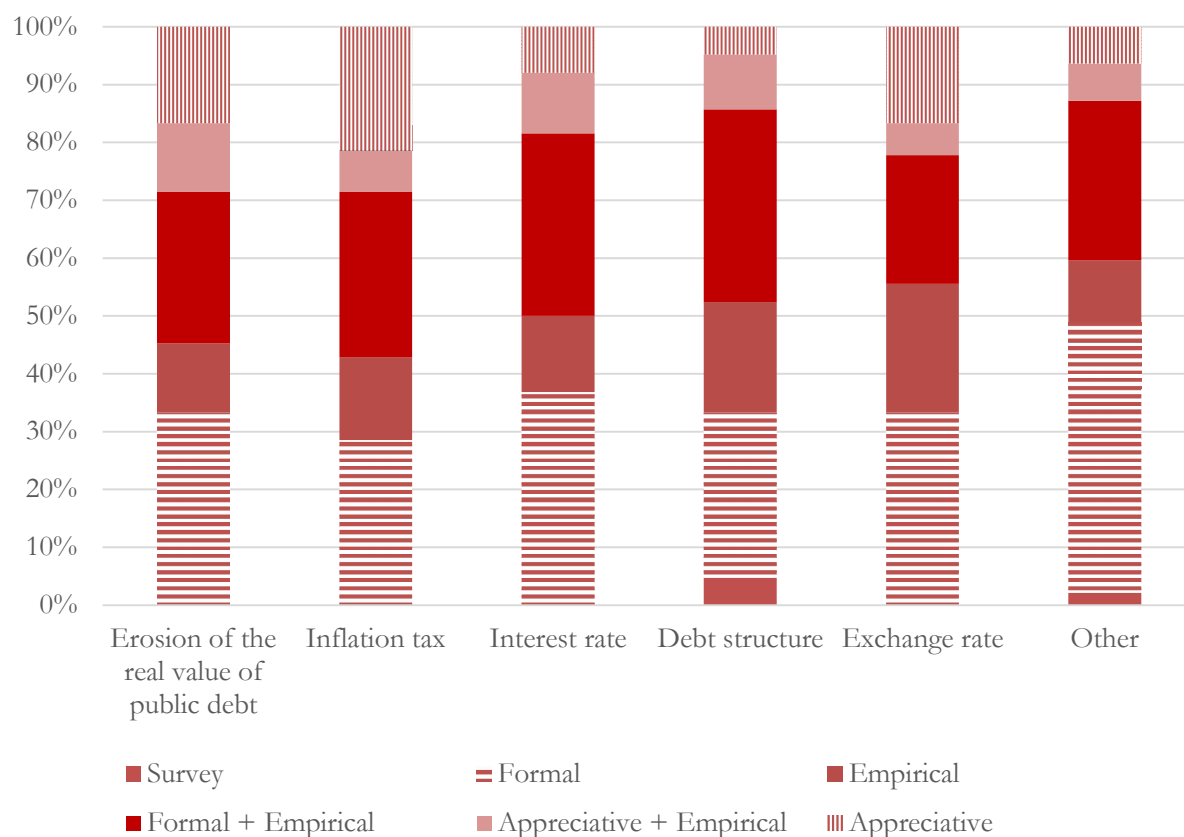


Source: own calculations.

It is also interesting to analyse the distribution of the documents collected by mechanism and methodology. The “formal” category represents the majority share across all mechanisms, except for “debt structure”. Only for this mechanism and “inflation tax” did this methodology collect less than 30% of the documents.

The methodology “formal + empirical” also plays an important role, being the second most representative with shares between 22% and 33%, followed by “empirical” and “appreciative” methodologies. The minor shares are centred on “appreciative + empirical” and “surveys” methodologies, the last one only present in one document.

FIGURE 10: DISTRIBUTION OF DOCUMENTS ON THE I-PD RELATION BY MECHANISM AND METHODOLOGY, 1951-2023



Source: own calculations.

Based on the documents collected, it is also possible to draw a conclusion regarding the relationship between inflation and public debt. 94 of the 129 documents collected provide us with inputs to qualify the impact of inflation on public debt as positive, negative or non-significant.

The relation I-PD is shown to be either positive or negative in 14 documents (15%), depending on the factors considered. Besides these, in 19 documents (20%) this relation is described as positive (when inflation increases, public debt level increases as well), while the majority, 59 documents (63%), state the opposite: when inflation increases, public debt decreases. In 2 of the documents collected it is defended a null impact of inflation in public debt.

It is worth mentioning that in 11 out of the 19 documents that describe a positive impact of inflation in public debt, the main argument is the “interest rate” mechanism, while of those 59 documents exhibiting a negative relation from inflation into public debt, the most

significant mechanism is “erosion of the real value of public debt”, mentioned in 22 of the documents in this group.

The remaining mechanisms (except “others”) presented very similar importance to support the negative relation: 10 documents mentioned the “interest rate” mechanism; “inflation tax” and “debt structure” were the main arguments in 9 documents, and “exchange rate” was the mechanism identified in 8 of the documents.

This data is validated with empirical evidence in 62% of the documents (59 of the 94 documents): 58% of the documents provide evidence of a negative relation (34 documents), 24% a positive one (14 documents), and 15% of these documents support a relation in both ways (9 documents). Only 4% - 2 documents – conclude that inflation does not impact public debt.

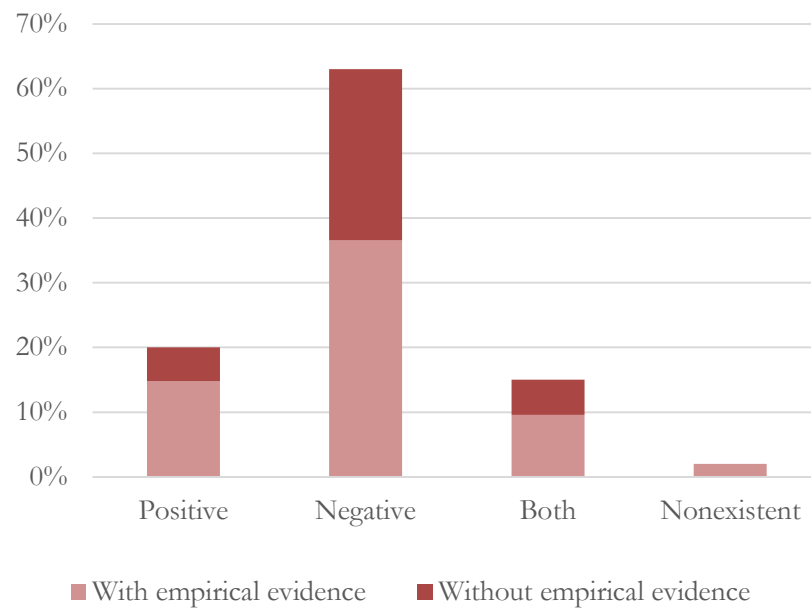
The sample of documents with empirical verification was mostly published after 2000. Until then, only 6 documents were released, and 4 of them concluded for a negative impact of inflation on public debt. The decade between 2010 and 2019 was the most productive: 5 documents demonstrated a positive relation, the same number supported a two-sign relation, and 18 documents provided evidence of the negative impact of inflation on public debt.

Most documents with empirical evidence focused their analysis on only one country (57%), while the remaining 43% were based on samples from several countries.

Considering the total group of documents collected, the distribution is quite similar regarding the documents that present positive and negative relations: 36% of the articles that defend a positive relation tested groups of countries instead of a single country, while for the negative relation, the value is 39%.

The majority of the documents (both with and without empirical evidence) support a negative relation, and the “erosion of the real value of public debt” mechanism is presented as the most relevant one to support this view, followed by the “others” category. There is also evidence to support a positive relation, for which the “interest rate” mechanism plays the major role in determining this relation.

FIGURE 11: SIGN OF I-PD RELATION VERIFIED IN THE DOCUMENTS COLLECTED, 1951-2023



Source: own calculations.

The journal rating and rankings allow for management and tracking academic performance's development of the research that studies the relation from inflation to debt. It is particularly useful to access the quality and dissemination of a paper when evaluating individual articles is not possible. However, journal rankings and ratings have been strongly criticized, especially because the quality of an article may not correspond to the quality and reputation of the journal in which it appears. It can also be seen as an inappropriate shortcut to avoid analyzing and judging each academic contribution (Walters, 2024). On the other hand, the traditional metrics – like citations and number of publications, for example – do not account for an author's impact within their field (Benedetto et al., 2024).

Table 1 shows the ten journals that published more documents regarding I-PD relation and their h-index rating and SJR classification. The h-index is the most used measuring tool. It aims to balance the quantity and impact of a researcher's work, considering both the number of publications and the number of citations of those publications (Benedetto et al., 2024). Nevertheless, this index may be influenced by self-citation and collaborations and overlooks the context and age of the publications. To make this analysis more robust, the table also includes the SJR, a size-independent metric constructed based on the Scopus database that measures a journal's influence or prestige. It defines different points for citations considering

the scientific influence of the journals in which they are included in a three-year citation window. Since SJR limits journals' self-citation to a maximum of 33%, artificial journal citation overvaluation is prevented (González-Pereira et al., 2010).

In this analysis, “European Economic Review” is the journal with the largest number of documents published concerning the relation from inflation to public debt and has an h-Index of 142 – it has published 142 articles that were cited at least 142 times. Its SJR value is 2.251, meaning a document has above-average citation potential (the opposite would be verified for values inferior to one).

In our analysis, we found eight journals that published two documents. In our top ten presented in Table 1, we selected the ones with higher h-Index and SJR classification.

TABLE 1: TOP 10 JOURNALS WITH THE LARGEST NUMBER OF PUBLISHED DOCUMENTS REGARDING I-PD, CORRESPONDING H-INDEX AND SJR CLASSIFICATION, 1951-2023

Journals	Number of documents published	H-INDEX	SJR (2023)
European Economic Review	9	142	2.251
Journal of Economic Dynamics and Control	8	98	1.799
Journal of International Money and Finance	6	108	1.351
Journal of Monetary Economics	5	142	6.564
Economic Affairs	3	21	0.254
Economic Modelling	3	98	1.335
Journal of Macroeconomics	3	56	0.671
Review of Economic Dynamics	3	70	3.582
American Economic Journal: Macroeconomics	2	75	12.324
Journal of International Economics	2	151	4.583

Source: <https://www.scimagojr.com/>. Retrieved May, 2024

In order to prime the most influential documents in our collection, the number of citations was considered. Table 2 illustrates the 10 most cited documents of our group sample, their publication year, the mechanisms they analyze and the number of times they were cited.

“Monetary policy and price level determinacy in a cash-in-advance economy” by Michael Woodford is the most cited document of our sample: it was cited in 286 documents with its analysis of the “interest rate” mechanism and was cited, on average, 9.9 times per year since its publication in 1994. This average is only overcome by “Optimal fiscal and monetary policy under sticky prices”, with an average of 12.9 citations per year, making Stephanie Schmitt-Grohé and Martin Uribe the most influential authors analysing the relation from inflation to public debt. These two documents analyse both relations (PD-I and I-PD).

Focusing only on I-PD relationship, the highlight is for article “Inflation expectations and risk premiums in an arbitrage-free model of nominal and real bond yields”, that has the highest number of citation in absolute number and per year.

TABLE 2: TOP 10 MOST CITED DOCUMENTS COVERING THE I-PD, 1951-2023

Article	Authors	Publication Year	Mechanisms	Number of citations	Number of citations per year
Monetary policy and price level determinacy in a cash-in-advance economy	Woodford M.	1994	Interest rate	286	9.9
Optimal fiscal and monetary policy under sticky prices	Schmitt-Grohé S., Uribe M.	2004	Erosion of real public debt	246	12.9
Optimal fiscal and monetary policy in a medium-scale macroeconomic model	Schmitt-Grohé S., Uribe M.	2005	Erosion of real public debt	123	6.8
The economics of the government budget constraint	Fischer S., Easterly W.	1990	Inflation tax	102	3.1
Inflation expectations and risk premiums in an arbitrage-free model of nominal and real bond yields	Christensen J.H.E., Lopez J.A., Rudebusch G.D.	2010	Others	88	6.8
Understanding inflation-indexed bond markets	Campbell J.Y., Shiller R., Viceira L.M.	2009	Others	83	5.9
Debt, deficits, and inflation: An application to the public finances of India	Buiter W.H., Patel U.R.	1992	Inflation tax	74	2.4
Optimal fiscal and monetary policy with sticky prices	Siu H.E.	2004	Others	72	3.8
Inflation and the fiscal limit	Davig T., Leeper E.M., Walker T.B.	2011	Others	66	5.5
Why do we have nominal government debt?	Bohn H.	1988	Debt structure	65	1.9

4.3. Detailed analysis of public debt → inflation (PD-I) literature

The 207 documents focused on the relation from public-debt to inflation include 154 documents that solely analyze public debt-inflation relation and the 53 documents that analyze both directions - that in this section these are considered only with the purpose to analyze the PD-I relationship.

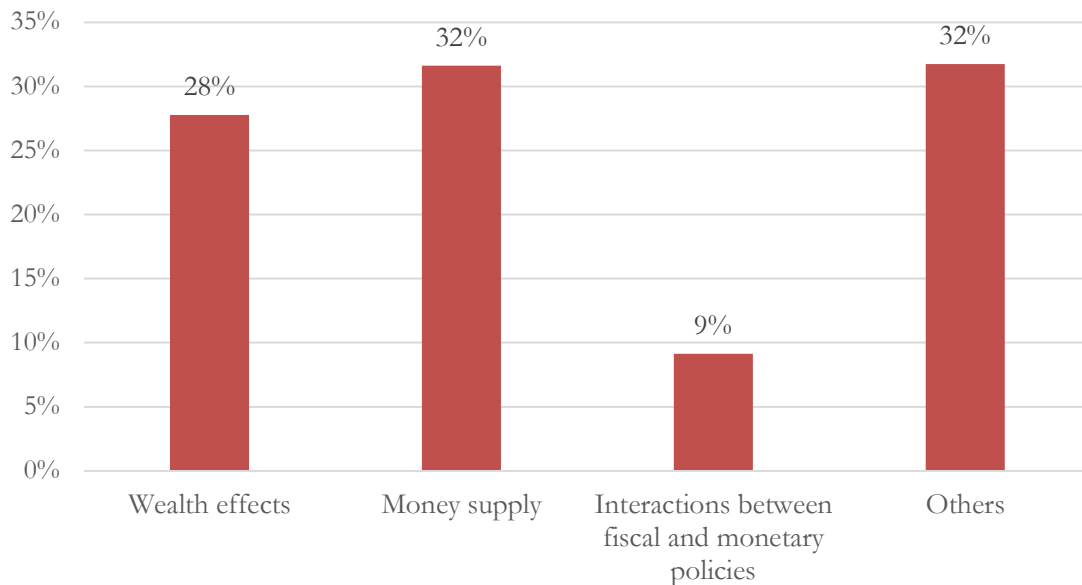
Considering the purpose of this analysis, 9 of the 208 documents were disregarded since they solely embrace empirical studies and do not provide any relevant information about the mechanisms' patterns. Our analysis will thus contemplate 199 documents.

The 199 documents considered for the PD-I are focused on four main mechanisms' categories: "wealth effects", "money supply", "interactions between fiscal and monetary policies", and "others". The latter category encompasses the mechanisms with minor relevance compared with the former three (exchange rate, level of external debt, inflation expectations, and government's risk of default, among others).

"Money supply" is the mechanism that draws the main attention of the authors. It is analyzed in 80 documents, while the "wealth effects" mechanism is discussed in 70 documents and "interactions between fiscal and monetary policies" in 23 documents. 80 out of the 199 documents in our sample also analyze the mechanisms that fall into the "others" category.

Figure 12 shows the relative weight of each of these four categories in the total number of documents analyzed.

FIGURE 12: DISTRIBUTION OF DOCUMENTS REGARDING THE PD-I RELATION PER MECHANISM, 1951-2023

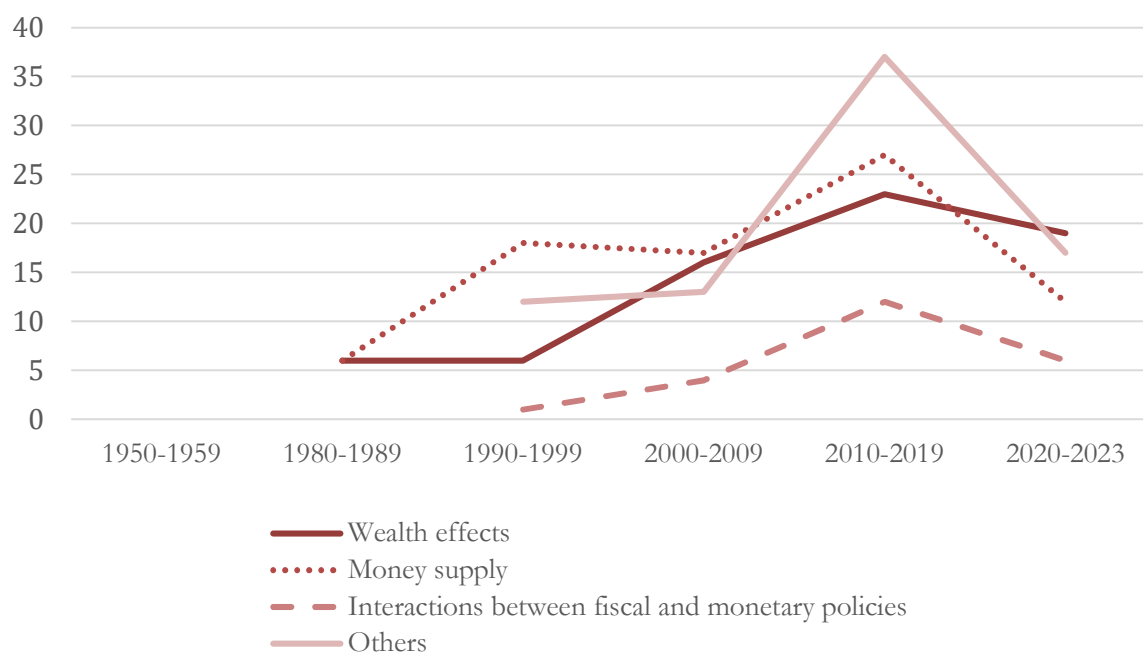


Source: own calculations.

Even though “money supply” and “others” mechanisms have been mentioned in 80 documents each, the distribution of the analysis of these mechanisms per decade was not similar (Figure 13). The “money supply” mechanism was the focus of most authors until the decade 2010-2019. During this decade, this mechanism was mentioned in 27 documents, while the “others” category dominated being nominated in 37 publications.

All four categories present a rising interest throughout the years: the “wealth effects” mechanism was analyzed in 6 documents between 1980 and 1989 and 23 between 2010 and 2019; “money supply” was identified as the main topic of discussion also in 6 documents between 1980 and 1989 but in 2010-2019 this number increased to 27. The “interactions between fiscal and monetary policies” mechanism represented the most notorious increase: until 1999, it was analyzed only once, while between 2010 and 2019, this mechanism was discussed 12 times. With a similar trajectory, the number of documents focused on “others” mechanisms more than triplicated: it was mentioned 12 times between 1990 and 1999 and 37 times between 2010 and 2019. Given the latter’s trajectory, a growing number of documents centered on their analysis is expected.

FIGURE 13: EVOLUTION OF DOCUMENTS ON THE PD-I RELATION PER MECHANISM, PER DECADE, 1951-2023 (IN NUMBER OF PAPERS)

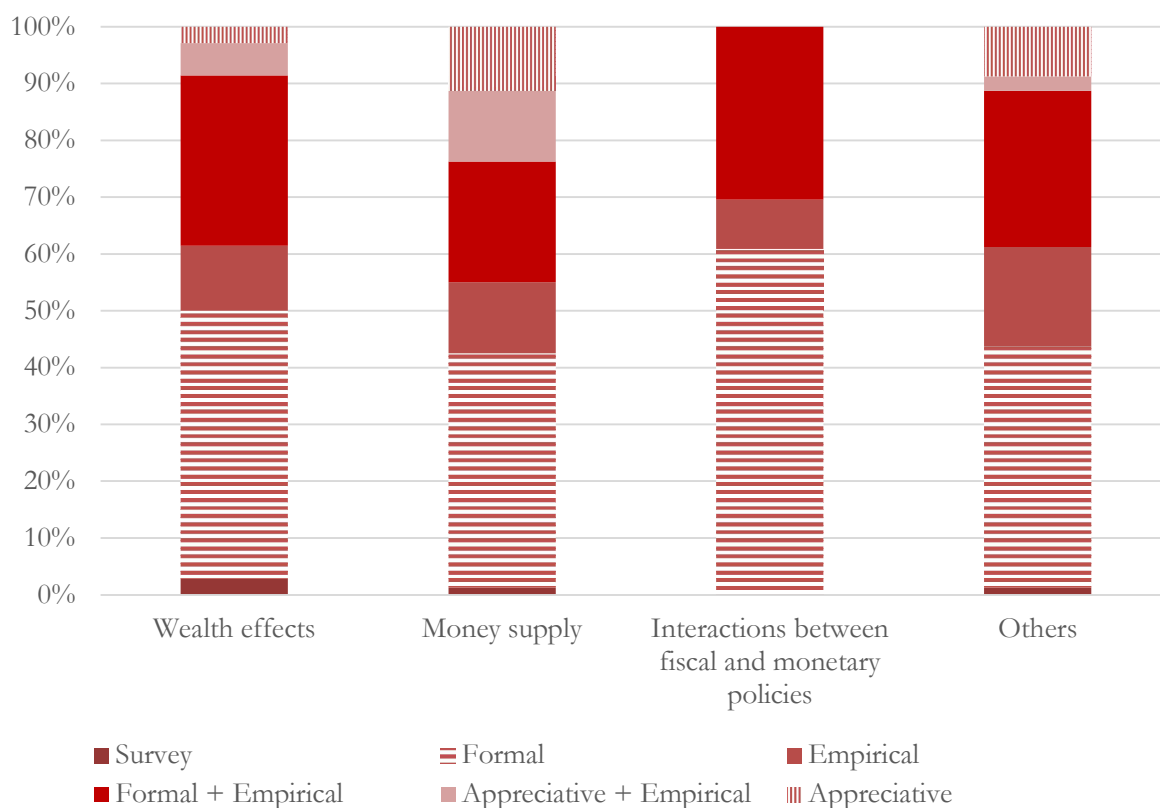


Source: own calculations.

Considering the methodologies adopted in each of these documents, the two most predominant categories in the public debt to inflation relation are the same as for the other-way relationship: “formal” methodology, followed by “formal + empirical”. The “formal” category is adopted in 47% of the 70 documents that analyze “wealth effects” and, respectively, in 41%, 61% and 43% of the documents that were centered on the “money supply” mechanism, in the “interactions between fiscal and monetary policies” mechanism, and in “others”.

After “formal” and “formal + empirical” methodologies, “empirical” is the one mostly applied, followed by “appreciative” and “appreciative + empirical”. The “survey” category is presented in only 4 of the 199 documents examined.

FIGURE 14: DISTRIBUTION OF DOCUMENTS ON THE PD-I RELATION BY MECHANISM AND METHODOLOGY, 1951-2023



Source: own calculations.

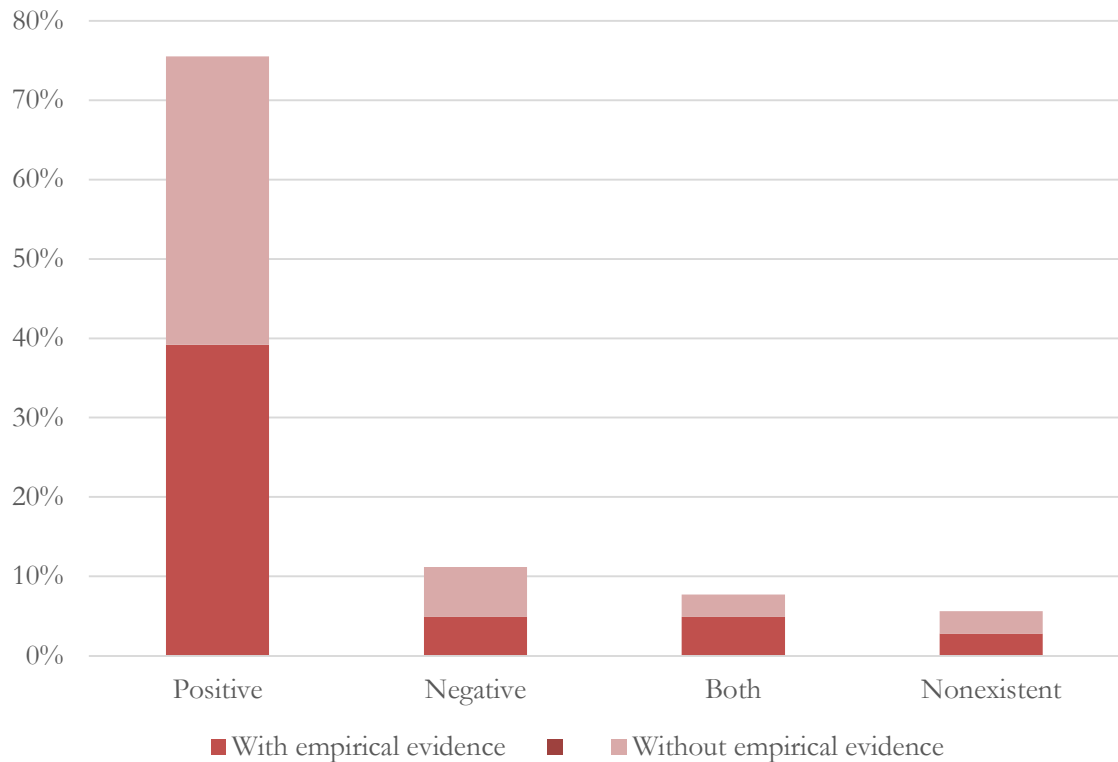
Out of 199 documents, 143 provide insights into the sign between public debt and inflation. 108 of these 143 documents conclude for a positive sign: as public debt rises, so does the inflation rate. This direct relation is highlighted in 76% of the documents, and over half of them (56 publications) corroborate this conclusion with empirical data.

The mechanisms that most contribute to this positive impact of public debt in inflation – adopting as an evaluation metric the number of times they are mentioned – are “money supply” and “wealth effects”. These were analyzed in 47 and 41, respectively, of the documents that concluded a positive impact.

The opposite relation – when an increase in the public debt level is translated into a decrease in the inflation rate – is the main conclusion of only 11% of the documents, 16 in total, and in only 7 of them this relationship is empirically proved. In this universe of documents, “wealth effects” and “others” were the most cited mechanisms, being identified in 6 documents each.

11 documents present proofs for both types of relations – almost 8% of the total – and in 7 of them empirical data is used to prove both these directions. The opposite is defended in 8 documents that state that no relation is verified, with the effect of public debt on inflation being not statistically significant in 4 of these documents that use empirical analysis.

FIGURE 15: SIGN OF PD-I RELATION VERIFIED IN THE DOCUMENTS COLLECTED, 1951-2023



Source: own calculations.

To monitor and manage the academic development of the documents published concerning the public debt to inflation relationship, Table 3 presents the h-Index and the SJR classification of the ten journals in which more articles were published.

The documents under analysis in this subsection were published in 111 different journals. Four journals published 4 documents each regarding the PD-I relationship; however, only those with higher H-Index and SJR classification are depicted in Table 3.

Similar to what is verified in the I-PD relationship, “European Economic Review” is the journal with the largest number of published documents (13).

TABLE 3: TOP 10 JOURNALS WITH THE LARGEST NUMBER OF PUBLISHED DOCUMENTS REGARDING PD-I, CORRESPONDING H-INDEX AND SJR CLASSIFICATION, 1951-2023

Journals	Number of documents published	H-INDEX	SJR (2023)
European Economic Review	13	142	2.251
Journal of Economic Dynamics and Control	10	101	1.799
Journal of International Money and Finance	8	113	1.351
Journal of Monetary Economics	6	149	6.564
Economics Letters	5	125	0.729
Journal of Development Economics	5	171	3.737
Review of Economic Dynamics	5	73	3.582
Journal of Money, Credit and Banking	5	123	1.88
Journal of International Economics	4	159	4.583
Economic Journal	4	185	4.507

Source: <https://www.scimagojr.com/>. Retrieved May, 2024

Regarding the most influential articles, we can verify in Table 4 that Michael Woodford's paper "Monetary Policy and Price Level Determinacy in a Cash-in-Advance Economy" assumes, again, the leading position when considering the total number of citations, having been cited 286 times up to 2023, and that Stephanie Schmitt-Grohé and Martin Uribe's paper "Optimal fiscal and monetary policy under sticky prices" is, also, the article with higher average number of citations per year (12.9). These two papers focus their analysis on both PD-I and I-PD relationships. When considering the documents solely focused on PD-I relationship, "Long-term debt and optimal policy in the fiscal theory of the price level" is the most cited document in absolute number, while "Understanding policy in the great recession: Some unpleasant fiscal arithmetic" collects the higher number of citations per year.

John Cochrane is the leading author among the most cited articles, with consistent publications across all decades under analysis. As for mechanisms, the dominant ones in the most influential articles are "others" and "money supply", being "interactions between fiscal and monetary policies" the main topic of the article with a higher number of citations per year, on average.

TABLE 4: TOP 10 MOST CITED DOCUMENTS COVERING THE PD-I, 1951-2023

Article	Authors	Publication Year	Mechanisms	Number of citations	Number of citations per year
Monetary policy and price level determinacy in a cash-in-advance economy	Woodford M.	1994	Money supply	286	9.9
Optimal fiscal and monetary policy under sticky prices	Schmitt-Grohé S., Uribe M.	2004	Interactions between fiscal and monetary policies	246	12.9
Long-term debt and optimal policy in the fiscal theory of the price level	Cochrane J.H.	2001	Wealth effects; Others	152	6.9
Is the price level determined by the needs of fiscal solvency?	Canzoneri M.B., Cumby R.E., Diba B.T.	2001	Others	138	6.3
Optimal fiscal and monetary policy in a medium-scale macroeconomic model	Schmitt-Grohé S., Uribe M.	2005	Wealth effects; Interactions between fiscal and monetary policies	123	6.8
Understanding policy in the great recession: Some unpleasant fiscal arithmetic	Cochrane J.H.	2011	Others	116	9.7
A Frictionless View of U.S. Inflation	Cochrane J.H.	1998	Wealth effects	104	4.2
The economics of the government budget constraint	Fischer S., Easterly W.	1990	Money supply	102	3.1
Debt, deficits, and inflation: An application to the public finances of India	Buiter W.H., Patel U.R.	1992	Money supply	74	2.4

5. Conclusions

The current research aimed to identify the main dynamics in the relation between inflation and public debt. It was proposed to answer through which mechanisms channels inflation and public debt are mutually impacted and their study's evolution across the last decades.

The central questions for this aim were the following: what is the impact of inflation on public debt? What is the impact of public debt on inflation? How are mutual effects transmitted, and through which transmission channels? How has the study of these channels evolved over the last few decades?

To proceed with these goals, the relevant literature was analyzed to identify the main mechanisms through which inflation impacts public debt and vice-versa, to evaluate if the impact is positive or negative, and to determine the conditions that affect their effectiveness. A methodology based on a bibliometric analysis was adopted to complement the literature review.

After the literature review, the screening of the documents to be considered as our sample for the bibliometric analysis was initiated by searching with specific keywords in the database considered (SCOPUS). The documents obtained were reviewed (first manually and then through a web-based platform), and the final group of documents was categorized according to the type of relation, the mechanism identified, the methodology adopted, the sign of relation presented, and the number of countries analysed, when applicable.

Based on the analysis and categorization, it was possible to retrieve some conclusions from the literature. The number of documents published on these matters presents an increasing trend for both relations, demonstrating the adequacy and pertinence of the questions raised. It is notorious in the period after 2008 – when the Great recession started -, with the number of published documents noticeably raising.

The majority of the documents analysed adopted “formal” and “formal + empirical” methodologies, both for I-PD and PD-I relationships; however, the number of mechanisms treated and the relative weight of each one presented some discrepancies.

The impact of inflation on public debt (I-PD) is conducted by six main mechanisms, being the most significant ones the “erosion of the real value of public debt” and the “interest rate”, while “inflation tax” was described as the least significant one of the group considered.

The articles that empirically tested this relation found that it is mainly negative; however, it is interesting to notice that while the mechanism “erosion of the real value of public debt” is the one that more support provides to a negative impact of inflation on public debt, the “interest rate” mechanism supports mainly a positive relationship. This information is consistent with the one obtained through empirical tests for individual countries. For groups of countries and/or economic areas, the sample considered lacks information. It would be insightful to explore this matter in future approaches.

The impact of public debt in inflation (PD-I), on its side, is strongly dependent on “money supply”, “wealth effects”, and “interactions between fiscal and monetary policies” mechanism channels. The study of these mechanisms has been increasing over the years, and “money supply” is the one that has gathered the greatest attention from the authors.

The effect of public debt in inflation is described as positive in more than three quarters of the articles that tested it empirically, and “money supply” and “wealth effects” are the mechanisms that contribute most to this sign. In the remaining articles, there is also evidence that an increase in public debt results in a decrease in the inflation rate, even though on a small scale, and “wealth effects” is the mechanism that assumes the higher relevance for this sign.

This dissertation faced some limitations that may impact its findings. First, the research relied solely on one database, which may have restricted the depth of relevant literature. As a result, the findings may not capture the whole diversity and variety of documents published about I-PD and PD-I literature. Furthermore, the documents were analyzed manually, which introduces the potential for human error and subjectivity in the assessment and categorization of the documents collected.

For future research, it may be relevant to focus on the applicability of the mechanisms identified for specific groups of countries – with different development levels – and different economic areas. This matter wasn’t explored for PD-I relation, and it would be interesting to complete the analysis with the countries’ specificities. It would also be interesting to explore which factors may negatively affect and possibly break these mechanisms channels and under which conditions. Finally, a meta-analysis could be conducted, allowing us to quantitatively systematize the empirical results presented in the literature on the effect that public debt has on inflation, and vice-versa.

References

- Aimola, U.A. & Odhiambo, N. M. (2021). Public debt and inflation: empirical evidence from Ghana. *Development Studies Research*, 8:1, 1-13, DOI: 10.1080/21665095.2021.1872392
- Aizenman, J. & Marion, N. (2009). Using Inflation to Erode the U.S. Public Debt. *US Santa Cruz Working Paper Series*. <https://escholarship.org/uc/item/6xf174rs>
- Alonzo, S. N. L., Fernández, M. A. E., Forradellas, R. R. & Jorge-Vázquez, J. (2022). From the Great Recession to the COVID-19 Pandemic: The Risk of Expansionary Monetary Policies. *Risks*, 10, 23. <https://www.mdpi.com/2227-9091/10/2/23>
- Baert, P. (2022). Taxation in times of high inflation. European Parliamentary Research Service, PE 733.710. [https://www.europarl.europa.eu/RegData/etudes/ATAG/2022/733710/EPRS_ATAG\(2022\)733710_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/ATAG/2022/733710/EPRS_ATAG(2022)733710_EN.pdf)
- Bianchi, F. & Melosi, L. (2022). Inflation as a Fiscal Limit*. *Federal Reserve Bank of Chicago, Working Papers*, No. 2022-37. https://www.kansascityfed.org/Jackson%20Hole/documents/9037/JH_Paper_Bianchi.pdf
- Barro, R. J. & Gordon, D. B. (1983). Rules, Discretion and Reputation in a Model of Monetary Policy. *NBER Working Paper Series*. Working Paper No. 1079. https://www.nber.org/system/files/working_papers/w1079/w1079.pdf
- Berkovich, E., Dinerstein, M. & Ricco, J. (2021). Can Higher Inflation Help Offset the Effects of Larger Government Debt? *Penn Wharton University of Pennsylvania, Briefs*. <https://budgetmodel.wharton.upenn.edu/issues/2021/10/21/can-inflation-offset-government-debt>
- Benedetto, U., Pellicia, F. & Zimarino, M. (2024). The H-index in the road for academic progression. *International Journal of Cardiology* 408, 132119. <https://www.sciencedirect.com/science/article/pii/S0167527324007411?pes=vor>
- Bilan, I. & Roman, A. (2014). Interconnections Between Public Indebtedness and Inflation in Contemporary Economies. *Economics and Sociology*, 7(4), 59-70.

- Bhattarai, S., Lee, J. W. & Park, W. P. (2012). Inflation Dynamics: The Role of Public Debt and Policy Regimes*. Federal Reserve Bank of Dallas. *Globalization and Monetary Policy Institute*. Working Paper No. 124
- Blanchard, O. (2004). Fiscal dominance and inflation targeting: Lessons from Brazil. NBER Working Paper Series. Working Paper 10389. <https://www.nber.org/papers/w10389>
- Burdekin, R. C. K. & Burkett, P. (1996). Hyperinflation, the exchange rate and endogenous money: post-World War I Germany revisited. *Journal of International Money and Finance*, 15, 4, 599-621
- Claessens, S., Klingebiel, D. & Schmukler, S. L. (2007). Government Bonds in Domestic and Foreign Currency: the Role of Institutional and Macroeconomic Factors. *Review of International Economics*. 5(2), 370–413. <https://onlinelibrary.wiley.com/doi/epdf/10.1111/j.1467-9396.2007.00682.x>
- Cochrane, J. H. (2017). Stepping on a rake: replication and diagnosis. *NBER Working Paper Series*. Working Paper 22979
- Comín, F. (2012). Default, rescheduling and inflation: Public debt crises in Spain during the 19th and 20th centuries. *Revista de Historia Económica, Journal of Iberian and Latin American Economic History*, 30, 3, 353-390.
- Donthu, N., Kumar, S., Mukherjee, D., Pandey N. & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research*, 133, 285-296.
- Emmanuel, B. S. (2016). Deficit Financing and Economic Growth in Nigerian . [Master's thesis, Faculty of Management Sciences, Delta State University, Abraka]. <https://www.delsu.edu.ng/clt/DEFICIT%20FINANCING%20AND%20ECONOMIC%20GROWTH%20IN%20NIGERIAN.pdf>
- Erdogdu, O.S. (2002). Price Level Determination: Ricardian vs. Non-Ricardian Policies. Iowa State University Digital Repository, Ph.D. Thesis. Retrieved from: <https://lib.dr.iastate.edu/cgi/viewcontent.cgi?article=1510&context=rtd> (24.03.2020)
- Escolano, J. (2010, January). A Practical Guide to Public Debt Dynamics, Fiscal Sustainability, and Cyclical Adjustment of Budgetary Aggregates. *Technical Notes and Manuals*, 10/02. <https://www.imf.org/external/pubs/ft/tnm/2010/tnm1002.pdf>

- European Commission (2010). *Employment in Europe 2010*. Directorate-General for Employment, Social Affairs and Equal Opportunities.
https://ec.europa.eu/employment_social/eie/index_en.html
- González-Pereira, B., Guerrero-Bote, V. & Moya-Anegón, F. (2010). A new approach to the metric of journals' scientific prestige: The SJR indicator. *Journal of Informetrics* 4, 379-391.
<https://www.sciencedirect.com/science/article/pii/S1751157710000246>
- Hauptmeier, S., & Kamps, C. (2022). Debt policies in the aftermath of COVID-19 - The SGP's debt benchmark. *European Journal of Political Economy*, 0176-2680, 1.
<https://www.sciencedirect.com/science/article/pii/S0176268022000064>
- International Monetary Fund (IMF) (2010). *World Economic and Financial Surveys*. World Economic Outlook, October.
<https://www.imf.org/en/Publications/WEO/Issues/2016/12/31/World-Economic-Outlook-October-2010-Recovery-Risk-and-Rebalancing-23542>
- International Monetary Fund (IMF) (2023). Public Debt in Emerging Markets: is it too high?. *World Economic Outlook*, September (pp 113-152).
- Khan, H., Marimuthu, M. & Lai, F. (2020). Fiscal Deficit and Its Less Inflationary Sources of Borrowing with the Moderating Role of Political Instability: Evidence from Malaysia. *Sustainability*, 12, 366.
- Koester, G., Lis, E., Nickel C., Osbat, C. & Smets, F. (2021). Understanding low inflation in the euro area from 2013 to 2019: cyclical and structural drivers. *ECB Occasional Paper Series*, 280.
- Krause, M.U. & Moyen, S. (2013). Public debt and changing inflation targets, Deutsche Bundesbank Working Paper no. 6
- Kwon, G., McFarlane, L. & Robinson, W. (2006). Public Debt, Money Supply, and Inflation: A Cross-Country Study and Its Application to Jamaica. IMF Working Paper No. 2006/121
- Lagoa, S. C., Leão, E. R. & Leão, P. R. (2019). *Política Monetária e Mercados Financeiros*. (3rd ed.). Edições Sílabo
- Leeper, E. M. (1991). Equilibria under 'Active' and 'Passive' Monetary and Fiscal Policies. *Journal of Monetary Economics* 27 (1), 129–147

- Levine, P. & Mandilaras, A. (2001). Public Debt and Inflation: The Role of Inflation-Sensitive Instruments. *The Manchester School*, 69, s1, 1-21. <https://doi.org/10.1111/1467-9957.69.s1.1>
- Lyziak, T. & Mackiewicz-Lyziak, J. (2020). Does fiscal stance affect inflation expectations? Evidence for European economies. *Economic Analysis and Policy*, 68, 296-310.
- Martin, F. M. (2009). A positive theory of government debt. *Review of Economic Dynamics*, 12, 4, 608-631. <https://doi.org/10.1016/j.red.2009.02.003>
- Martin, F. M. (2015). Debt, inflation and central bank independence. *European Economic Review*, 79, 129-150
- Mehmeti, I., & Deda, G. (2022). Econometric evaluation of public debt on inflation: evidence from Kosovo and North Macedonia. *Journal of Liberty and International Affairs*, 8(3), 171-187. <https://doi.org/10.47305/JLIA2283171m>
- Nelson, R. and Winter, S. (1982). *An Evolutionary Theory of Economic Change*. BelknapPress/Harvard University Press: Cambridge.
- Niemann, S., Pichler, P. & Sorger, G. (2011). Public debt, discretionary policy, and inflation persistence. *Journal of Economic Dynamics and Control*, 37 (6), 1097-1109. <https://doi.org/10.1016/j.jedc.2013.01.014>
- Reinhart, C. M, Reinhart, V. & Rogoff, K. (2015). Dealing with debt. *Journal of International Economics* 96, S43–S55. <https://www.sciencedirect.com/science/article/pii/S0022199614001214>
- Reinhart. C. M. & Sbrancia, M. B. (2011). The Liquidation of Government Debt. NBER Working Paper Series. Working Paper 16893. <https://www.nber.org/papers/w16893>
- Sargent, T. J. (2013). *Rational Expectations and Inflation*. (3rd). Princeton University Press.
- Sargent, T. J., & N. Wallace. (1981). Some Unpleasant Monetarist Arithmetic. Federal Reserve Bank of Minneapolis, *Quarterly Review* 5 (3), 1–17
- Tanzi, V. (1977). Inflation, Lags in Collection, and the Real Value of Tax Revenue. *IMF Staff Papers*, 24, 1, 154-167. <https://www.jstor.org/stable/pdf/3866540.pdf>
- Walters, W. (2024). Relationships between expert ratings of business/economics journals and key citation metrics: The impact of size-independence, citing-journal weighting, and

subject-area normalization. *The Journal of Academic Librarianship* 50, 102882.
<https://www.sciencedirect.com/science/article/pii/S0099133324000430?via%3Dihub>

Willems, T. & Zettelmeyer, J. (2022). Sovereign Debt Sustainability and Central Bank Credibility. IMF Working Papers. WP/22/16.
<https://www.imf.org/en/Publications/WP/Issues/2022/01/28/Sovereign-Debt-Sustainability-and-Central-Bank-Credibility-512335>