



The Bank of Canada and Financial Stability
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Economics Working Paper 19113

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The Bank of Canada has been considering whether to focus on financial stability (defined as responding to the build-up of financial imbalances) in addition to its mandate of a two per cent inflation target. In this paper we marshal historical and empirical evidence to make the case that the BoC should “stick to its knitting” and focus on price stability.

A major impediment to burdening the BoC with additional responsibilities to maintain financial stability is that there is disagreement not only about when financial instability erupts, not to mention the form this instability can take, but also about its overall economic impact. Although calls to increase the burdens placed on central banks have become more widespread in recent years at the international level, policymakers also need to be made aware that such views are sometimes based on erroneous assumptions. These include: (i) *All financial crises are the same*. They are not; (ii) *We know the size, timing and spillovers from financial crises*. There is no one-size-fits-all response to financial crises; (iii) *Financial stability policy is capable of being forward-looking*. Unlike monetary policy, which has been forward-looking for more than two decades, there is little evidence yet that the same is currently feasible to maintain future financial stability.

Any renewal of the Bank of Canada’s inflation target, while explicitly acknowledging the bank’s role as one of several agencies responsible for the maintenance of financial stability, should not confuse the public by adding the burden of meeting a goal it cannot reasonably achieve on its own. Unlike inflation, which, as discussed below, inflation-targeting central banks have managed to control within tolerance ranges for more than two decades, financial stability requires a much wider set of tools. If the central bank were to become responsible for these tools, this would bring the institution dangerously close to making political-style decisions.

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“If history repeats itself, and the unexpected always happens, how incapable must Man be of learning from experience!” George Bernard Shaw (1948)

1. Introduction

Discussions about the role of financial stability in the mandate of the monetary authority are as old as central banking. When the Bank of Canada (BoC) and the government agreed, in October 2016, to renew the inflation target for 5 more years the Bank’s own research concluded that it might be beneficial to show some flexibility in responding to the build-up of financial imbalances.¹ After all, recent history has shown that such conditions can produce asset price booms that, once the inevitable bust emerges, may trigger a financial crisis.² If financial imbalances are equated with greater risks to financial stability it is natural to ask whether this could conflict with the Bank’s mandate of targeting inflation around 2% in headline CPI, with a $\pm 1\%$ tolerance range.

There was no explicit statement at the time of the inflation target renewal about whether or how long the core principle of monetary policy can be set aside in order to manage any threat to financial stability.³ Equally important, there is no explicit definition of ‘financial stability’. A major impediment, as we shall see, is that there is disagreement not only about when financial instability erupts, not to mention the form this instability can take, but its overall economic impact. We are left with ‘we know it when we see it’ as one former Federal Reserve district President remarked a few years ago (Hoenig 2016) when it comes to explaining what financial stability means.

¹ The Bank of Canada’s statutory mandate is defined in law (<https://laws-lois.justice.gc.ca/PDF/B-2.pdf>) as follows: “WHEREAS it is desirable to establish a central bank in Canada to regulate credit and currency in the best interests of the economic life of the nation, to control and protect the external value of the national monetary unit and to mitigate by its influence fluctuations in the general level of production, trade, prices and employment, so far as may be possible within the scope of monetary action, and generally to promote the economic and financial welfare of Canada;”. In practical terms this has been operationalized in terms of an inflation target agreement renewed periodically.

² A financial imbalance is the finance counterpart of an imbalance in the trade of goods and services (a trade surplus or deficit). When asset prices appear to deviate too far away or for too long from what ‘fundamentals’ (i.e., observable factors that ought to drive the value of an asset) policy makers will refer to the situation as one where there is an imbalance. These developments have also generated the so-called ‘lean’ versus ‘clean’ debate, which asks whether monetary policy ought to strike pre-emptively to head off asset price booms (lean) as opposed to cushioning the economic costs stemming from asset price busts (clean). The debate is not new and predates the last financial crisis. See, for example, Bernanke and Gertler (2001) who take the view that it is preferable to pick up the pieces, as it were, when a financial bubble bursts while Cecchetti, Genberg, Lipsky, and Wadhvani (2000) prefer a more activist approach when dealing with asset price inflation.

³ The renewal document (Bank of Canada 2016, pg. 25, https://www.bankofcanada.ca/wp-content/uploads/2016/10/background_nov11.pdf) states that “...some flexibility...” is needed without being explicit about the degree of flexibility required. Interestingly, the 2006 inflation target renewal published before the international financial crisis of 2008-9 (Bank of Canada 2006, pg. 9; https://www.bankofcanada.ca/wp-content/uploads/2010/06/background_nov06.pdf) contains, almost verbatim, the same language found in later renewal agreements.

Adding an explicit financial stability objective to the Bank of Canada's existing mandate is motivated by a desire to avoid financial crises. Although calls to do so have become more widespread in recent years at the international level (e.g., see Siklos 2017) policy makers also need to be made aware that such views are based on strong assumptions. These include:

- (i) All financial crises are the same. Instead, they are varied (e.g., banking, currency and debt) and stem from a variety of sources (asset price booms and busts, contagion) that need not always lead to a financial crisis. Even if empirical evidence suggests that excessive credit growth is a predictor of financial crises (e.g., Jordà, Schularick and Taylor 2011, Schularick and Taylor 2012), policies to restrain credit exist and it is up to the politicians to use available instruments to control its growth. History may not be kind to politicians who fail to heed this piece of advice, but it is far from clear why an autonomous institution responsible for monetary policy, appointed by the political authorities, ought to be charged with implementing policies that have distributional effects;⁴
- (ii) We know the size, timing and spillovers from financial crises. Whereas in reality the effects are heterogeneous over time and across countries. To be sure, there is agreement over the consequences of a few major financial crises in history. However, this result does not extend to explain what happens in most financial crises. More importantly, there is no 'one size fits all' response to these crises.
- (iii) Unlike monetary policy which has, over more than two decades, been forward-looking there is, as we shall see, little evidence yet that the same is currently feasible when it comes to maintaining future financial stability;
- (iv) Interventions by central banks in financial systems since the last financial crisis may have prevented a much worse economic outcome but per se they cannot generate sustained growth. Moreover, historically, a monetary policy that is, in part, industrial policy (i.e., with a goal of picking winners and losers in private markets) is not a recipe for a successful policy in normal times;
- (v) Interventions in reaction to past financial crises may enable policy makers to avoid 'fighting the last war'. But history never exactly repeats. It just rhymes.

The BoC's own research argues that "...financial stability objectives should be primarily met with a strong financial regulatory and supervisory framework that has the necessary microprudential and macroprudential policies and tools." (Bank of Canada 2016, pg. 4) This reminds us that the task of ensuring financial stability is not the sole responsibility of the BoC

⁴ A good example of the potential distributional consequences is the build-up and bursting of the housing bubble in the United States. See, for example, Albanesi, De Giorgi, and Nosal (2017). The policy implications of their findings would force any central bank into making uncomfortable distributional decisions.

but such a mandate is the joint responsibility of several institutions.⁵ Although financial stability is equated with resilience in the face of financial shocks, the latest renewal document, written after the so-called global financial crisis (GFC) of 2008-9, does not provide an explicit definition of the concept. This is not surprising as the profession continues to grapple with this question (e.g., see Mayes 2019).

The role of the monetary authority in maintaining financial stability has evolved from the lender of last resort function defined as heading off a banking panic⁶, historically viewed as one of the ‘raison d’être’ of central banking (e.g., Bordo 1990), to one where systemic financial risks of all kinds, including from non-bank financial intermediaries (i.e., shadow banks), are now considered fair game for the central bank to tame. This turn of events has led several central bankers to highlight concerns over the potential ‘overburdening’ of the monetary authority.

The discomfort with adding financial stability to the existing goal(s) of monetary policy also stems from the pre-crisis view that monetary policy can deliver price stability and that this objective, combined with vigilance and prompt action in the face of a financial crisis, is the best way to clearly and transparently define the mission of a central bank. The GFC has threatened this consensus but, so far, there is no agreement about rules and policies that should be adopted to deal with financial imbalances (Bordo 2018).

Any renewal of the Bank of Canada’s inflation target, while explicitly acknowledging its role as one of several agencies responsible for the maintenance of financial stability, should not confuse the public by adding the burden of meeting a goal it cannot reasonably achieve on its own. Unlike inflation which, as discussed below, inflation targeting central banks have managed to control within tolerance ranges for over two decades and have the tools to continue doing so, financial stability requires a much wider set of tools. If the central bank were to become responsible for these instruments this would bring the institution dangerously close to making political style decisions. For example, restrictions on the type and size of mortgage loans, or the make-up of risky versus riskless assets in portfolios represent decisions not historically associated with monetary policy and central banking, at least in advanced economies. The adage that the Bank of Canada ought to ‘stick with their knitting’ (Laidler 2004), remains the correct advice. Therefore, a change in the Bank of Canada’s mandate would create forces that, during normal times, bring it uncomfortably close to having a fiscal role.

The rest of the paper is organized as follows. Since the financial stability mandate of central banks is a global issue, as well as one that has waxed and waned for decades, our strategy is to marshal international evidence over a long historical period with a Canadian flavour. We first explore varied notions of the financial stability concept, the heterogeneous nature of past

⁵ The Bank of Canada provides a list of provincial, federal and even international agencies it collaborates with to both monitor and respond to shocks that can threaten financial stability. <https://www.bankofcanada.ca/core-functions/financial-system/financial-system-committees/>.

⁶ That is, an attempt by the public to convert their bank liabilities into cash

financial crises, and why their aftermath can place central banks in a precarious position. We then move on to provide some empirical evidence of the connection between financial crises and economic performance where we highlight the need not to confuse financial crises of the kind experienced in 2008-9 with other financial crises that preceded it. We conclude by proposing that while the Bank of Canada's focus on price stability should not change it ought to be provided with more latitude to becoming more forward-looking in highlighting potential threats, domestic and foreign, to financial stability.

2. Did the Pendulum Swing Too far? Response and Recovery from Financial Crises

a. Some Preliminaries

The most recent financial crisis led to an outpouring of books and articles.⁷ At least two reasons explain the difference between earlier financial crises and the crisis that was triggered by events in global financial markets beginning in 2007. First, the output fallout from the crisis was truly global in nature. Second, the last financial crisis originated in advanced economies. Figure 1 makes the point. Annual rates of change in real GDP are shown for the world and three other regions, namely the advanced economies (AE), the G7, and emerging and developing economies (EME). The period shown is roughly from the start of the so-called 'Great Moderation' in the mid-1980s (Bernanke 2004) to 2018. While global growth shrank in 2009, only the G7 and AE experienced negative growth rates in 2008 and 2009. Nevertheless, it is striking that growth in all types of economies dropped sharply and at the same time. Notice also that, as growth rates between EME and AE began to diverge beginning around 2000, differences in growth rates after the GFC, while still in favour of the EME, remain essentially constant thereafter. In addition, countries with fewer macroeconomic and financial vulnerabilities pre-crisis fared much better than others with similar levels of development (e.g., see IMF (2010), and Bordo and Siklos (2019)).

The foregoing arguments are relevant for the Canadian case since the mandate of a central bank, and its capacity to fulfill promises, is influenced by the overall economic and institutional environment in which it operates. Therefore, in what follows, we focus on the historical experience of a small set of AE.

b. Financial Crises and Central Banks: Definitions, Challenges

Because the historical incidence of financial crises in any one AE is small, we consider the macroeconomic and financial experience in ten AE going back to the late 19th century. This strategy also permits us to examine a cross-section of central banks that were created for a variety of reasons, including political motives. The U.S. Federal Reserve came into existence

⁷ A selective short list would include Reinhart and Rogoff (2009), Blinder (2013), Bernanke (2015), King (2016), Mody (2018), and Tooze (2018). Accompanying book length manuscripts are numerous articles that have exposed historical links with earlier crises, lessons to be learned from the latest crisis, and overviews of the consequences of the events that unfolded, especially between 2007 and 2010. Again, a selective list would include Romer and Romer (2017), Bordo (2008, 2018), and Lombardi, Siklos, and St. Amand (2018).

with a financial stability motive (Reinhart and Rogoff 2013). Typically the central banks considered in this study were created not to manage inflation or mitigate the amplitude of business cycles but in response to the economic havoc in the wake of financial crises, as well as to introduce a lender of last resort, again in response to a desire to reduce the likelihood of financial instability.⁸ The countries examined are: Canada (CAN; 1934), Switzerland (CHE; 1907), Germany (DEU; 1876), France (FRA; 1800), Great Britain (GBR; 1694), Italy (ITA; 1893), Japan (JPN; 1882), Norway (NOR; 1816), Sweden (SWE; 1668), and the USA (USA; 1913). The ISO country code and year the central bank was established are in parenthesis.

Financial crises come in various forms. A list would include, in rough order of importance, banking, currency, sovereign debt, and inflation variability. Leading causes include: asset price boom busts (commodity prices, property prices, and equity markets), contagion from other countries, and liberalization (innovation) in financial systems.⁹ Inflation, defined as a sustained rise in the average of consumer prices is not a financial phenomenon although variability in inflation can still be associated with financial instability (Bordo and Wheelock 1998). A broad consensus is that excessive inflation represents an economic threat.¹⁰ Inflation, of course, can come in various forms. Thus, a sharp drop in equity prices can also be associated with an episode of financial instability (e.g., see Mishkin and White (2008)).¹¹ Similarly, booms and busts in housing prices are also associated with financial crises (e.g., see Burnside, Eichenbaum, and Rebelo (2016)). Banking crises are, arguably, the most frequent as these originate when one or more financial institutions fail or merge, and the consequences have systemic implications leading to direct government intervention.¹² Hence, in what follows we focus on this type of financial crisis.

Bordo and Landon-Lane (2012) present evidence to the effect that there were only two truly global financial crises over the past century or so, namely the Great Depression of 1929-1933 in the U.S. and the international financial crisis of 2007-9. Both are notable because they originated in the advanced world and not EMEs and were propelled by problems in the banking sector.

⁸ In a few other cases (e.g., Sweden, the U.K., Spain) the need to finance expenditures that had to be financed by the State also figures prominently as a motivating factor in establishing a monetary authority. There was likely some political element as well since economic downturn raise pressure on the political authorities.

⁹ We highlight these crises because of their potential for directly impacting monetary policy. To conserve space, we ignore fiscal crises even though these may well have monetary implications as is clear, for example, from a retrospective of the Eurozone crisis (e.g., see Mody 2018, Bordo and Meissner 2016).

¹⁰ Although there have been suggestions that very low or negative inflation rates and declines in the price level (deflation) are also associated with crisis conditions these are viewed as accompanying a financial crisis not necessarily the trigger for a future one (e.g., see Burdekin and Siklos 2004). For example, during the Great Depression deflation was a key cause of the banking panics that occurred in many countries (Bernanke and James 1991).

¹¹ These events arise with the following frequency since 1870 to 2015 in the ten countries examined. USA: 16, GBR: 11, NOR: 11, SWE: 18, DEU: 27, CHE: 18, CAN: 12, ITA: 16, FRA: 16, JPN: 16.

¹² Although there are subtle differences in how different authors define the onset of a banking crisis, they all involve some form of “distress” in the banking system that lead to mergers, acquisitions by stronger banks of weaker ones, and direct government intervention. See Bordo and Meissner (2016, Table 1).

Even the Eurozone sovereign debt crisis that dovetails the 2007-9 crisis stems from weaknesses in the banking sector that spilled over into sovereign debt markets due to the ‘doom loop’ that ties banks to the sovereigns (Brunnermeier, James, and Landau (2016), James (2012), Mody (2018)).

All other forms of financial crises (currency, sovereign debt) require that a threshold beyond which it is said that an economy is in crisis. For example, a sovereign debt crisis always involves a potential debt default and is often triggered by a ‘sudden stop’ of capital inflows from abroad.¹³ Complicating the identification of these types of crises is the fact that history includes cases where one kind of financial crisis is followed by, or simultaneously triggers, another kind of crisis. For example, twin crises often consist of a banking crisis followed by a currency crisis although the reverse is also possible (Eichengreen and Portes (1987)).¹⁴ Moreover, in recent years triple crises involving banking, currency, and sovereign debt have become an issue (Bordo and Meissner (2016)).

The global nature of the last financial crisis is germane for the prospects of any future changes to the mandate of the Bank of Canada. Specifically, policy makers in the economies where the crisis originated may have over-reacted by responding to a once in a century financial crisis as opposed to asking whether any new regime is fit for the purposes of dealing with a future crisis. Unless the next financial crisis is very similar to the last one it is not clear how current policy instruments or regulations in place today will prevent a recurrence. This is not to suggest, of course, that efforts to forestall such events in future should be abandoned but that the most appropriate strategy need not consist of an expansion in the Bank of Canada’s current mandate.

The bottom line is that financial crises emerge from a wide variety of sources, often lead policy makers to overreact hoping that such events will never be repeated, and usually place the central bank in the middle of efforts to, as it were, pick-up the pieces. This raises the possibility that the monetary authority’s mandate will promise more than it can reasonably deliver, thus setting them up to face excessive political pressure.

3. Financial Crises and Central Bank Performance: Some Evidence

a. The Historical Record in Advanced Economies

The various definitions of financial crises make the historical record of their incidence sensitive to the chronologies used (e.g., see Bordo and Meissner (2016), Figure 1), the period covered, and the number of countries sampled. Figure 2 compares the historical record of the ten developed economies in our sample based on our preferred chronology. The top portion of the Figure ‘stacks’ the incidence of a financial crisis across the ten economies. The higher the bars the more countries simultaneously experience banking and currency crises at the same time.

¹³ However, sudden stops generally do not affect advanced economies, especially ones able to borrow internationally in their own currency.

¹⁴ Bordo and Meissner (2016) define a banking crisis as one that is not followed in a year’s time by a currency and/or debt crisis.

The Figure makes three points. First, AE are not immune to financial crises especially of the banking variety. Second, although crises and real GDP growth can be negatively correlated, the results depend on whether war years are included and is usually weak. This is illustrated by the bottom portion of the Figure that plots median, maximum and minimum real GDP growth rates for all ten economies in the sample. Indeed, while the Scandinavian economies in our sample (i.e., Norway and Sweden) were in the throes of a banking crisis in the early 1990s, which largely explains the ‘spike’ in crises around that time, economic growth was not especially hard hit across all ten AE. This changes for the 2008-9 period, which stands out as another era when financial crises reappeared and economic growth collapsed. The larger economies in the sample (i.e., the US, the UK) drive the sharp fall in real GDP growth producing the ‘global’ financial crisis label. Third, despite the adoption of various monetary policy regimes, ranging from the Gold standard of the 19th and early 20th centuries, the Bretton Woods pegged regime of the post-World War II period, through to the adoption of inflation control policies, including the adoption of explicit inflation targets in four of the countries in our sample beginning in the 1990s, financial crises do still recur.¹⁵ The bottom line is that there is considerable heterogeneity in both the timing, form, and international scope of financial crises.

Next, we turn to the inflation record. The combination of more activist and interventionist fiscal and monetary policies together with the search for an anchor for monetary policy after World War II eventually shifted central bank policies in the direction of inflation control. Inflation rates became low and stable once the Bretton Woods era was fully in place at the end of the 1950s but, by the mid 1960s, inflation began to ratchet up as central banks both accommodated expansionary fiscal policy and manipulated the Phillips curve trade-off to maintain full employment (Bordo and Orphanides 2013). The oil price shocks of the 1970s were both an endogenous response to the Great Inflation and an exacerbating factor. In the end the Great Inflation was brought under control by the tight monetary policy strategies of Paul Volcker in the US beginning in 1979 and similar policies adopted in the UK and Canada. In the 1970s and 80s, through fits and starts, policy makers tried to control inflation through limits to exchange rate movements and the targeting of money growth, but both approaches were met with limited success (e.g., see Bernanke and Mishkin (1992)). By the early 1990s, the desirability of price stability, such as, for example, via targeting inflation was thought to be the best way to anchor inflation expectations so long, of course, as the targets were credible. Hence, the drive to enhance central bank transparency together with an increase in accountability.¹⁶

¹⁵ The gold standard is generally dated as being in place between the early 1800s until shortly before World War II (e.g., see Bordo and Schwartz (1984), and Bordo and Kydland (1990)). The same is true of the Bretton Woods period. It is generally dated as beginning in the early 1950s until the U.S. suspended the gold-dollar link in 1972. Similarly, the four economies that adopted formal inflation targets (i.e., Canada (1991), the U.K. (1992), Norway (2001), and Sweden (1993)) introduced them between the early 1990s and 2000s.

¹⁶ Another important contributor to this outcome was greater central bank autonomy. Although there is a consensus that improvements in inflation control were facilitated by more independent central banks this relationship remains somewhat controversial. See, for example, Cukierman (2008), Siklos (2008), Cargill (2014) and Parkin (2014).

The combination of these developments led to lower and more stable inflation rates than at almost any other time in history (Bordo and Schwartz 1999, Benati and Goodhart 2010). While, during the heyday of the Gold Standard in the late 19th and early 20th centuries, median inflation rates were low by historical standards they were volatile and the Gold Standard comparison is not helpful in this case because monetary policy was passive during this regime unlike the activist monetary policy of the most recent decades.

b. Central Banks and Financial Stability

No common understanding about how to define financial instability exists. Hence, it becomes difficult to design effective policies to counteract financial instability when there is no agreement about when an economy reaches such a state. Typically, financial stability refers to policies intended to build and maintain ‘confidence in the financial system’, improve a country’s ‘resilience to shocks’, prevent ‘financial disruptions’, or the rise of ‘financial imbalances’ spilling over into the real economy.¹⁷

Even if we agree on a consensus definition of financial stability, central banks themselves have acknowledged that monetary policy can come into conflict with the objective of financial stability. “On the one hand, financial system conditions can affect the effectiveness of monetary policy. On the other hand, monetary policy can contribute to the buildup of financial imbalances, thus magnifying the economic consequences of future adverse shocks and increasing the probability and severity of future crises.” (Bank of Canada (2018))

It is also not entirely correct to argue that central banks were deaf to concerns about financial stability. However, in recent decades, their mandate increasingly centred on price stability. There was also hope that low and stable inflation rates would create an environment that ensures financial stability even if proponents of such a view did not explicitly view this link as causal. Siklos (2002, Table 3.6), written several years before the GFC, suggests that financial stability concerns led to changes in central banks statutes in several advanced economies during the 1990s, including a majority of the ten economies considered in this study.¹⁸ There would be more changes, of course, following the GFC of 2008-9. Nevertheless, it is instructive to consider the nature of the changes in the responsibilities of the central banks over time. The changes made in the 1990s were, for the most part, a response to the growing speed with which financial transactions were being carried out both domestically and around the globe. As a result, concerns were raised about the smooth functioning of payments systems and the threat this might pose in the case of a breakdown in the ability (and trust) of counterparties to clear transactions (e.g., see Friedman (1999), Goodhart (2000)).

¹⁷ Siklos (2017, Table 6.2) provides a long list of language introduced by several central banks around the world since the GFC.

¹⁸ The only exceptions were the U.S., Switzerland, and Norway. By the late 1990s the European Central Bank came into existence and replaced many, though not all, of the functions, with financial stability implications, in Italy, Germany, and France. Indeed, this was one of the reasons given for the severity of the GFC and policy makers’ slow response. See James (2012), Brunnermeier, James, and Landau (2016), and Mody (2018).

Such worries eventually passed, but the appropriate responsibility for managing risks was left unresolved. A former central banker would later observe that, on the eve of the GFC, the problem was that “...no single body was given both the resources to monitor the ebb and flow of risks within the financial system as a whole and the responsibility to deliver on that mandate.” (Barwell 2013, pg. 12). Beyond negligence of overall levels of risk in the financial system, the quote is consistent with the view that the central bank should be primarily responsible for this task, in part because it is already the lender of last resort.¹⁹

The foregoing view is subject to a variety of criticisms. First, there is a potential conflict of interest between an institution that is responsible for mitigating the economic consequences of a financial crisis while simultaneously holding power as the lender of last resort. Indeed, central banks such as the US Federal Reserve, accused of permitting lax lending practices were then quick to bailout parts of the financial system once it became clear that a crisis was underway.²⁰ The so-called ‘moral hazard’ argument can, at least in theory, be overcome if effective governance arrangements are in place and function as designed. ‘Best laid plans’ are not a guarantee that the ‘Chinese wall’, that is, a barrier between the financial stability and monetary policy responsibilities of a central bank, will not be breached in a time of crisis leading to a bailout. Indeed, the emergence and growth of the ‘shadow’ banking sector is one reason that policy makers are often unable or unwilling to commit to limiting their intervention within some arbitrarily ring-fence that defines the financial system.²¹ Second, it remains unclear what the risks to monetary policy, and inflation, are when the risks to financial stability change over time. Indeed, in recent years, a debate has emerged between those who favour ‘leaning against the wind’ while others argue that other instruments can be used to dampen excessive financial imbalances, for example, via the application of ‘macroprudential’ policy instruments.²² The debate remains largely theoretical as there is insufficient historical data to assess which position delivers the best economic results (e.g., see Svensson (2018), and Filardo and Rungcharoenkitkul (2016)).

¹⁹ Barwell is primarily inspired by his experience in the U.K. where responsibility for financial stability was eventually given to a separate agency, the Financial Stability Agency (FSA), from 2001 to 2013. One of culprits in the 2008-9 financial crisis was the failure of the FSA to adequately coordinate with the Bank of England. But this is an indictment of how these institutions performed and not an argument for housing responsibility for financial stability primarily, if not solely, with the central bank.

²⁰ A consequence was that new legislation (the Dodd-Frank Act of 2010) restricts the power and ability of the Fed to intervene in the event of a future financial crisis.

²¹ In many instances existing regulatory frameworks, because they tend to be backward-looking, cannot anticipate the limits to the intervention of any legal authority. The U.S. Fed’s intervention with AIG in 2018 represents one such example. See, for example, Bernanke (2015).

²² The term macroprudential refers to economy-wide threats to financial stability as distinct from microprudential concerns that involve the regulation and supervision of individual financial institutions. The literature that has since emerged is split about the ability of so-called macroprudential instruments to substitute for what would otherwise necessitate, say, a tightening of the stance of monetary policy. See, for example, Lombardi and Siklos (2016), and references therein. The issue is not whether there is a place for macroprudential instruments but how much responsibility a central bank ought to shoulder in implementing these as well as their effectiveness. These considerations would take us far afield and hence are not discussed further.

Even if policy makers can fine-tune the choice between leaning against the wind and some alternative response, there remains an important gulf between how monetary policy and financial stability objectives operate. Monetary policy's success in recent decades is due, in no small part, to a critical forward-looking component. In contrast, financial stability remains largely backward-looking since, as the top portion of Figure 2 suggests, bouts of instability and financial crises erupt at irregular moments in time and spread unevenly among the AE.

If, in common with other central banks, the tension between inflation control and financial stability is unclear, institutions whose core currency is to seek and preserve credibility will face challenges achieving so. As Bordo and Siklos (2016, 2017, 2018) have argued, the long-run historical experience, as well as more recent events, clearly demonstrates that central banks with credibility were better able to weather the consequences for inflation of the fallout from the GFC. Arguably, the narrow mandate of achieving price stability generated forces to enhance both the accountability and transparency of these central banks. While a little luck also helped, in the form of years of benign economic shocks soon after inflation objectives were introduced, it is also clear that central banks sought to enhance their reputation by relying and, by and large, meeting the targets to improve their reputation and enhance their ability to ensure that inflation expectations were better anchored to the mandate they were given by government.²³ This creates resilience against the loss of reputation in the event targets cannot be achieved temporarily.

Four of the ten economies in our sample formally target inflation around 2% (IT; Canada, the U.K., Norway, and Sweden). The remaining economies, while formally supportive of the goal of price stability (also around 2%), are not considered among the inflation targeting group of countries (non-IT).²⁴ As seen from Figure 3, the range of inflation rates in the IT group have consistently remained relatively close to the 2% objective since the early 1990s. In contrast, the non-IT economies have, more recently, struggled more with inflation rates well below the 2% level since the onset of the GFC. Note that two of the IT economies in our sample (i.e., Norway and Sweden) did experience a financial crisis (twin banking and currency crises) in the early 1990s thereby illustrating the point made earlier that CPI inflation is not a financial phenomenon.²⁵

Beyond the considerations discussed above there is another complication stemming from the tension between the inflation control and financial stability objectives raised in the Bank of Canada's medium-term research program mentioned in the Introduction. If there exists a financial cycle (e.g., Borio (2014)) whose amplitude and duration differs from the well-known business cycle but has some predictive ability to forecast it (Mian and Sufi (2018); Borio, Drehmann, and Xia (2018)), the balancing act of policies meant to avoid the build-up of financial

²³ Good luck, in the form an era of small shocks. aided policy makers to maintain low and stable inflation also plays a significant role. See Stock and Watson (2003).

²⁴ Japan is a grey area and is left out of the IT group of countries since the adoption of a 2% target in 2013 and is aspirational rather than formal. Indeed, reducing the 2% goal has, since April 2013, been delayed at least twice.

²⁵ It is, however, also worth noting that a convergence in inflation rates in the AE shown, emerges by the end of 2018.

imbalances against the desire to use monetary policy to ensure price stability becomes even more demanding.

Asking a single institution to guarantee both financial stability as well as meeting an inflation target may, at least given what we know to date, be unrealistic and, as noted already, increases the likelihood of a future loss of credibility and reputation.²⁶ Indeed, central banks that became used to using a single instrument to control inflation, namely a policy rate, point out that this strategy is unable to satisfy two different objectives.²⁷ And the addition of other instruments, namely using the central bank's balance sheet, while undoubtedly one of the success stories in some monetary authorities' belated response to the GFC, has also created considerable unease and may be difficult to use again with the same force and scope. The reasons are straightforward: so-called Quantitative Easing (QE) policies have, at times, been likened to monetary policy spilling over into the realm of fiscal policy or direct intervention in the private financial sector.²⁸ Large scale purchases of government bonds, especially of the long-term variety whose price may change and impact the financial position of the central bank, favourable lending terms to the private sector, the purchase of mortgage-related debt, and the purchase of private sector shares, are just some examples of how a central bank can play a role in fiscal policy and influence the functioning of the private sector. These kinds of activities are viewed as sitting uncomfortably with the traditional mandate of central banking.²⁹

There are skeptics about the economic benefits of QE type policies. For example, the scale of interventions has been extraordinary, amounting to trillions of US dollars in some economies, and their scope is also unprecedented. This has raised concerns about inducing distortions in financial markets (e.g. Borio and Disyatat (2010)). Other concerns are that low policy interest rates and additional stimulus provided by QE have exacerbated international spillover effects (e.g. Rajan (2014)). As a result, central banks have been accused of risking the loss of their hard-earned credibility in managing inflation expectations (e.g. Taylor, 2014) not to mention moving away from rules-based monetary policy of the kind promoted by the eponymous Taylor rule toward considerable discretion via reliance on a large balance sheet.³⁰

²⁶ Note that we are not suggesting that the two objectives be met simultaneously. This does not prevent politicians or the public from expecting that the two should always hold raising a difficult communication problem which is outside the scope of this paper. See, however, Born, Ehrmann, and Fratzscher (2013) who delve into the issue.

²⁷ This is known in economics as Tinbergen's rule named after the first Nobel Laureate in economics who demonstrated that policy makers require at least as many instruments as there are targets.

²⁸ Once again there is insufficient space to analyze the costs and benefits of QE. Canada had the good fortune of not having to cross that bridge yet although the GFC did prompt the central bank to prepare for such an eventuality (e.g., negative policy rates) if required in future. For a review of the international record of QE to date see, for example, Lombardi, Siklos, and St. Amand (2018).

²⁹ We are not suggesting that such interventions should never take place. Instead, the conditions under which such activities take place should make it clear that they are exceptional but not the norm. Also helpful in this connection are agreements between central banks and government that indemnify them against balance sheet losses.

³⁰ Two other issues are also worth mentioning as potential fallouts from QE style policies. First, as the separation between fiscal and monetary policies become more blurred there is a greater threat of loss of central bank autonomy.

What we have shown from this historical analysis is that there are at least three critical challenges for central banks that have responsibilities for maintaining financial stability: crises are episodic events often with unique characteristics that do not lend themselves to simple rules preventing their recurrence; unless governance and the scope of responsibilities of the central bank that is burdened with the task of preventing financial crises are clearly thought through, the public's trust in the monetary authority is likely to be affected; and, finally, there remains considerable resistance to interventions by central banks in private financial markets on the scale experienced during the 2008-9 global and the Eurozone sovereign debt financial crises.

c. The Financial Cycle and the Business Cycle: Two Peas in a Pod?

One way of illustrating the challenge of adding an explicit financial stability mandate is to empirically contrast business and financial cycles. Business cycles are the metric used by central banks, for example, to gauge the appropriateness of the stance of monetary policy and whether there is a need to tighten or loosen monetary policy to ensure that inflation is kept under control while preventing large swings in output and inflation. In contrast, the financial cycle describes "...self-reinforcing interactions between ..., risk-taking, and financing constraints" (Borio (2014)).

The impact of these "interactions" is primarily reflected in financial asset prices and credit growth. In principle there is nothing to suggest that the duration or amplitude of these cycles differ yet the proponents of financial cycles have argued, primarily through empirical evidence, that financial cycles are relatively longer in duration. Even if this is the case, and the evidence is not yet conclusive, just as business cycles are not time invariant neither are financial cycles. This alone greatly complicates the task of the central bank.³¹

Consider first the top portion of Figure 4. Two sets of bars are shown. The 'C.D. Howe' bars show the peak to troughs during a business cycle, the usual definition of a recession, as defined by Cross and Bergevin (CDHI; 2012). The authors are inspired by the well-known U.S. chronology of the National Bureau of Economic Research (NBER) determined by the judgment of several individuals on a panel.³²

Second, devices such as forward guidance represent attempts to introduce considerably more discretion in monetary policy. Indeed, it is in part for this reason that, Stephen Poloz, the Governor of the BoC came to view forward guidance as a policy to be used only in crisis conditions (Poloz 2015).

³¹ Bekiros et. al. (2019) dispute the usual characterizations of financial cycles and business cycles with some long-run empirical evidence for the U.S. They also find that financial cycles change over time so that the usual claims that macro-prudential and monetary policy can easily complement each other is in doubt. Also see Lombardi and Siklos (2016).

³² "A recession is a significant decline in economic activity spread across the economy, lasting more than a few months, normally visible in production, employment, real income, and other indicators" (NBER 2008, <https://www.nber.org/cycles/dec2008.html>). Cross and Bergevin (2012) identify the quarter and year recession begin and end. Here we rely on annual data. The C.D. Howe Institute also has a Business Cycle Council that reports on the stage of the business cycle in Canada.

A well-known approach that seeks to mirror judgment in the dating of business cycles with evidence based on numerical economic performance is a technique originally due to Bry and Boschan ((1971) and revived by Harding and Pagan (2002)). Essentially, their technique identifies turning points in the data, such as real GDP, which are then quantified. This approach has the virtue of relying on observable economic performance while closely mimicking the NBER's chronology.³³ We apply this approach to several macroeconomic indicators. They are: annual retail sales data, real GDP growth rates, and an employment index since the early 1930s for Canada. All of these provide useful signals of the overall state of the Canadian economy. Next, we combine the estimates by asking how often these indicators likely send the same signal about overall economic conditions, that is, an indicator of business cycle synchronicity.³⁴ If the CDHI chronology is adopted then our combined indicator misses the 1947 and 1951 recessions while the same ratio identifies a recession in 1977 whereas the CDHI does not. Otherwise, both the judgmental and quantitative indicators match quite well.

Next, we turn our attention to constructing a synchronicity indicator for variables that reflect financial conditions. They are: bank loans, public debt as a percent of GDP, house prices, the spread between short-term and long-term government debt also called the term spread, and equity prices. Loans, house prices, and equity prices are deflated by consumer prices and so are expressed in real terms.

The results are shown in the bottom portion of Figure 4. Other than around the period of the Great Depression of the 1930s and again during the GFC of 2008-9 there is almost no overlap between the two cycles. There is only a small overlap during the early 1970s that saw the two oil price shocks and the return to floating exchange rates as the Bretton Woods era ended. It is also clear that the frequency and timing of business and financial cycles differ.³⁵ Even if policy makers agree on how and when to use a monetary policy instrument to control inflation and mitigate business cycle contractions, central banks also charged with a financial stability goal must simultaneously weigh using macroprudential instruments to tame the financial cycle. Given the differences in the behaviour of business and financial cycles central banks must decide

³³ The basic notion is to create an algorithm that minimizes the role of individual judgment when selecting turning points in economic activity that give rise to business (or financial) cycles. The closeness of the Bry-Boschan and NBER chronologies is considered a strength of the procedure and helps explain its wide applicability in dating business cycles.

³⁴ These estimates are combined using a 'wiring ratio', defined as the fraction of times pairs of the chronologies generated signal a downturn. Let S_{it} represent the incidence of signals of the number of times an indicator indicates a recession. When a recession is identified, $S=1$. If n represents the total number of indicators (three in this case, or four if we include Cross and Bergevin's chronology) and we define $r_t = \sum_{i=1}^n S_{it}/n$ and $\eta_t = \sum_{i=1}^n S_{it}$ then the wiring ratio is defined as $w_t = \frac{\eta_t(\eta_t-1)}{n(n-1)}$. Hence, for example, if there are at most 12 pairs of indicators and half of them agree there is a downturn then $w=0.50$. If all recession indicators point in the same direction, then $w=1$. Berge (2012), and Jordà, Schularick and Taylor (2011) also use the wiring ratio to combine recession indicators for the U.S., and financial crises across countries, respectively.

³⁵ For example, Lee-Poy (2018), for a much shorter sample, who reports for Canadian data that the duration of financial cycles is twice as long as the business cycle.

whether and when policy rate changes represent too blunt an instrument to deal with a threat to financial stability. This is a complex task and, as previously discussed, the debate on this issue remains unsettled.³⁶

The evidence presented is largely descriptive. We next provide more formal, though still illustrative, evidence in two steps. First, we combine the available financial variables into a smaller set of indicators, called factors, not only to simplify the discussion but because the supremacy of an aggregate indicator of credit to represent financial conditions has not definitively been established.³⁷ Several central banks, including the Bank of Canada, routinely perform similar calculations to gauge the level of pressure on the financial system.³⁸

Based on our estimates it appears that two factors drive the set of variables used to summarize financial conditions in Canada. The first set of factors is dominated by real house prices, while the second factor is primarily driven by the term spread, public debt to GDP, and stock returns.³⁹ Hence, we will refer to the first factor as the property factor. The second factor, largely driven by interest rates and government debt, is accordingly referred to as the ‘sovereign’ factor. The resulting series are displayed in Figure 5 together with the CDHI business cycle chronology indicated by vertical lines or shaded areas. Positive values for the property factor can be interpreted as akin to increases in real housing prices while negative values indicate a fall. Similarly, a rise in the sovereign factor signal improvements in financial conditions and the opposite when the same factor experiences a decline.

We observe that, on a few occasions, financial stress originating from the spread and debt are associated with some of the recessions (4 out of 10 recessions shown), while only twice do property prices developments coincide with a recession. Indeed, in one case (1975), property prices are rising pre-recession while a price fall essentially coincides with the 1981-82 recession. Note that the 2008-9 financial crisis is not accompanied by deteriorating housing prices or of the

³⁶ Indeed, this dilemma is referred to as the risk-taking channel of monetary policy (Adrian, Estrella, Shin (2019)) because the maintenance of, say, ultra-low interest rates to support economic activity leads to a build-up of financial imbalances that are offset via the application of macroprudential instruments.

³⁷ The combinations are generated via a principal component analysis (PCA) applied to five time series. They are: real loans, public debt to GDP, real house prices, the term spread (long less short-term interest rates on government bonds) and a real stock price index. All series, except the spread and public debt to GDP, are in rates of change form. The change of the spread in the level of public debt to GDP are used. In principle, if there are n series there are potentially $n-1$ factors. The chief benefit of principal component analysis is to reduce the number of factors to a small number that can be interpreted in terms of the variables that drive each factor. The estimated factor is said to proxy financial conditions.

³⁸ The indicators in question are typically called financial, credit conditions or financial stress indexes. See <https://credit.bankofcanada.ca/financialindicators> for an indication of the series that are candidates for inclusion in such an index in Canada. In what follows we rely on indicators available over a long sample. In practice, other series, available more recently, could also be added.

³⁹ In more technical terms, the variables that combine most strongly to create the factors are referred as the loadings. Loadings indicate, in effect, the relative importance of the variables in question, that is, their relative weight in driving factor variation.

sovereign factor. Once again, the results illustrate the challenge of simultaneously managing business and financial cycles.

Next, we ask: is there a statistical relationship between our indicators of financial conditions and business cycle activity in Canada? To obtain an answer, we regress an indicator of medium-term fluctuations in real GDP, the generally accepted proxy for the state of the business cycle, against the two financial factors described above. Table 1 provides the results.⁴⁰ Both factors are statistically significant, but the estimated coefficients are economically small. A rise in the property factor has a modest negative impact on real GDP two years into the future while the same rise in the sovereign factor has a positive influence.⁴¹ When both financial factors are combined their total impact on medium-term real GDP is found not to be statistically different from zero (not shown).

We perform one final test. Assume that real GDP growth, the property and sovereign factors are jointly determined.⁴² Next, we ask how a shock, that is, an unexpected change in any of the three variables impacts the other variables considered. The results are shown in Figure 6.⁴³ A positive sovereign factor shock, signalling a temporary improvement in fiscal conditions, raises real GDP growth for three years. More precisely, a 1% sovereign shock raises real GDP growth by less than 1% at its peak (around 0.8%). An increase in the sovereign factor also increases property prices by a small amount, roughly 0.2% after two years (bottom left plot).⁴⁴ These results are expected since both shocks are consistent with improved economic conditions. There are, however, a couple of offsetting effects. Rising property prices negatively impact real GDP growth after 3 and 4 years a result also reported for the U.S. (e.g., Case, Quigley, and Shiller

⁴⁰ We were careful to retain only the business cycle and medium-term variations in real GDP. This is done by computing 2 year centered moving averages for the logarithm of real GDP and then using the Bry-Boschan algorithm referred to above to identify turning points and, therefore, identify peaks and troughs in business cycle activity. The same procedure is used for the financial variables except that a 5-year centered moving average is used (the 5-year moving average translates into a 10 year horizon deemed to approximate the length of a financial cycle in Canada). Burnside, Eichenbaum, and Rebelo (2016) also use the centered moving average approach to identify medium-term fluctuations in housing prices.

⁴¹ The overall conclusions are unchanged if we look at the impact of financial factors on real GDP one or three years lagged. However, both factors are only statistically significant when they are lagged two years.

⁴² In the language of economics, the three variables are endogenously determined.

⁴³ Since there are three variables a total of 9 permutations of shocks on the variables in the model are possible. We omit the impact of own shocks, that is, the impact of past shocks of each variable on itself, as well as the impact of real economic shocks on financial factors. The model is a vector autoregression (VAR) consisting of real GDP growth and the two factors. Versions which rely on only the medium-term fluctuations in real GDP, alternative estimates of the financial factors, and ones that add a dummy variable for the sum of banking, currency, inflation and sovereign debt crises produced similar conclusions (not shown). The VAR is estimated with two lags and a constant. Adding dummies for the years when there is a financial crisis (banking, currency, inflation, and debt) does not impact the results. Clearly, the model estimated here is simplistic and merely illustrates the interactions between the real economy and the financial sector.

⁴⁴ The cumulative impact of the sovereign factor on real GDP growth is about 1% after ten years while the cumulative effect of sovereign shocks on property prices is less than 1% (about 0.8%) over the same horizon.

(2006)). Finally, rising property prices depresses the sovereign factor, that is, produces a deterioration in financial conditions.

To conclude, two results stand out. Overall, links between financial variables that give rise to a financial cycle and the business cycle are weak (also see Bordo 2018).⁴⁵ Of course, an exercise such as the one conducted above is, arguably, incomplete as it ignores other factors over the past several decades that might play a role in impacting economic and financial performance. But part of the difficulty with trying to understand how the financial system interacts with the real economy is that, ideally, we require a long span of data to enable successful policies to be developed. Yet, history and the evidence presented above also suggest that while the era of the Great Depression followed by the most recent GFC stand out, these events should not be conflated with other financial crises that are, sadly, recurring events around the globe. Stated differently, financial imbalances of the kind experienced a decade ago are rare events and do not translate into a stylized fact about all financial crises.

4. Conclusions

The BIS may have been far sighted when it warned about a possible financial crisis well before 2007.⁴⁶ Perhaps spurred on by the dot-com bubble of 2001 the BIS's 2001/2 Annual Report lamented that forecasts of economic activity "...presumes an understanding of the way in which the fortunes of the real economy affect the health of the financial system. ... The truth is that our understanding of each link is limited, and the possibility of unexpected interactions between these various forces makes our knowledge more limited still. Things could indeed turn out quite well, in a self-reinforcing way, but they could also turn out quite messily." (BIS 2002, p. 141-2). Indeed, a complete chapter in that report focuses on the channels of influence from the financial sector to the real sector. Almost two decades later it remains hard to know how to square a financial cycle with a monetary policy that aims for price stability and is more responsive to business cycles.

International regulatory schemes meant to reduce the incidence of financial crises (e.g., Basel I to III; Financial Stability Board) typically are a reaction to past financial crises. They may notionally attempt to put in place a regime that forestalls the next crisis but since these are generally unpredictable their success is doubtful. After all, the Basel I international regulatory framework of the late 1980s was succeeded by Basel II in the early 2000s which was followed by Basel III in the wake of the GFC.⁴⁷ None were able to prevent a future financial crisis. Nevertheless, to the extent that these arrangements reduced the severity of previous financial

⁴⁵ The results are even weaker if we are less generous when specifying the confidence bands shown in Figure 6.

⁴⁶ Warnings about factors that would lead to a financial crisis of some kind can, of course, be traced back earlier. (e.g., Minsky (1977), Kindleberger (1978)) while the BIS's view was no doubt also influenced by William White, Economic Adviser at the time (see White (2000, 2006), Bordo and White (2003)). Their forecasts of serious financial instability were generally wrong until the 2007-2008 crisis. Hence audiences were not be as receptive of their views then as they are today.

⁴⁷ Named after the Basel Committee on banking Supervision housed at the Bank for International Settlements in Basel, Switzerland. To be fair, Basel III has yet to be tested.

crises argues in favour of a collaborative approach across various agencies, not only central banks, in maintaining financial stability. While monetary policy became more successful by taking a forward-looking view of economic conditions as a device to manage expectations, central banks and other agencies are not yet able to do the same when it comes to predicting levels of financial stability.

The bottom line is that the BoC's mandate should not be expanded. As noted previously, our recommendation does not depart from others who previously expressed similar sentiments (Laidler 2004, Crow 2012, Thiessen and Jenkins (2012), and Longworth and Jenkins (2012)). However, we have emphasized, among other issues, the risks for the central bank being too closely involved in implementing policies that potentially violate the monetary policy principle of "doing no harm".

The Bank should remain a critical partner among others in the maintenance of financial stability. There is simply too much heterogeneity in the sources, types, and scope of past financial crises to offer any guidance about how a financial stability mandate would translate into practice. Moreover, history does not treat kindly central banks that become an arm of the fiscal authorities. Finally, a country is best prepared for a financial crisis, especially the kind that afflicted the global economy in 2008-9 when monetary, regulatory, and fiscal authorities jointly respond aggressively to looming threats and consequences of financial malfeasance. We may express the wish that 'this time is different' but we should also be skeptical in believing such sentiments.

Why should these issues concern Canada? Although a financial crisis was avoided the economic fallout from the crisis in the U.S. led to a brief but sharp downturn in the Canadian economy. Indeed, the IMF in its 2009 Article IV assessment of Canada's economy (IMF 2009), noted our country's "sound regulation and conservative banking practices" (op.cit., p. 3) but then went on to highlight the looming "strains" of household indebtedness, a point that the Bank of Canada has repeatedly raised it remains vigilant about. Hence, if our economy is to retain its enviable record of resilience to financial shocks, whether of the domestic or external varieties, revisiting the question whether the Bank's mandate ought to explicitly incorporate a financial stability goal is a pertinent one.

The Bank of Canada's mandate should not change but it should be asked to be more forward-looking about future sources of financial instability and be encouraged to highlight when necessary and possible how partner agencies can pre-empt a future crisis while striving to maintain inflation within the target range. Of course, we are not suggesting that the BoC, or any central bank for that matter, announce the next financial crisis in advance. This would be tantamount to yelling "fire" in a crowded room. Nevertheless, the Bank can be expected to warn its partners in macroeconomic and regulatory policy more forcefully of any imminent dangers to

the stability of the financial system.⁴⁸ As Karl Blessing, President of the Bundesbank during the Bretton Woods era, remarked long ago: “A central bank which never fights, which at times of economic tension never raises its voice, that central bank will be viewed with mistrust.”⁴⁹

⁴⁸ Readers might point out that several central banks, including the Bank of Canada, publish financial stability reports. Perhaps unsurprisingly some have found that these can under-emphasize financial stability risks. See, for example, Osterloo, de Haan, and Jong-A-Pin (2007), and Wilkinson, Spong, and Christensson (2010).

⁴⁹ As quoted in Marsh (1992, p. 256-7). Nevertheless, the spread of such reports suggests there is unhappiness with the status quo and that central banks require clarity if and when they are called upon to deal with the next financial crisis. It is instructive that the United States is currently undergoing a review of the financial stability role of the Federal Reserve which raises issues quite similar to the ones that will challenge policy makers in Canada (e.g., see Kasyap and Siegert 2019)/

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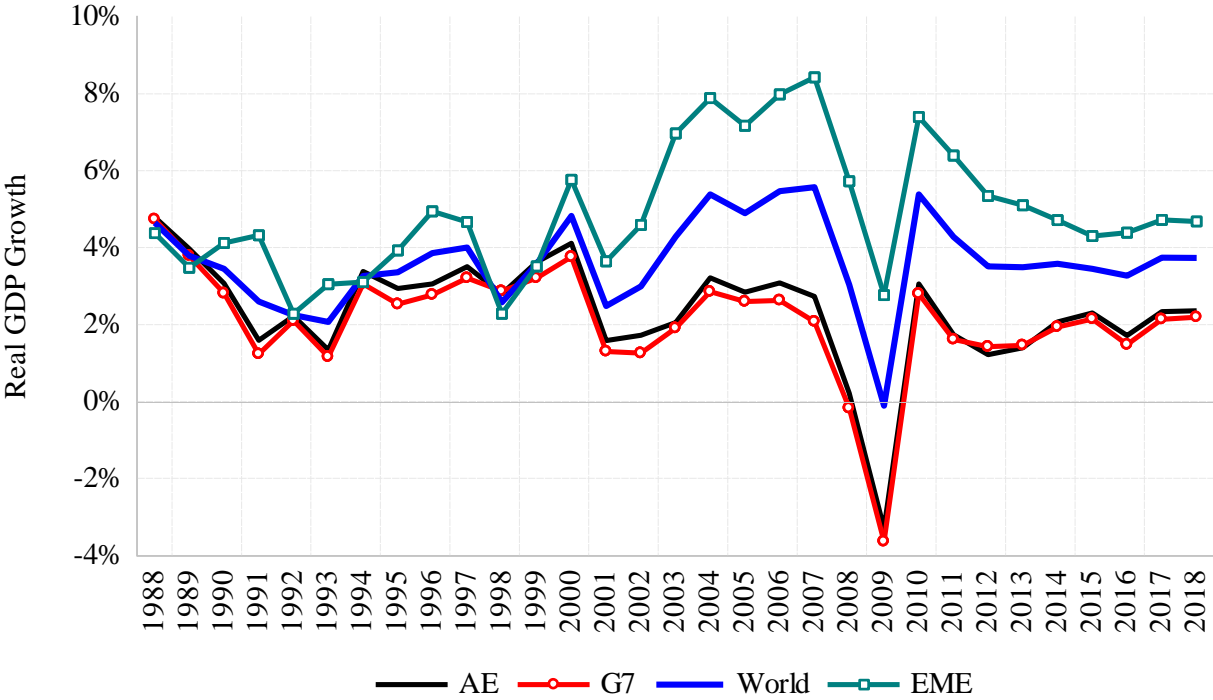
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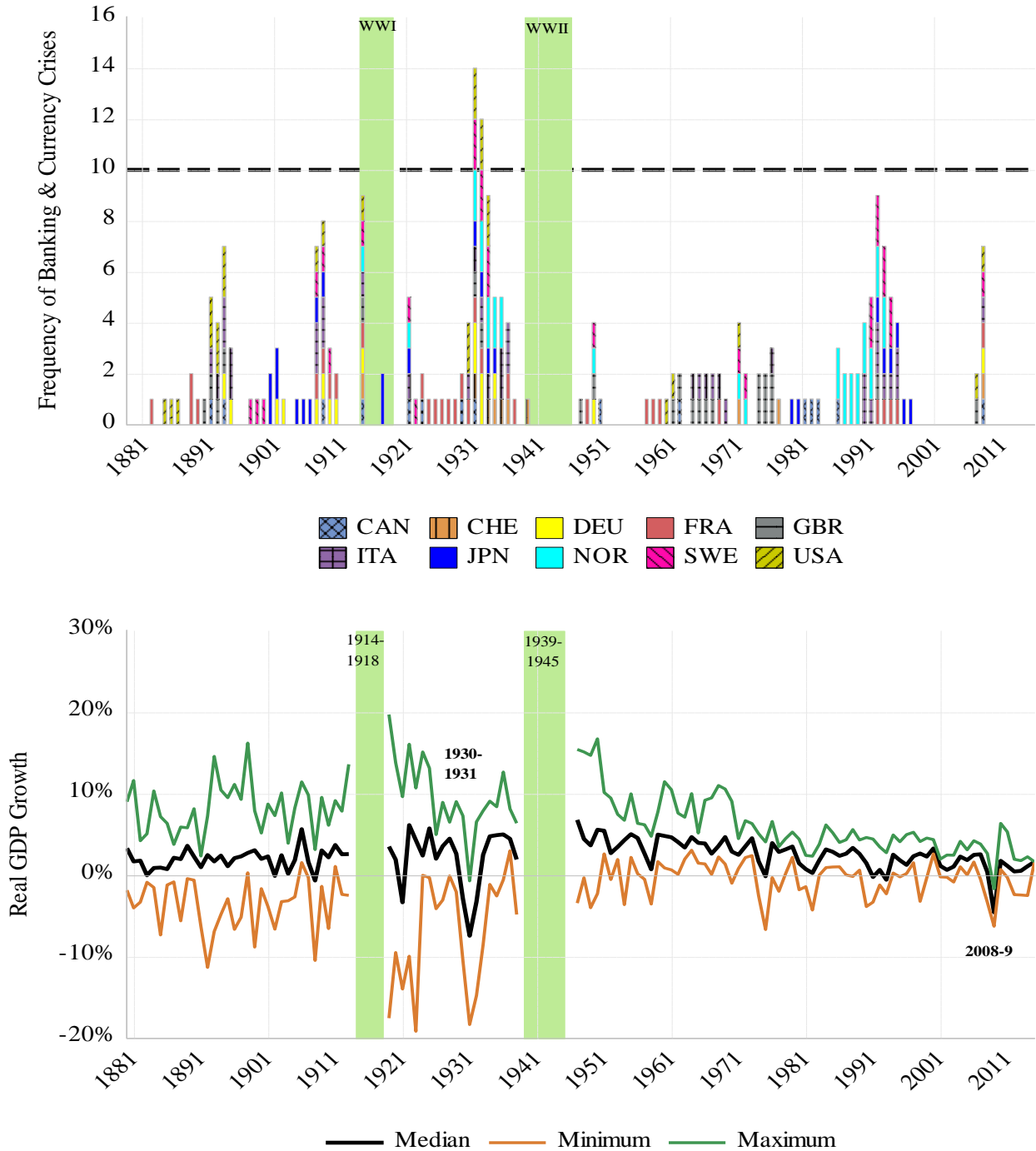
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Figure 1 Real GDP Growth Rates in Different Regions of the World



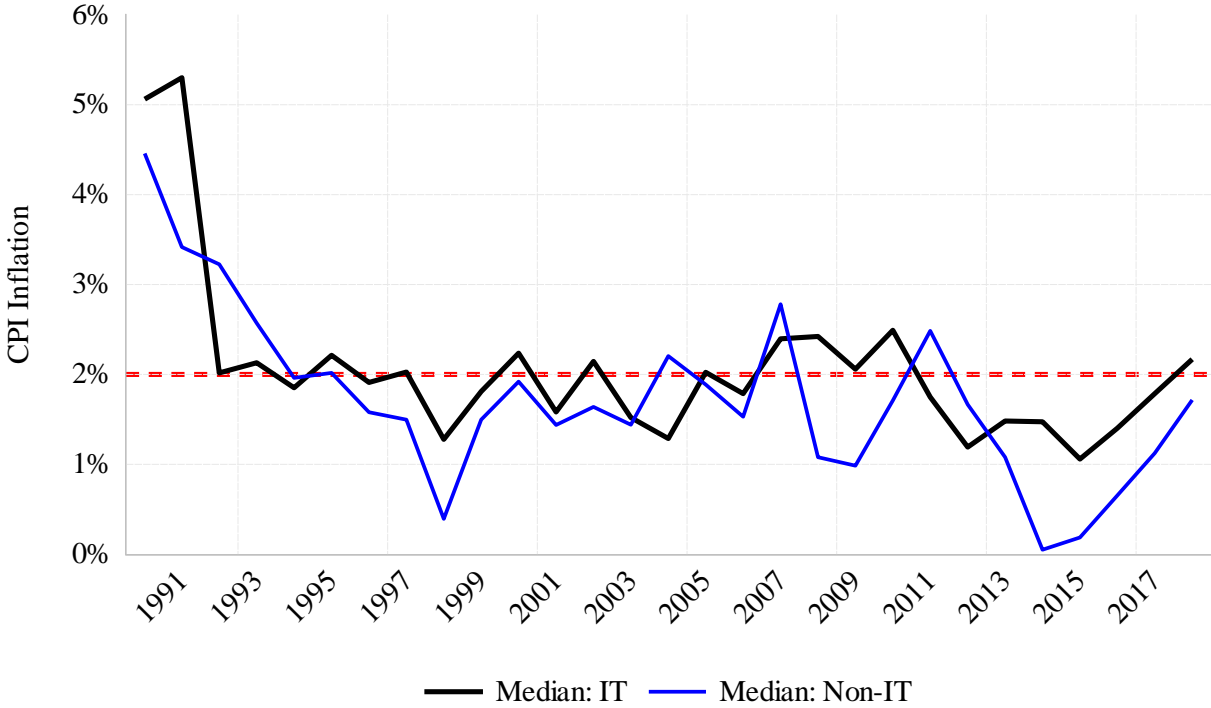
Notes: Annual data from the International Financial Statistics (Washing, D.C.: International Monetary Fund) retrieved January 2019 for the 1988-2018 period. AE are advanced economies; G7 are the Group of 7 advanced economies; EME are emerging and developing economies. Definitions follow the IMF’s World Economic Outlook database (<https://www.imf.org/external/pubs/ft/weo/2018/02/weodata/index.aspx>).

Figure 2 The Incidence of Financial Crisis and Economic Growth in 10 Advanced Economies Since 1880



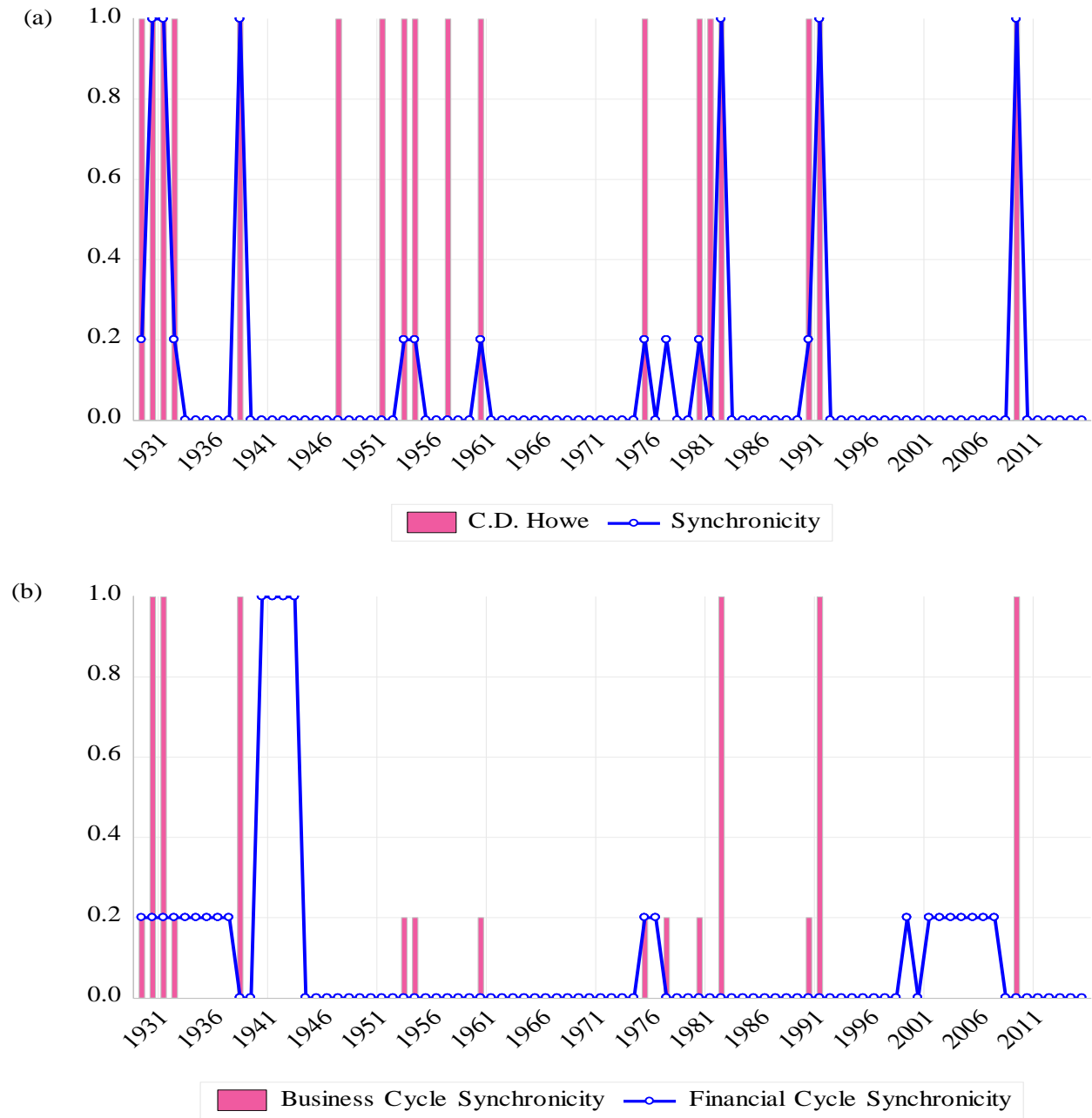
Notes: Data for the top portion of the Figure are from Bordo and Meissner (2016). The definition of a financial crisis is provided in the main body of the paper. Data for the bottom portion are from Bordo and Siklos (2016). Data are annual for the 1870-2015 period.

Figure 3 Median Inflation in Inflation and Non-Inflation Targeting Economies Since 1990



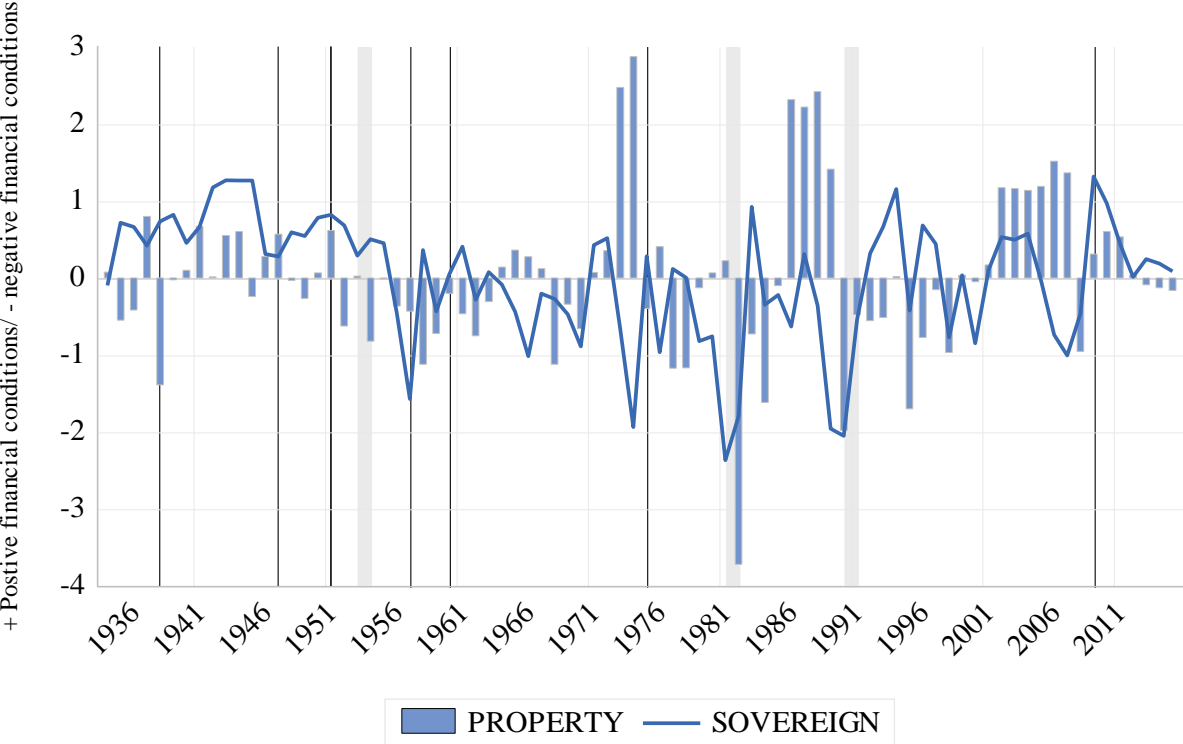
Notes: See Figure 1 for data sources and sampling frequency. IT means inflation targeting. IT economies are Canada, Norway, Sweden, and the United Kingdom. Non-IT countries are: France, Germany, Italy, Japan, Switzerland, and the United States. Data are annual for the 1990-2018 period.

Figure 4 Business and Financial Cycle Chronologies for Canada Since 1931



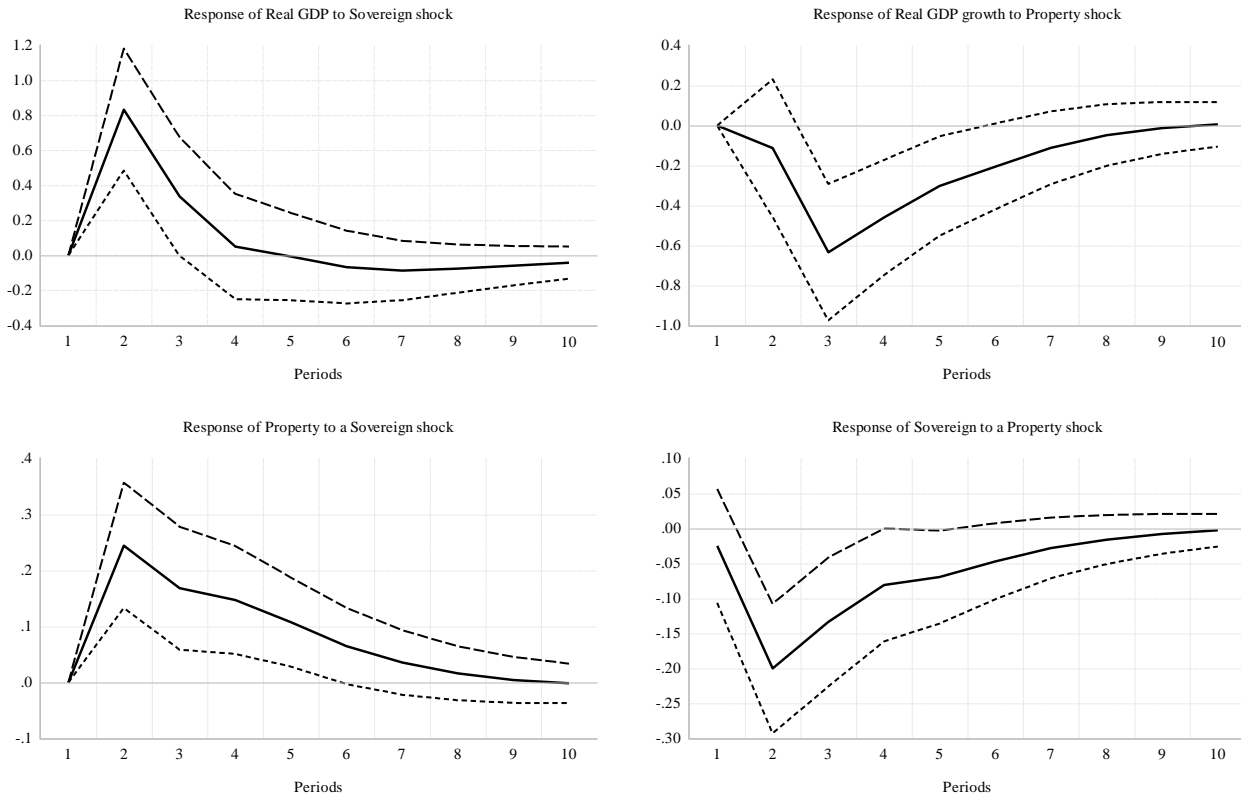
Notes: the C.D. Howe Institute business cycle chronology is due to Cross and Bergevin (2012). The formula for the wiring ratio is given in n. 32. For the business cycle the variables used consist of retail sales, employment, and real GDP. For the financial cycle, the variables are: (real) bank loans, public debt to GDP, (real) house prices, the long-short interest rate spread, and (real) equity prices. Data are for the 1929-2015 period and are annual.

Figure 5 Measuring Financial Conditions in Canada By Factor



Notes: Factor scores from a principal components analysis applied to the five financial series listed in the notes to Figure 5. Two principal components are extracted. Factor loadings and other details are available in a separate appendix on request.

Figure 6 The Impact of Two Kinds of Financial Shocks



Notes: Estimates are based on a vector autoregression of real GDP growth, the property and sovereign factors, in that order (also see notes to Figure 6). 2 lags are used. The dashed lines are the confidence intervals estimated via Monte Carlo methods based on a 1000 replications representing ± 1 standard deviation. The solid lines are the point estimates of the impulse responses to the shock shown in the heading to each figure. Each shock is 1 standard deviation or 1% in size in the variable that is being shocked.

Table 1 Financial Factors and Medium-Term Real GDP in Canada Since 1936

<i>Dependent Variable: Medium-term (log) real GDP</i>				
<i>Factors</i>	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-Statistic</i>	<i>Prob.</i>
Constant	0.025	0.003	8.839	0.000
PROPERTY (-2)	-0.005	0.003	-1.775	0.080
SOVEREIGN (-2)	0.006	0.003	1.887	0.063
R-squared	0.081			
Adjusted R-squared	0.056			
F-statistic	3.298			
Prob(F-statistic)	0.042			

Notes: Ordinary least squares estimate of the medium-term portion of the logarithm of real GDP (see main body of the text for a description) on the estimated factors (see notes to Figure 5) lagged two periods. Data are annual for the period 1936-2013.

APPENDIX
THE BANK OF CANADA AND FINANCIAL STABILITY

Unless otherwise indicated all annual data are from the Jordà-Schularick-Taylor macrodata base updated until 2015. Some of the data were originally constructed from the work of Bordo and others cited in the main body of the paper and used in Bordo and Siklos (2016, 2018).⁵⁰

⁵⁰ At the time of writing the microhistory data base (<http://www.macrohistory.net/data/>) was updated to 2016 but we rely on the data set until 2015 used in Bordo and Siklos (2016, 2018). Other data (annual) for more recent samples (see Figures 1 and 4) are from International Financial Statistics (International Monetary Fund), <http://data.imf.org/?sk=4C514D48-B6BA-49ED-8AB9-52B0C1A0179B&sId=1390030341854>, downloaded in December 2018 and January 2019.

Table A1 – Business Cycle Chronologies: Canada

Sources				
Cross and Bergevin (2012) ¹	Bry-Boschan ²	Centered Mov.Avg. ³	Bry-Boschan ⁴	
			Employment Index	Retail Sales
Apr. 1929 - Feb. 1933 1929-1932	1929-1933	1930-1933		1930-1933
Nov. 1937 – Jun. 1938 1938			1938-1939	1938-1939
Aug. 1947 – Mar 1948 1947	1945-1946 1948-1949	1945-1946	1949	
Apr. 1951 – Dec. 1951 1951				
Jul. 1953 – Jul. 1954 1953-1954	1954		1953-1954	
Mar. 1957 – Jan. 1958 1957	1957-1958	1958	1958	
Mar. 1960 – Mar. 1961 1960			1960-1961 1968	1961
Dec. 1974 – Mar. 1975 1975			1975 1977	1977
Jan. 1980 – Jun. 1980 1980				1980
Jun. 1981 – Oct. 1982 1981-1982	1982	1981-1982	1982-1983	1982
Mar. 1990 – Apr. 1992 1990-91	1990-1992	1990-1992	1991-1992	1989-1991
Oct. 2008 – May 2009 2009	2009	2009	2009	2009

Notes: Sample is 1929 to 2015 unless indicated otherwise below. (1) the top row is the chronology due to Cross and Bergevin (CB; 2012). The bottom row is the annual equivalent plotted in figures in the main body of the paper. When the CB chronology dates the start of a recession more than six months before the end of the year the annual version of the chronology assumes the recession of the for the full year. Similarly, when a recession ends before July the recession is deemed to have ended the preceding year. (2) Chronology is dated according to Harding and Pagan (2002) relying on the Bry and Boschan (1971) algorithm applied to the log of real GDP. A recession requires a minimum of 1 year in length with a minimum business cycle of a length of 2 years. (3) uses a 2-year centered moving average applied to the log of real GDP following the methodology of Burnside, Eichenbaum and Rebelo (2016). (4) The BB algorithm is applied to an employment index and the log of retail sales using the same definition as is used for the log of real GDP. For the employment index, employment index by industry, annual averages 1921-1975 from Historical Statistics of Canada (<https://www150.statcan.gc.ca/n1/pub/11-516-x/11-516-x1983001-eng.htm>), Table D528-D539 updated from Statistics Canada to 1983 (ceases publication). Spliced thereafter with an index of employed workers from Statistics Canada (1961=100). Retail sales by kind of business 1930-1975, Tables V1-V24, from Historical Statistics of Canada, spliced with annualized Total Retail Trade (millions of dollars) from FRED (<https://fred.stlouisfed.org/>).

Table A2 Principal Component Analysis for Financial Time Series

Variable ⁴	Loadings ¹		Explained ²	Communality ³
	Property	Sovereign		
Loans	0.10	0.04	F1: 0.56	0.01
Public Debt	0.08	-0.31	F2: 0.44	0.14
House Prices	0.99	0.04		0.68
Spread	0.08	0.79		0.49
Stock Prices	-0.10	0.32		0.16

Notes: sample is 1929-2015. (1) rotated factor loadings; (2) proportion of total variation explained by factor 1 (F1: Property), and factor 2 (Sovereign); (3) proportion of variance that each variable has in common with the remaining variables; (4) loans, house prices, and stock prices are deflated by a CPI; public debt is a percent of GDP, and term spread (long term less short-term government debt).

Table A3 Banking and Currency Crises in Canada from Bordo and Meissner (2016)

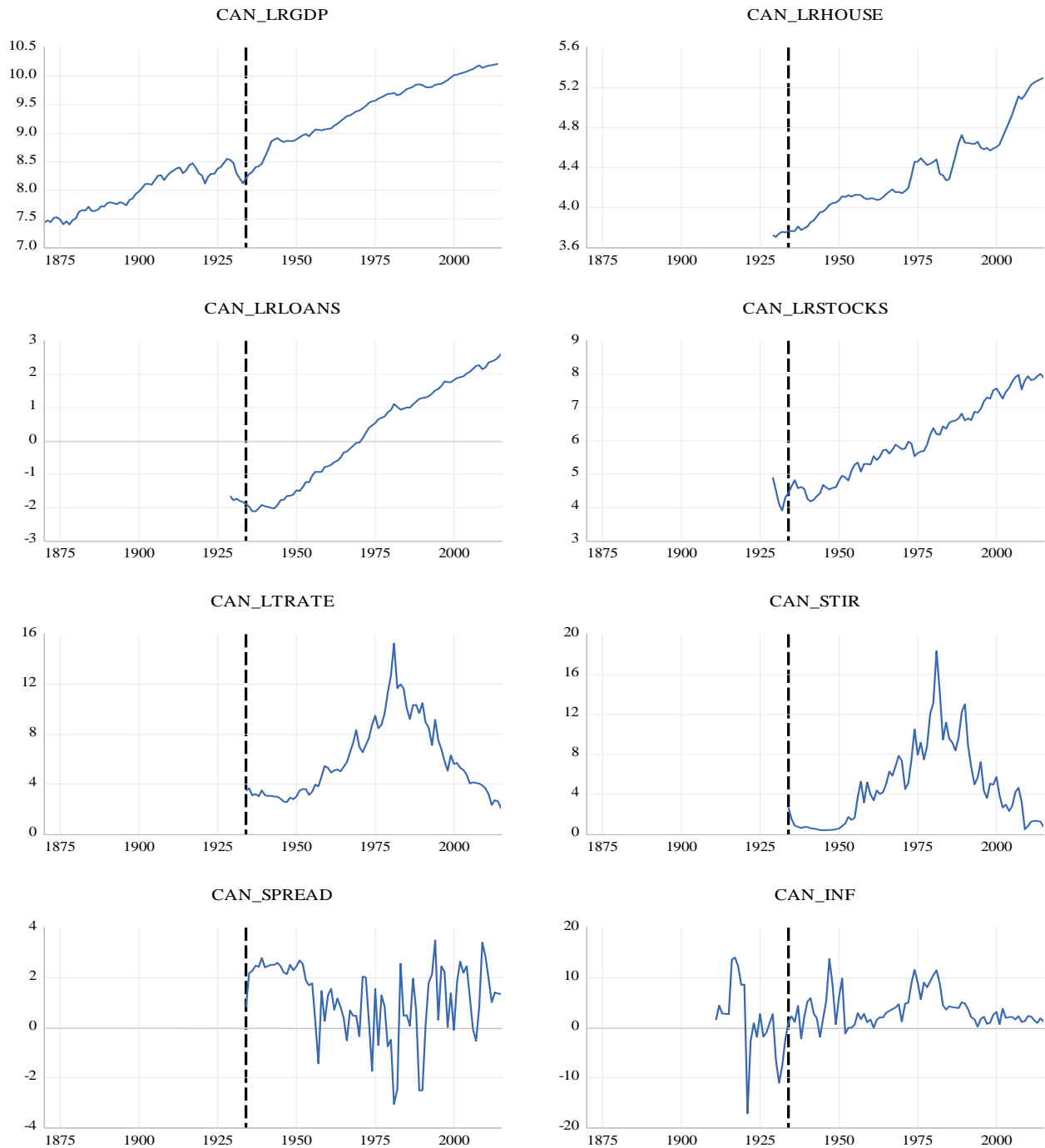
	BM_CAN_BC	BM_CAN_CC
1870	0	0
1871	0	0
1872	0	0
1873	0	0
1874	0	0
1875	0	0
1876	0	0
1877	0	0
1878	0	0
1879	0	0
1880	0	0
1881	0	0
1882	0	0
1883	0	0
1884	0	0
1885	0	0
1886	0	0
1887	0	0
1888	0	0
1889	0	0
1890	0	0
1891	0	1
1892	0	0
1893	0	1
1894	0	0
1895	0	0
1896	0	0
1897	0	0
1898	0	0
1899	0	0
1900	0	0
1901	0	0
1902	0	0
1903	0	0
1904	0	0
1905	0	0
1906	0	0
1907	0	0
1908	0	1
1909	0	0
1910	0	0
1911	0	0
1912	0	0
1913	0	0
1914	0	1
1915	0	0
1916	0	0
1917	0	0
1918	0	0
1919	0	0
1920	0	0
1921	0	1
1922	0	0
1923	1	0
1924	0	0
1925	0	0
1926	0	0
1927	0	0
1928	0	0
1929	0	1
1930	0	0

1931	0	1
1932	0	0
1933	0	0
1934	0	0
1935	0	0
1936	0	0
1937	0	0
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1948	0	0
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1955	0	0
1956	0	0
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1988	0	0
1989	0	0
1990	0	0
1991	0	0
1992	0	0
1993	0	0
1994	0	0
1995	0	0

1996	0	0
1997	0	0
1998	0	0
1999	0	0
2000	0	0
2001	0	0
2002	0	0
2003	0	0
2004	0	0
2005	0	0
2006	0	0
2007	0	0
2008	1	0
2009	0	0
2010	0	0
2011	0	0
2012	0	0
2013	0	0
2014	0	0
2015	0	0

Note: BC means banking crisis, CC means currency crisis. A 1 indicates a year when there is a financial crisis.

Figure A1 Selected Plots of Raw Canadian Macroeconomic Data



Note: LRGDP (log real GDP), LRHOUSE (log real house prices), LRLOANS (log real loans), LRSTOCKS (log real stock price index; Toronto Stock exchange), LTRATE (long-term government bond yield), STIR (three-month government bond yield), SPREAD (long less short rate), INF (CPI inflation; 100 times log change in CPI). Vertical lines indicate when the Bank of Canada was established. See the main text for transformations applied prior to testing.

Figure A2 Canada's Public Debt to GDP Ratio Change

CAN_PB

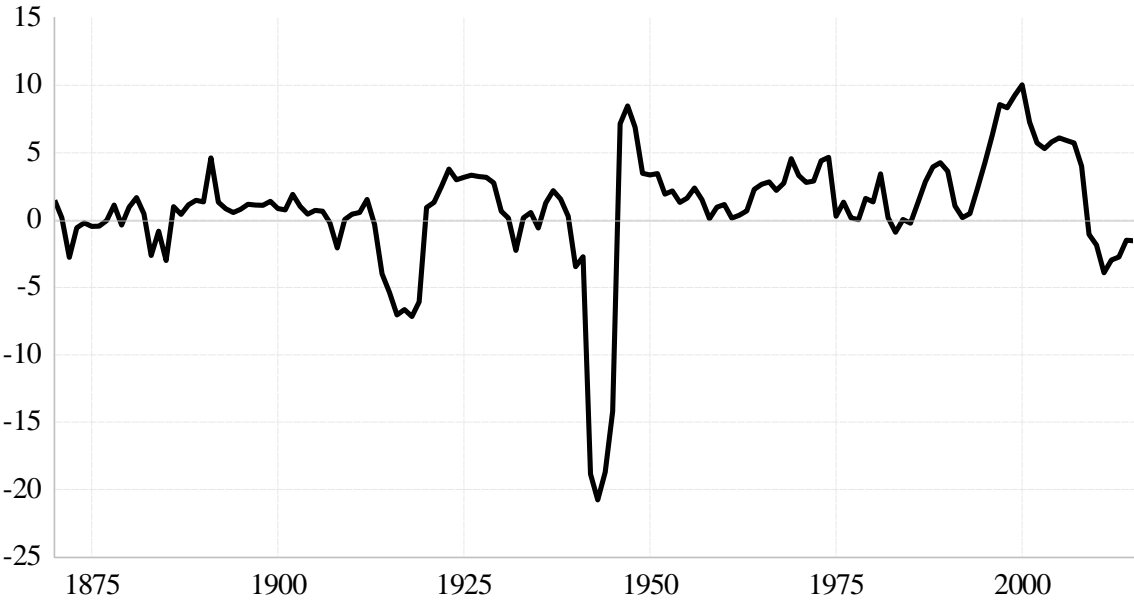
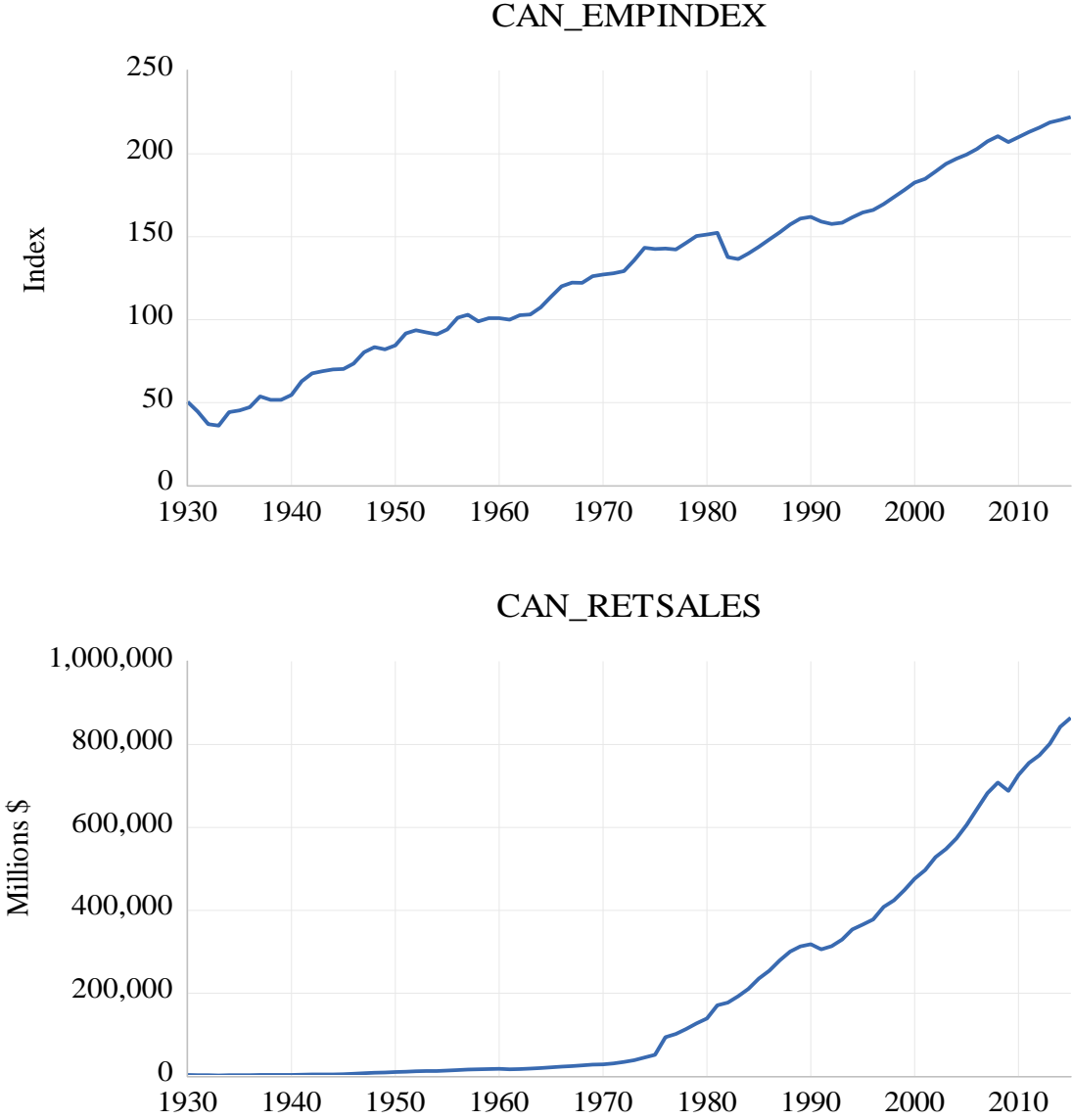
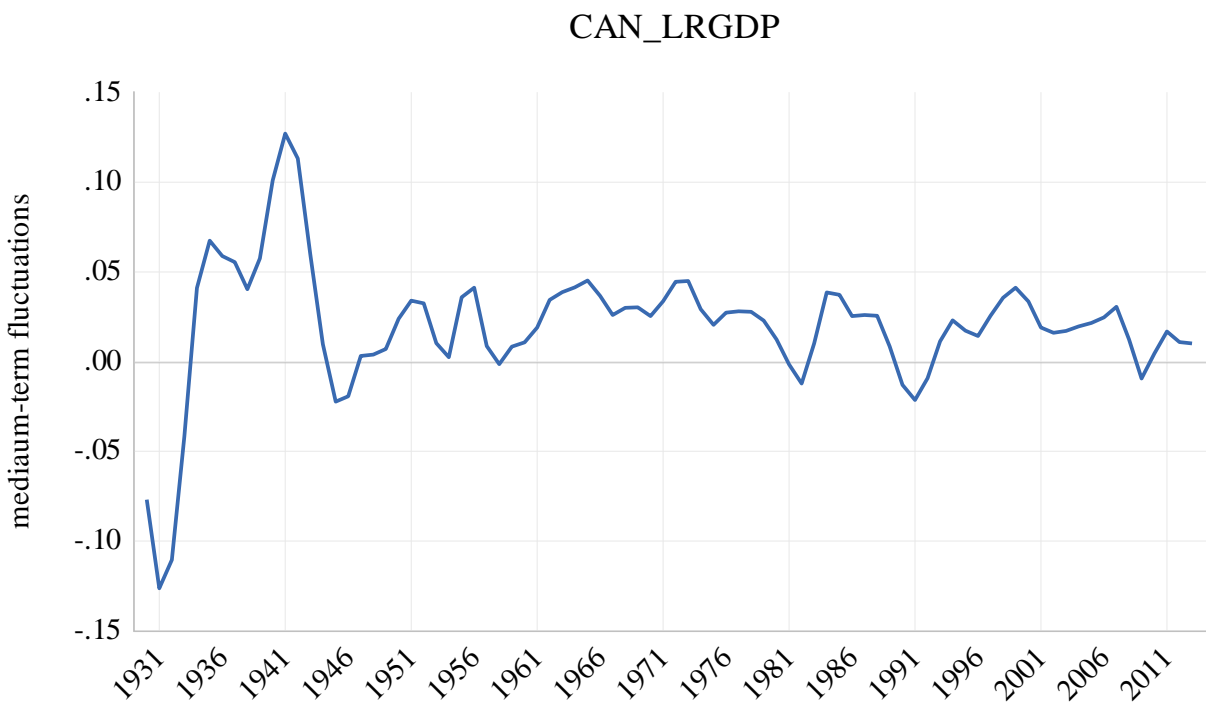


Figure A2 Employment and Retails Sales Data Used to Generate Business Cycle Chronology for Canada



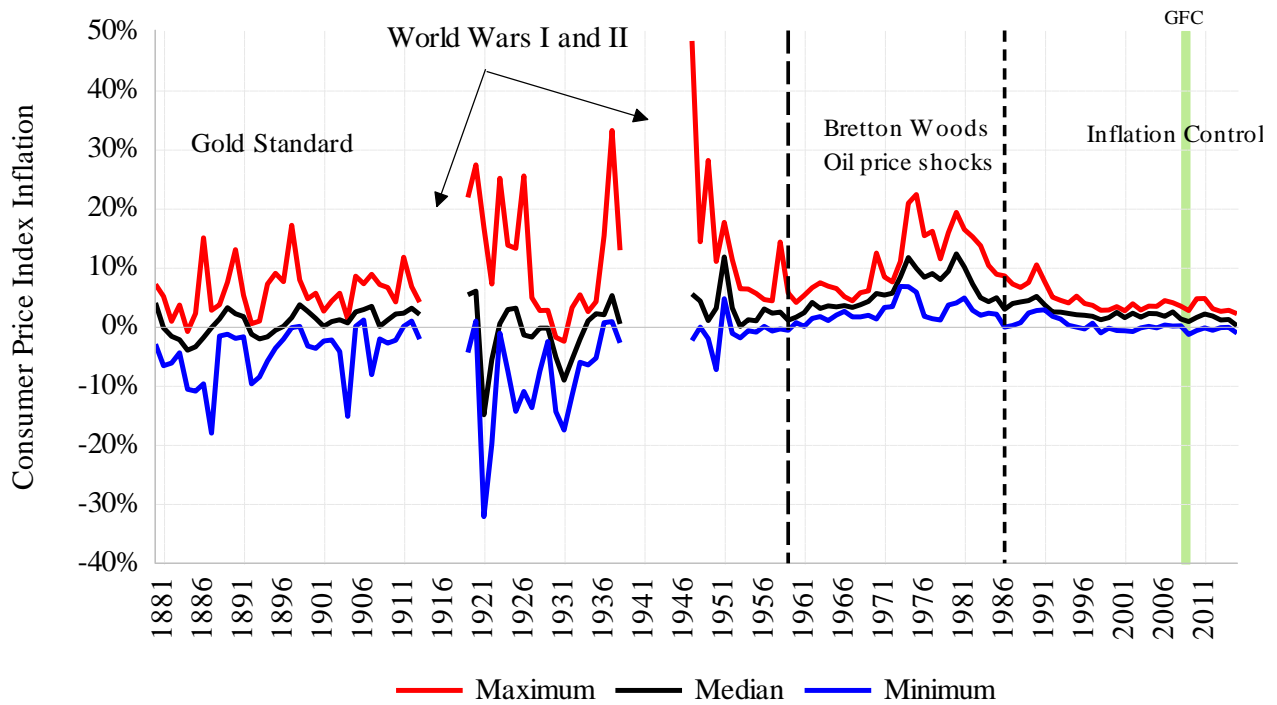
Note: see Table A1 for sources and other details about the construction of these series.

Figure 3 Estimates of Medium-Term Fluctuations in Canada's real GDP



Note: generated via a 2 year centered moving average applied to the log of real GDP. This is evaluated as $z_t = \frac{1}{2N+1} \sum_{k=-N}^{k=N} y_{t+k}$ where y is the (log) of the series, N is the length or horizon of the moving average, and z is the smoothed series. $\Delta z < 0$ signals a recession. The technique is due to Burnside, Eichenbaum, and Rebelo (2016).

Figure 3 Consumer Price Inflation Since 1880 in 10 Advanced Economies



Notes: Data are annual from Bordo and Siklos (2016) for the 1870-2015 period. Inflation is 100 times the log difference in an index of Consumer Prices. Dates for dashed and vertical straight lines are in the main body of the text identify the Bretton Woods period.