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Uncertainty: Macroeconomic Effects and Policy Implications*

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Abstract

Uncertainty is a concept which refers to the inability of consumers, managers and policymakers to perfectly predict future events like a change in labor income, the growth rate of technology, or a variation in the economic environment. Given that consumers and entrepreneurs typically have to make decisions about consumption, labor supply, productive investment and so on in the presence of uncertainty, it is of interest to understand how uncertainty can affect such decisions. This policy brief reviews the most recent literature on this subject by addressing the following questions: Is there a relationship between uncertainty, agents' decisions, and the business cycle? Is the source of uncertainty domestic or global? How should macroeconomic policies be designed to tackle the negative effects of uncertainty? The findings of this policy brief are: (i) uncertainty is countercyclical (as it tends to peak during recessions) and it appears to be a driver of the business cycle (namely, consumption and investment) in many countries; (ii) investment is found to be more reactive than consumption to heightened uncertainty; (iii) movements in financial markets and economic policy uncertainty indexes are informative about the macroeconomic effects of uncertainty shocks; (iv) the effectiveness of monetary and fiscal policy interventions is negatively affected by uncertainty; (v) conventional macroeconomic policies should be used to stabilize the business cycle and to avoid the build-up of uncertainty; (vi) a clear communication of economic plans by policymakers is crucial to maintaining low uncertainty; and (vii) financial market regulation and macroprudential policies can potentially play an important role in limiting the negative business cycle effects of uncertainty.

JEL classification: E21, E44, G11, G12

Keywords: Financial uncertainty, economic policy uncertainty, recessions, monetary policy, fiscal policy, international spillovers, gains from clear communication

"If you think that another Depression might be around the corner, better to be careful and save more. Better to wait and see how things turn out. Buying a new house, a new car or a new laptop can surely be delayed a few months. The same goes for firms: given the uncertainty, why build a new plant or introduce a new product now? Better to pause until the smoke clears. This is perfectly understandable behaviour on the part of consumers and firms—but behaviour which has led to a collapse of demand, a collapse of output and the deep recession we are now in."

Olivier Blanchard, *The Economist*, Jan. 29, 2009

What is uncertainty? According to Knight (1921), uncertainty is people's inability to forecast the likelihood of events happening in the future. This concept is closely related to risk, which describes a known probability distribution over a set of events. Blanchard (2009) refers to uncertainty as the concept capturing the "unknown unknowns", and to risk as the concept capturing the "known unknowns". An example of the former situation is that of a worker who expects to face either a pay rise or a pay cut in one year, but she does not know what likelihood to assign to these two events. An example of the second scenario is that of a worker knowing that she will enjoy the pay rise with a probability equal to, say, 35% and the pay cut with a probability of 65%. While these two situations are very different from a theoretical standpoint, uncertainty and risk are very hard to distinguish in practice (in the data). Hence, following most of the extant macroeconomic literature, this policy brief will refer to uncertainty as a broad concept that embeds Knightian uncertainty and risk.

Uncertainty and the business cycle. An example on why uncertainty is important at a macroeconomic level regards consumption. Suppose a worker has annual income of \$50,000. This worker knows that, in the future, things could change, and she could earn more or less than \$50,000 per year. Assume her income in the following year could be \$60,000 with a 50% probability (perhaps due to a productivity bonus) and \$40,000 with a 50% probability (say, because of the possible downsizing of the firm she works for). In expected terms, the worker will still earn \$50,000. Thus, if she is risk neutral, her savings should be similar in both years. However, if the worker is risk averse, she will prefer to save extra money this year (say, \$5,000 extra with respect to the savings she would aim for in the absence of uncertainty) in order to address the possibility of earning less in the following year. In other words, she will reduce her current consumption in order to maintain her consumption profile over time to be as smooth as possible if the pay cut realizes. This form of savings - termed "precautionary savings"

by Caballero (1990) - is one of the channels via which uncertainty can affect consumption and, therefore, aggregate demand. Notice that the higher is the uncertainty about the future labor income, the higher will be the amount of precautionary savings implemented by the worker today. Consequently, the higher is the level of current uncertainty, the lower will be the level of current consumption. At an aggregate level, a weaker consumption implies a softer aggregate demand. The quote by Olivier Blanchard reported above refers exactly to the desire of postponing the purchase of a house, a car or a laptop by agents facing an increase in uncertainty that can trigger a slowdown in the economic system.¹

A similar reasoning can be applied to firms. Suppose firms have to pay irreversible costs out of an investment (say, fixed costs for setting up machinery). In the presence of uncertainty, firms may optimally decide to "wait-and-see" until the smoke clears (i.e., until uncertainty vanishes) and postpone an investment that they would have otherwise made in the absence of uncertainty (Bernanke (1983), Bloom (2009)). This mechanism, which technically refers to the influence of uncertainty on the real option value of waiting before making an action, is the one Blanchard had in mind when he wrote his 2009 piece for *The Economist*.

Facts. According to the theory, if uncertainty results in more saving and less spending by consumers and firms, a slowdown of the economic system should realize. Do the data support this hypothesis? To address this question, economists have to work with empirical models suited to quantify the response of consumption and investment to changes in uncertainty. The first challenge for economists is that of measuring uncertainty. In fact, uncertainty is not directly observable in the real world. Hence, economists have to build measures of uncertainty to estimate the role played by its variations for the business cycle. Given that uncertainty is a complex concept, economists do not have a "perfect" measure of uncertainty that is universally accepted. The academic literature has proposed different measures of uncertainty. Taking the U.S. economy as a reference, Figure 1 plots four different measures of uncertainty for the post-WWII period. The VXO is a measure of future financial volatility of stock market returns computed by focusing on the S&P 100 stock market index; the measure proposed by Ludvigson, Ma, and Ng

¹To be clear, uncertainty refers to a change in the variance of a distribution - e.g., that of future labor income - all else being equal. In particular, to isolate the effects of a change in uncertainty, one should imagine a situation in which the expected level of income does not change even if the variance of expected income increases - in other words, conditional on the same expected level of income, more extreme income realizations might occur in the future. This is what economists mean when they say that uncertainty is a mean-preserving concept.

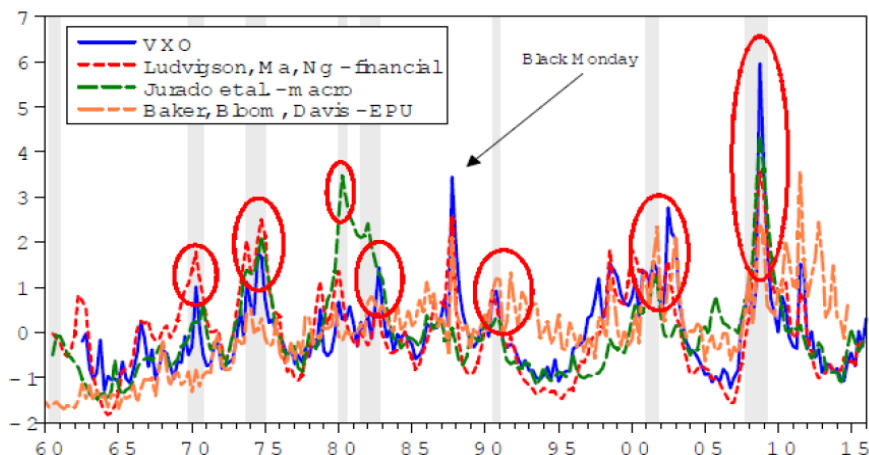


Figure 1: **Proxies for macroeconomic uncertainty.**

(2016) is another measure of financial volatility computed with a sophisticated econometric technique which exploits the information coming from 147 financial time series; the macroeconomic measure of uncertainty proposed by Jurado, Ludvigson, and Ng (2015) is obtained by working with a panel of 134 indicators of real activity and 147 financial series; the proxy for Economic Policy Uncertainty (EPU) proposed by Baker, Bloom, and Davis (2016) captures the perceptions of newspaper readers on the level of uncertainty due to economic policy decisions. Several considerations are in order here. Although differently defined, these four measures co-move, i.e., they tend to move in sync. Moreover, each one of them peaks during recessions, a characteristic which makes them countercyclical. This countercyclicity, robust across different measures of uncertainty, is consistent with the conjecture that changes in uncertainty might be one of the drivers of the U.S. business cycle. In other words, such changes may be among the macroeconomic shocks responsible for the booms and busts of the U.S. economy. Interestingly, the countercyclicity of uncertainty is a well-established fact in a variety of countries (Bloom (2014), Castelnuovo, Lim, and Pellegrino (2017)), something which justifies the attention posed by many research teams around the world on uncertainty, its evolution over time, and its interaction with the business cycle.

Uncertainty shocks and macroeconomic responses. A number of empirical investigations have tried to quantify the role of uncertainty as a driver of the business cycle. To do that, one has to isolate exogenous variations of uncertainty (variations of uncertainty that are not due to fluctua-

tions in real activity) termed "uncertainty shocks". Uncertainty shocks are difficult to identify in the data due to the contemporaneous movements between uncertainty and real activity indicators and because of the fact that part of the uncertainty may be generated by other macroeconomic shocks (fiscal, monetary, exchange rate, commodity prices shocks) that lead to a slowdown/recession and, therefore, to high uncertainty. With this caveat in mind, Bloom (2009) finds that a jump in the U.S. stock market volatility comparable to the one that occurred during the Global Financial Crisis (GFC) could be responsible for a share as high as 1/3 of the total output loss during the 2007-09 recession.

Another measure that has gained a lot of attention in academic and policy circles as well as from financial market operators is the Economic Policy Uncertainty (EPU) measure constructed for the U.S., Australia, and other countries by Baker, Bloom, and Davis (2016). Each national EPU index is constructed by computing the relative frequency of own-country newspaper articles that contain a trio of terms pertaining to economic, uncertainty and policy-related matters. The aim of the EPU index is to capture uncertainty about who will make economic policy decisions, what economic policy actions will be undertaken and when, and what are the economic effects of policy actions (or inactions). Baker, Bloom, and Davis (2016) exploit this index to study the effects of an increase in the EPU index from its 2005-2006 to its 2011-2012 average value. Figure 2 reports the dynamic responses of U.S. aggregate real consumption, investment and GDP to such a shock. Two facts stand out. First, all three variables respond negatively and persistently to such an increase in the EPU index. In particular, real GDP is 1% lower than its trend after a few quarters; consumption drops by about 0.5% with respect to its trend; and the drop in investment is about 7% with respect to its trend. This fact confirms that uncertainty shocks are recessionary, and can be behind the negative correlation between uncertainty measures and the business cycle documented in Figure 1. Moreover, the response of consumption and investment are consistent with the "precautionary savings" and "wait-and-see" theoretical mechanisms described above. Second, the reaction of investment is much larger than that of consumption.

According to Bloom (2017), the large sensitivity of investment to an uncertainty shock may be due to the fact that firms are more forward looking than consumers, hence they are more attentive to future events and suffer more increases in uncertainty surrounding such events. Consumers, on the other hand, are more myopic (on aggregate), less sensitive to fluctuations in uncertainty, and start responding only when wages and employment are influenced by uncertainty, that is, with a delay of a few quarters.

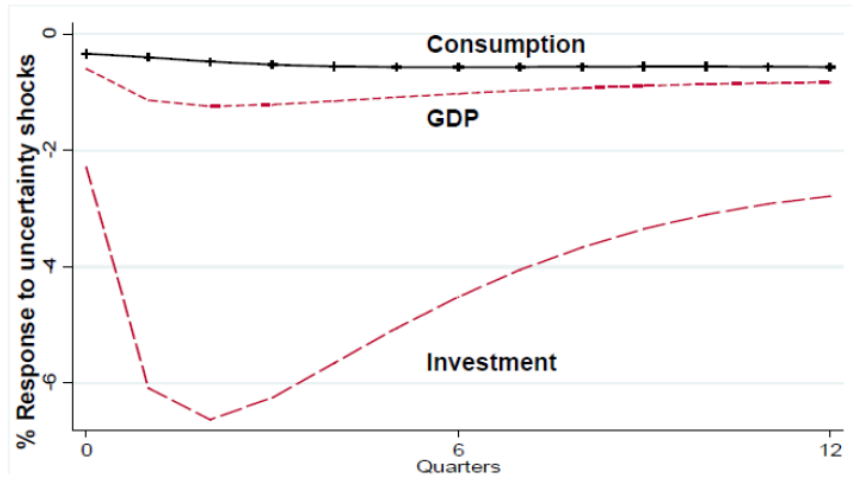


Figure 2: **Response of investment and consumption to an uncertainty shock.**

Economic Policy Uncertainty in Australia: causes and consequences. So far this policy brief has focused on empirical evidence mainly referring to the U.S. economy. Figure 3 displays the EPU index developed by Baker et al. (2016) for Australia. A mixture of foreign and domestic events are associated with the spikes displayed by this index in the 1998-2016 period, a sign pointing to Australia being a "net importer" of uncertainty.

Moore (2016) estimates macroeconomic models to have a sense of the impact of uncertainty shocks on the Australian economy. Figure 4 plots the responses of retail sales growth, employment growth, the cash rate, and consumer confidence to an unexpected increase in uncertainty. The impact of this jump in uncertainty for Australia appears to be small as regards the first two variables, amounting to a 0.15% temporary decrease. With regard to consumer confidence, Moore's estimates point to a negligible and temporary decrease. This mild impact may be due to the monetary policy response to uncertainty. Consistent with this view, the easing of the cash rate is of about 25 basis points after two years. Two other possible rationales for a weak impact of uncertainty on the Australian business cycle are related to the quite peculiar recent economic history of this country. First, Australia has not experienced a recession since 1991. It may very well be the case that uncertainty shocks hit most severely during recessions, when a country is already experiencing an inefficient allocation of resources (Caggiano, Castelnuovo, and Groshenny (2014), Caggiano, Castelnuovo, and Nodari (2017), Caggiano, Castelnuovo, and Figueres (2017a)). Second, the Australian cash

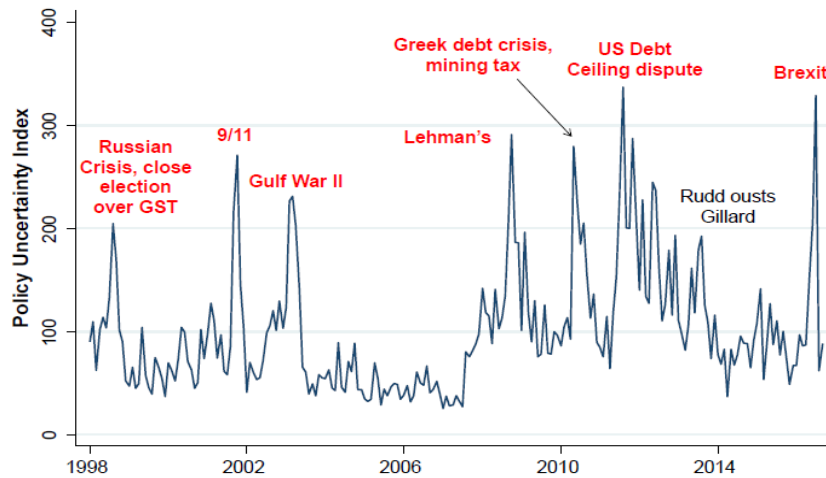


Figure 3: **EPU in Australia.**

rate, while being low from an historical standpoint, is still well above the zero lower bound (1.5% in October 2016). Recent research conducted at the Melbourne Institute which focuses on U.S. data shows that uncertainty shocks hit harder when the zero lower bound is in place (Caggiano, Castelnuovo, and Pellegrino (2017)). The lack of recessions and a policy rate away from the zero lower bound in the sample analyzed by Moore (2016) may be reasons behind the absence of a strong effect of uncertainty shocks on Australia's real activity.

Global uncertainty. Another interesting aspect of uncertainty is that of cross-country spillovers. Davis (2016) constructs a measure of Global Economic Policy Uncertainty (GEPU) by weighting EPU indices for sixteen countries that account for two-thirds of global output. This index rises markedly in correspondence of events such as the Asian Financial Crisis, 9/11, the U.S.-led invasion of Iraq in 2003, the GFC in 2008-09, the European immigration crisis, sovereign debt and banking crises in the Euro zone, the fiscal battles in the U.S., fears about a slowdown of the Chinese economy in late 2015, and the Brexit referendum in June 2016. These events represent a "common negative shock" able to slow down a large set of countries in the world.

Figure 5 plots the GEPU index. An interesting thing to notice is that its average value is 60% higher when moving from July 2011 to August 2016 than in the previous fourteen and a half years, and 22% higher than in 2008-09. This increase in the level of uncertainty may be one of the factors behind

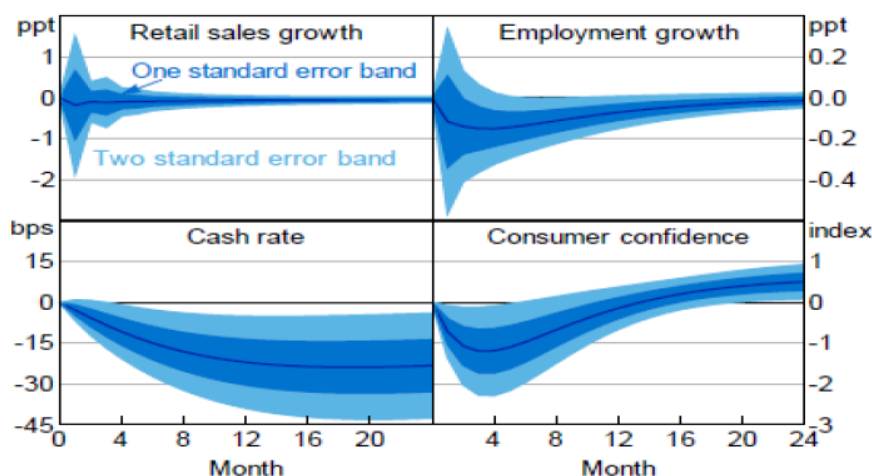


Figure 4: **Macroeconomic effects of uncertainty shocks in Australia.**

the poor economic performance of most industrialized countries following the GFC. Interestingly, this is not the only measure identifying spikes in uncertainty at a global level. Caggiano and Castelnuovo (2017) model data on stock market, exchange rate, and bond yield volatility for a battery of industrialized and developing countries to build a measure of global uncertainty which controls for country- and region-specific effects. They find their measure of global uncertainty to be positively correlated with the GEPU measure by Davis (2016).

As mentioned previously, the fact that part of the uncertainty affecting countries in the world could be "global" suggests that uncertainty shocks originating in a country could spillover to other countries with negative consequences for the latter. Colombo (2013) finds that an uncertainty shock originating in the United States may partly explain the fluctuations in real activity in the Euro area. Caggiano, Castelnuovo, and Figueres (2017b) find that U.S. EPU shocks have a significantly negative effect on unemployment in Canada and the United Kingdom, above all in recessions. These papers complement other existing contributions on the spillover effects of uncertainty shocks originating in the U.S. and hitting other countries via movements of asset prices variables on the international financial markets (see, e.g., Benigno, Benigno, and Nisticò (2012)).

Macroeconomic policies and uncertainty. Given the above documented macroeconomic impact of uncertainty, policymakers are naturally called to handle it. How can policymakers tackle uncertainty? Probably the

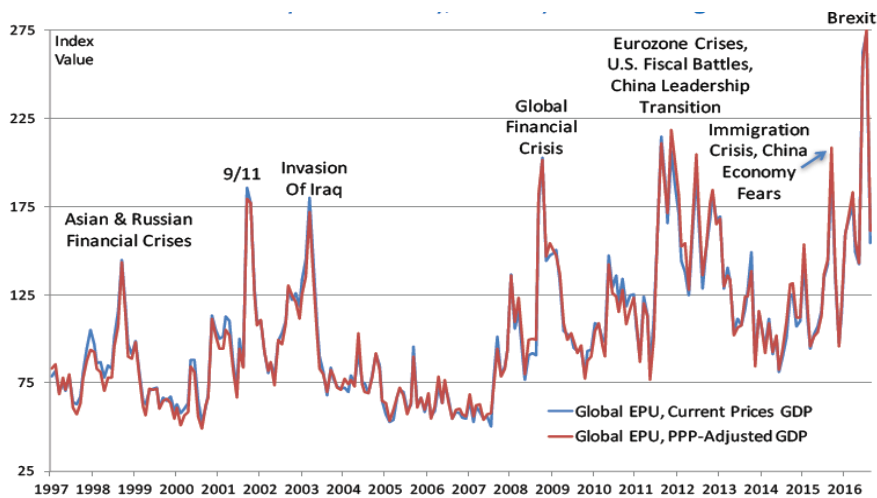


Figure 5: **Global economic policy uncertainty.**

best way to do it is to avoid the build-up of uncertainty. Clearly communicated policies can importantly reduce the degree of uncertainty about future fiscal plans or monetary policy movements. Uncertainty is in part related to business cycle movements and, therefore, driven by first moment shocks like fiscal, monetary, technology, or oil shocks. As stressed by Ludvigson, Ma, and Ng (2016), some recent theories suggest that economic downturns can foster risky behaviour, such as price experimentation; they reduce information and, therefore, the predictability of future outcomes, which naturally increases uncertainty; and they trigger new and unfamiliar economic policies (the so-called "unconventional" monetary policies, e.g., quantitative easing and forward guidance). Hence, a way to combat uncertainty is to act decisively and promptly with conventional policies (fiscal spending, taxation, movements of the cash rate) to stabilize the business cycle and dampen nascent uncertainty. Of course, shocks like the GFC are hard to (at least, fully) anticipate. Hence, policymakers are at times called to step in and operate when uncertainty is already high. Unfortunately, recent research suggests that this is not an easy scenario to deal with. Bloom (2009) finds that the Federal Reserve should drop the interest rate of 700 basis points to keep the level of firms' investment unchanged after an uncertainty shock as large as the one observed during the GFC. Pellegrino (2017a) finds the response of real activity indicators to monetary policy shocks to be much weaker when uncertainty is high in the United States. Working with Euro area data, Pellegrino (2017b) confirms this result. A complementary result is found by Caggiano, Castelnovo, and Nodari (2017), who show that sys-

tematic monetary policy is much less effective after spikes in financial uncertainty in the pre-GFC period in the United States. Finally, Ricco, Callegari, and Cimadomo (2016) document a large, positive and significant response of output to fiscal spending innovations only in the presence of low fiscal uncertainty. When uncertainty is high, such a response gets muted.

The above mentioned contributions point to a weakened power of conventional monetary and fiscal policy tools in the presence of high uncertainty. On the one hand, this evidence supports the call for timely policy interventions aimed at stabilizing the business cycle and avoiding the build-up of uncertainty. On the other hand, alternative policies to the conventional ones and which are more effective in maintaining uncertainty at low levels should be considered. Given that uncertainty shocks appear to be connected to financial markets, financial regulation could be a useful tool not only to dampen financial instabilities but also to keep financial uncertainty under control. Macroprudential policies, which are designed to stabilize the banking sector, could also have the potential of dampening credit market-related uncertainty (for references and a discussion on macroprudential policies, see Castelnovo, Lim, and Robinson (2016)). Moreover, financial regulation could also be important for dampening the negative effects of hikes in uncertainty in light of some recent evidence by Alessandri and Mumtaz (2014) and Nodari (2014) on the role played by financial stress as an amplifier of such negative effects. Finally, clear policy communication is crucial in order to keep economic policy uncertainty as low as possible.

The fact that uncertainty is increasing at a global level may suggest that there is a need for policy coordination across countries. However, the literature has not yet given a clear indication of the pros and cons of having more G20 meetings, bilateral agreements, and the like to design policies aimed at stabilizing the business cycle and, therefore, uncertainty. To the extent that international agreements can be successful in dampening business cycle fluctuations at a world-wide level, international policy coordination seems to be an idea worth pursuing.

Conclusions. This policy brief has documented recent findings on the macroeconomic effects of uncertainty and discussed policy implications. The main messages are the following:

1. Uncertainty increases during recessions. This may signal the fact that uncertainty causes recessions (in other words, uncertainty shocks may be relevant in explaining the evolution of the business cycle in a country), and/or that uncertainty is a consequence of economic downturns (e.g., because recessions call for new policies which are less known to

the public, like unconventional monetary policies). This fact is robust to the use of different empirical proxies of uncertainty and across a number of countries.

2. In general, households cut consumption in the presence of uncertainty in order to "save for rainy days" (precautionary savings). Entrepreneurs pause their investment and "wait-and-see" until the smoke clears (real option channel).
3. Financial markets and economic policy are two major sources of uncertainty. Financial market volatility is a possible major driver of changes in macroeconomic uncertainty that are not due to the evolution of the business cycle. Uncertainty about future economic policy decisions (in particular, fiscal policy) is also considered by households and entrepreneurs as being a negative element suggesting a temporary cut in consumption and a pause in investment.
4. Uncertainty shocks are found to exert a more powerful (negative) effect on investment than on consumption. This can be due to the fact that firms tend to be forward-looking and anticipate future events, while consumers start reacting to jumps in uncertainty just when such jumps affect real wages and employment.
5. Uncertainty shocks are found to be more powerful in recessions and when conventional monetary policy is constrained by the zero lower bound. This may be the reason behind the significant but modest empirical response of real activity indicators to uncertainty shocks in Australia, a country that has not experienced a recession since 1991 and whose monetary policy has not been constrained by the zero lower bound. Larger recessionary effects are found for countries like the U.S. that have experienced both recessions and a binding zero lower bound in recent times.
6. At a global level, uncertainty has been on an upward trend since the GFC. Recent contributions in the literature deal with the possibility of uncertainty spillovers, and find uncertainty shocks originating in the U.S. to be a relevant driver of real activity in neighbouring countries like Canada, but also for larger economic zones like the Euro area and the United Kingdom.
7. Conventional monetary and fiscal policies are found to have a weaker influence on the business cycle in periods of high uncertainty. Conventional policies can and should avoid the build-up of uncertainty by

intervening in a timely manner to stabilize the business cycle, therefore controlling the endogenous (real activity-related) component of the business cycle. Policies communicated in a clear manner would help maintain economic policy uncertainty at a low level. Uncertainty spillovers seem to call for a policy coordination aimed at stabilizing the business cycle across countries and, consequently, uncertainty, at a global level.

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