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The long-run effects of pandemics on inflation: Will this time be different?☆

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ABSTRACT

We find that past major pandemics have led to a significant decline in trend inflation in Europe that lasts for more than a decade. The effects of the COVID-19 pandemic on trend inflation could, however, be different this time around.

1. Introduction

How will inflation dynamics unfold following the COVID-19 pandemic? Answering this question is difficult, as pandemics are an omnibus of demand and supply shocks that drive inflation in opposite directions (Baqaee and Farhi, 2020). Moreover, the extent to which the pandemic affects (trend) inflation further depends on hysteresis effects, which leave permanent scars on the economy, and countries' ability to adjust to the post-pandemic economy. Although, recently, inflation has risen in some advanced economies, it is not clear yet whether the underlying trend in inflation has followed suit. The literature also provides little guidance, as it has focused mostly on the short-run economic effects of pandemics (e.g. Eichenbaum et al., 2020a,b; Brinca et al., 2020)—less is known about its potential long-run effects.[1]

This paper contributes to the literature by studying the long-run effects of pandemics on trend inflation in Europe. We use a local projection model and historical data since the 14th century, covering 19 major pandemics. We find that pandemics led to a significant decline in trend inflation that lasts for more than a decade. These results suggest that, from an historical perspective, pandemics have had a significant effect on economic activity, long after the pandemic ended. We discuss what may underlie these results and why the effects of the COVID-19 pandemic on trend inflation could be different this time around.

2. Data and empirical methodology

We use the historical dataset from Schmelzing (2020),[2] which covers the period 1313–2018 and inflation series for six European countries: France (1387–2018), Germany (1326–2018), Italy (1314–2018), the Netherlands (1400–2018), Spain (1400–1729, 1800–2018), and the UK (1314–2018). Aggregate (GDP-weighted) European inflation (Fig. 1) behaved quite erratically over the recent centuries, exhibiting strong volatility. Given these ample fluctuations in the raw data, we focus on the Kalman-filtered

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[1] A notable exception is Jordà et al. (2020), who study the long-run effects of pandemics on the natural rate of interest, and Kozlowski et al. (2020), who study long-run believe-scarring effects of the COVID-19 pandemic.

[2] Available at the Bank of England's data repository.

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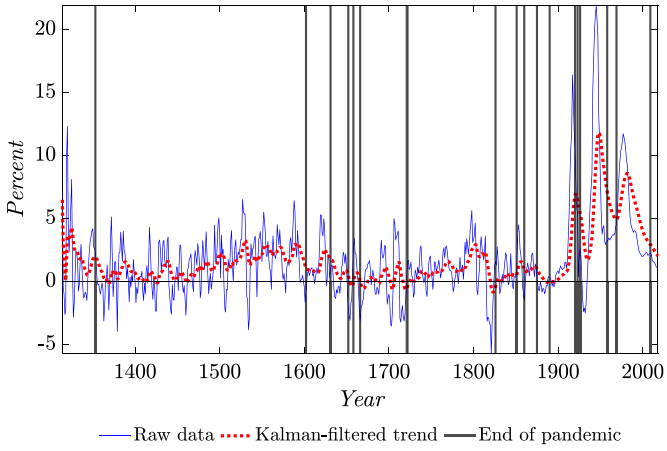

Fig. 1. Aggregate European inflation and pandemics, 1314–2018.

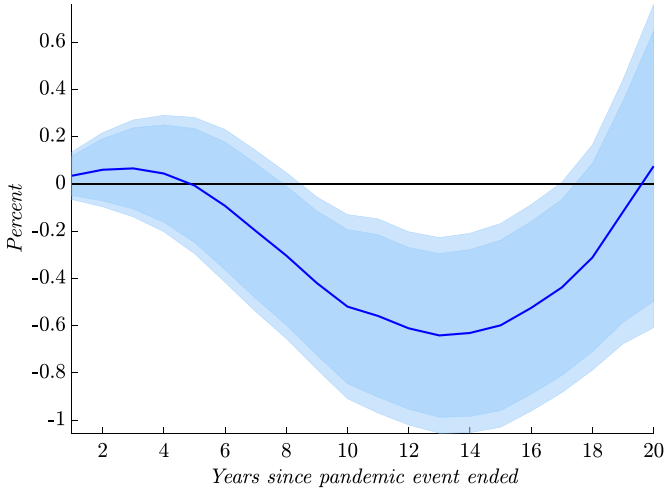

Fig. 2. Response of trend inflation in Europe following a pandemic event. *Notes:* Shaded areas represent the 90% and 95% confidence intervals.

trend of inflation.[3] This also helps isolate the impact of pandemics from the many short-run disturbances that affect inflation dynamics.

The vertical lines in Fig. 1 mark the end of major pandemic events. These dates are taken from Jordà et al. (2020, hereafter JST), who classify major pandemics as pandemics resulting in at least 100,000 estimated deaths (data on the death toll is taken from Cirillo and Taleb, 2020). Following JST, we construct a dummy variable, P_t, that equals 1 in year t when a major pandemic ended.[4] We then use this dummy to estimate the dynamic effects of pandemics on trend inflation, π_t, using the following local projection model:

$$\pi_{t+h} - \pi_{t-1} = c_h + \beta_h P_t + \alpha_n \mathbf{x}_t + u_{t+h}, \quad (1)$$

where c_h denotes a constant and $\mathbf{x}_t$ a vector of controls that includes 10 lags of P_t, trend inflation, global GDP growth and a war dummy that accounts for wars resulting in more than 20,000 deaths (all taken from Schmelzing, 2020).[5] Our coefficient of interest is β_h, which measures the impact of pandemics on trend inflation h years following a pandemic. Eq. (1) is estimated using Newey–West corrected standard errors to account for serial correlation in the error terms, u_t.

3. Results

3.1. Main findings

Fig. 2 shows the response of trend inflation in Europe to a pandemic event. We find that trend inflation falls significantly below its initial level for more than a decade. This decline meets its trough after 13 years since the pandemic event has ended, at which point trend inflation is 0.6 percentage points lower than if the pandemic had not occurred. It takes about two decades before trend inflation reverts back to its pre-pandemic level. This striking result suggests that, historically, pandemics have had a significant and long-lasting effect on economic activity.[6]

This depressing effect of pandemics on aggregate demand may occur through heightened uncertainty that increases precautionary savings and lowers investment demand (see Stiglitz, 2020). Kozlowski et al. (2020), for example, show that the COVID-19 pandemic may entail long-run economic costs due to the 'scarring of beliefs', i.e. a persistent change in the perceived probability of extreme negative shocks in the future. Moreover, JST report a significant and persistent decline in the natural rate of interest following major pandemics, likely reflecting a rise in (precautionary) savings and decline in investment demand.[7] Finally, if nominal and real frictions hinder an efficient reallocation of resources needed to adjust to the post-pandemic economy, productivity might drop (see Bilbiie and Melitz, 2020), exerting downward pressure on potential output and, ultimately, trend inflation.

3.2. Robustness checks

Our findings survive several robustness checks. First, we estimate (1) for the individual European countries included in Schmelzing's dataset. The country-specific results (Fig. 3) show that the long-run decline in trend inflation following a pandemic is observed in all countries considered, except for Spain.[8] Therefore, the impact of pandemics on trend inflation does not seem to be driven by country-specific features.

[3] We extract trend inflation, π_t, from headline inflation, $\pi_{H,t}$, by applying the Kalman filter on the following state-space model:

$$\pi_{H,t} = \pi_t + e_t, \qquad e_t \sim \mathcal{N}(0, R)$$
$$\pi_t = \pi_{t-1} + v_t, \qquad v_t \sim \mathcal{N}(0, Q).$$

[4] We also used a dummy for years that marked the start or middle of a major pandemic. Results under these alternative timing conventions are similar to our main results.

[5] Our main results do not hinge on the inclusion of these control variables, nor on the lag structure.

[6] We conducted the same exercise for the US and found similar results (available upon request).

[7] While we find that the inflation response to pandemics bottoms out after 13 years, JST show that, following a pandemic event, the natural rate of interest declines for about 20 years. This more persistent response to pandemics may be due to the fact that fluctuations in the natural rate, which is a real variable, are more tightly related to changes in real economic activity, which in turn depend on the negative supply-side effects exerted by (long-lasting) pandemics. On the other hand, (trend) inflation, being a nominal variable, may recover more quickly and could even be fueled by cost pressures arising from supply-side disruptions. Nevertheless, further research is warranted to better understand this discrepancy.

[8] Data for Spain starts in 1414, but has missing observations between 1730 and 1800. Hence, we have to work with data from the 19th century onward, which covers only 11 major pandemics and which may partly explain the differences in the responses of trend inflation. Furthermore, Spain is the only country in our sample that never adopted the gold standard, causing the peseta's exchange rate to fluctuate, sometimes strongly, against other gold currencies (Martín-Aceña et al., 2012).

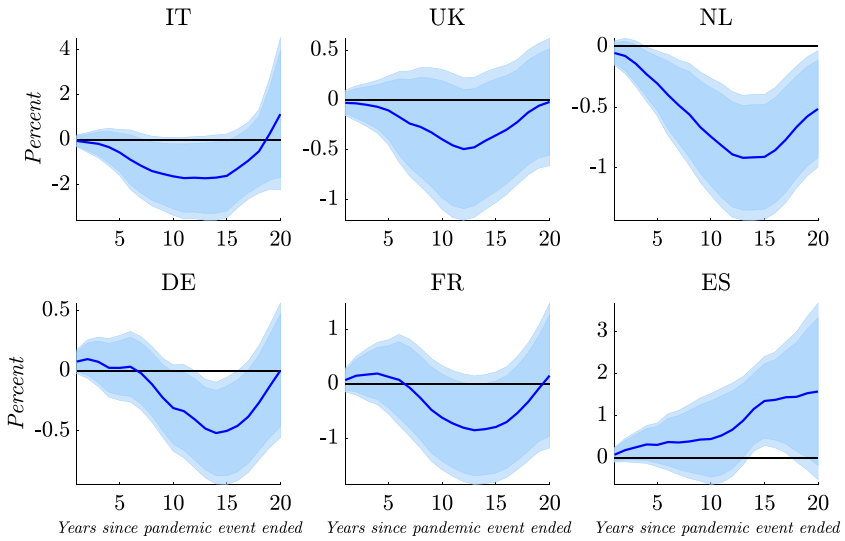

Fig. 3. Response of trend inflation following a pandemic event: country-specific results. *Notes:* Shaded areas represent the 90% and 95% confidence intervals..

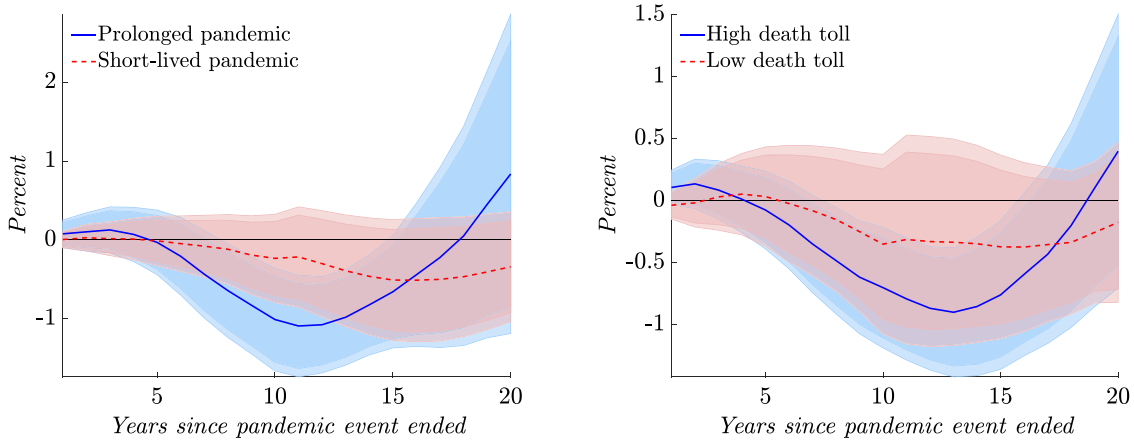

Fig. 4. Response of trend inflation following a pandemic event: conditioning on duration and severity of the pandemic. *Notes:* Shaded areas represent the 90% and 95% confidence intervals.

Second, we split the data based on the duration and severity of the pandemics in our sample. Fig. 4 shows that the long-run decline in trend inflation following a pandemic is more pronounced when the pandemic is relatively more prolonged (i.e. lasts longer than the average duration of 8 years) or more severe (i.e. has a death toll in excess of the median number of deaths as estimated by Cirillo and Taleb, 2020). Regarding our conjecture on what drives the impact of pandemics on trend inflation, these results suggest that if a pandemic lasts longer and has a higher death toll, the impact on uncertainty and aggregate demand is likely to be stronger and more persistent.

Finally, as in JST, we compare the impact on trend inflation of both pandemics and wars. The response of trend inflation to war events is captured by the coefficient of the war dummy in (1). Fig. 5 shows that, while pandemics exert a negative impact on trend inflation, wars have historically been followed by a persistent rise in underlying inflation. This qualitative difference between the impact of wars and pandemics on inflation substantiates that our results are driven by pandemics and not wars. As explained by Daly and Chankova (2021), wars typically spurred aggregate demand through debt-financed war- and reconstruction-related expenditures, yet impaired aggregate supply through the destruction of physical capital, thereby fueling investment demand during post-war years.[9] Moreover, governments often relied on money printing and inflation to cover (major) war-related costs, so as to avoid debt issuance and potential surges in interest rates (Rockoff, 2015).[10]

4. Discussion and conclusion

In this paper, we investigate the long-run effects of major pandemics on trend inflation in Europe. We use a historical dataset, covering the 1313–2018 period and 19 major pandemics, and local projection methods. We find that, following a pandemic, trend inflation falls significantly below its initial level for more than a decade. The more prolonged and severe are pandemics,

[9] Daly and Chankova (2021) find that, following pandemic events, headline inflation declined, with median inflation falling below zero after 1 year and hovering close to zero after 9 years. While their analysis helps substantiate our own findings, some of their results differ from ours which is likely because we (i) use a different sample of countries, (ii) use a different definition for major pandemics, (iii) focus on trend rather than headline inflation, and (iv) use a model-based approach rather than focusing on stylized facts.

[10] Our main results survive additional robustness checks, including removing the 'super pandemics', (i.e. the Black Death and Spanish Flu) or small and localized pandemics (i.e. the plagues of London, Sevilla and Marseille) from our sample.

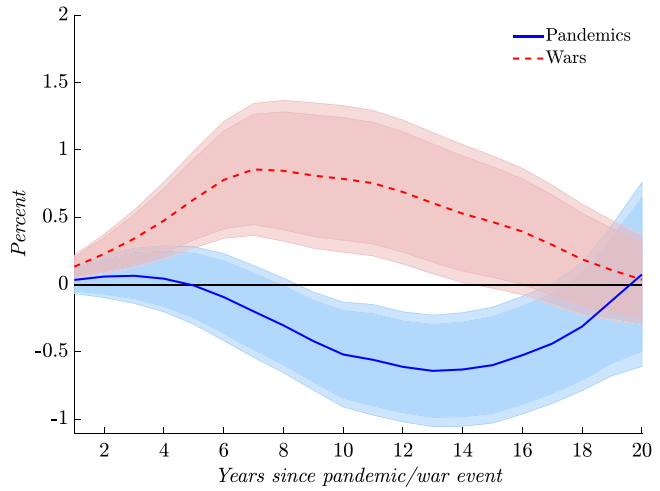

Fig. 5. Response of trend inflation following a pandemic or war event. *Notes:* Shaded areas represent the 90% and 95% confidence intervals.

the more pronounced and persistent are the associated negative effects on trend inflation.

While these results do not bode well for the foreseeable future, the response of trend inflation to the COVID-19 pandemic might be different this time around. First, both fiscal and monetary authorities have responded to the pandemic with unprecedented heft. Governments worldwide engaged in large-scale stimulus measures to prevent mass layoffs and bankruptcies, and avoid costly worker–firm separations, while monetary policy has been exceptionally accommodative to prevent a sharp tightening of credit conditions and liquidity shortages. These policies have likely alleviated the adverse economic effects of the pandemic, and can even lead to a rise in inflation if maintained beyond the health crisis. Second, the swift arrival of several vaccines for the COVID-19 virus allows for lockdown measures to be slowly wound down, which is likely to induce a rebound in economic activity as households unlock their savings and release pent-up demand (provided vaccines offer protection also against mutated versions). Third, although retail store and workplace closures have had a detrimental effect on sales in some sectors, other sectors were less affected, e.g. because of the ability to work from home or because firms found alternative ways to conduct their businesses (see Brinca et al., 2020). The resilience of the business sector and the asymmetric impact of the pandemic on economic activity vary across countries, yet they might help smooth out the overall impact on inflation. Finally, pressures stemming from pandemic-related disruptions, and rising transport and packaging costs (reflecting surging commodity prices) could eventually be passed onto consumers, especially if firms cannot afford to further squeeze markups. As the COVID-19 pandemic continues to unfold, it is too early to tell which factors will ultimately dominate inflation dynamics. As more data becomes available, further analysis on the long-run macroeconomic effects of pandemics is needed.

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