

Uncertainty and the Great Slump[†]

By JASON LENNARD*

This article investigates the impact of economic policy uncertainty on the British interwar economy. The first type of evidence examined is qualitative. The historical record shows that contemporaries regularly reported the incidence and consequences of major uncertainty shocks. The second type of evidence analysed is quantitative. Based on a new index of economic policy uncertainty constructed from newspapers and vector autoregressions, the results suggest that uncertainty was an important source of economic fluctuations in Britain between the wars.

The interwar period holds a number of unwanted records in British economic history. Unemployment in the 1930s was higher than at any point since reliable records began in 1855.¹ The volatility of output growth was greater than under any macroeconomic regime of the past three centuries.² No recession since the beginning of the 1700s has been as deep as that of the early 1920s.³ What caused this instability?

Textbook answers to this question identify four main factors. The first factor is the reduction in hours worked after the First World War, which led to an increase in the natural rate of unemployment.⁴ The second is the behaviour of the nominal and real exchange rate, which had both short- and long-run effects.⁵ The third is the decline of the old staple industries.⁶ Textiles, iron and steel, and shipbuilding suffered from weak demand and oversupply.⁷ The final factor is the constraint on stabilization policy. Monetary policy was curbed by the commitment to the interwar gold standard, while fiscal policy was limited by the balanced budget orthodoxy of the time.

Yet contemporaries were concerned with another issue. Economists, industrialists, journalists, and politicians frequently held uncertainty over economic policy accountable for the turbulence. In 1930, for example, the Labour government faced a vote of no confidence on this issue. Winston Churchill appealed to the House of Commons: ‘the charge that we make against the Chancellor of the

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¹ The figures in this paragraph are calculated from data in Thomas and Dimsdale, ‘Millennium of macroeconomic data’.

² Volatility is measured using the sample standard deviation. The chronology of regimes is based on Benati, ‘UK monetary regimes’.

³ Based on the annual percentage change in output.

⁴ Broadberry, *British economy*.

⁵ Solomou, *Themes in macroeconomic history*.

⁶ Richardson, ‘Over-commitment in Britain’.

⁷ Eichengreen, ‘British economy’.

Exchequer is that, without due cause, he has created uncertainty which has been harmful to trade and employment'.⁸ Ultimately, the noes had it by a majority of 73 and the government avoided defeat. The role of uncertainty has since been relegated to a footnote in the economic history of interwar Britain.

Beyond the fog of 1930, there may have been other uncertain times, given the volume of extraordinary events. Economically, there was the return to and break from the gold standard, the fiscal aftermath of the First World War, and the slide to protection. Politically, there were snap general elections in 1923 and 1931, hung Parliaments following the elections of 1923 and 1929 and National Governments during the 1930s.

A possible explanation for why the impact of uncertainty has not been investigated further in this context is measurement. As a nebulous concept, uncertainty is difficult to quantify. Alexopoulos and Cohen and Baker et al. address this challenge by constructing indices based on the frequency of articles in a sample of newspapers relating to economic policy uncertainty.⁹ As newspapers reflect the public discourse, the intuition is that changes in coverage of this topic are an informative indicator of variation in agents' perceptions of uncertainty.¹⁰ Vector autoregressions (VARs) show that these measures have been associated with lower output and higher unemployment and volatility in the US.

This article revisits the old uncertainty hypothesis using a new index of economic policy uncertainty constructed from the archives of the *Daily Mail*, the *Guardian*, and *The Times*. The index confirms that the interwar period was indeed a time of uncertainty. A VAR and narrative evidence suggest that this uncertainty negatively affected the British economy.

The rest of this article is structured as follows. Section I reviews the relevant theoretical and empirical literature. Section II deals with the measurement of economic policy uncertainty. Section III discusses the sources of fluctuations in uncertainty. Section IV presents narrative evidence documenting how uncertainty affected the economy. Section V quantifies these effects. Section VI assesses the sensitivity of the baseline results to a series of alternative specifications. Section VII concludes.

I. Previous literature

There is a rich literature investigating the macroeconomic effects of uncertainty in theory and in practice. The theoretical literature has emphasized that uncertainty can both depress and stimulate the economy. On one hand, uncertainty increases the option value of postponing decisions that are costly to reverse. As a result, firms delay investment and households hold back on durable consumption, leading to lower output and employment.¹¹ Bernanke's 'bad news principle' suggests that this effect may not be linear, as what matters for irreversible investment is uncertainty that changes the probability of bad, as opposed to good, outcomes.¹² On the other

⁸ *Hansard* (Commons), 5th ser., CCXXXVI, 13 March 1930, cols. 1535–654.

⁹ Alexopoulos and Cohen, 'Power of print'; Baker, Bloom, and Davis, 'Measuring economic policy uncertainty'.

¹⁰ See Alexopoulos and Cohen, 'Power of print', for a more detailed discussion of various measures of uncertainty.

¹¹ Bernanke, 'Irreversibility'; Bertola, Guiso, and Pistaferri, 'Uncertainty and consumer durables'; Mathy and Ziebarth, 'How much does political uncertainty matter?'.

¹² Bernanke, 'Irreversibility'.

hand, uncertainty can generate growth. One channel is the ‘growth options’ effect. As uncertainty increases the spread of possible outcomes, bigger prizes for winners are potentially available, which can stimulate investment.¹³ Another channel is the Oi–Hartman–Abel effect, which suggests that uncertainty can be desirable in the absence of adjustment costs as firms are able to expand to exploit good outcomes but contract to insure against bad outcomes.¹⁴

The empirical literature has addressed the major practical issue of measuring uncertainty in a variety of ways. Among the ‘first generation’ of indicators are the volatility of various asset prices, the dispersion of firm-level outcomes, and the disagreement of forecasts.¹⁵ An important criticism of these measures is that although they may be correlated with uncertainty, they may also be responsive to other factors.¹⁶ Share price volatility, for example, can change as a result of variation in leverage, risk aversion, or sentiment.¹⁷ In a historical context, a further limitation is that collecting these data can be challenging.

A significant advance is the development of news-based indicators, which are based on the frequency of key words related to uncertainty in newspapers. The advantages of these indices over first generation measures are that, first, they are more reliable; second, they allow for the measurement of not only macroeconomic but also other types of uncertainty, such as economic policy uncertainty; and third, they can be constructed historically as long as newspaper archives are available.¹⁸

There are a number of key references in this literature. First, Alexopoulos and Cohen construct macroeconomic and economic policy uncertainty indices for the US between 1985 and 2007 based on the frequency of relevant articles in the *New York Times*.¹⁹ Second, Baker et al. measure economic policy uncertainty in the US between 1985 and 2014 using a sample of 10 newspapers.²⁰ These articles show that uncertainty causes significant drops in output and employment.

Uncertainty has also been studied in historical contexts. Using the variability of stock markets and qualitative evidence, Romer argues that the hangover of uncertainty from the Great Crash was a key factor in the propagation of the Great Depression.²¹ Mathy constructs a measure of uncertainty based on articles in the *New York Times* during the Great Depression, showing that uncertainty accounted for a substantial share of the deep decline in industrial production.²² Mathy and Ziebarth study political uncertainty in Louisiana during the 1920s and 1930s using newspapers and stock return volatility, finding no impact of uncertainty on employment.²³ Lopez and Mitchener measure uncertainty based on the realized volatility of exchange rates for 10 European economies in the aftermath of the

¹³ Bloom, ‘Fluctuations in uncertainty’.

¹⁴ Oi, ‘Desirability of price instability’; Hartman, ‘Effects of price and cost uncertainty’; Abel, ‘Optimal investment’.

¹⁵ Bloom, ‘Fluctuations in uncertainty’.

¹⁶ Jurado, Ludvigson, and Ng, ‘Measuring uncertainty’.

¹⁷ Alexopoulos and Cohen, ‘Power of print’.

¹⁸ *Ibid.*

¹⁹ *Ibid.*

²⁰ Baker et al., ‘Measuring economic policy uncertainty’.

²¹ Romer, ‘Great Crash’.

²² Mathy, ‘How much did uncertainty shocks matter?’.

²³ Mathy and Ziebarth, ‘How much does political uncertainty matter?’.

First World War.²⁴ The results suggest that uncertainty pushed Austria, Germany, Hungary, and Poland towards hyperinflation.

A related strand of research is on expectations. Whereas an expectation is a belief about the future path of a variable, uncertainty is the doubt around that path. As both are difficult to measure in historical contexts, similar approaches have been used in the literature. For example, rising inflation expectations are an important explanation for the American recovery from the Great Depression.²⁵ In order to measure expected inflation in a data-scarce context, researchers have turned to newspapers to identify whether there were spikes in coverage of inflation relative to deflation.²⁶ This ‘quantitative news’ approach has also been used in the case of the recovery from the German Great Depression.²⁷

II. Measuring economic policy uncertainty

Measuring uncertainty over economic policy is challenging as it is not directly observable. In order to overcome this challenge, an index is developed based on the number of articles about economic policy uncertainty relative to all articles in a sample of newspapers: the *Daily Mail*, the *Guardian*, and *The Times*. An article is identified as relating to economic policy uncertainty if it contains an economic, policy, and uncertainty related term. The economic terms are ‘business’, ‘commerce’, ‘commercial’, ‘economic’, ‘economy’, and ‘industry’. The policy terms include ‘Bank of England’, ‘Bank Rate’, ‘budget’, ‘deficit’, ‘duty’, ‘policy’, ‘regulation’, ‘spending’, ‘tariff’, ‘tax’, and ‘war’. The uncertainty terms are ‘uncertain’ and ‘uncertainty’. Plurals of the key words are also included, such as ‘uncertainties’.

The index is constructed as follows: first, by counting the number of articles about economic policy uncertainty in newspaper $i = 1, 2, 3$ in month t , denoted X_{it} ; second, by counting the total number of articles in newspaper i in month t , N_{it} ; third, by calculating the ratio of articles about economic policy uncertainty to total articles in newspaper i in month t : $Y_{it} = \frac{X_{it}}{N_{it}}$; fourth, by normalizing the newspaper-specific ratios: $Z_{it} = \frac{Y_{it}}{\sigma_i}$, where σ_i is the sample standard deviation of Y_{it} ; fifth, by averaging the normalized newspaper-specific ratios to form a basic index: $Z_t = \frac{\sum_{i=1}^3 Z_{it}}{3}$; and sixth, by dividing the basic index, Z_t , by its mean, \bar{Z} , and multiplying by 100 to construct the final index: $EPU_t = \frac{Z_t}{\bar{Z}} \times 100$.

An important decision was the selection of the search terms. The starting point was to compile a set of candidate key words, consisting of standard terms in the literature and others that may have been relevant in interwar Britain.²⁸ Experiments were carried out with different subsets of these words, reading all of the identified articles in a sample of months with the objective of minimizing the sum of false positives (identified articles that were not about economic policy uncertainty) and false negatives (articles that were about economic policy uncertainty not identified

²⁴ Lopez and Mitchener, ‘Uncertainty and hyperinflation’.

²⁵ Temin and Wigmore, ‘End of one big deflation’; Eggertsson, ‘Great expectations’.

²⁶ Binder, ‘Estimation’; Jalil and Rua, ‘Inflation expectations’.

²⁷ Daniel and ter Steege, ‘Inflation expectations’.

²⁸ Baker et al., ‘Measuring economic policy uncertainty’.

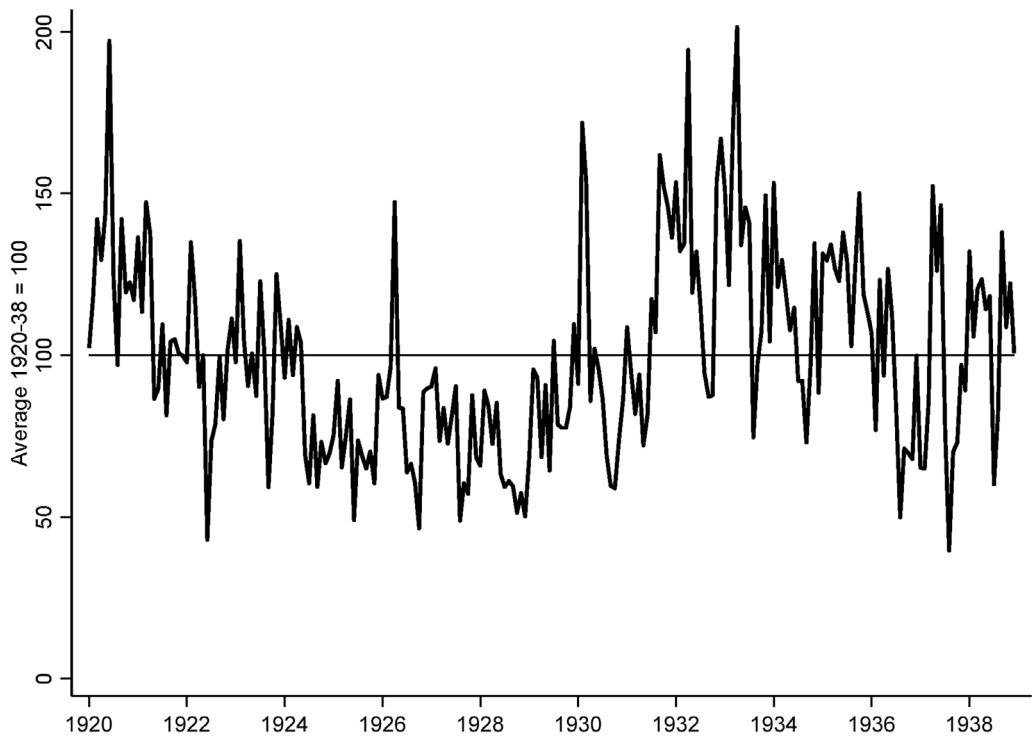


Figure 1. *New economic policy uncertainty index for the UK, 1920–38*

Source: See section II.

as such). Some non-standard terms helped to lower the rate of false negatives, such as ‘Bank Rate’, the main instrument of monetary policy, and ‘duty’, a common word for tariff. However, others raised the number of false positives, such as various synonyms for uncertainty (for instance, ‘doubt’).

Another important decision was the selection of newspapers. The *Daily Mail*, the *Guardian*, and *The Times* are included, based on a number of factors. First, these publications had significant readerships with average daily circulations in 1930 of 1,968,000, 47,000, and 187,000, respectively.²⁹ Second, these publications are broadly balanced in terms of political slant. Third, these publications have digital archives that permit sufficiently detailed searches.³⁰

III. Fluctuations in economic policy uncertainty

The new economic policy uncertainty (EPU) index is shown in figure 1.³¹ The interpretation is that larger (smaller) values are associated with greater (lesser) economic policy uncertainty. What caused these fluctuations in uncertainty? To

²⁹ Butler and Freeman, *British political facts*, p. 284.

³⁰ A number of other publications were considered, such as the *Economist* and *Financial Times*. At the time of writing, however, the digital archives of these newspapers do not allow searches of the necessary complexity.

³¹ The data are available in online app. S1.

answer this question, the *Daily Mail*, the *Guardian*, and *The Times* were consulted, as well as a wider range of primary sources.

Following the end of the Great War, economic policy uncertainty was at fever pitch. In June 1920, EPU increased by 37 per cent. According to the *Economist*, the public did not know whether the war wealth levy had been abandoned or not:

At home uncertainty concerning the government's action with regard to the war wealth tax is still the chief preoccupation of the business world. It was definitely stated by a Sunday paper last Sunday that the tax had been abandoned. This apparently was not correct, although it seems to have been true that opinion in the Cabinet has been growing against it with considerable force, and it seems likely that the statement of the *Sunday Express* may turn out to be wrong only in being made a week or so too early.³²

In addition, there were anxieties related to Irish independence, such as debates in the House of Commons on 2, 14, and 28 June and riots in Londonderry on 19 June.³³

The EPU index spiked again in November 1923. The *Economist* wrote that the prime minister, Stanley Baldwin, U-turned on the Conservative party's pledge of the previous year of 'no fundamental fiscal change', which 'appealed to an electorate that was weary of legislation and experiment', opting instead for 'fiscal revolution'.³⁴ A snap general election was held on 6 December, resulting in a hung Parliament.

On 28 April 1925 the UK returned to the gold standard at the prewar parity of £3.85 per ounce. The return was not associated with an immediate change in EPU, which is not surprising as the intention to do so had been announced as early as November 1919.³⁵ EPU was almost a third lower on average during the gold standard, relative to the periods before and after. While the interwar gold standard may have been flawed in retrospect, an advantage in real time was reduced uncertainty.

The index climbed sharply in April 1926. One cause was the looming general strike. Although the strike did not come into force until May, news of growing tension was reported in April. *The Times*, for instance, wrote of 'the uncertainty of the coal trade trouble' and of the 'baffling uncertainties regarding the coal crisis'.³⁶ Another cause was Winston Churchill's second budget as chancellor. This was expected to be less 'spectacular' than his first, but uncertainty remained over whether taxes would be cut.³⁷

The EPU index increased by 89 per cent in February 1930. As the budget loomed on 14 April, there was significant uncertainty over whether the chancellor, Philip Snowden, would alter the McKenna Duties or the Safeguarding of Industries Act.³⁸ The *Financial Times* commented several times on the 'budget uncertainties'.³⁹

³² *Economist*, 5 June 1920, pp. 1241–2.

³³ *Ibid.*, 5 June 1920, p. 1241; 19 June 1920, p. 1333; 26 June 1920, p. 1385; 3 July 1920, p. 2.

³⁴ *Ibid.*, 17 Nov. 1923, p. 863.

³⁵ Solomou, *Themes in macroeconomic history*, p. 93.

³⁶ *The Times*, 10 April 1926, p. 17; 30 April 1926, p. 25.

³⁷ *Economist*, 1 May 1926, p. 867.

³⁸ See de Bromhead, Fernihough, Lampe, and O'Rourke, 'When Britain turned inward', for a brief history of interwar trade policy.

³⁹ *Financial Times*, 4 Feb. 1930, p. 6; 7 Feb. 1930, p. 7.

Sir Walter Raine, president of the Association of British Chambers of Commerce, went to HM Treasury to plead to the chancellor:

Can you see your way to make an immediate statement with regard to the McKenna Duties and the Safeguarding Duties? . . . There is a precedent for what I am suggesting on behalf of industry in the fact that one of your predecessors, Sir Austen Chamberlain, made a declaration in advance of his Budget, in regard to excess profits duties. The situation is much more serious than it was then, and if you can see your way to do something now to cause this uncertainty to be dissipated, you will help trade: whereas if we have to wait until April 14, I am afraid that the damage, so far as this year's trade is concerned, will be very serious.⁴⁰

September 1931 was blighted by a series of major events. One was the second budget of the year as well as the increasing likelihood of an early general election. The *Mail* wrote that 'there is, as is only natural, uncertainty pending to-morrow's Budget announcement . . . But if the folly of a general election next month is persisted in, then we shall have a further period of paralysing uncertainty'.⁴¹ The *Economist* noted that there was 'growing talk of an early General Election in this country', while the *Financial Times* observed that there was 'uncertainty regarding the date of the General Election'.⁴² Another major event was Britain's departure from the gold standard. According to contemporaries, the uncertainty did not stem from the period leading up to the break from gold but the period after. *The Times* noted that 'there remained, however, immense uncertainties arising out of Britain's action in suspending gold redemption', while according to the *Economist* 'the week's events, in short, showed that professional and private investors were uncertain of the extent of possible development under the new currency regime'.⁴³

Policy inertia on multiple fronts came to a head in April 1932. The *Economist* argued that the 'world was in doubt as to our monetary policy'.⁴⁴ Ahead of Neville Chamberlain's first budget, the *Daily Mail* reported that 'the country is anxiously waiting for a full declaration of future tariff policy . . . Industry cannot plan ahead if it is left in ignorance and uncertainty'.⁴⁵ The *Financial Times* again referred to 'budget uncertainties', while *The Times* observed that:

this uncertainty applies, it is true, more especially to the Revenue Estimates; for until the outcome of the Lausanne meeting and of the Ottawa Conference is known it will hardly be possible to do much more than guess the yield of many sources of income. Meanwhile on the expenditure side too there must remain an element of uncertainty so long as the world problem of government indebtedness remains unsolved.⁴⁶

'A period of uneasy suspense' hung over December 1932 as a result of the war debts due to the US.⁴⁷ The British, French, and other European governments had asked the US to reconsider the payments. According to the *Economist*, 'uncertainty

⁴⁰ *The Times*, 28 Feb. 1930, p. 16.

⁴¹ *Daily Mail*, 9 Sept. 1931, p. 2.

⁴² *Economist*, 19 Sept. 1931, p. 525; *Financial Times*, 21. Sept. 1931, p. 5.

⁴³ *The Times*, 28 Sept. 1931, p. 20; *Economist*, 26 Sept. 31, p. 572.

⁴⁴ *Economist*, 30 April 1932, p. 951.

⁴⁵ *Daily Mail*, 18 April 1932, p. 10.

⁴⁶ *Financial Times*, 20 April 1932, p. 1; *The Times*, 18 April 1932, p. 13.

⁴⁷ *Economist*, 3 Dec. 1932, p. 1015.

as to the debt outcome has acted as a drag on all markets, and has probably to some extent injured trade in general'.⁴⁸

Uncertainty jumped again in March 1933. One possible cause was Neville Chamberlain's budget, which was to be delivered in April. Another source of uncertainty was the war debts, which were once again soon due. The *Financial Times* summarized:

Conflicting stories are in circulation here regarding the war debt instalment due on 15th June and the future of the Liberty bonds. According to the cabled reports from London and elsewhere, widely published here in the past few days, it is evident that the foreign correspondents are as much in the dark as those here at home, and are largely guessing at the position. They have based their stories on a few known facts, plus a little 'information' gleaned in talks with officials at Washington—other than Mr. Roosevelt—who are also merely guessing. It is no secret that preliminary talks have been held between Government officials here and in London regarding war debts and the next payment due in June.⁴⁹

The EPU index increased by 77 per cent in April 1937. An important determinant was 'budget uncertainty' once again.⁵⁰ The *Daily Mail* observed that 'news of the additional defence contribution, which came as a surprise, caused uncertainty', while the *Financial Times* wrote that there was uncertainty 'resulting from the profits tax proposals'.⁵¹ The final major event came in September 1938, which began with an emergency meeting of the cabinet, escalated into one of Europe's most 'nerve-racking weeks', and ended with the Munich Agreement.⁵²

To summarize, uncertainty built around recurring events in the calendar such as budget announcements and general elections. Uncertainty also spiked in response to more specific factors such as the general strike, inter-allied debt, and the rising probability of war.

An interesting question is how coverage differed between newspapers. The mean number of articles reporting economic policy uncertainty was 8 in the *Daily Mail*, 31 in the *Guardian*, and 42 in *The Times*. Therefore, the *Daily Mail* was less concerned with the specific issue of economic policy uncertainty, on average, than the *Guardian* and *The Times*, which perhaps reflects the *Mail's* broader readership.

Another interesting question is how the coverage covaried across newspapers. Each of the individual indices has a positive and statistically significant correlation with each other. The correlation between the *Daily Mail* and the *Guardian* is 0.47 ($p < 0.01$), between the *Daily Mail* and *The Times* is 0.55 ($p < 0.01$), and between the *Guardian* and *The Times* is 0.53 ($p < 0.01$). That *The Times* had the highest average correlation with the other publications suggests that it was middling in terms of political slant. The implication is that the other papers were slightly off-centre, presumably with the *Guardian* to the left and the *Mail* to the right.

The new EPU index is not the first to cover the interwar period in Britain. Baker et al. have produced an index that spans from 1900 until the present.⁵³

⁴⁸ *Ibid.*, 17 Dec. 1932, p. 1136.

⁴⁹ *Financial Times*, 23 March 1933, p. 7.

⁵⁰ *Ibid.*, 20 April 1937, p. 1.

⁵¹ *Daily Mail*, 21 April 1937, p. 2; *Financial Times*, 24 April 1937, p. 10.

⁵² *Economist*, 17 Sept. 1938, p. 529.

⁵³ Baker et al., 'Measuring economic policy uncertainty'.

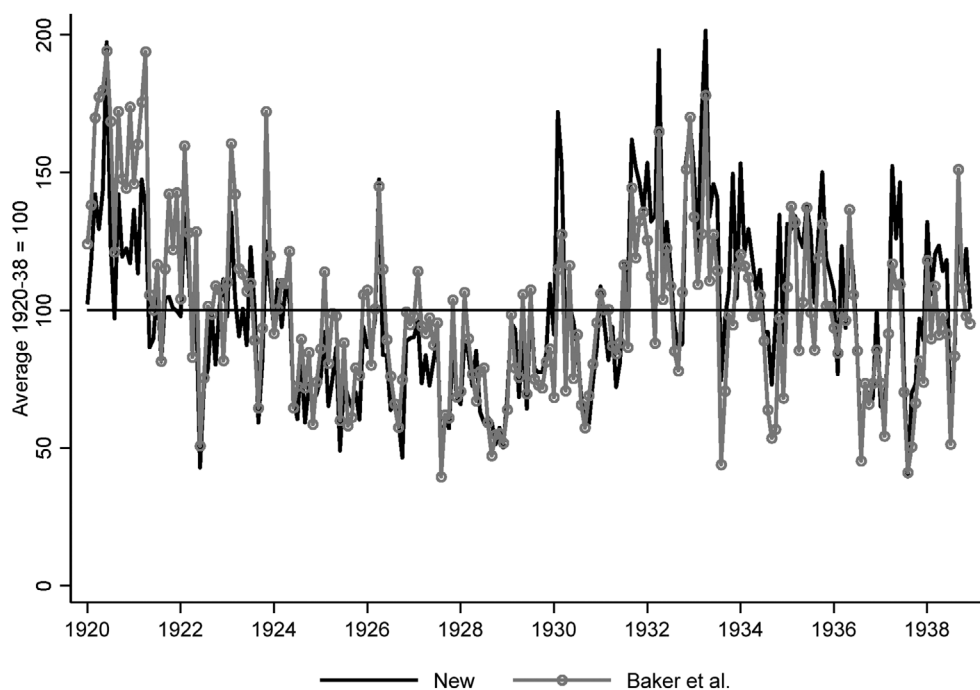


Figure 2. *Comparing economic policy uncertainty indices for the UK, 1920–38*

Sources: See section II and Baker et al., 'Measuring economic policy uncertainty'.

The new index builds on the existing series in two important ways. First, the search set is expanded to include period-appropriate terms to better capture uncertainty over monetary and tariff policy. Second, the number of newspapers is increased to include not only the *Guardian* and *The Times* but also the *Daily Mail*. Expanding the coverage has several advantages. One is to reduce the amount of variation stemming from idiosyncratic factors such as newspaper-specific bias, optical character recognition error, and so on. That the individual indices are far from perfectly correlated with each other suggests that there is non-trivial independent variation. Another is to redress the political slant so that the right (*Daily Mail*), left (*Guardian*), and centre (*The Times*) are represented.

As shown in figure 2, the two series are positively, although not perfectly, correlated ($r = 0.8$, $p < 0.01$). There are deviations around some of the major events identified in the chronology. For example, in June 1920, when there was uncertainty regarding the war wealth levy, the new index increases to a greater extent than the existing series. Equally, in February 1930, coinciding with newspaper reports of budget uncertainties, the new series is more sensitive. Finally, around September 1931, when a new monetary regime was adopted, the new index is higher.

This analysis suggests that the new index provides a better measure of uncertainty in this particular period. In any case, previous research has not investigated how economic policy uncertainty affected the economy in interwar Britain. It is to this question that we now turn.

IV. The macroeconomic effects of economic policy uncertainty: qualitative evidence

This section analyses qualitative evidence relating to the macroeconomic effects of economic policy uncertainty in interwar Britain. The first type of evidence considered is economic reports in contemporary newspapers.

On the Safeguarding Act, for example, the *Guardian* noted that ‘industry can adapt itself to any stable and calculable condition, even the condition of a regular tariff; the one condition fatal to enterprise and trade recovery is uncertainty. The Government’s proposal is a proposal to introduce such uncertainty’.⁵⁴ In relation to the possibility of a general election, Churchill observed that ‘the uncertainty is bad from every point of view. It hangs like a cloud over the trade of the country’.⁵⁵ In a letter to the editor of *The Times* in the summer of 1932, signed by the economics departments of the universities of Oxford (including James Meade) and Cambridge (including John Maynard Keynes), the government was urged to ‘explicitly declare its policy in advance. A definite pronouncement of this kind should remove all fears of uncontrolled inflation—fears which arise primarily from a sense of uncertainty’.⁵⁶ The *Economist* summarized that ‘business this year has been overshadowed by the economic and political uncertainty at home and abroad’.⁵⁷

Uncertainty’s depressive effect on jobs was also widely recognized. In the winter of 1920, the *Daily Mail* observed that ‘among the main causes of unemployment at the present moment . . . is uncertainty in the business world’.⁵⁸ In the same newspaper a decade later, Sir William Morris, founder of Morris Motors Ltd, attacked the incumbent government on the same issue:

No business could be run on the lines on which we try to run England. Whoever heard in the board room of a successful commercial house the counterpart of such childish bickerings and pettifogging personal pin-prickings as those to which we have been treated of late in our supposedly austere and deep-thinking House of Parliament? . . . This is the position we find ourselves in to-day, floundering in a sea of uncertainty . . . the result being colossal unemployment.⁵⁹

Meanwhile *The Times* noted:

There are manufacturers unable to do their usual amount of trade because of an expectation, or a bare possibility, that Government policy may interfere with their markets and affect the price of their products. Commercial uncertainty is contagious, and uncertainty soon intensifies the depression of which the increase of unemployment is a measure. Enterprise languishes in a period of political uncertainty.⁶⁰

The narrative evidence also sheds light on some other economic outcomes of uncertainty. The *Mail* observed that ‘surely the uncertainty as to taxation has had much to do with the lessened popularity of industrial investments’, which is one of

⁵⁴ *Guardian*, 20 Dec. 1924, p. 13.

⁵⁵ *The Times*, 19 March 1930, p. 20.

⁵⁶ *Ibid.*, 5 July 1932, p. 10.

⁵⁷ *Economist*, 30 Jan. 1932, p. 1.

⁵⁸ *Daily Mail*, 30 Dec. 1920, p. 4.

⁵⁹ *Ibid.*, 29 Aug. 1930, p. 8.

⁶⁰ *The Times*, 12 March 1930, p. 15.

the key effects highlighted in the theoretical literature.⁶¹ Similarly, on the National Government's financial proposals in 1931, the paper noted that 'uncertainty as to these has played havoc with the stock markets of late'.⁶² Depressed stock prices could lead to lower investment and consumption through Tobin's q and wealth effects, respectively.

At the microeconomic level, Sir William Letts, chairman and managing director of Willys Overland Crossley, a car manufacturer, told shareholders at the annual general meeting:

I do not wish to introduce politics or thrust my opinion upon a body of shareholders, but I think it is only right that attention should be directed to what has been and is really hindering our business—the uncertainty regarding the McKenna duties. I believe that no sensible Chancellor of the Exchequer would take these duties off, but uncertainty exists, it is crippling business and holding back activity and energy in our great industry. We rely upon the buying public, and if they are led to believe that prices will be reduced if the duties come off, naturally they prefer to wait and see what happens. The result is that our manufacturing programmes are held up and unemployment in our industry is being increased. All this could be checked if the powers that be would make a definite statement without delay.⁶³

Similarly, 'no one in the motor industry can go ahead and lay plans in advance for large and economical production if there is complete uncertainty as to whether the McKenna duties will be maintained'.⁶⁴ The McKenna duties affected not only the car industry but others too: 'motorcar manufacturers and piano manufacturers . . . could not believe that any British administration would be so enslaved by financial pedantry as to keep our industries in disastrous uncertainty, which is absolutely destructive of business'.⁶⁵

Tariff anxieties also hung over the textile industry. To a chorus of 'hear, hear', the chairman of the Fine Cotton Spinners and Doublers Association recounted at the annual general meeting in 1930 that 'uncertainty which existed throughout the year as to whether the government intended to repeal the Safeguarding and McKenna duties . . . undoubtedly gravely affected [the] particular trade as well as the general trade of the country'.⁶⁶ In dress goods, it was expected that business 'held up because of uncertainty as to a tariff will now go to the French instead of being placed here'.⁶⁷ There was also uncertainty over duties on artificial silk, if the 'duties are to be imposed, we would prefer to have them at once rather than have any unnecessary prolongation of the present uncertainty. It is not only stopping the weaving of the artificial silk but also of the cotton which would have gone to build up the fabric in which the artificial silk is used'.⁶⁸ This uncertainty continued in the rayon industry for at least a decade, 'retarding every branch of the trade from the producer to the shopkeeper'.⁶⁹

⁶¹ *Daily Mail*, 7 June 1920, p. 2.

⁶² *Ibid.*, 7 Sept. 1931, p. 3.

⁶³ *Guardian*, 25 Feb. 1930, p. 6.

⁶⁴ *Daily Mail*, 13 Nov. 1929, p. 12.

⁶⁵ *Ibid.*, 16 April 1924, p. 8.

⁶⁶ *Guardian*, 28 May 1930, p. 14.

⁶⁷ *Daily Mail*, 14 Dec. 1923, p. 5.

⁶⁸ *Guardian*, 20 June 1925, p. 13.

⁶⁹ *Ibid.*, 10 Dec. 1935, p. 7.

In the electricity industry, there was damaging uncertainty over legislation. At the ordinary general meeting of the British Electric Traction Company it was noted that ‘it is undoubtedly true that further uncertainty has a serious deterrent effect on enterprise in this important key industry’.⁷⁰

In summary, the qualitative evidence is supportive of the uncertainty hypothesis. According to contemporaries, policy uncertainty hit a number of industries from cars to textiles. The impact of policy uncertainty on consumption and investment was also recognized, dragging down employment and output.

V. The macroeconomic effects of economic policy uncertainty: quantitative evidence

The economic consequences of uncertainty are clearly documented in the historical record. This section investigates whether these effects are also evident in the statistical record. In order to do so, the following VAR is estimated:

$$X_t = B(L) X_{t-1} + U_t \quad (1)$$

where X_t is a vector of endogenous variables that includes the level of the EPU index and a macroeconomic variable of interest (for example, the natural logarithm of real GDP at factor cost), B is a matrix of coefficients, and L is a polynomial in the lag operator with P lags. A time trend and seasonal dummies are also included as exogenous variables. The sample period is 1920 to 1938.

In terms of P , Baker et al. include three months of lags, while Alexopoulos and Cohen use six.⁷¹ The Akaike information criterion (AIC) is minimized at three lags, while the Schwarz Bayesian information criterion (BIC) is minimized at two. In the baseline model, three lags are included, but as section VI shows the results are robust to $P = 2$ and $P = 6$.

In terms of identification, a Cholesky decomposition is used. Alexopoulos and Cohen and Baker et al. order uncertainty first, which assumes that economic policy uncertainty affects the macroeconomy contemporaneously, but that the macroeconomy does not affect economic policy uncertainty within the period.⁷² In this article, uncertainty is ordered last, which is a more cautious approach that assumes that the economy affects uncertainty contemporaneously, but that uncertainty only affects the economy with a lag. In any case, section VI shows that the results are not sensitive to the ordering of the variables.

While this methodology is considered to be at the frontier in the literature, there is an important caveat.⁷³ A general empirical challenge is that increases in uncertainty sometimes coincide with bad news. For example, a rise in the probability of war may lead to both weaker confidence, expectations, or sentiment, and greater uncertainty. If news is correlated with both uncertainty and economic activity, there is a potential omitted variable bias problem, where the bias is likely to be negative so that the economic costs of uncertainty may be overestimated. This possible issue should be kept in mind when interpreting the macroeconomic effects of uncertainty.

⁷⁰ *Financial Times*, 3 July 1920, p. 2.

⁷¹ Alexopoulos and Cohen, ‘Power of print’; Baker et al., ‘Measuring economic policy uncertainty’.

⁷² *Ibid.*

⁷³ Novy and Taylor, ‘Trade and uncertainty’.

Table 1. *Data sources*

<i>Variable</i>	<i>Source</i>	<i>Description</i>
Advances	Capie and Collins, <i>Inter-war British economy</i> , p. 96	London clearing banks. £ millions
Bank Rate	Thomas and Dimsdale, 'Millennium of macroeconomic data'	% . End month
Economic activity index	Albers, 'Prelude'	Average 1925–33 = 100
EPU index	See section II	Average 1920–38 = 100
EPU index (alternative)	Baker et al., 'Measuring economic policy uncertainty'	Average 1920–38 = 100
Exchange rate	Thomas and Dimsdale, 'Millennium of macroeconomic data'	\$/£
Major strikes	Mitchell et al., 'Monthly GDP estimates'	Equals 1 during the major strikes of 1921 and 1926 and 0 otherwise
M0	Capie and Webber, <i>Monetary history of the United Kingdom</i> , pp. 56–7	£ millions. End month
Real exports and imports	Capie and Collins, <i>Inter-war British economy</i> , pp. 78, 83	£ millions at 1924 prices
Real GDP at factor cost and market prices	Mitchell et al., 'Monthly GDP estimates'	£ millions at 1938 prices
Real government expenditure, revenue, and debt	<i>Economist</i> , 1920–39. Collected for month t from the first issue of month $t + 1$	£ millions at 1924 prices. Deflated by the retail price index
Real turnover	Phelps Brown and Shackle, 'Index of real turnover'	Average 1930 = 100
Real wages	Capie and Collins, <i>Inter-war British economy</i> , p. 62	Deflated by the retail price index
Retail price index	Capie and Collins, <i>Inter-war British economy</i> , p. 38	Average 1924 = 100
Share price index	Thomas and Dimsdale, 'Millennium of macroeconomic data'	Average 1920–38 = 100. Spliced monthly index weighted by market capitalization
Unemployment	Capie and Collins, <i>Inter-war British economy</i> , p. 63	%
Yield on consols	Capie and Webber, <i>Monetary history of the United Kingdom</i> , pp. 515–18	% . End month

The sources and definitions for the data used in the analysis are given in table 1. Data on the debt, expenditure, and revenue of the government have been collected from contemporary issues of the *Economist*.⁷⁴ The remaining data are from secondary sources. The main economic outcome of interest is real GDP at factor cost, which has been calculated by allocating the annual total across the months of the year based on the movements in a common factor, which itself is a function of up to 14 indicators of economic activity collected by the *Economist* at the time.⁷⁵ The series has been used previously in econometric work.⁷⁶ This and other outcome variables are plotted in figure 3.

Turning to the main results of the article, figure 4 plots the response of economic activity to a one-standard-deviation economic policy uncertainty shock, where X_t includes the natural logarithm of real GDP at factor cost. The shaded

⁷⁴ The data are available in online app. S1.

⁷⁵ Mitchell, Solomou, and Weale, 'Monthly GDP estimates'.

⁷⁶ Cloyne, Dimsdale, and Postel-Vinay, 'Taxes and growth'; Crafts and Mills, 'Rearmament to the rescue?'; eisdem, 'Self-defeating austerity?'.

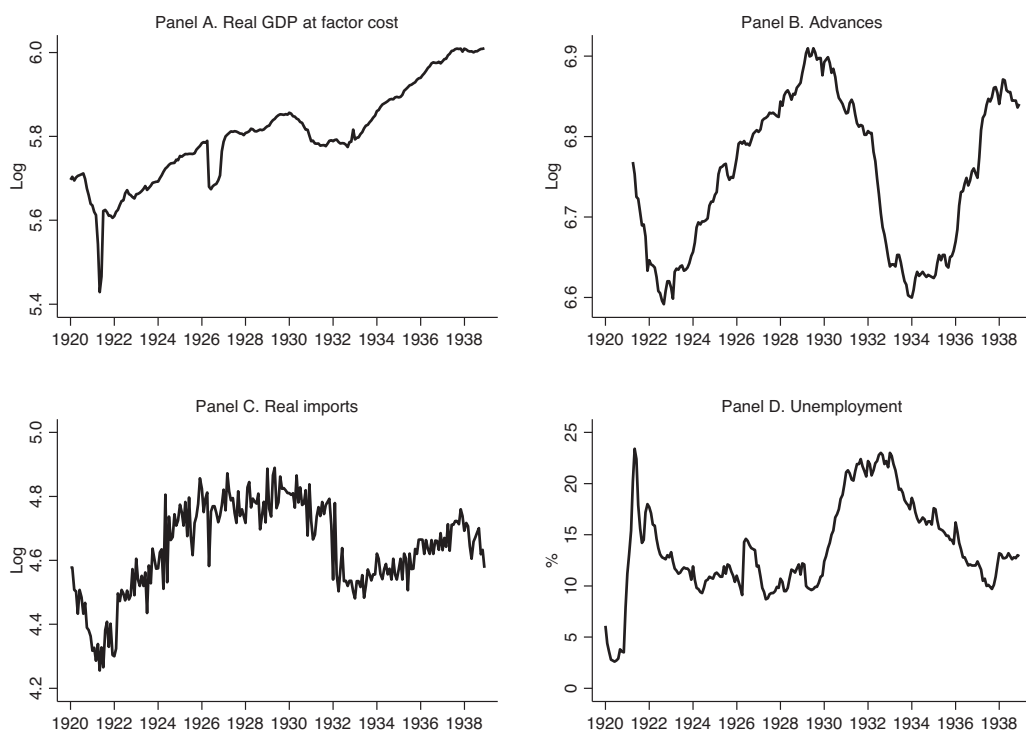


Figure 3. *Real GDP at factor cost, advances, real imports, and unemployment, 1920–38*

Source: See tab. 1.

area represents the 95 per cent confidence interval. The implication is that an uncertainty shock had an economically and statistically significant effect on output, declining by a maximum of -0.5 per cent ($t = -3.1$) after six months and returning towards zero thereafter. The effect is statistically significant at the 5 per cent level for the first 18 months.

Figure 5 illustrates the impulse response of the economic policy uncertainty index to a one-standard-deviation innovation to itself. The index increases by 21.6 per cent (relative to its sample mean) on impact and decays thereafter.

Alexopoulos and Cohen and Baker et al. scale the shock to correspond to the change around a major event, such as 9/11 or the Global Financial Crisis.⁷⁷ In order to compare the estimates, the shock is set to a 60 per cent increase (relative to the sample average), which is equal to the change in April 1932, when there were uncertainties across the spectrum of economic policy ahead of Chamberlain's first budget. On this basis, the peak fall in output is 1.5 per cent, which is between Baker et al.'s and Alexopoulos and Cohen's estimates of 1.1 per cent and 2 per cent, respectively.⁷⁸

⁷⁷ Alexopoulos and Cohen, 'Power of print'; Baker et al., 'Measuring economic policy uncertainty'.

⁷⁸ Ibid.

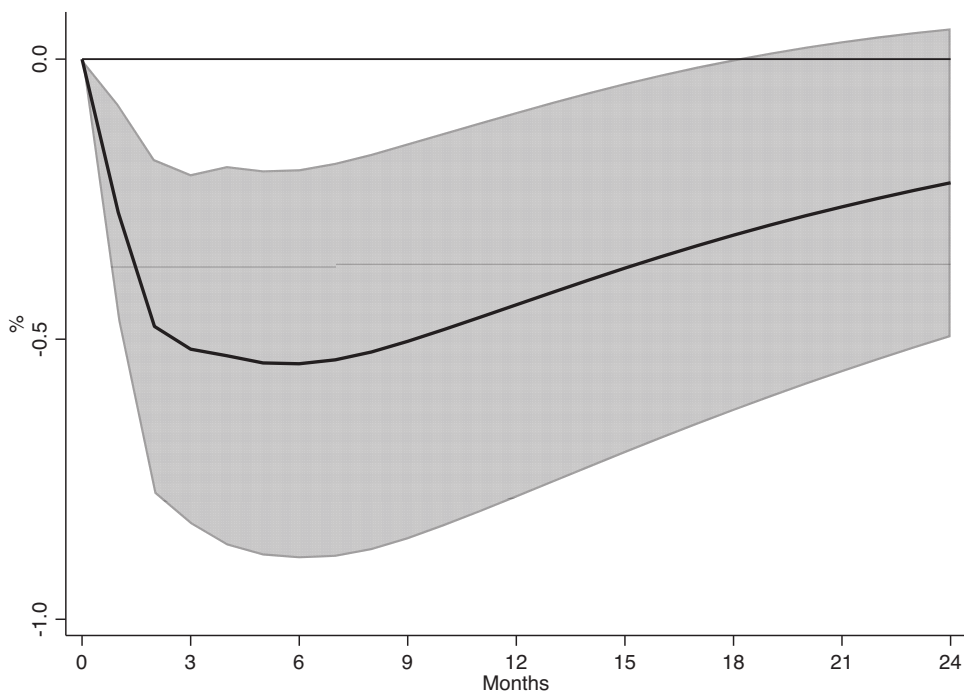


Figure 4. *Response of real GDP at factor cost to an EPU shock*

Note: The shaded area represents the 95% confidence interval.

Source: Based on estimation of equation 1.

In terms of persistence, the peak economic impact occurs after six months. While this is similar to the findings of Baker et al., it is more rapid than those of Alexopoulos and Cohen, who find that output continues to decline for up to 18 months.⁷⁹ The short, sharp drop in economic activity found in this article is consistent with Bloom's theoretical model of 'wait-and-see' uncertainty-driven business cycles.⁸⁰

A standout feature of the interwar period relative to other macroeconomic epochs in British history was the volatility of the business cycle. A variance decomposition can speak to this issue. The results show that economic policy uncertainty explains 22 per cent of the variance in output, which suggests that uncertainty has been an underappreciated cause of macroeconomic volatility in interwar Britain.

In times of uncertainty, households and firms delay decisions that are costly to reverse. Previous empirical and theoretical work has shown that this wait-and-see effect is associated with reduced credit, lower imports, and lost jobs.⁸¹ This article therefore moves beyond GDP to explore these other economic outcomes. In order to do so, a series of alternative variables of interest are rotated into X_t .

⁷⁹ Ibid.

⁸⁰ Bloom, 'Impact of uncertainty shocks'.

⁸¹ Bordo, Duka, and Koch, 'Economic policy uncertainty'; Novy and Taylor, 'Trade and uncertainty'; Alexopoulos and Cohen, 'Power of print'; Baker et al., 'Measuring economic policy uncertainty'.

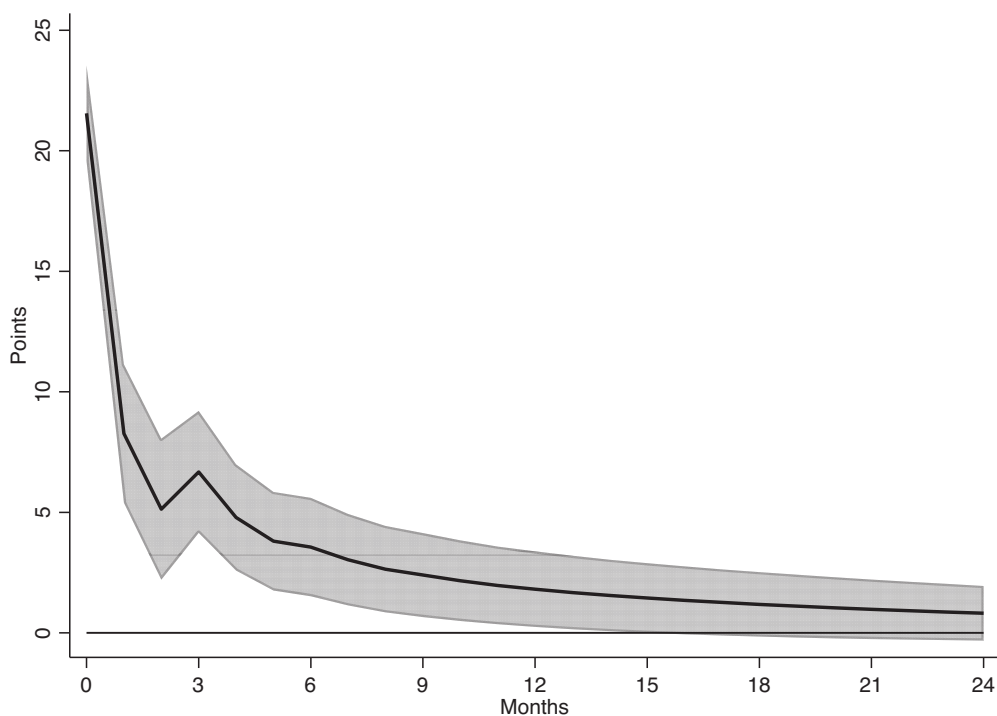


Figure 5. *Response of EPU to an EPU shock*

Note: The shaded area represents the 95% confidence interval.

Source: Based on estimation of equation 1.

Figure 6 shows the response of credit, imports, and unemployment in response to a one-standard-deviation uncertainty shock. Panel A shows that there is a persistent decline in credit of up to 0.8 per cent ($t = -2.9$), which implies a ‘financial frictions effect’.⁸² Panel B displays a reduction in the volume of imports of 1.2 per cent ($t = -3.5$). That the fall is larger in trade than in output is consistent with the ‘magnification effect’ documented by Novy and Taylor.⁸³ In their theoretical model, firms cut orders of foreign inputs to a greater degree than domestic inputs under uncertainty, as there are larger fixed costs associated with transporting goods internationally. There is therefore a higher option value of waiting when ordering inputs from abroad. As a result, imports fall by more than economic activity. Panel C shows a hump-shaped impact on unemployment, peaking at 0.4 percentage points ($t = 2.6$) after seven months and slowly subsiding after. The effect is statistically significant at the 5 per cent level for the first 18 months.

Consistent with the narrative evidence, the statistical results suggest that uncertainty caused widespread disruption. However, given the discussion about the potential confounding influence of news, the magnitude of the estimates are probably an upper bound (in absolute terms) on the true causal effects.

⁸² Jurado et al., ‘Measuring uncertainty’.

⁸³ Novy and Taylor, ‘Trade and uncertainty’.

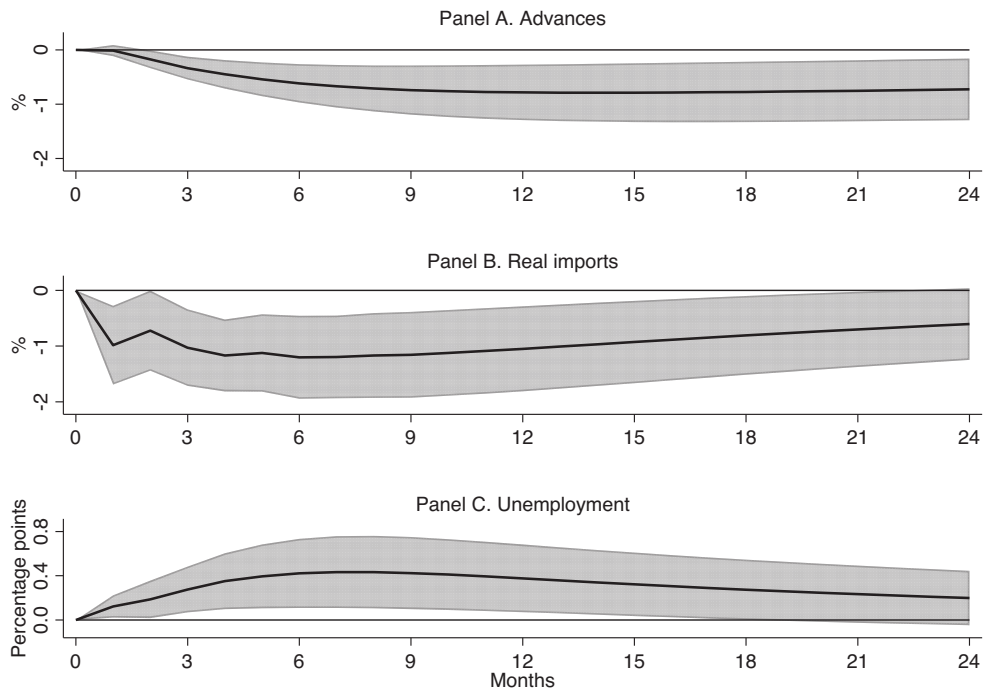


Figure 6. *Response of advances, real imports, and unemployment to an EPU shock*

Note: The shaded areas represent the 95% confidence intervals.

Source: Based on estimation of equation 1.

VI. Robustness

This section assesses the sensitivity of the results to alternative measures of uncertainty and economic activity, to variations of the econometric specification, and to the inclusion of additional control variables.

An interesting question is whether the results are robust to alternative measures of uncertainty. A common measure of general uncertainty is stock market volatility, measured as the monthly standard deviation of daily stock returns.⁸⁴ As daily data are not readily available throughout the interwar period, a GARCH(1,1) model is estimated for the logarithmic change in monthly share prices, which yields a time-varying monthly measure of the conditional standard deviation of stock returns. Figure 7 shows the response of output to a one-standard-deviation shock to this measure of uncertainty, alongside the baseline impulse response and confidence interval. The results are similar, if a little stronger, peaking at -0.7 per cent ($t = -3.6$) after 10 months. Figure 7 also plots the results where EPU in equation 1 is substituted by Baker et al.'s indicator of policy uncertainty.⁸⁵ The response is similar to the baseline, peaking at -0.7 per cent ($t = -4.3$).

The baseline measure of economic activity is real GDP at factor cost, which has been estimated using annual data from the national accounts and high-frequency

⁸⁴ Mathy and Ziebarth, 'How much does political uncertainty matter?'; Mathy, 'Stock volatility'.

⁸⁵ Baker et al., 'Measuring economic policy uncertainty'.

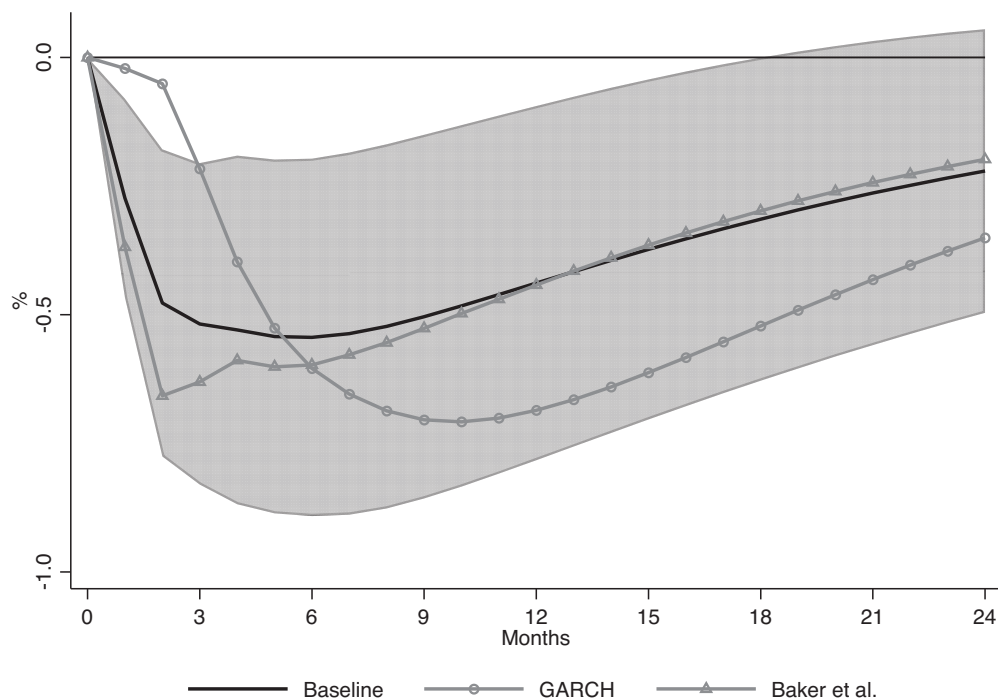


Figure 7. *Sensitivity to alternative measures of uncertainty*

Note: The shaded area represents the 95% confidence interval.

Source: Based on estimation of equation 1.

data for a collection of indicators. A potential concern is that this series may be measured with error. The sensitivity of the results is therefore investigated in incremental steps. Figure 8 plots the impulse response functions from these models, as well as the baseline point estimates and confidence interval.

The first step is to use real GDP measured at market prices instead of at factor cost. Both are based on the same high-frequency indicators but have been normalized using different annual estimates of real GDP. As the two series are highly correlated, it is unsurprising that the effects are unchanged. The second is to use an index of economic activity, which has been calculated using an alternative econometric methodology and different high-frequency indicators. The peak drop of 0.4 per cent ($t = -1.9$) is similar to the baseline but is less precisely estimated, which is a consequence of the shorter sample (the index is only available between 1925 and 1936). The third is to use real turnover, which is an indicator of 'the physical amount of goods and services traded' that is available from 1920 to 1936.⁸⁶ This measure is associated with a decline of up to 0.7 per cent ($t = -3.8$).

A number of decisions had to be made to estimate the model. The first was the number of lags to include. In the baseline case, three months of lags were included, which was motivated both by the minimization of the AIC and by previous

⁸⁶ Phelps Brown and Shackle, 'Index of real turnover'.

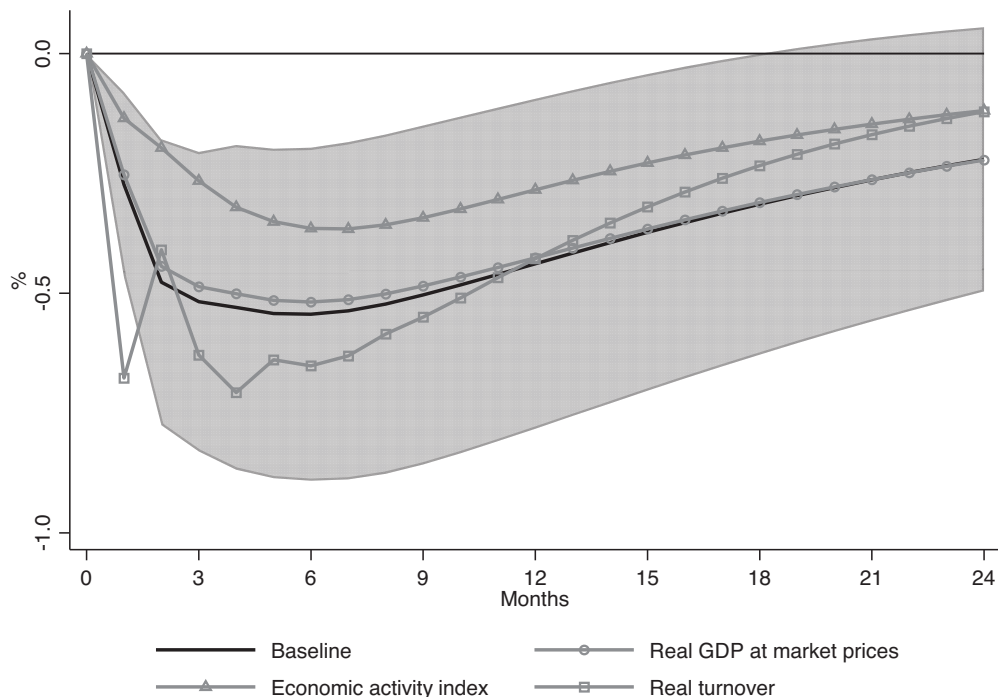


Figure 8. *Sensitivity to alternative measures of economic activity*

Note: The shaded area represents the 95% confidence interval.

Source: Based on estimation of equation 1.

research.⁸⁷ However, the BIC was minimized with two lags. Reducing the lag length raises the peak effect to -0.7 per cent ($t = -3.7$), while the effects remain statistically significant between months 1 and 14. Alexopoulos and Cohen, on the other hand, include six months of lags in their VAR model.⁸⁸ The inclusion of extra lags also increases the peak effect to -0.7 per cent ($t = -3.7$). The response is statistically significant between months 1 and 19. The impulse response functions for these alternative specifications are plotted in figure 9.

The second decision was the causal ordering. In the baseline case, output was ordered before uncertainty, which implies that output affected uncertainty contemporaneously but not vice versa. The sensitivity of the results to this assumption can easily be gauged by reversing the order so that uncertainty is first and output second. The peak effect is unchanged at -0.5 per cent ($t = -2.6$) and is statistically significant between months 2 and 16.

The third decision was the econometric model. A plausible alternative to the VAR is a local projections model, which imposes weaker assumptions on the dynamics of the data but is less efficient and may suffer from excessive variability.⁸⁹ To

⁸⁷ Baker et al., 'Measuring economic policy uncertainty'.

⁸⁸ Alexopoulos and Cohen, 'Power of print'.

⁸⁹ Jordà, 'Estimation and inference'; Barnichon and Brownlees, 'Impulse response estimation'.

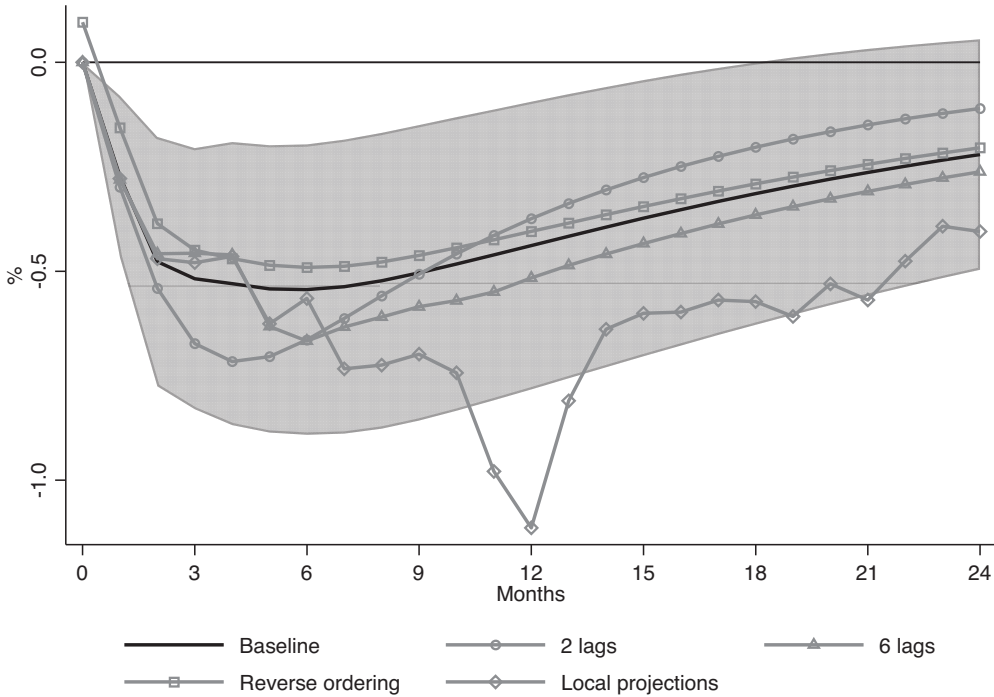


Figure 9. Sensitivity to alternative specifications

Note: The shaded area represents the 95% confidence interval.

Source: Based on estimation of equations 1 and 2.

explore the sensitivity of the results to the econometric method, the following local projections model was estimated:

$$y_{t+h} = \beta_h EPU_t + \sum_{k=1}^3 \gamma_{h,k} EPU_{t-k} + \sum_{k=0}^3 \theta_{h,k} y_{t-k} + \varphi z_t + e_{t+h} \quad (2)$$

where y_{t+h} is the natural logarithm of real GDP at factor cost, EPU_t is the new index of economic policy uncertainty, and z_t is a series of exogenous variables that includes a constant, seasonal dummies, and a time trend. β_h measures the impulse response of economic activity to uncertainty at time $t + h$. The shock has been scaled to match the increase in uncertainty in the baseline model (one standard deviation or 21.6 per cent relative to the sample mean) so that the responses are comparable. Inference is based on Newey–West standard errors, where the maximum autocorrelation lag is set to $h + 1$.⁹⁰

At horizon (h) 0, equation 2 regresses the log-level of economic activity on itself, meaning that the coefficients on output and policy uncertainty are 1 and 0 respectively. At horizons beyond 0, variation in uncertainty that is orthogonal to output contemporaneously is free to have a non-zero effect. This ordering of

⁹⁰ Tenreyro and Thwaites, ‘Pushing on a string’.

Table 2. *Peak effects from alternative models (%)*

	<i>Specification</i>	<i>Peak effect</i>
(1)	Alternative measure of uncertainty: GARCH	-0.7 (-3.6)
(2)	Alternative measure of uncertainty: Baker et al.	-0.7 (-4.3)
(3)	Alternative measure of economic activity: real GDP at market prices	-0.5 (-3.1)
(4)	Alternative measure of economic activity: economic activity index	-0.4 (-1.9)
(5)	Alternative measure of economic activity: real turnover	-0.7 (-3.8)
(6)	Alternative specification: 2 lags	-0.7 (-3.7)
(7)	Alternative specification: 6 lags	-0.7 (-3.7)
(8)	Alternative specification: reverse ordering	-0.5 (-2.6)
(9)	Alternative specification: local projections	-1.1 (-2.7)
(10)	Additional control variable: real government expenditure	-0.6 (-3.2)
(11)	Additional control variable: real government revenue	-0.5 (-3.1)
(12)	Additional control variable: real government debt	-0.6 (-3.1)
(13)	Additional control variable: Bank Rate	-0.5 (-3.1)
(14)	Additional control variable: <i>M0</i>	-0.5 (-3.0)
(15)	Additional control variable: yield on consols	-0.6 (-3.4)
(16)	Additional control variable: real exports	-0.5 (-3.1)
(17)	Additional control variable: real wages	-0.5 (-3.2)
(18)	Additional control variable: retail price index	-0.5 (-3.1)
(19)	Additional control variable: share price index	-0.3 (-2.1)
(20)	Additional control variable: major strikes	-0.4 (-2.5)
(21)	Additional control variable: exchange rate	-0.4 (-2.6)
	Baseline	-0.5 (-3.1)
	Minimum	-1.1 (-2.7)
	Maximum	-0.3 (-2.1)
	Mean	-0.6

Note: *t*-statistics in parentheses.

Source: Based on estimation of equations 1 and 2.

the variables is consistent with the Cholesky decomposition used in the baseline model.

The responses from the local projections model are larger than those from the VAR, but are, as expected, less precisely estimated and not as smooth. Following a one-standard-deviation shock to uncertainty, economic activity falls by up to 1.1 per cent ($t = -2.7$) after 12 months. The effects are statistically significant throughout most of the forecast horizon.

The baseline model was a bivariate VAR. This parsimonious approach was taken not only for its simplicity but also because it has been used in previous research.⁹¹ However, if there were other determinants of output that were also correlated with economic policy uncertainty, then the impulse responses could be affected.

Table 2 presents the peak effects from a variety of models. Rows 10 to 21 show the results from models where a control variable of interest has been rotated in. The first set of control variables relates to fiscal policy, including the natural logarithm of real government expenditure, revenue, and debt. The second set of controls relates to monetary policy, such as Bank Rate and the monetary base (*M0*). The yield on consols, which reflects both fiscal and monetary policy, is also included. The third set of controls relates to the more general economy: the natural logarithms of real exports, real wages, retail price index, share prices, a dummy variable for major

⁹¹ Alexopoulos and Cohen, 'Power of print'; Baker et al., 'Measuring economic policy uncertainty'.

strikes, and the level of the exchange rate. The inclusion of these variables has little impact on the size or precision of the estimated responses.

In order to gauge the sensitivity of the baseline results to alternative specifications, 21 additional models have been estimated, which experiment with alternative measures of uncertainty and economic activity, with the econometric specification and with the inclusion of additional control variables. The results are summarized in table 2: the minimum peak effect was -1.1 per cent ($t = -2.7$), while the maximum was -0.3 per cent ($t = -2.1$). In each and every case, the peak impact was statistically significant. The mean peak was -0.6 per cent, which is slightly larger (in absolute terms) than the baseline estimate. The depressive impact of uncertainty on the British interwar economy is therefore a robust result.

VII. Conclusion

The British economy was deeply unstable between the wars. Economic historians have identified a number of causes, from the demise of the old staples to the shortening of the working week. Macroeconomists, however, emphasize the significance of not only first but also second moment shocks, such as uncertainty. This article has argued that uncertainty was an important source of fluctuations in interwar Britain.

In order to test this hypothesis, two types of evidence were investigated. The first was qualitative. A close inspection of newspaper reports revealed that contemporaries—academics, businesspeople, journalists, and politicians—harboured great uncertainties. There were doubts over fiscal, monetary, and tariff policy, which peaked around budgets and general elections. Agents associated this uncertainty with a range of negative economic outcomes.

The second type of evidence explored was quantitative. Based on a new index and a VAR, it was found that uncertainty was associated with a fall in output, a rise in unemployment, and more than a fifth of macroeconomic volatility. These effects are economically meaningful, statistically significant, and robust to more than 20 permutations of the model. Therefore, both types of evidence suggest that uncertainty was an important source of instability in interwar Britain.

The goal of the article was to use state-of-the-art methods to understand whether uncertainty mattered in an important historical context. However, there are a number of opportunities to push the empirical frontier that are promising avenues for future research. The first is to disentangle news from uncertainty to establish the size of the potential bias. The second is to distinguish downside and upside uncertainty in order to test for the possible non-linearities of the bad news principle.

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Supporting information

Additional supporting information may be found online in the Supporting Information section at the end of the article.

S1. New macroeconomic data for the UK, 1920–38