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<https://doi.org/10.1057/s41599-021-00833-7>

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# Pandemics and protectionism: evidence from the “Spanish” flu

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The impact of COVID-19 on recent tendencies towards international isolationism has been much speculated on but remains to be seen. We suggest that valuable evidence can be gleaned from the “Spanish” flu of 1918–20. It is well-known that the world fell into a protectionist spiral following the First World War, but scholars have almost exclusively ignored the impact of the pandemic. We employ a difference-in-differences strategy and find that the flu had a significant impact on trade policy, independent of the war. In our preferred specification, a one standard deviation increase in excess deaths during the outbreak implied 0.022 percentage points higher tariffs subsequently, corresponding to an increase of one third of a standard deviation in tariffs. Health policy should aim to avoid the experience of the interwar period and consider the international macroeconomic impact of measures (not) taken.

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## Introduction

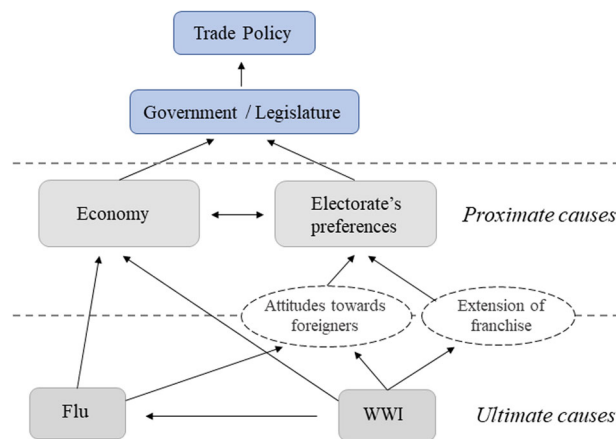
To what extent might health emergencies have an impact on international macroeconomic policy? Might countries turn more inwards following loss of life during the Covid-19 pandemic? There has been much speculation about how the post-coronavirus world will look. For example, *Foreign Policy* wrote that “the coronavirus is killing globalization as we know it”, and that “the outbreak has been a gift to nativist nationalists and protectionists, and it is likely to have a long-term impact on the free movement of people and goods” (Legrain, 2020). In a similar vein, an article in the *New York Times* stated that the coronavirus has come at a time “when the world was already turning inward, largely in reaction to the global financial crisis of 2008. Nations have been erecting barriers to the free flow of people, money and goods”.<sup>1</sup> Only history can give us any guidance, and the latter article points out in passing that the Spanish flu perhaps simply “accelerated trends that were already underway”. We quantify the impact of the severity of the impact of the pandemic on openness, and trade policy in particular, after the First World War, and find that countries hardest hit had more restrictive trade policies during the 1920s, even when controlling for participation in the war.<sup>2</sup>

Economists have long known that the First World War led to a definitive break with the globalization of the late-nineteenth century (see for example, O’Rourke and Williamson, 1999), and John Maynard Keynes’ famous passage about the end of “an extraordinary episode in the economic progress of man”,<sup>3</sup> reminiscing just after the First World War about the lost world of internationalization that had gone before, has often been used to illustrate this (see e.g., Harley, 2020). Thus, the war itself has often been considered to mark the division between the “first era of globalization” and the relative isolationism that was to follow. However, no one today could ignore the fact that Keynes was writing during a major pandemic, the so-called “Spanish” flu, which hit the world in several waves between 1918 and 1920. We employ a difference-in-differences strategy, finding that countries more affected saw increased trade protection subsequently. This is independent of the similarly positive effect of participating in the First World War, and a flexible specification reveals that countries were on parallel trends prior to the pandemic, but diverged subsequently, with the impact lasting throughout the 1920s until the onset of the Great Depression in 1929.

The remainder of this paper proceeds as follows. The following section provides a brief overview of the historical background to our analysis and provides primary historical evidence on the link between the Spanish flu and trade policy using evidence from the case of the United States in the run up to the passage of the infamous Fordney-McCumber tariff of September 21, 1922. Section “Data” presents our data, section “Empirical strategy” presents our empirical strategy, and section “Results” gives our results. Section “Conclusion” concludes.

## Historical background

Since the shocks of the First World War and the pandemic overlapped, both events are discussed here. Figure 1 provides, in a flow-chart, a visualization of the effects and mechanisms we discuss below. Here, we make a distinction between proximate and ultimate causes of governments’ trade policies. We propose (and test below in a reduced form specification) that there were two ultimate causes of the increases in tariffs observed in the 1920s: the Spanish flu and the First World War. Both impacted directly on the economy, which might have promoted revenue-raising and/or protective tariffs. They might also both have increased suspicion of foreigners, making protectionist policies more attractive. Finally, the war is also considered to have played



**Fig. 1 Flowchart of the suggested mechanisms.** Overview of the suggested mechanisms between the First World War, the Spanish Flu, and tariffs; see text for details.

an important role for the extension of the franchise to women in many countries, and to the extent that this might have impacted on the preferences of the electorate, we have also included this mechanism.

Starting with the war, this had manifold impacts on the World Economy, as systematically summarized by Broadberry and Harrison (2005), Findlay and O’Rourke (2007), and Feinstein et al (2008). The most direct were that it killed people, destroyed infrastructure and dramatically increased government spending, most of which went into the “unproductive” war effort. In addition, front lines, destroyed and requisitioned infrastructure, naval blockades and naval warfare severely disrupted international trade, directly and by disproportionately increasing insecurity and corresponding trade costs such as insurance. Workers and resources were drawn from civil production into the war itself and the production and provision of war materials. In the medium run, this created problems for government finance and economic reconversion after the war. Wounded and traumatized soldiers needed to return to civilian life. An international oversupply of heavy industry and basic foodstuffs created domestic need for adjustment, and lobby groups campaigned for at least temporary protection after the heroic effort. As noted above, franchise extensions were another consequence of the collective efforts, as was the increased importance of parties representing workers’ interests (see for example Przeworski, 2009). Women were also given the vote in most places, and de Bromhead (2018) finds that they were more likely than men to hold protectionist attitudes, and that where women were entitled to vote tariffs were, on average, higher.<sup>4</sup>

Heavily burdened government finance craved revenue, and defeated countries in particular turned to the printing press. This was accompanied by balance of payments and banking crises, also in countries such as the UK, which soon after the war opted for severe deflationist policies in order to return to the gold standard (Morys, 2014). Thousands of kilometers of new borders emerged, as the Treaty of Versailles and the breakdown of the Habsburg Empire created new states especially in Central and Eastern Europe. While many of the direct interventions in national and international markets were – except for Germany—dismantled soon after the end of the war (Feinstein et al., 2008; Hardach, 1977), the peace treaties failed to commit all parties to the third of US President Wilson’s 14 points: “the removal, as far as possible, of all economic barriers and the establishment of an equality of trade conditions among all the nations consenting to the peace and associating themselves for its maintenance.” (cited after

Hardach, 1977, p. 242).<sup>5</sup> So, despite efforts to keep markets open through the League of Nations, many of these forces created protectionist backlashes in the 1920s (Findlay and O'Rourke, 2007), since tariff protection often served several goals, although with minor tradeoffs. Tariffs raised government revenue, aimed to correct balance of payment imbalances, helped struggling import-competitors, and provided visible input to political discourses of national reconstruction and nation-building.

Some of these issues might have worked in the same direction as for our second “ultimate cause”, the Spanish flu, that—on a global level—hit regions with limited healthcare and public health capacities harder. Both shocks were related in many ways, as reflected by the arrow from the war to the flu in Fig. 1. A significant share of doctors served in the military instead of in their civilian offices and hospitals. Soldiers spread the disease, both in the military and when returning home from the war. Trade disruptions, like the Allied blockade in Europe, affected food provision and precarious nutritional status affected immune systems (Spinney, 2018). Little seems to have been written about the importance of public health interventions in Europe during the pandemic itself, but we know that, partly due to the war, far less focus was put on them there than in the US, since communication about outbreaks was far less transparent among the belligerent parties. It has been demonstrated that in the US cities that implemented earlier interventions saw lower rates of transmission (Bootsma and Ferguson, 2007; Hatchett et al., 2007).

The disease thus likely created pressure on authorities to adopt means and improve access to healthcare, in a similar way to other factors which have been noted above, such as the presence of veterans, the franchise extensions to women and poorer sections of the male population, the rise of trade unions, and social unrest in general (Feinstein et al., 2008). Such means required funding and revenues. Anecdotal evidence, however, suggests that relatively few public health reactions actually occurred before the 1940s, the best documented probably being the creation of a Federal Department of Health in Canada, a country to which the pandemic spread to a significant extent through US soldiers on their way to Europe (Humphries, 2013). Also, in Weimar Germany there was a gradual shift to public healthcare, and the League of Nations featured a health institution (Spinney, 2018).

On the other hand, at least in the short run, there was a marked increase in suspicion of foreigners and theories about the origin of the (assuredly not) Spanish flu during and immediately after the pandemic (Spinney, 2018). Such trends might have made ways of raising government revenue that (ostensibly) fell on foreigners, like raising tariffs, more acceptable. Highlighting a different version of the same channel, in her popular book on the 1918 influenza pandemic, Laura Spinney (2018)<sup>6</sup> argues that Gandhi's anticolonial movement, which featured campaigns for a boycott of British imports and substitution by traditional Indian production (see Wolcott, 1991), received a decisive boost from the tragic outcomes of the Spanish flu in India, although Gandhi had no direct influence on India's rising tariffs (cf. Arthi et al., 2020).

So, while admittedly the literature on the macroeconomics of the Spanish flu and especially on the relationship to policy openness is virtually non-existent, it is likely that the link we uncover below worked through one of the following channels, both difficult to track in existing data: first, since reactions to pandemics are costly, they create needs for revenue, and especially at low(er) state capacity customs duties are a convenient way of raising this (Cagé and Gadenne, 2018). Second, if pandemics create a more inward-oriented public discourse, increasing tariffs becomes more tolerable.<sup>7</sup>

Ultimately, the onset of the Great Depression in 1929 was to overshadow all aspects of economic policy, and here trade policy seems to have played a significant role as a reaction to crisis.<sup>8</sup>

Thus, de Bromhead et al. (2019) demonstrate the impact of trade policy on trade flows, showing that policy explains the majority of the UK's shift to Imperial preference in the 1930s. Otherwise, the reasons for the far greater outbreak of protectionism in the 1930s are well known, with Eichengreen and Irwin (2010) demonstrating that exchange rate policies played a crucial role. Countries that retained fixed exchange rates under the gold standard were more susceptible to resorting to tariffs, import quotas and exchange controls. Their inability to use monetary policy led them to resort to protectionism in an ultimately futile attempt to stem the decline in their economies.

In the light of the lack of previous research on the matter, and in order to provide some more concrete historical evidence for the link between the Spanish flu and subsequent trade policy beyond our empirical results below, we turn to primary sources, and specifically the case of the United States and evidence taken from Congressional debates. We examined these in the period from the end of the First World War and until the passage of the Fordney-McCumber Tariff of 1922, which represented the largest even increase in US tariffs (Irwin, 2011) and gave the US one of the highest tariffs of any creditor nation in the world, leading to some retaliation by European and Latin American countries. Besides being proposed as an internal reaction to agricultural crisis and an economic downturn resulting from monetary stabilization measures, the tariff was the result of the US's increasingly isolationist stance following its losses during a foreign and “European” war, and was fueled by a new sense of nationalism, as well as the idea that American prosperity during the war had been due to a lack of imports and abundant exports. Its result was damage both to the domestic and the world economies (see for example Kaplan, 1996; Kaplan and Ryley, 1994; Irwin, 2017). When systematically going through the sources, beyond its immediate impact on military and other government personnel, as well as occasional calls for a more coordinated federal response, we found perhaps surprisingly few mentions of influenza or “flu” in the *Congressional Record* (United States Congress, 1919–1922) reflecting the lack of attention it received by politicians at the time, as noted by others.<sup>9</sup> Famously, despite collapsing with the illness during peace talks at Versailles, and thus perhaps silencing his opposition to the punitive sanctions on Germany which many consider to have played a role in precipitating the Second World War (Flecknoe et al., 2018), President Woodrow Wilson never spoke openly about the illness.<sup>10</sup>

We did, however, find it mentioned in the context of debates about raising tariffs a number of times. For example, the Republican Congressman Caleb R. Layton was particularly prominent in discussions about ensuring a domestic supply of various products necessary for combatting influenza and other illnesses. Layton was a physician and served in the House of Representatives from 1918 to 1920, when he lost to the African American political activist Alice Dunbar Nelson after opposing the Dyer Anti-Lynching Bill. In 1919 he spoke during a debate on tariffs on coal-tar products, stressing his medical qualifications, and noting their use not only in dyes but also for pharmaceuticals (Cong. Rec. 58:6, p. 6006), and again in 1921, he spoke passionately during the debate on the bill (H. R. 7456—what eventually became the Fordney McCumber Tariff) “to provide revenue, to regulate commerce with foreign countries, to encourage the industries of the United States, and for other purposes.” He stated that he was “lifetime a firm believer in the policy of the protective tariff”, and again, as a doctor, he felt obliged to mention the importance of protection for coal-tar products, of which Phenacetin “was found to be of almost priceless value in the treatment of the late epidemic of influenza” (Cong. Rec. 61:4, pp. 3493–3494). Similarly passionate statements were also made by Democratic Senator James Thomas Heflin, a notorious white

supremacist, in relation to a bill (S. 3390) seeking federal funding for the manufacture of nitrates, and highlighting in particular the unfortunate experience of establishing a plant in his own state of Alabama:

“I wish to ask Senators whence the opposition comes that would seek to prevent America having a nitrate plant of her own? ... This plant at Muscle Shoals was built under great difficulties. The influenza came just at the time these thousands of men were there at work. Many of them were stricken down and many of them died. In the hurry and the stress and strain money was wasted, doubtless; money was extravagantly spent, doubtless; but there is no getting away from the fact that that plant is located at a fine place, a very desirable place; that it is close to the phosphate beds; that it is on a fine stream of water; that it is located at one of the finest water-power sites in the wide world; and that the Government has spent eighty-odd million dollars on it; and I submit that there is no justifiable excuse for the fight that is being made to destroy this bill.” (Cong. Rec. 60:2, pp. 1309–1310).

Then, in 1922, Republican Senator Joseph S. Frelinghuysen Sr. spoke in a debate regarding Senate bill 1807, “A bill to aid in stabilizing the coal industry”, noting that “During the influenza epidemic ... one of the greatest elements that aided the spread of the disease was the high price of coal, which the poor families could ill afford to purchase”—and thus in favor of regulation of the industry (Cong. Rec. 62:1, p. 689). There were opposing voices, of course, and William H. King, the senior Democratic Senator for Utah (and perhaps not coincidentally the junior senator for Utah was the Republican Reed Smoot, of Smoot-Hawley fame) spoke during consideration of the Fordney-McCumber tariff bill (H. R. 7456) against raising tariffs which would increase the price of pharmaceuticals, including those used to treat influenza (Cong. Rec. 62:6, p. 6197), and he spoke again on a debate on protection for coal-tar products for the same reason (Cong. Rec. 62:13, p. 13859).

The influence of the pandemic on debates was even felt outside the realm of trade policy and industrial regulation. For example, in 1922, in a debate on the conference report on the bill (B. R. 9548) “for the relief of the distressed and starving people of Russia”, Democratic Senator Henry F. Ashurst noted that the bill would give “\$20,000,000 for relief of distressed Russians; not a penny for relief of distressed Americans”, and quotes from the *Washington Times* of December 21, 1921, where it was reported how after the closing of a mine “Two thousand men, women, and children, comprising the populace of a West Virginia town—Minden, in Fayette County—are literally starving to death” and that “To add to the misery, an influenza epidemic is sweeping the territory. The death rate has been alarming. Schools have closed; out of 500 pupils only 101 were able to attend classes last week” (Cong. Rec. 62:1, p. 677). This, together with countless similar isolationist sentiments during the debates we read, not all of which of course explicitly stated the impact of the pandemic on their thinking, provides some backing for the idea that the protectionist thinking of contemporaries might have been influenced by the experience of the influenza epidemic.

This was not restricted to the United States, of course. We also went through the Australian Parliamentary debates from the relevant period. There is much discussion of quarantines, vaccines, outbreaks on shipping, whether or not to keep churches open, and the closure of state borders—mirroring to a striking degree the contemporary debate on COVID-19 in that country. In one particularly pertinent debate<sup>11</sup> on the “Supply Bill (No. 1) 1919–20” it is noted that the effects of the war, the flu and outbreaks of strikes are all linked, and the protection of various industries including wheat, wool and dairy produce is discussed,

as well as support and subsidies for the mining industry and plans for the “development of Australian production and manufacture”.

## Data

To investigate more formally the impact of the Spanish flu on trade openness, we make use of several sources of data.<sup>12</sup> For tariffs we rely on the import-weighted average ad valorem tariff (AVE), as collected by Lampe and Sharp (2013). This is calculated as the ratio of customs duty revenues to total imports for domestic consumption. There are of course a number of issues with this measure of protectionism, as Lampe and Sharp acknowledge. First, some of their data for Germany (1914–24) are interpolated,<sup>13</sup> although our results are not sensitive to the inclusion of that country.<sup>14</sup> Second, tariffs at that time were usually specific, and thus declining prices would automatically lead to an increase in ad valorem equivalents. However, using price data from Jordà et al. (2017), we find no significant correlation with our measure of protection. Third, not all protection is captured by tariffs, since subsidies, quantitative restrictions and prohibitions are also of importance. While indeed there was wide use of quantitative restrictions up to the Allied sea blockade of the Central Powers from March 1915, which also affected neutral countries in Europe (Hardach, 1977), except for commercial relationships between especially France and Germany, these were dismantled quickly after the end of the war in Western and Central Europe (Hardach, 1977). From then on, import duties were the main trade frictions (Hardach, 1977; Feinstein et al., 2008). However, the fact that the League of Nations in 1927 sponsored a conference on import and export restrictions and in 1929 the “International Convention for the Abolition of Import and Export Prohibitions and Restrictions” was adopted (Boyce, 1987), might create the impression that in the 1920s, as was to be the case in the 1930s, non-tariff restrictions were omnipresent. They were probably not. The Prohibition Convention contained the possibility of exempting certain goods on a country level, and annexes contained these exemptions. Most had to do with the possibility of strategically limiting exports, and regarding imports we find clauses only referring to coal, coke, peat, lignite and briquettes in Germany and synthetic and organic dyestuffs and colors in the UK, and very little for elsewhere.<sup>15</sup> We therefore assume that quotas did not distort the level of protection as measured by average tariffs.

Our main analysis is conducted using data for measuring the impact of the Spanish flu from Ansart et al. (2009) who estimate the number of cumulative excess deaths due to the Spanish flu pandemic. The reported excess mortality is defined as the difference between the observed and the predicted number of all-cause deaths using the pre period 1906–1917 as baseline) during the pandemic. The exact pandemic period differs from country to country and is defined as the period in which the observed number of deaths exceeded a given threshold. In all countries, it starts during 1918 and ends at some point in the first half of 1919. Thus, the relatively minor peak of the flu in April 1920 experienced by several countries is not accounted for by the excess mortality measure. Besides its drawbacks, using all-cause excess mortality is probably the best way to measure the severity of the pandemic across countries as it is highly comparable. Deaths are rather accurately measured in most countries and using all-cause excess mortality is then less prone to measurement error than any measure of flu-specific deaths, which would largely depend on the right diagnosis of medical personnel, which may differ vastly across countries. This *core sample* consists of 12 European countries, for which tariffs are also available.<sup>16</sup>

As discussed earlier, until now the increase in protectionism in the 1920’s has been explained with the adverse effects of World

**Table 1 Summary statistics.**

Variable	Mean	Standard deviation	Min.	Max.
<i>Core sample</i>				
excess deaths	158,751.9	176,442.8	10,650	544,288
battle deaths	393,691.1	597,343.6	0	1,773,700
Tariff	0.105	0.077	0.008	0.330
<i>Extended sample</i>				
flurate	0.913	0.194	5.220	0.220
battlerate	0.385	0.664	0.000	2.650
Tariff	0.155	0.102	0.008	0.619

War I. Clearly, the concurrent timing of World War I is the main concern with our analysis: as the pandemic started when the war ended, we have to account for the war to be able to demonstrate an independent effect of the flu. We therefore include a measure of intensity with which a country was affected by the war by using the number of battle deaths suffered during the war in some of the specifications. This measure is taken from the “Correlates of War project” (Sarkees and Wayman, 2010).

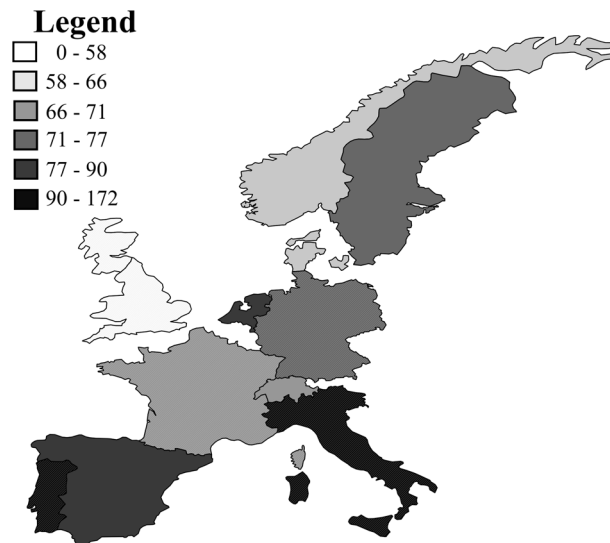
As a robustness check and to increase external validity, we also present results using an *extended sample* using data from Barro et al. (2020), who present death rates (relative to total population) for the flu and for World War I. It is important to note that this data presents flu-specific death rates for countries where this measure is available and all-cause excess mortality rates where flu-specific deaths are not available. Barro et al. note, however, a “close correspondence” for those countries where both measures are available. For some countries the timing of deaths is also extrapolated from data of neighboring countries. An advantage of this data, however, is the much more diverse set of countries, a larger number of which did not participate in the First World War. Ultimately, we use data from 29 countries<sup>17</sup> as a number of countries cannot be included for our purposes because tariffs are not available, they were subject to colonial relationships or forced tariffs (such as China) or were otherwise obvious outliers in this respect such as the Soviet Union.

Table 1 presents summary statistics. Tariffs are measured annually from 1900 to 1939, while the number of excess deaths and battle deaths, has just one observation for each country.

In Fig. 2, we map the distribution of excess deaths caused by the Spanish flu in Europe alone while Fig. 3 shows the distribution of the decadal average level of tariffs for the 1910s, 1920s, and 1930s, with darker shades indicating higher levels of deaths/tariffs. The extreme protectionism of the 1930s is very clear.<sup>18</sup>

**Empirical strategy**

To identify the effect of excess deaths on the tariffs after the Spanish flu pandemic, we implement a difference-in-differences strategy. This method allows us to obtain an estimate of the average effect of excess deaths on tariffs, i.e., the average treatment effect. Originally the difference-in-differences method was employed in the social sciences to study the effect of new policies. The method attempts to simulate a natural experiment dividing the population into two groups, the treated group (the group experiencing the new policy) and a control group (a group with similar characteristics not experiencing the policy). The two groups are then compared before and after the treatment to establish the average treatment effect of the policy. In our setting, the “treatment” is the level of excess deaths due to the pandemic. Thus, all countries are unaffected before the pandemic but, with the event of the pandemic, some countries are more affected than others. This method allows us to compare the change in the level of tariffs across countries and time, to find the average effect of excess deaths on tariffs.<sup>19</sup>



**Fig. 2 Rates of excess deaths caused by the Spanish Flu from 1918 to 1919.** Excess death rates are computed as the number of excess deaths per expected deaths. Darker grays indicate higher excess deaths. The countries shaded diagonally participated in WWI.

To have a correctly specified model, the timing of the effect is important. We hypothesize that the effect will start after the beginning of the first peak in 1918. Furthermore, we allow for the effect to take place before the end of the pandemic, because it is likely that affected countries took measures against the disease, one of which could be to become less open. These measures could have been implemented while the pandemic was still in progress. An advantage of this is that the time of treatment coincides with the end of the First World War, which is useful for our analysis.

To find the average treatment effect of excess deaths, we start by estimating the following difference-in-differences model

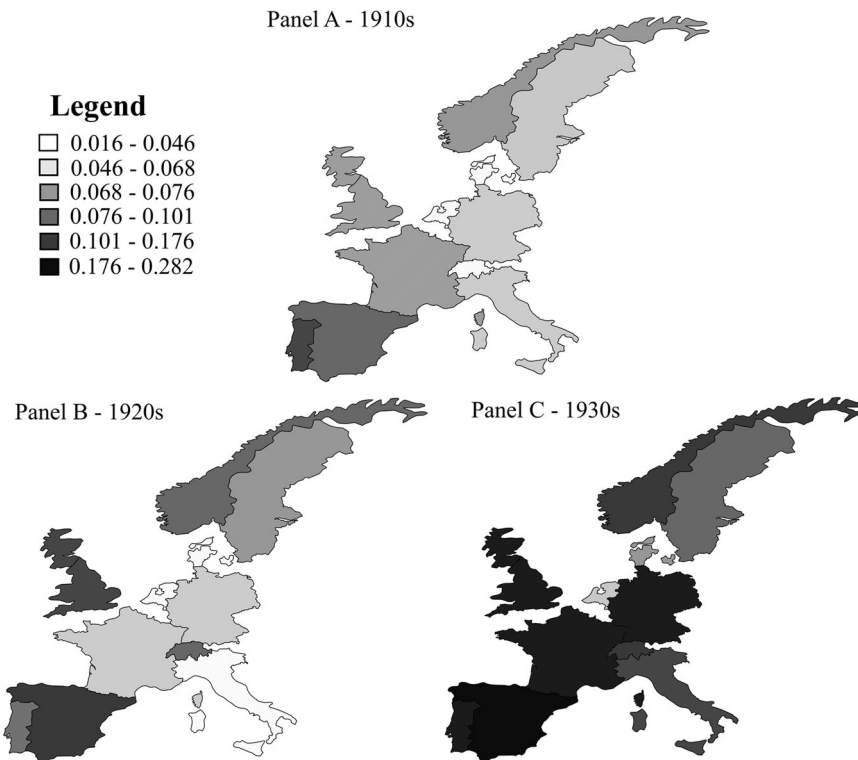
$$tariff_{it} = \beta_0 + \beta_1 post1918_t * \ln(excessdeaths)_i + \beta_2 post1918_t + c_i + \theta_t + \epsilon_{it}, \tag{1}$$

where  $tariff_{it}$  is the tariff level in year  $t$  for country  $i$ ,  $post1918_t$  is a dummy taking the value 1 for the years 1919–1939 and zero otherwise. Our main explanatory variable,  $\ln(excessdeaths)_i$ , is the log of excess deaths caused by the Spanish flu. The specification also includes country fixed effects,  $c_i$ , and year fixed effects,  $\theta_t$ . The country fixed effects control for any time invariant characteristics of each country and are allowed to be correlated with the explanatory variables.  $\epsilon_{it}$  is the error term clustered at the country level. Our main parameter of interest is  $\beta_1$ , which gives us the average treatment effect.

As noted above, the end of the pandemic coincides with the end of the war, and thus a major concern in Eq. 1 is that we do not control for the war. Indeed, the above discussion makes it likely that countries experiencing the war more severely implemented higher tariffs afterwards. Therefore, for comparison, we also estimate the average treatment effect for the number of battle deaths during the war as:

$$tariff_{it} = \beta_0 + \beta_1 post1918_t * \ln(battledeaths)_i + \beta_2 post1918_t + c_i + \theta_t + \epsilon_{it}, \tag{2}$$

where  $\ln(battledeaths)_i$  is the natural logarithm of (1 + the number of deaths in battle) during the First World War. Note that only about half of the countries in our sample participated in the war and only these will have positive values in the number of deaths.<sup>20</sup> This means that the number of battle deaths is only positive for these countries.



**Fig. 3 Average tariffs in the decades 1910s, 1920s and 1930s.** The maps show standardized tariff intervals, in order to make the decades comparable to one another. Panel (A) shows the average tariffs for 1910–1919, Panel (B) shows the average tariffs for the interval 1920–1929, and Panel (C) shows the average tariffs for 1930–1939.

**Table 2 Regression results.**

Dependent variable is: tariff	(1)	(2)	(3)
<i>after1918</i> × ln( <i>excessdeaths</i> )	0.017*** (0.004)		0.008*** (0.002)
<i>after1918</i> × ln( <i>battledeaths</i> )		0.004*** (0.001)	0.003*** (0.001)
<i>after1918</i>	−0.197*** (0.040)	−0.034** (0.011)	−0.117*** (0.030)
Year FE	Y	Y	Y
Country FE	Y	Y	Y
Observations	480	480	480
Number of countries	12	12	12

Robust standard errors in parentheses, clustered at the country level. \**p* < 0.1; \*\**p* < 0.05; \*\*\**p* < 0.01.

Finally, to assess the relative significance of our two treatments, we also estimate a version where both the pandemic and the war are included simultaneously.

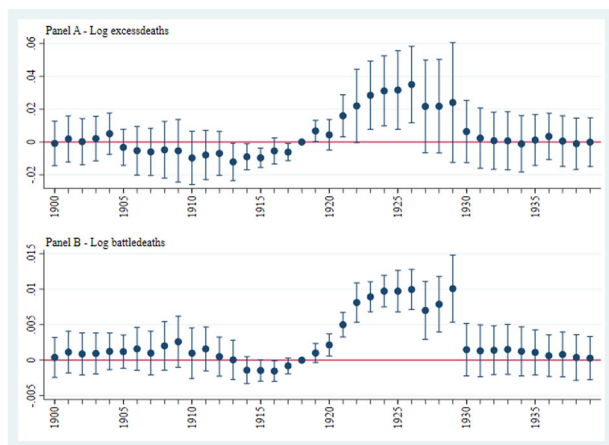
**Results**

Table 2 provides the results of estimating Eq. 1 to 3 using our core sample.

Despite few observations, we obtain significant results at standard significance levels. From column 1 in Table 2 it is clear that there is a positive correlation between the number of excess deaths and the level of tariffs after 1918. We find that a 1 percent change in the number of excess deaths leads to a tariff increase equal to 0.017 percentage points. In terms of standard deviations, one standard deviation more excess deaths implies 0.022 percentage point higher tariffs, corresponding to an increase of one third of a standard deviation in tariffs. From column 2, it is also clear that the number of battle deaths in the First World War had an important effect on tariffs after 1918. On average, one percent more battle deaths results in 0.004 percentage points higher tariffs. In terms of standard deviations, the result is similar to excess

deaths, given that one standard deviation more battle deaths implies 0.026 percentage point higher tariffs. It is thus clear that the effect of the war is also not negligible. However, in column 3 where both the effect of the pandemic and the effect of the war are estimated together, the estimate on ln(*excessdeaths*) remains positive and significantly different from zero at the 1 percent level. The effect of excess flu deaths is in fact stronger than that of battle deaths when including both simultaneously. However, it should also be kept in mind that the number of battle deaths is zero for half of our sample. This, as well as the fact that excess deaths and participation in the war are correlated due to returning soldiers spreading the illness make it difficult to compare the size of the coefficients. Nevertheless, these results together imply that the number of deaths in battle during the war alone was most likely not the only important determinant of tariffs: a non-trivial determinant was indeed mortality during the Spanish flu.

A difference-in-differences model relies on the assumption of a common trend. This assumption states that, in the absence of treatment (the pandemic/the war), the difference in tariffs



**Fig. 4** Estimated coefficients from a flexible model using  $\ln(\text{excessdeaths})$  or  $\ln(\text{battledeaths})$  as explanatory variable. Panel (A) shows the point estimates from a flexible difference-in-differences model with  $\ln(\text{excessdeaths})$  on tariff. Panel (B) shows the point estimates from a flexible difference-in-differences model with  $\ln(\text{battledeaths})$  on tariff. The base year is 1918 and the error bars show  $p < 0.1$  based on robust standard errors, clustered at the country level.

between the treatment group and the control group would be constant. In our case this implies that the difference in tariffs before and after 1918 would be constant between countries, had they not experienced the flu or the war. The common trend assumption can be tested by estimating a flexible differences-in-differences model, where  $\ln(\text{excessdeaths})$  and  $\ln(\text{battledeaths})$  interact with year dummies including the pre-treatment period. The effect of the two variables is thus allowed to differ in each year. If the assumption holds, all estimates before 1918 should be insignificant, thus showing no trend prior to treatment. In this way, we can also determine when the effects died out, as we expect they might have done with the onset of the Great Depression. Due to the small sample size, we estimate these specifications separately. The results can be seen in Fig. 4.

For both the pandemic and the war, there is no clear pre-trend given that almost none of the coefficients are significantly different from zero before 1919. There are a few negative and significant coefficients for both excess deaths and battle deaths in the years during the war. The significant negative estimates during this period could simply reflect that countries participating in the war were more open then, since imports were fundamental for national supply, and countries participating in the war were more affected by the flu. Undoubtedly, the war period is unusual in many respects and it is thus reassuring that the only significant estimates before 1919 are during this period.

Thus, without any clear pre-trend, we can conclude that the assumption of a common trend holds. Moreover, Fig. 4 reveals nicely that the coefficients become significant after 1918. As for Table 2, it is clear that both  $\ln(\text{excessdeaths})$  and  $\ln(\text{battledeaths})$  play a role in explaining the tariffs. The effects from the pandemic seem to disappear earlier but, as expected, by the beginning of the 1930s all seem to have vanished. This is consistent with historical events. After 1929 and the Great Depression, countries started to become more protectionist for reasons which, ten years after both shocks, seem to have outweighed the previous determinants.

Figures A3–A4 in the supplementary information file show the results when using the extended sample consisting of 29 countries. As mentioned in section “Data”, for the extended sample we have (flu) death rates instead of excess deaths. We thus exchange the variables for excess deaths in Eqs. 1 and 2 with *flurate* and *battlerate*. Figure A3 shows the estimations separately,

corresponding to Fig. 4 using the core sample. Due to the larger sample, however, it is also possible to include both *flurate* and *battlerate* in the same flexible estimation, and these results are shown in Fig. A4. Both figures show the same pattern as was demonstrated above, with positive effects both from the flu rate and the battle rate. Although it is less clear than in the smaller sample, it should also be remembered that this larger sample consists of a very diverse set of countries and that especially the variable flu rate is very prone to measurement error, as noted above. However, another advantage is that this more diverse sample also allows us to conduct the analysis using only those countries which did not participate in the war, addressing more directly the aforementioned concern about the confounding timing and effect of the war as well as the fact that the severity with which the country was affected by it is likely to be correlated with the severity of the flu. Estimating only on countries not participating in the war then presents another test of a separate flu effect. Figure A5 shows the point estimates, clearly indicating a positive effect of the flu on tariffs.

## Conclusion

The impact of pandemics on trade policy is deserving of more attention. We find that it was not only the First World War which led to protection in the 1920s, but also the Spanish flu, and future analyses have the potential to add substantially to this preliminary work, for example by investigating the link to public health policy, which we might assume played a role for determining the severity of the outbreak. This provides an important new dimension to the debate today about the trade-off between the economic benefits versus the human costs of relaxing public health restrictions. It might be the case that the domestic benefits could to a substantial extent be offset by tendencies towards international isolationism.

For now, we offer this simple warning: policymakers and the media must take seriously the impact on isolationist policy that the present pandemic might unleash. It is a cliché, but if history teaches us nothing else, it is that we should be wary of making the same mistakes twice, and we should be cautious that the 2020s do not follow the pattern of the 1920s, if we are to avoid the turmoil the interwar period witnessed. We sincerely hope that our findings do not generalize.

## Data availability

Data sharing not applicable to this article as no new datasets were generated during the current study. We combined data documented in Ansart et al. (2009), Barro et al. (2020), Lampe/Sharp (2013), and Clemens and Williamson (2004), subject to the data availability policies of those papers. The digitalized (United States) Congressional Record (Bound Edition) is available online at <https://www.govinfo.gov/> (last accessed 20 February 2021).

Received: 27 October 2020; Accepted: 11 March 2021;

Published online: 17 June 2021

## Notes

- 1 Ruchir Sharma, “The Pandemic Isn’t Changing Everything”, *New York Times*, May 3, 2020.
- 2 Marcano (2020) makes similar speculations but provides limited quantitative analysis.
- 3 “What an extraordinary episode in the economic progress of man that age was which came to an end in August 1914! ... The inhabitant of London could order by telephone, sipping his morning tea in bed, the various products of the whole earth, in such quantity as he might see fit, and reasonably expect their early delivery upon his doorstep; he could at the same moment and by the same means adventure his wealth

- in the natural resources and new enterprises of any quarter of the world ... or he could decide to couple the security of his fortunes with the good faith of the townspeople of any substantial municipality in any continent that fancy or information might recommend. He could secure forthwith, if he wished it, cheap and comfortable means of transit to any country or climate without passport or other formality ... most important of all, he regarded this state of affairs as normal, certain, and permanent, except in the direction of further improvement, and any deviation from it as aberrant, scandalous, and avoidable. The projects and politics of militarism and imperialism, of racial and cultural rivalries, of monopolies, restrictions, and exclusion ... appeared to exercise almost no influence at all on the ordinary course of social and economic life, the internationalization of which was nearly complete in practice." -Keynes (1920, pp. 9–10).
- 4 Aggregate preferences may also be affected by other factors. Gozgor (2020), for example, shows that demographics, health and educational levels are related to trust in the government during the current COVID-19 crisis.
  - 5 The non-adoption of this principle is often attributed to Wilson's relatively weak position in trade liberalization, as at the same time the US was turning more—non-discriminatorily—protectionist (Hardach, 1977, p. 242). Nevertheless, this "sorry result" (ibid., p. 243) might also be connected to, as Spinney (2018) suggests, the fact that Wilson and his advisor Edward House suffered from influenza during the 1919 Paris Conference, and more importantly suffered from a related stroke later that year that could have compromised Wilson's strength in a way that meant that he might otherwise have been able to push more strongly for the US to join the League of Nations. This, of course, remains speculative counterfactual history.
  - 6 Cf. Shyam A, Krishna, "How the Spanish flu changed the course of Indian history: Gandhi survived the pandemic that united Indians against the British", *Gulf News*, March 15, 2020.
  - 7 During the COVID-19 pandemic, enforced lockdowns have given a more direct economic incentive, due to rising unemployment and the failure of firms.
  - 8 Although falling prices and falling economic activity explain a larger share of the post-1929 trade collapse, see de Bromhead et al. (2019) and Irwin (1998).
  - 9 We searched all volumes of *Congressional Record* from November 1918 until September 1922, and further examined incidences of the words "tariff" and "duty/duties" in proximity of "influenza" and "flu", which produced several hits in 58 Cong. Rec. (Bound)—Volume 58, Part 6 (September 13, 1919 to October 4, 1919), 60 Cong. Rec. (Bound)—Volume 60, Part 2 (January 7, 1921 to January 28, 1921), 61 Cong. Rec. (Bound)—Volume 61, Part 4 (June 29, 1921 to July 22, 1921), 62 Cong. Rec. (Bound)—Volume 62, Part 1 (December 5, 1921 to January 11, 1922), 62 Cong. Rec. (Bound)—Volume 62, Part 6 (April 13, 1922 to May 8, 1922), 62 Cong. Rec. (Bound)—Volume 62, Part 13 (December 5, 1921 to September 22, 1922). Many of these hits, however, were pure coincidence of mentions on the same page or referred to "military duty" and the like.
  - 10 See note 5 above.
  - 11 Commonwealth of Australia, Parliamentary Debates, House of Representatives Official Hansard No. 26, 1919. Wednesday, 25 June 1919, Seventh Parliament, Seventh Session.
  - 12 All data are available upon request.
  - 13 Interpolations are also made for revenue for Spain after 1935, and there is a change in the data source (but no interpolation) for the Netherlands in 1914.
  - 14 Table A1 and Figure A2 in the supplementary information file presents results excluding Germany.
  - 15 The text of the convention (League of Nations Treaty Series 393) can be found at <https://www.loc.gov/law/help/us-treaties/bevans/m-ust000002-0651.pdf>. Article 4 of the Convention states that, among others, it did not prevent "prohibitions or restrictions imposed for the protection of public health or for the protection of animals or plants against disease, insects and harmful parasites".
  - 16 Denmark, France, England, Germany, Italy, Netherlands, Norway, Portugal, Scotland, Spain, Sweden and Switzerland.
  - 17 Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, Colombia, Denmark, Finland, France, Germany, Greece, India, Italy, Japan, Mexico, Netherlands, New Zealand, Norway, Peru, Portugal, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States and Uruguay.
  - 18 For the developments in tariffs, see Fig. A1 in the supplementary information file. Here, we graph tariffs over time along with the excess deaths rates for each of the 12 countries in the core sample.
  - 19 For more about the theoretical setting of the difference-in-differences method, we refer to Wooldridge (2010).
  - 20 Denmark, the Netherlands, Norway, Spain, Sweden and Switzerland all remained neutral.
- Arthi, V, Lampe, M, Nair, A, O'Rourke, KH (2020) The impact of interwar protection: evidence from India. NBER Working Paper 27178. <https://doi.org/10.3386/w27178>
- Barro, RJ, Ursua, JF, Weng, J (2020) The coronavirus and the great influenza pandemic: lessons from the "Spanish Flu" for the coronavirus's potential effects on mortality and economic activity. NBER Working Paper 26866. <https://doi.org/10.3386/w26866>
- Bootsma MC, Ferguson NM (2007) The effect of public health measures on the 1918 influenza pandemic in US cities. *Proc Natl Acad Sci USA* 104:7588–7593. <https://doi.org/10.1073/pnas.0611071104>
- Boyce RWD (1987) British capitalism at the crossroads, 1919-1932: a study in politics, economics, and international relations. Cambridge University Press, Cambridge UK
- Broadberry SN, Harrison M (2005) The economics of world war I. Cambridge University Press, Cambridge UK
- Cagé J, Gadenne L (2018) Tax revenues and the fiscal cost of trade liberalization, 1792–2006. *Explor Econ Hist* 70:1–24. <https://doi.org/10.1016/j.eeh.2018.07.004>
- Clemens MA, Williamson JG (2004) Why did the tariff–growth correlation change after 1950? *J Econ Growth* 9:5–46. <https://doi.org/10.1023/B:JOEG.0000023015.44856.a9>
- de Bromhead A (2018) Women voters and trade protectionism in the interwar years. *Oxf Econ Pap* 70:22–46. <https://doi.org/10.1093/oxep/gpx028>
- de Bromhead A, Fernihough A, Lampe M, O'Rourke KH (2019) When Britain turned inward: the impact of interwar British protection. *Am Econ Rev* 109:325–352. <https://doi.org/10.1257/aer.20172020>
- Eichengreen B, Irwin DA (2010) The slide to protectionism in the Great Depression: Who succumbed and why? *J Econ Hist* 70:871–897. <https://doi.org/10.1017/S0022050710000756>
- Feinstein C, Temin P, Toniolo G (2008) The world economy between the wars. Oxford University Press, Oxford
- Findlay R, O'Rourke KH (2007) Power and plenty. trade, war, and the world economy in the second millenium. Princeton University Press, Princeton, NJ
- Flecknoe D, Wakefield CB, Simmons A (2018) Plagues & wars: the 'Spanish Flu' pandemic as a lesson from history. *Med Confl Surviv* 34:61–68. <https://doi.org/10.1080/13623699.2018.1472892>
- Gozgor, G (2020) Global evidence on the determinants of public trust in governments during the COVID-19. CESifo Working Paper 8313
- Hardach K (1977) The first world war, 1914–1918. Allen Lane, London
- Harley, CK (2020) Trade from the voyages of discovery to the first world war. Oxford Research Encyclopedia of Economics and Finance. <https://doi.org/10.1093/acrefore/9780190625979.013.559>
- Hatchett RJ, Mecher CE, Lipsitch M (2007) Public health interventions and epidemic intensity during the 1918 influenza pandemic. *Proc Natl Acad Sci USA* 104:7582–7587. <https://doi.org/10.1073/pnas.0610941104>
- Humphries MO (2013) The last plague: Spanish influenza and the politics of public health in Canada. Toronto University Press, Toronto
- Irwin DA (1998) The smoot-Hawley Tariff: a quantitative assessment. *Rev Econ Stat* 80:326–334. <https://doi.org/10.1162/003465398557410>
- Irwin DA (2011) Peddling protectionism: Smoot-Hawley and the great depression. Princeton University Press, Princeton NJ
- Irwin DA (2017) Clashing over commerce: a history of US trade policy. University of Chicago Press, Chicago
- Jordà Ò, Schularick M, Taylor AM (2017) Macrofinancial history and the new business cycle facts. NBER Macroeconomics Annual 31:213–263. <https://doi.org/10.1086/690241>
- Kaplan ES (1996) American trade policy, 1923–1995. Greenwood Press, Westport CT
- Kaplan ES, Ryley TW (1994) Prelude to trade wars: American Tariff Policy, 1890–1922. Greenwood Press, Westport CT
- Keynes JM (1920) The economic consequences of the peace. Macmillan, London
- Lampe M, Sharp P (2013) Tariffs and income: a time series analysis for 24 countries. *Cliometrica* 7:207–235. <https://doi.org/10.1007/s11698-012-0088-5>
- Legrain P (2020) The coronavirus is killing globalization as we know it. Foreign Policy (blog) 12 March 2020. <https://foreignpolicy.com/2020/03/12/coronavirus-killing-globalization-nationalism-protectionism-trump/>. Accessed 20 Feb 2021
- Marcano J (2020) Could the COVID-19 pandemic promote protectionist trade policies? Some responses based on the 1918 pandemic. Latin American and Caribbean Economic System (SELA), April 23, 2020. <http://www.sela.org/en/press/articles/a/63972/covid-19-pandemic-promote-protectionist-trade-policies>. Accessed 20 Feb 2021
- Morys M (2014) Cycles and depression. In: Floud R, Humphries J, Johnson P (eds) The Cambridge economic history of modern Britain, vol. 2: 1870 to the present. Cambridge University Press, Cambridge UK, pp. 229–254
- O'Rourke KH, Williamson JG (1999) Globalization and history: the evolution of a nineteenth-century Atlantic economy. MIT Press, Cambridge MA
- Przeworski A (2009) Conquered or granted? A history of suffrage extensions. *Br J Political Sci* 39:291–321. <https://doi.org/10.1017/S0007123408000434>

## References

- Ansart S, Pelat C, Boelle PY, Carrat F, Flahault A, Vallerona AJ (2009) Mortality burden of the 1918–1919 influenza pandemic in Europe. *Influenza Other Respir Viruses* 3:99–106. <https://doi.org/10.1111/j.1750-2659.2009.00080.x>



- Sarkees MR, Wayman F (2010) *Resort to War: 1816–2007*. CQ Press, Washington DC
- Spinney L (2018) *Pale rider: the Spanish flu of 1918 and how it changed the world*. Vintage, London
- United States. Congress (1919) *Congressional record (Bound Edition)*, Vols. 58–62. U.S. Government Printing Office, Washington DC, 1922
- Wolcott S (1991) British myopia and the collapse of indian textile demand. *J Econ Hist* 51:367–384. <https://doi.org/10.1017/S0022050700039000>
- Wooldridge JM (2010) *Econometric analysis of cross section and panel data*, 2nd edn. MIT Press, Cambridge MA

### Competing interests

The authors declare no competing interests.

### Additional information

**Supplementary information** The online version contains supplementary material available at <https://doi.org/10.1057/s41599-021-00833-7>.

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