

## Global Economics Analyst

# Inflation in the Aftermath of Wars and Pandemics (Daly)

- In economic terms, the battle against the COVID-19 pandemic is often compared to a war – national resources have been commandeered in a battle against an ‘invisible enemy’, driving government debt levels sharply higher around the world. To see how far this analogy can be extended, we use data extending back to the *Black Death* in the 1300s to compare how inflation and government bond yields have behaved in the aftermath of the world’s 12 largest wars and pandemics.
- We find that, while inflation has typically risen sharply during and (especially) in the aftermath of major wars, it has generally remained weak during and after major pandemics. Moreover, while bond yields have typically risen during wars, they have remained relatively stable during pandemics and fallen in their aftermath.
- In our view, this contrast in the performance of inflation and bond yields during wars and pandemics makes intuitive sense, for two reasons: First, in wars, government spending is used to fund increased war-related expenditure (before and during wars) and reconstruction efforts (in the aftermath), placing significant strain on available resources. In pandemics, by contrast, any increase in government spending is used to fill the gap left by absent private sector demand, with very different implications for the overall balance between aggregate demand and supply. Second, wars are often associated with the widespread destruction of physical capital, a development that increases the demand for investment and pushes interest rates higher. While pandemics result in a widespread loss of life, they do not result in any loss of physical capital.
- Every war and pandemic is different, and we should be cautious of drawing lessons from events that occurred in the long-distant past and in very different circumstances. One feature of the current pandemic that is clearly distinctive to past episodes is the size of the government response. Equally, however, one can argue that an unusually large government response was necessitated by an unusually large collapse in private sector demand.
- What is clear is that history provides no evidence that higher inflation or higher bond yields are a natural consequence of major pandemics.

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# Inflation in the Aftermath of Wars and Pandemics

## The 'War' Against COVID-19

In economic terms, the battle against the Covid-19 pandemic is often compared to a war – national resources have been commandeered in the battle against an 'invisible enemy', driving government debt levels sharply higher around the world. For financial markets, one worrying aspect of this analogy is that the aftermaths of major wars have often been associated with rising inflation, high bond yields and financial disruption.

But how close does the 'pandemic as war' analogy hold in practice? We use data extending back to the *Black Death* in the 1300s to compare how inflation and government bond yields have behaved in the aftermath of history's 12 largest wars and pandemics.

## From COVID-19 to the Black Death — Very Long-Run Data on Inflation and Bond Yields

Our economic data come from two separate sources, both from economists at the Bank of England ([A Millennium of Macroeconomic Data](#) and [Schmelzing \(2020\)](#)).<sup>1</sup> Our country sample consists of France, Germany, Italy, Holland, the UK, Spain, the United States and Japan. Combining these datasets provides us with annual inflation data for the UK from 1210, for France and Germany from the early 1300s and later dates for the other countries; nominal bond yield data for the UK, Italy and Germany from the early 1300s and later dates for the other economies. We focus on data for inflation and government bond yields, for two reasons: first, because there are reasonably accurate data for both extending over very long time horizons, based on contemporary records;<sup>2</sup> and second, where GDP data are available, it is difficult to separate changes in growth that have been driven by demand factors (e.g., increased spending on armaments) and those driven by supply factors (e.g., reduced potential output due to war destruction). Indeed, one advantage of focusing on inflation is that it provides a direct indication of the balance between demand and supply. Nevertheless, in an accompanying box, we discuss the broader economic context and the performance of a wider range of variables for a selection of key wars and pandemics.

Our sample of wars and pandemics includes the 12 largest wars and pandemics measured by deaths, excluding regional wars and pandemics affecting countries/regions where we have no data ([Exhibit 1](#)).<sup>3</sup> Re-scaling fatalities to today's global population, the cut-off point for inclusion in the sample is around 2 million deaths for wars and around

<sup>1</sup> See "A Millennium of Macroeconomic Data", Bank of England Research Datasets and Schmelzing, 2020, "Eight centuries of global real interest rates, R-G, and the 'suprasecular' decline, 1311–2018", *Bank of England Working Paper No. 845*.

<sup>2</sup> Some economists have attempted to construct very long-run historical estimates of other economic variables, such as GDP (see, for example, Maddison (2020)). However, in contrast to data that we use on prices and bond yields, these estimates are not measured directly and rely on some pretty strong assumptions (not least because the concept of GDP did not exist before the 1930s).

<sup>3</sup> As the end-year for wars and pandemics (Year = 0), we use the last year of significant fatalities. In a number of instances, this is one year before the formal end of the war/pandemic.

1-1.5 million deaths for pandemics (compared with an estimated 2.7 million deaths globally to date from COVID-19). Around half of the wars and pandemics in our sample were global in nature and, for these events, we focus on median economic outcomes across countries. For regional wars and pandemics, we focus only on data for the economies directly affected.<sup>4</sup>

### Exhibit 1: Our Sample of Major Wars and Pandemics

The 12 largest wars and pandemics measured by deaths, excluding regional wars and pandemics without economic data

Wars						Pandemics				
	Event	Years	Duration	Global	Fatalities*	Event	Years	Duration	Global	Fatalities*
1	World War 2	1939-1945	6	Y	150-250m	Black Death	1331-1353	22	Y	2-3bn
2	World War 1	1914-1918	4	Y	80-120m	Spanish Flu	1918-1920	2	Y	150-200m
3	Thirty Years War	1618-1647	29	Y	70-130m	Plague in Kingdom of Naples	1656-1658	2		15-16m
4	Napoleonic Wars	1803-1814	11	Y	35-45m	Encephalitis Lethargica Pandemic	1915-1926	11	Y	6-7m
5	Seven Years War	1755-1762	7	Y	10-12m	Third cholera pandemic	1848-1854	6	Y	6-7m
6	First English Civil War	1642-1646	4		6-8m	Plague in Spain	1596-1602	6		8-9m
7	Vietnam War	1963-1973	10		5-8m	Asian Flu	1957-1958	1	Y	4.5-5.5m
8	Korean War	1950-1953	3		4-8m	Russian Flu	1889-1890	1	Y	4-5m
9	American Civil War	1861-1864	3		4-6m	Italian plague	1629-1631	2		3-4m
10	Spanish Civil War	1936-1938	2		2-3m	Hong Kong Flu	1968-1969	1	Y	2m
11	Franco-Spanish War	1648-1658	10		2-3m	Great Plague of Sevilla	1647-1652	5		2m
12	Franco-Dutch War	1672-1677	5		2-3m	Great Plague of London	1665-1666	1		1-1.5m
		Avg. Duration	7.8				Avg. Duration	5.0		
		Med. Duration	5.5				Med. Duration	2.0		

\*The fatalities data for wars and pandemics have both been re-scaled to today's global population.

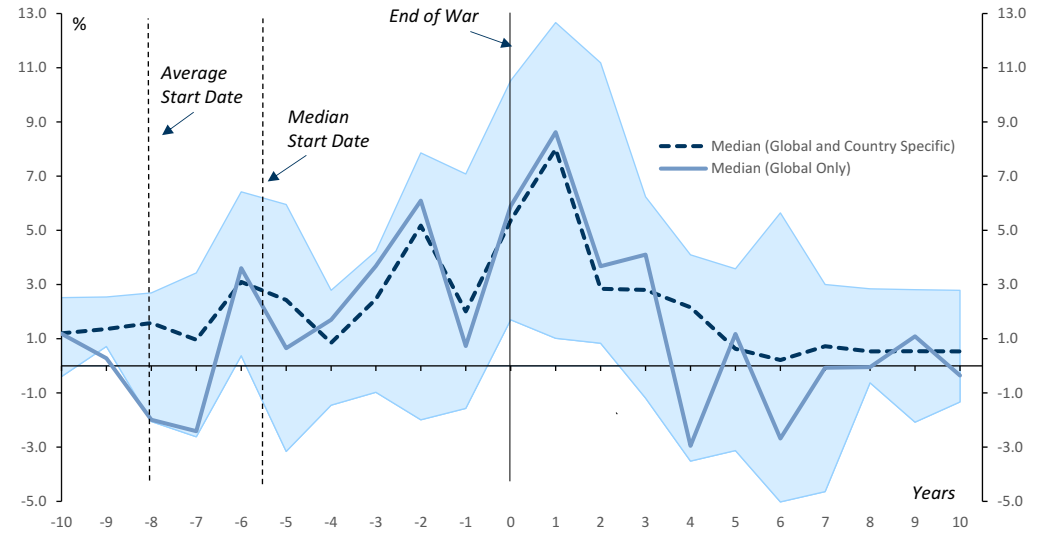
Source: Goldman Sachs Global Investment Research, Cirillo and Taleb (2020)

## Wars Result in Higher Inflation and Bond Yields, Pandemics Do Not

Exhibit 2 displays the median behaviour of inflation around major wars, together with its interquartile range (and also a median based only on global wars in our sample). Inflation has typically risen sharply both during and – especially – in the aftermath of major wars, with median inflation peaking at 8% one year after the war has ended.

<sup>4</sup> For example, for the Franco-Spanish war of 1648-1658, we consider only French and Spanish data. Note that, in the exhibits below, we also display results focusing only on global wars and pandemics.

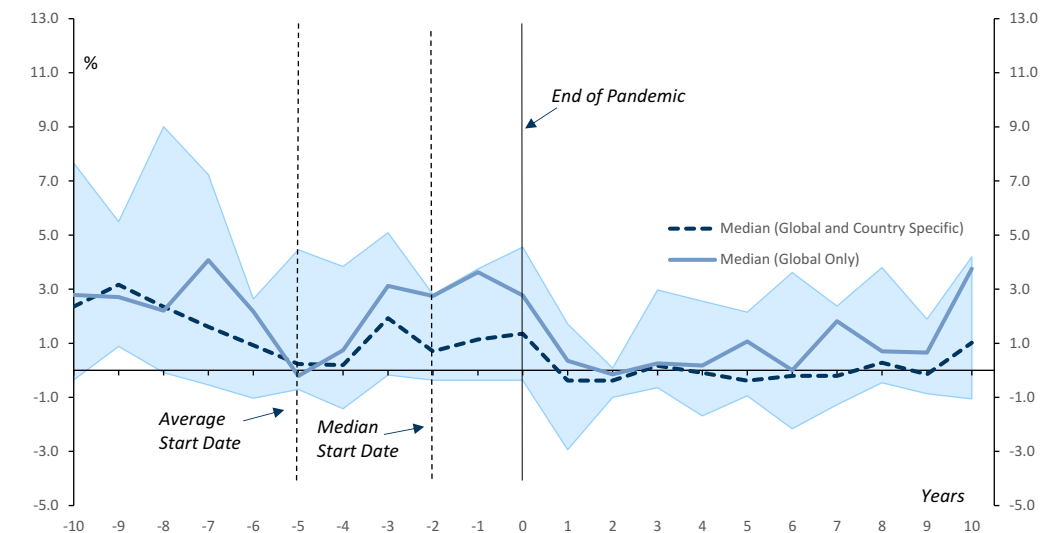
**Exhibit 2: Inflation Has Typically Risen Sharply Both During and Especially in the Aftermath of Major Wars**  
CPI Inflation (% yoy) Around Wars, Median and Interquartile Range



Source: Goldman Sachs Global Investment Research, BoE, Schmelzing (2018)

Exhibit 3 displays the same inflation data around the ends of pandemics. Inflation has typically remained weak during pandemics and declined in their aftermath, with median inflation falling below zero one year after the pandemic has ended and fluctuating close to zero for 9 years after the pandemic has ended.

**Exhibit 3: Inflation Has Typically Remained Weak in the Aftermath of Major Pandemics**  
CPI Inflation (% yoy) Around Pandemics, Median and Interquartile Range

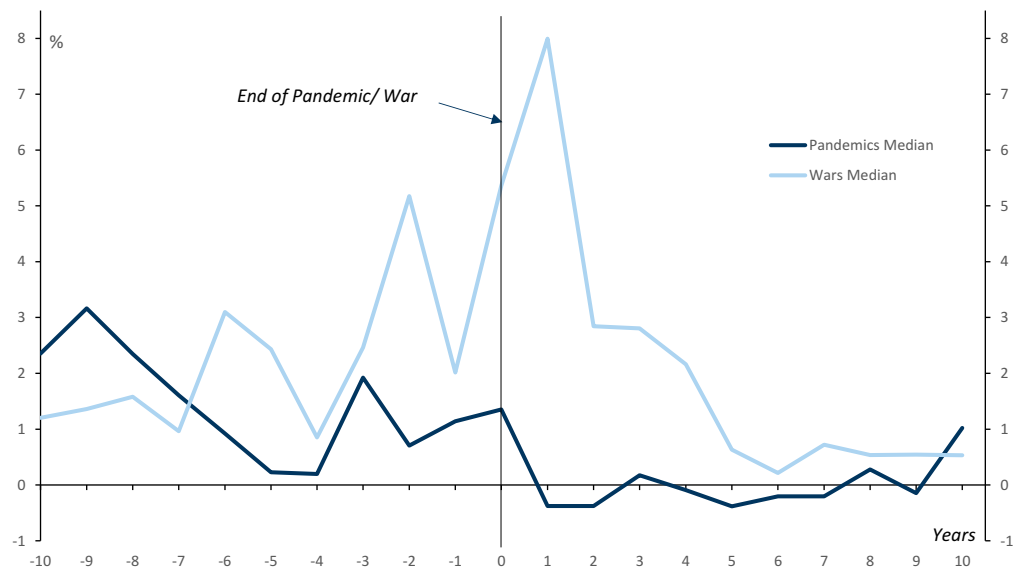


Source: Goldman Sachs Global Investment Research, BoE, Schmelzing (2018)

The contrast between the behaviour of inflation following wars and following pandemics is particularly clear in Exhibit 4, which plots median inflation rates across the 12 wars and pandemics.

**Exhibit 4: Inflation Has Typically Risen Sharply Following Major Wars, But Not Following Pandemics**

Median CPI Inflation (% yoy) Around Pandemics/Wars

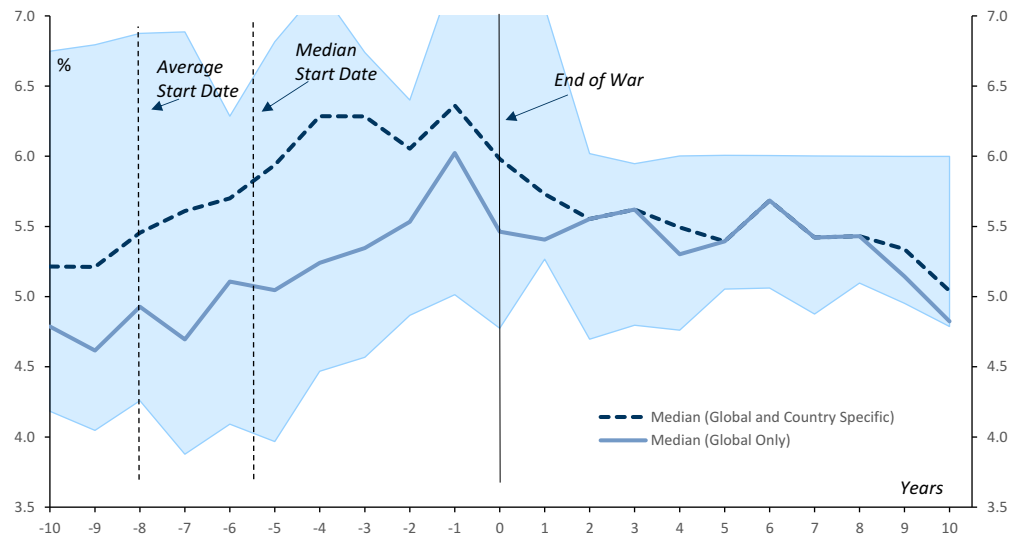


Source: Goldman Sachs Global Investment Research, BoE, Schmelzing (2018)

In [Exhibit 5](#), [Exhibit 6](#) and [Exhibit 7](#), we set out equivalent data for nominal government bond yields.<sup>5</sup> Bond yields have typically risen during wars, with median bond yields increasing by around 1pp to a peak of 6.4% in the final year of the war. By contrast, during pandemics, median bond yields remained stable at around 5.5%, before declining in the years following the pandemic.

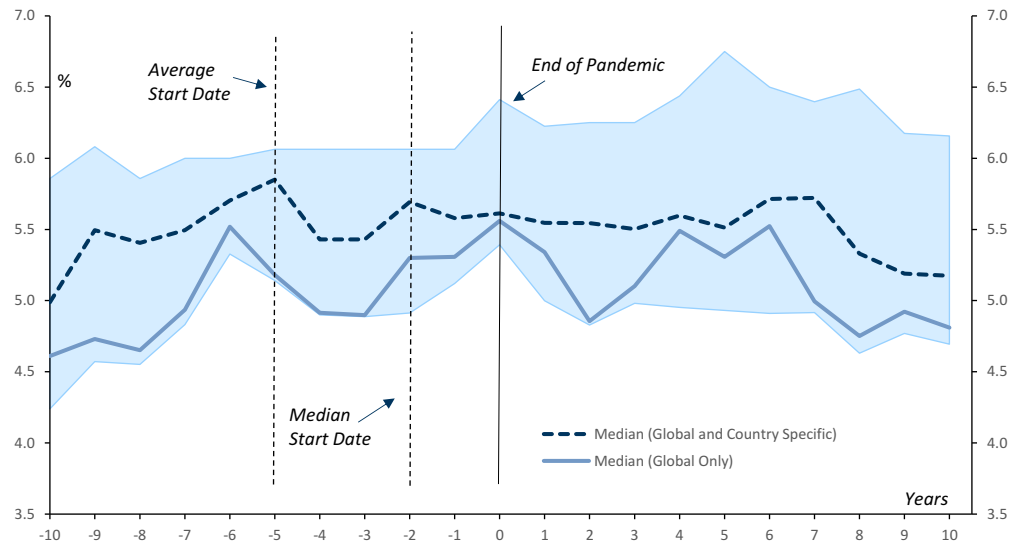
<sup>5</sup> Ideally, we would also consider *ex ante* real bond yields, but for this we would need a long-run history of inflation expectations. One can calculate a simple measure of real yields by subtracting current inflation but, because inflation typically rises sharply during wars, this has the effect of pushing real yields lower.

**Exhibit 5: Bond Yields Typically Rise During Wars**  
Nominal 10-Year Bond Yields (or Closest Equivalent) Around Wars, Median and Interquartile Range



Source: Goldman Sachs Global Investment Research, BoE, Schmelzing (2018)

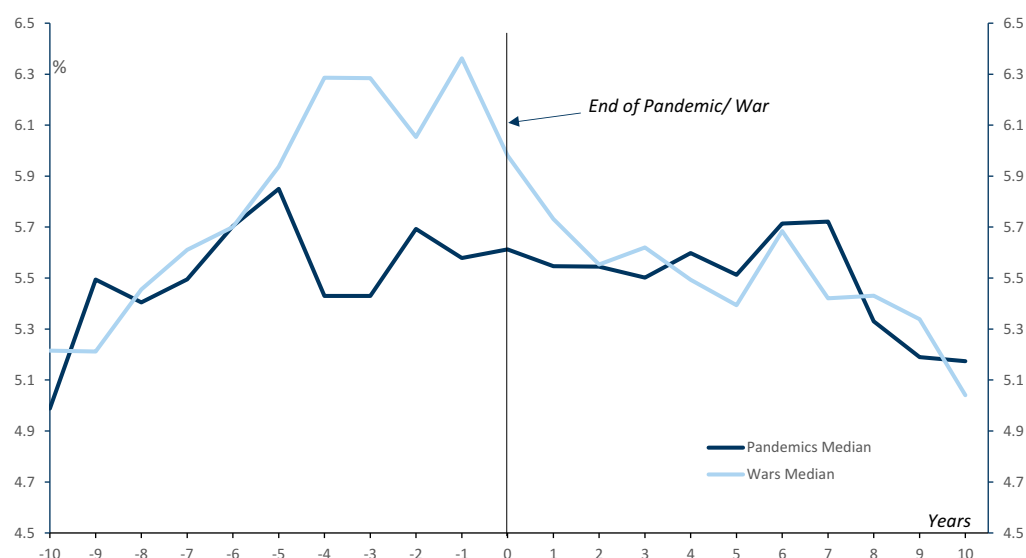
**Exhibit 6: Bond Yields Have Typically Remained Stable During Pandemics, And Fallen in Their Aftermath**  
Nominal 10-Year Bond Yields (or Closest Equivalent) Around, Median and Interquartile Range



Source: Goldman Sachs Global Investment Research, BoE, Schmelzing (2018)

**Exhibit 7: Bond Yields Rise Much More During Wars Than Pandemics**

Nominal 10-Year Bond Yields (or Closest Equivalent) Around Wars/Pandemics, Median (%)



Source: Goldman Sachs Global Investment Research, BoE, Schmelzing (2018)

**Why Wars Are Different from Pandemics — Wars Result in Overheating and the Destruction of Physical Capital**

This contrast between the performance of inflation and bond yields during wars and pandemics makes intuitive sense, in our view, for two reasons:

**1. Wars drive aggregate demand higher, while pandemics drive aggregate demand lower:**

In wars, there is a long history of using debt-financed spending to fund increased war-related expenditure (before and during wars) and reconstruction efforts (in the aftermath), driving aggregate demand higher relative to war-damaged supply. In pandemics, by contrast, any increase in government spending is used to fill the gap left by absent private sector demand, with very different implications for the overall balance between aggregate demand and supply.<sup>6</sup>

**2. Wars destroy physical capital, driving investment and interest rates higher:**

Wars are often associated with the widespread destruction of physical capital, a development that increases the demand for investment and pushes interest rates higher. By contrast, pandemics do not result in any loss of physical capital and, if there is widespread loss of life, can result in an increase in the capital-labour ratio. Standard economic theory suggests that a higher capital-labour ratio should lower equilibrium interest rates, while raising real wages.<sup>7</sup>

<sup>6</sup> A similar argument has previously been made by Broadbent (2020), who argues that institutional quality is a more important determinant of inflation than the rise in debt (Broadbent (2020), "Government debt and inflation", *Bank of England speech*).

<sup>7</sup> Jordà, Singh and Taylor (2020) also make this argument and find that pandemics tend to reduce  $r^*$  or the equilibrium interest rate (Jordà, Singh and Taylor (2020), "Longer-run Economic Consequences of Pandemics," *NBER Working Paper No. 26934*).

## Lessons from the Past: From the World Wars to the Black Death

Our core argument is that the economic implications of wars and pandemics are very different from each other: first, wars place unprecedented strains on existing resources (driving inflation higher in the process), whereas pandemics are more typically characterised by an underutilisation of resources (with the opposite effect); and second, in contrast to pandemics, wars often result in the widespread destruction of physical capital, increasing the demand for investment and pushing interest rates higher.

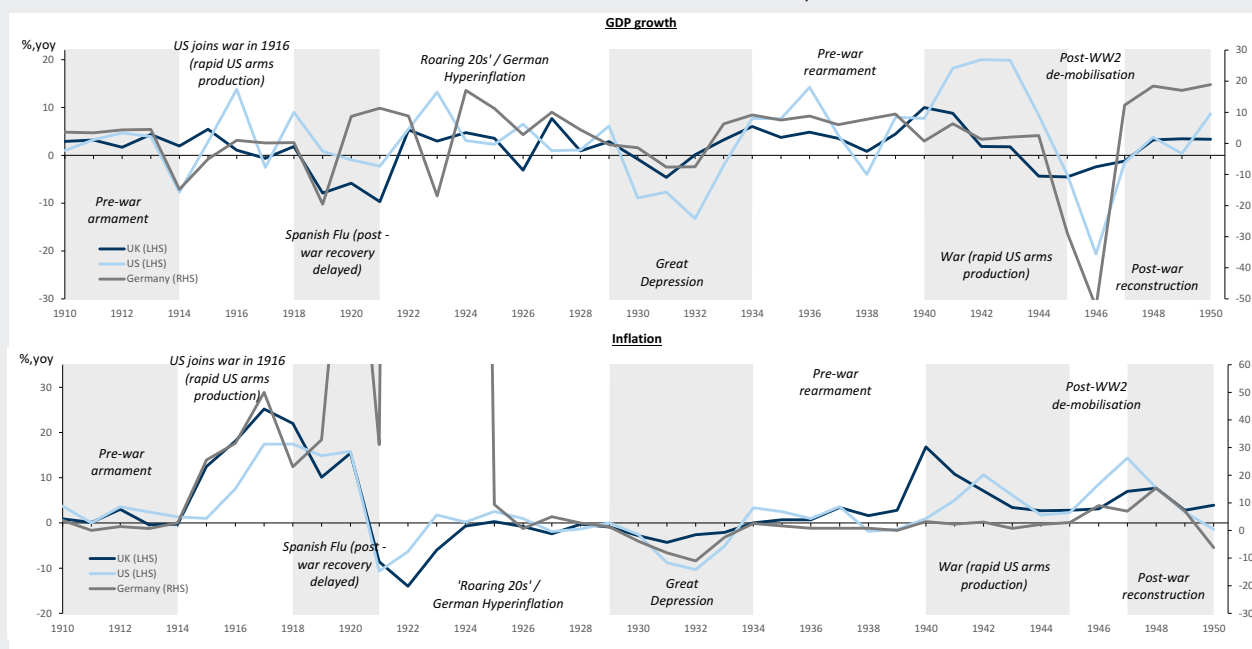
In this box, we consider the economic implications of some key wars and pandemics in more detail, to see whether they are consistent with this view:

- **World War I (1914-18):** The years leading up to the outbreak of war were characterised by relatively rapid growth, partly fuelled by a rapid military expansion by European powers ([Exhibit 8](#)). Inflation accelerated sharply across Europe from 1914 onwards, as the UK, Germany and France were forced to abandon the Gold Standard, rising to a peak of 50%yoy in Germany and 25%yoy in the UK in 1917. The US did not join the war until 1916 and growth and inflation both accelerated sharply in that year, with GDP rising 14%yoy and inflation reaching 17%yoy in 1917.
- The **Spanish Flu (1918-1920)** is estimated to have killed around 40-50 million people worldwide, or 2-2½% of the world's population, around twice the number that died during World War I. While growth and inflation both weakened during the pandemic ([Exhibit 8](#)), it is difficult to determine from time series data alone whether this was due to the war ending or the pandemic. To distinguish between these effects, [Barro, Ursua and Weng \(2020\)](#) use cross-sectional data on war and flu deaths.<sup>8</sup> On this basis, they estimate that the Spanish Flu reduced real GDP per capita by 6% on average and that, in contrast to the highly inflationary effects of World War I, the pandemic had a “negligible” impact on the price level.
- **World War II:** In common with WWI, the years leading up to WWII were also characterised by relatively strong growth which, in Europe, was partly fuelled by rapid military expansion. Inflation accelerated sharply in the UK in 1939-40, as war was initially declared, and later in the US, as it subsequently joined the war ([Exhibit 8](#)). During the war years, GDP growth was exceptionally strong in the US (boosted by a significant increase in arms production and without the cost of war damage) but weaker in Europe (where governments strained to maintain arms production amid widespread war damage). Inflation remained high throughout the war years and through the initial post-war period, before declining in 1949/1950.<sup>9</sup>

<sup>8</sup> Barro, Ursua and Weng (2020), “The Coronavirus and the Great Influenza Pandemic: Lessons from the



**Exhibit 8: GDP and Inflation Over Two World Wars and the Spanish Flu**  
Evolution of GDP Growth and Inflation Between 1910 and 1950 in the UK, US and Germany



Source: Goldman Sachs Global Investment Research, BoE, Schmeling (2018), Maddison

- **Napoleonic Wars:** As tensions rose between England and France ahead of the Napoleonic Wars, the UK government tripled government spending over a five-year period (1792-97), partly funding this increase through a depletion of the Bank of England's gold reserves (Broadbent (2020)). Fears over the impending war resulted in a private sector switch from Bank paper into gold, causing the government to suspend gold convertibility. The price level subsequently rose by 59% over the following 3 years, although it stabilised thereafter and gold convertibility was subsequently restored in 1821.
- **The Black Death:** The bubonic plague reached England in late 1348 and, over the subsequent 3 years, resulted in a 30-45% reduction in the country's population. As Jordà, Singh and Taylor (2020) discuss, the sharp reduction in labour was the primary cause of the *Peasants' Rebellion*, a doubling of real wages, and a significant reduction in rates of return on land.

## Higher Inflation is Not a Natural Consequence of Pandemics

Every war and pandemic is different, and we should be cautious of drawing lessons from events that occurred in the long-distant past and in very different circumstances. One feature of the current pandemic that is clearly distinctive to past episodes is the size of the government response. Equally, however, one can argue that an unusually large government response was necessitated by an unusually large collapse in private

"Spanish Flu" for the Coronavirus's Potential Effects on Mortality and Economic Activity", *NBER Working Paper No. 26866*.

<sup>9</sup> The US's post-WWII experience is discussed in "Pent-Up Savings and Inflation After World War 2", *US Daily*, 25 February 2021.

sector demand.<sup>10</sup>

What is clear is that history provides no evidence that higher inflation or higher bond yields are a natural consequence of major pandemics.

None of this precludes the possibility that higher inflation might result as a policy choice in the face of elevated debt levels. Higher inflation can bring welcome relief to debtors, including the government, by eroding the real value of their obligations. Faced with the choice of reducing debt through austerity or inflation, it is possible that policymakers might 'choose' higher inflation to help limit the need for tax rises and/or government expenditure reductions.

However, such a policy would require the cooperation of central banks to keep interest rates low, even as inflation is rising. And, in a world of independent central banks, even this route towards higher global inflation appears less likely than it did during past crises.

### **Kevin Daly and Rositsa Chankova\***

*\*Rositsa is an intern in the CEEMEA Economics team*

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<sup>10</sup> One can list many other differences between the COVID-19 pandemic and previous pandemics. However, the differences that are likely to be most relevant for the medium-term inflation outlook are those that affect the relative balance between demand and supply and, in our view, those differences appear to have broadly offsetting effects. In particular, relative to past pandemics, there has been a greater willingness through COVID to lower activity through lockdowns/restrictions, implying a larger short-term collapse in private demand and more short-term downward pressure on inflation. Set against this, there has also been a greater willingness to offset this shortfall through larger government income replacement.

# Disclosure Appendix

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