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Complementarities Between Fiscal Policy and Monetary Policy—Literature Review

by Wei Dong,[1] Geoffrey Dunbar,[2] Christian Friedrich,[2] Dmitry Matveev,[1] Romanos Priftis[1] and Lin Shao[2]

[1]Canadian Economic Analysis Department
Bank of Canada, Ottawa, Ontario, Canada K1A 0G9

[2]International Economic Analysis Department
Bank of Canada, Ottawa, Ontario, Canada K1A 0G9

wdong@bankofcanada.ca, GDunbar@bankofcanada.ca, cfriedrich@bankofcanada.ca, DMatveev@bankofcanada.ca, RPriftis@bankofcanada.ca, LShao@bankofcanada.ca

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Abstract

This paper reviews and summarizes the literature on the complementary relationship between fiscal policy and monetary policy. We focus on four types of fiscal policy: (1) automatic stabilizers, (2) state-contingent non-discretionary fiscal policy, (3) discretionary fiscal stimulus and (4) government credit policies. The literature shows that automatic fiscal stabilizers can play a role in stabilizing business cycle fluctuation. But because they can have multiple policy objectives, their optimal design remains an open question. An alternative policy framework features state-contingent non-discretionary fiscal expenditures with a pre-committed fiscal spending formula triggered by objective macroeconomic conditions. Such a policy offers the advantage of being timely and easy to communicate; but at the same time, it poses challenges for identifying appropriate triggers and program expenditures with high short-run multipliers. The literature also shows that discretionary fiscal expenditures can support aggregate demand, and some expenditures have short-run multipliers close to, or above, 1. While these expenditures can focus on specific policy priorities that are relevant at the time, their discretionary nature may slow the policy response. When interest rates are close to the effective lower bound (ELB), fiscal stimulus can be particularly effective for complementing the stabilizing efforts of monetary policy. Finally, studies show that government credit policies can mitigate economic downturns that are accompanied by severe financial market distress. However, the effects of scaling up this channel are uncertain.

Topics: Fiscal policy; Monetary policy
JEL codes: E52, E62, E58, E63

Résumé

Dans la présente étude, nous passons en revue les travaux qui ont été publiés sur la complémentarité des politiques budgétaire et monétaire. Nous nous sommes intéressés à quatre types de politique budgétaire : les stabilisateurs automatiques; les politiques budgétaires non discrétionnaires modulées selon l'évolution de la situation; les mesures discrétionnaires de relance et, enfin, le soutien public du crédit. Il ressort des écrits que les stabilisateurs budgétaires automatiques peuvent atténuer les variations cycliques de l'activité. Cependant, comme ces mécanismes peuvent être mis en œuvre à diverses fins, la question de leur conception optimale reste entière. Autre possibilité : un dispositif de dépenses budgétaires non discrétionnaires modulées selon l'évolution de la situation, dans lequel les dépenses sont déterminées selon une formule préétablie et engagées de manière objective dès que la conjoncture l'exige. Ce genre de politique offre l'avantage d'une mise en œuvre rapide à exécuter et facile à communiquer, mais pose des difficultés pour la détermination des seuils de déclenchement appropriés et des dépenses à effets multiplicateurs élevés à court terme. Les études montrent également que les dépenses budgétaires discrétionnaires peuvent soutenir la demande globale, et certaines dépenses ont des effets multiplicateurs à court terme légèrement inférieurs ou supérieurs à un. Bien que ces dépenses puissent viser

des objectifs de politique publique qui sont prioritaires au moment où elles sont engagées, du fait même de leur caractère discrétionnaire, leur mise en œuvre peut aussi s'en trouver ralentie. Quand les taux d'intérêt avoisinent leur valeur plancher, les mesures de relance budgétaire peuvent compléter de manière particulièrement efficace les efforts de stabilisation des autorités monétaires. Enfin, les études montrent que les politiques de soutien public du crédit peuvent atténuer les ralentissements économiques qui s'accompagnent de fortes tensions sur les marchés financiers. Les effets de l'élargissement de ces mécanismes sont cependant incertains.

Sujets : Politique budgétaire; Politique monétaire
Codes JEL : E52, E62, E58, E63

1. Introduction

For much of the past half century, the independence of monetary policy from fiscal policy has been a cornerstone of macroeconomic theory. This independence is rooted in a fundamental assumption that economic activity can be separated into two parts: a cycle and a trend. The theoretical consensus has been that monetary policy is responsible for stabilizing economic cycles and that fiscal policy is better suited to influencing the trend. Solow (2002) pointed to this "separation of powers" during his presidential address to the American Economic Association when he remarked that, in the context of policy responses to economic shocks, "serious discussion of fiscal policy has almost disappeared."

The global financial crisis of 2008–09 spurred a re-examination of the limits of monetary policy. In many large economies, monetary policy was constrained by an effective lower bound (ELB) on policy rates precisely when more stimulus was needed to stabilize the economy. With monetary policy unable to respond, the potential benefits of countercyclical fiscal policy became apparent (Bernanke 2016; Schembri 2018). The stability of the monetary transmission mechanism has also come into focus. Baunsgaard and Symansky (2009, 5) argue that "monetary policy may not provide a sufficient response, particularly, when its transmission mechanism is impeded by the conditions of the financial system." Meh and Poloz (2018) add a third caveat that monetary policy in an open economy could be constrained by external economic conditions when fiscal policy is not.

Constraints on monetary policy do not lessen the need for stabilization. Countercyclical fiscal policy appears capable of stabilizing economic fluctuations during periods when monetary policy cannot (Correia et al. 2013). The limits of monetary policy during the decade after the global financial crisis, 2010–19, are evidence that such episodes can occur. This, in turn, suggests that the separation of powers between monetary and fiscal policy may not always be optimal. This paper reviews and summarizes the relevant literature on the complementarities of fiscal and monetary policy, focusing on the following research questions:

- How do fiscal policies affect the ability of monetary policy to achieve its mandate?
- Does the macroeconomic environment (e.g., at the ELB) affect the degree of complementarity between fiscal and monetary policy?
- Does fiscal and monetary policy complementarity differ between large and small open economies?

The paper proceeds as follows. Section 2 discusses the types of fiscal policy tools that we focus on in this review and examines how they complement monetary policy. Section 3 presents the specific considerations and implications of conducting fiscal policy in a small open advanced economy, such as Canada's. Finally, Section 4 concludes and discusses the complementarities of policies in economic crises.

2. Fiscal policy tools and complementarities with monetary policy

To frame the analysis, we begin by defining the types of fiscal policies that will be addressed. The analysis focuses on:

- the potential role of automatic stabilizers and other non-discretionary fiscal policies in the conduct of monetary policy
- the potential role of discretionary fiscal policies and how they differ from non-discretionary fiscal policies in the conduct of monetary policy
- the potential role of credit subsidies by governments to act as a fiscal policy tool

2.1. Automatic fiscal stabilizers

Automatic stabilizers are fiscal policies that may counteract business-cycle fluctuations in an economy because they make government expenditures and/or revenues dependent on the economic cycle. Many fiscal policies can be considered automatic stabilizers: employment insurance, welfare programs and various types of taxation. These policies share the characteristic that their expenditure or revenue depends on an individual's or firm's economic circumstances. These policies are automatic in the sense that the rules governing them are unchanged by macroeconomic conditions.

A defining feature of automatic fiscal stabilizers is that policy-makers do not need to perform any deliberate action for them to operate. Various automatic adjustments are embedded into existing tax-and-transfer systems. These changes do not require any new legislation, which makes automatic fiscal stabilizers immune to lags in the design and implementation of policy changes. Globally, automatic stabilizers operate most frequently at the federal level because sub-national governments are more likely to operate under balanced budget requirements.[1, 2]

Examples of specific policy instruments

An example of an automatic fiscal stabilizer is employment insurance (EI). Workers pay into EI according to a schedule that depends on their earned income. They are eligible to receive benefits if they become unemployed. Since employment is procyclical, during economic expansions EI revenues rise and EI expenditures fall. The reverse is true in economic recessions—revenues fall and expenditures rise. EI programs are thus considered automatic fiscal stabilizers because their expenditure is negatively correlated with aggregate demand even though the program itself is unchanged over the business cycle (the payroll deductions for individual workers are generally independent of the economic cycle).

[1] Sheiner and Ng (2019) show that on average, over the past 40 years in the United States, the stimulus provided by state and local tax systems during downturns are generally offset by spending cuts required to balance the budgets.

[2] Note that in Canada, some provinces and territories are not bound by the balanced budget requirements. See Library of Parliament (2015) for more information.

Another example of an automatic stabilizer is the federal individual income tax. A progressive income tax imposes a lower marginal tax rate on low-income earners relative to those with a higher income. When the earned income of individuals goes up during economic expansions, a larger fraction of income is taxed. The opposite occurs during recessions. Hence, a more progressive income tax dampens the volatility of after-tax income relative to pre-tax income.

Channels of operation

The stabilizing effect of EI and progressive income tax schedules described above relies on reducing variation in the disposable income of individuals, thereby stabilizing aggregate demand. This is the traditional mechanism the literature on automatic stabilization highlights. Beyond this disposable income channel, the literature proposes three more theoretical mechanisms that affect the role of fiscal policy in smoothing the business cycle (McKay and Reis 2016).

First, with a progressive personal income tax, labour supply incentives change as the income of individuals and their corresponding marginal tax rates vary over the cycle. In a recession, a decline in the marginal tax rate increases incentives to work and hence offsets part of the initial income decline. The opposite effect takes place during a boom. Overall, this channel stabilizes income by reducing the pro-cyclicality of labour supply.

Second, a lower volatility of disposable income does not translate into stability of aggregate demand one-to-one. The propensity to consume out of income varies across individuals and depends on their ability to use financial markets to smooth transitory income changes. Individuals who are unable to access financial markets may have a higher marginal propensity to consume; and a policy that redistributes resources from unconstrained to constrained individuals during a recession may stimulate aggregate demand.

Third, automatic stabilizers provide social insurance that affects the individual income risk. This risk makes individuals engage in precautionary saving, implying a reduction in consumption. A system of automatic stabilizers that mitigates the individual income risk could alleviate the need to self-insure and, therefore, reduce excess savings.

These three additional channels depend on decisions made by individuals about labour supply, consumption and savings, which implies that aggregate responses to any policy change will depend on the distribution of individual heterogeneity. For example, a policy change that raises unemployment insurance payoffs may simultaneously affect the extensive and intensive margins of labour supply and consumption so the aggregate effect on demand may be uncertain. Ferriere and Navarro (2018) include heterogeneity of households' marginal propensity to consume and labour supply elasticity and show that government spending induces larger expansions in output and consumption when financed by more progressive taxes. This is because the distributional impact of fiscal policy can be central to its aggregate effects.

Assessment and design of automatic stabilizers

Most studies agree that, of available fiscal policy options, automatic stabilizers could play an important role in stabilizing economic activity (Baunsgaard and Symansky 2009; International Monetary Fund Fiscal

Affairs Department 2015). Indeed, the International Monetary Fund (IMF) recommends that countries enhance their automatic stabilizers to reduce macroeconomic volatility. Boushey and Shambaugh (2019) argue that automatic stabilizers in the United States should be enhanced during recessions to boost aggregate demand.

Are the automatic stabilizers that are in place effective? Until recently, researchers have used microsimulations (Auerbach and Feenberg 2000; Dolls, Fuest and Peichl 2012) and time-series aggregate regressions (Fedelino, Ivanova and Horton 2005) to examine the impact of automatic stabilizer. While these provide insights on how changes in automatic stabilizers affect disposable income, neither approach examines the responses of individual behaviour. This limitation implies that counterfactual scenarios are difficult to evaluate. To address this shortcoming, recent research has focused on structural macroeconomic models.

McKay and Reis (2016) show that fiscal stabilizers in the United States are not, in general, very effective in stabilizing business cycle fluctuations. The conventional stabilizing effect from the disposable income channel of automatic stabilizers has little impact on the dynamics of the business cycle because it is offset by an increase in the volatility of hours worked.[3] However, the social insurance and the redistribution channels can have larger effects for stabilizing output. McKay and Reis (2016) examine a counterfactual simulation in which spending on both social insurance (unemployment benefits) and redistribution (transfers for low income) channels was reduced by 0.6 percent of gross domestic product (GDP). They report that the volatility of output and hours increased 6 percent and 9 percent, respectively. They also find that automatic stabilizers are more effective at stabilizing output if the ELB on nominal rates is binding.

Using the model developed by McKay and Reis (2016), Graziano and Thwaites (2019) compare the effectiveness of automatic stabilizers in the United Kingdom during two time periods: in the run-up to the Great Recession and in the recovery phase. The difference in the latter period is mainly due to a significantly more progressive personal income tax. This difference results in a stronger stabilizing effect on consumption through the redistribution channel and a reduction in volatility of both aggregate output and hours through the labour incentives channel.

For Canada, Meh and Poloz (2018) assess the power of automatic fiscal stabilizers using the Terms-of-Trade Economic Model (ToTEM), the projection model of the Bank of Canada. They find that existing Canadian stabilizers can cushion the effect of a foreign demand shock. However, the strength of stabilizers is not enough to provide meaningful assistance to monetary policy.

Can existing automatic stabilizers be improved? Although policy discussions feature the role of automatic stabilizers in macroeconomic stabilization, there appears to be no consensus on their optimal design (Blanchard, Dell'Ariccia and Mauro 2010). Indeed, Auclert (2019) emphasizes that individual heterogeneity in marginal propensities to consume also affects the transmission of monetary policy to aggregate demand. Thus, the design of optimal automatic stabilizers requires understanding how

[3] In the current US tax system, the marginal tax rate function is relatively flat above median income. As a result, the marginal tax rate that many employed households face does not differ much across different stages of the business cycle.

monetary and fiscal policy complement each other at the individual level. Such analysis currently does not exist. And, any discussion of optimal policy would, inherently, have to characterize other fiscal policy goals of automatic stabilizers.

McKay and Reis (2020) provide one framework for the design of optimal automatic stabilizers. Their framework includes concerns about both macroeconomic stabilization and public finance objectives. Macroeconomic stabilization considerations warrant more progressive and generous fiscal policy if the economy responds to social programs more strongly in recessions than in booms. Using US data, they conclude that the optimal generosity of EI appears to be sensitive to stabilization concerns while the optimal progressivity of the personal income tax is not.

It is also important to recognize that automatic stabilizers do not always contribute to stabilizing economic activity. Some policies may have asymmetric effects on macroeconomic volatility. For example, some tax deductions (e.g., for mortgage interest payments or certain types of investment) and indexation rules applied to some expenditure items (e.g., wages and pensions) would stimulate expenditure and amplify economic activity during economic booms (International Monetary Fund Fiscal Affairs Department 2015).

Finally, if automatic stabilizers reduce macroeconomic volatility, it is because the economic circumstances of individuals and firms are correlated over business cycles. Nevertheless, stabilization is often not their primary purpose, and attempts to scale their expenditures to achieve stabilization targets may be ineffective.

As an example, EI payments are negatively correlated with aggregate demand, but it does not follow that simply increasing those payments would further reduce business cycle volatility. EI programs are designed to provide benefits for individual workers and to encourage labour market efficiency since the economic surplus of a job match depends in part on the outside option of these benefits (Baily 1978; Chetty 2006). Increasing the level of benefits during a recession would affect the efficiency of the labour market (e.g., by discouraging unemployed individuals from accepting job offers) and may in fact prolong economic downturns. Di Maggio and Kermani (2016) use regional differences in unemployment benefit generosity in the United States to show that local economies are less responsive to local labour demand shocks in regions where EI is more generous. Another issue is that EI programs are often designed as insurance against unemployment spells for eligible workers and not for individuals marginally attached to the labour market (Gray and Busby 2016). For example, EI eligibility requirements may exclude gig workers, workers who work part time on a regular basis and those just entering the job market. It is plausible that these segments of the labour market may be more sensitive to the business cycle and would not be served by increasing EI benefit rates.

Similarly, macroeconomic stabilization alone would not justify increasing tax progressivity. Typical considerations for the design of income tax schedules are the desire to reduce income inequality and the desire to promote labour market efficiency. A more progressive income tax may reduce the efficiency of the labour market by discouraging the labour supply of more productive individuals. The public finance literature has long emphasized that optimal tax progressivity should balance the efficiency cost with the equity benefit from the resulting income redistribution (Mirrlees 1971; Varian

1980; Benabou 2002; Conesa and Krueger 2006; Heathcote, Storesletten and Violante 2017; Krueger and Ludwig 2013; and Golosov, Troshkin and Tsyvinski 2016).

Complementarities with monetary policy

How effective automatic stabilizers are depends on how monetary policy is conducted. This is because expansionary (contractionary) fiscal expenditure can be offset by tighter (looser) monetary policy. McKay and Reis (2016) show that existing stabilizers in the United States would have larger impacts on GDP if monetary policy responded less aggressively when inflation is off target. However, little is understood if, and how exactly, the cost and credibility of inflation targeting depends on the system of automatic stabilizers in place.

The discussion on the effectiveness of automatic stabilizers can be extended to argue that stronger stabilizers not only mitigate the extent of contraction during recessions but also reduce the probability of a recession. A stronger system of automatic stabilizers could allow for a more gradual adjustment of interest rates in response to aggregate demand shocks without undermining the ability to hit the inflation target.

There are at least two channels through which this could mitigate recession risks. First, the mix of monetary and fiscal policy matters to the economy's debt load (Poloz 2016). In the presence of financial stability risks, more gradual interest rate dynamics could limit the build-up of private debt and lower the risk of financial instability.[4] Second, stronger automatic stabilizers could mitigate the risk of reaching the ELB by allowing for less aggressive interest rate cuts. Importantly, the risk of reaching the ELB creates a challenge for the central bank's stabilization policy even when the current interest rate is not constrained by the ELB (Adam and Billi 2007; Hills, Nakata and Schmidt 2019). A lower risk of reaching the ELB should better anchor inflation expectations, making monetary policy more effective. Stronger automatic stabilizers could also mitigate the expected ELB risk if individuals and firms anticipate the extent of stabilization in a liquidity trap.

Unemployment benefit extensions can be optimal when monetary policy is at the ELB, despite the anticipated cost arising from a lower intensity of job search by unemployed workers (Kekre 2021). More generous unemployment insurance reduces individuals' exposure to income risk and stimulates consumption when individuals make consumption decisions in response to risk. Extending unemployment benefits at the ELB is likely to reduce the power of forward guidance: because of the increase in procyclical income risk, the expansionary effect of a promised future boom is offset by an increase in desired precautionary savings (Acharya and Dogra 2020).

An important caveat is that the implication that changing the strength of automatic stabilizers results in gradual interest rate adjustments may not hold in countries that are exposed to large supply-side shocks. For instance, if the economy is hit by a negative productivity shock, the cushioning of disposable income by automatic stabilizers may result in a slower convergence to the new level of potential output

[4] Automatic stabilizers affect financial stability through other channels as well. Hsu, Matsa and Melzer (2018) show that more generous employment insurance stabilizes the housing market by helping unemployed people avoid mortgage default. Agrawal and Matsa (2013) show that more generous employment insurance leads to increased corporate leverage.

and inflationary pressure (Baunsgaard and Symansky 2009). This, in turn, would call for a more aggressive interest rate change to keep inflation on target.

2.2. State-contingent non-discretionary fiscal policy

State-contingent non-discretionary fiscal expenditures are explicitly triggered by macroeconomic conditions. Unlike automatic fiscal stabilizers, state-contingent non-discretionary fiscal expenditures are designed to stabilize economic conditions and do not have other public policy objectives. A defining characteristic of state-contingent non-discretionary fiscal stimulus is that fiscal agents can pre-commit to the policy.[5] A second defining characteristic is that the economic conditions that trigger the non-discretionary fiscal stimulus can be defined and measured in a timely and accurate way.

There has been limited use of such policies. The recent academic literature has discussed several policy options that can be linked to the macroeconomic outlook. Gali (2020) suggests that it may be optimal for taxes to fall during crises, such as the COVID-19 pandemic, and to be financed by monetary expansions. Eichenbaum (2018) proposes an asymmetric, rules-based approach where fiscal policy stabilizes the economy during times of stress. Specifically, when monetary policy reaches the ELB, unemployment insurance benefits increase and/or tax rates adjust; when the policy rate returns to a predetermined policy setting, unemployment insurance and tax rates are recalibrated. If an economic downturn is accompanied by a large pessimistic shock to expectations, then policy-makers may have to resort to fiscal stimulus even before reaching the ELB. Evans, Guse and Honkapohja (2008) argue that an aggressive fiscal response triggered by inflation falling below a threshold is needed to prevent an expectations-driven liquidity trap. Blanchard, Dell'Ariccia and Mauro (2010) connect the state-contingent fiscal response to a recipe for creating additional fiscal space, according to which policy-makers make major fiscal adjustments when cyclical conditions permit. And in situations where economic growth recovers rapidly, the surplus should be exploited to substantially reduce debt-to-GDP ratios rather than to finance expenditure increases or tax cuts. Elmendorf and Furman (2008) propose three principles for fiscal stimulus: it should be timely, targeted and effective. In the context of the United States, they discuss the benefits of several potential channels, including temporarily extending unemployment insurance benefits.

Benefits and challenges of automating the fiscal response

The benefits of automating a fiscal response relate primarily to reducing uncertainty, speeding up implementation and providing greater credibility. Pre-committing to state-contingent fiscal policy action reduces uncertainty about the fiscal framework. This is similar to increasing the use of automatic stabilizers. However, the latter allows for a gradual response, closely related to the evolving output gap, whereas any state-contingent response would be episode specific (Baunsgaard and Symansky 2009) and may be targeted at programs that are not normally automatic stabilizers (e.g., sales tax rates). State-contingent non-discretionary fiscal stimulus would ensure a timely response to macroeconomic conditions that are shielded from political inference. If the fiscal policy is legislated and clearly communicated to the public and market participants, this would enhance its credibility and help anchor expectations (Eichenbaum 2018). This logic can be extended to argue that automating fiscal response

[5] Such a proposal is not new (see, e.g., the discussion in Blanchard 2000; Blanchard, Dell'Ariccia and Mauro 2010; Seideman 2003; and Elmendorf and Furman 2008) but has so far had limited application.

would also preclude the need to coordinate monetary and fiscal policy in real time, thereby helping to preserve the independence of the monetary authority.

The literature highlights two key challenges to automating a fiscal response.

The first challenge is choosing appropriate triggers for state-contingent fiscal spending and ensuring their independence from fiscal or monetary policy interference. The fiscal agent and the monetary policy maker may prefer different triggers because of their differing mandates. Solow (2005) proposes the use of an "automated" fiscal policy board that would operate a "standard stabilization package" allowing for discretionary adjustments automatically linked to specific economic indicators.

Triggers may differ in their timeliness and in how informative they are about the need for additional stimulus. Whichever trigger is chosen should be transparent, timely and easily communicated to the public. As Baunsgaard and Symansky (2009) suggest, the macroeconomic trigger has to capture the underlying economic environment while being sufficiently forward-looking. If timely data are available (e.g., for employment or unemployment at a monthly level or with little lag), then macroeconomic triggers can be constructed based on these. For example, Feldstein (2007) proposed a conditional fiscal stimulus package for 2008 that would be triggered by a three-month cumulative decline in payroll employment and that would end when employment began to rise or when it reached its pre-downturn level.

Sahm (2019) proposes such a policy for the United States (also known as the Sahm Rule). According to the Sahm Rule, automatic lump-sum payments are paid to individuals totalling 0.7 percent of GDP if the 3-month average national unemployment rate rises 0.5 percentage points (pps) or more relative to its 12-month low. The trigger is clear and can be measured on a timely basis, and the fraction of lump-sum payments to individuals that are spent has been estimated to be as high as 0.9 (Parker et al. 2013). The Sahm Rule also considers additional payments if unemployment remains persistently high. This rule is an example of non-discretionary fiscal stimulus targeted at employment through demand stimulus. The Sahm Rule also highlights the importance of coordinating monetary and fiscal policy responses, because monetary policy could counteract fiscal demand stimulus by raising the policy rate if the mandates are not aligned, such as might occur in a period of stagflation.

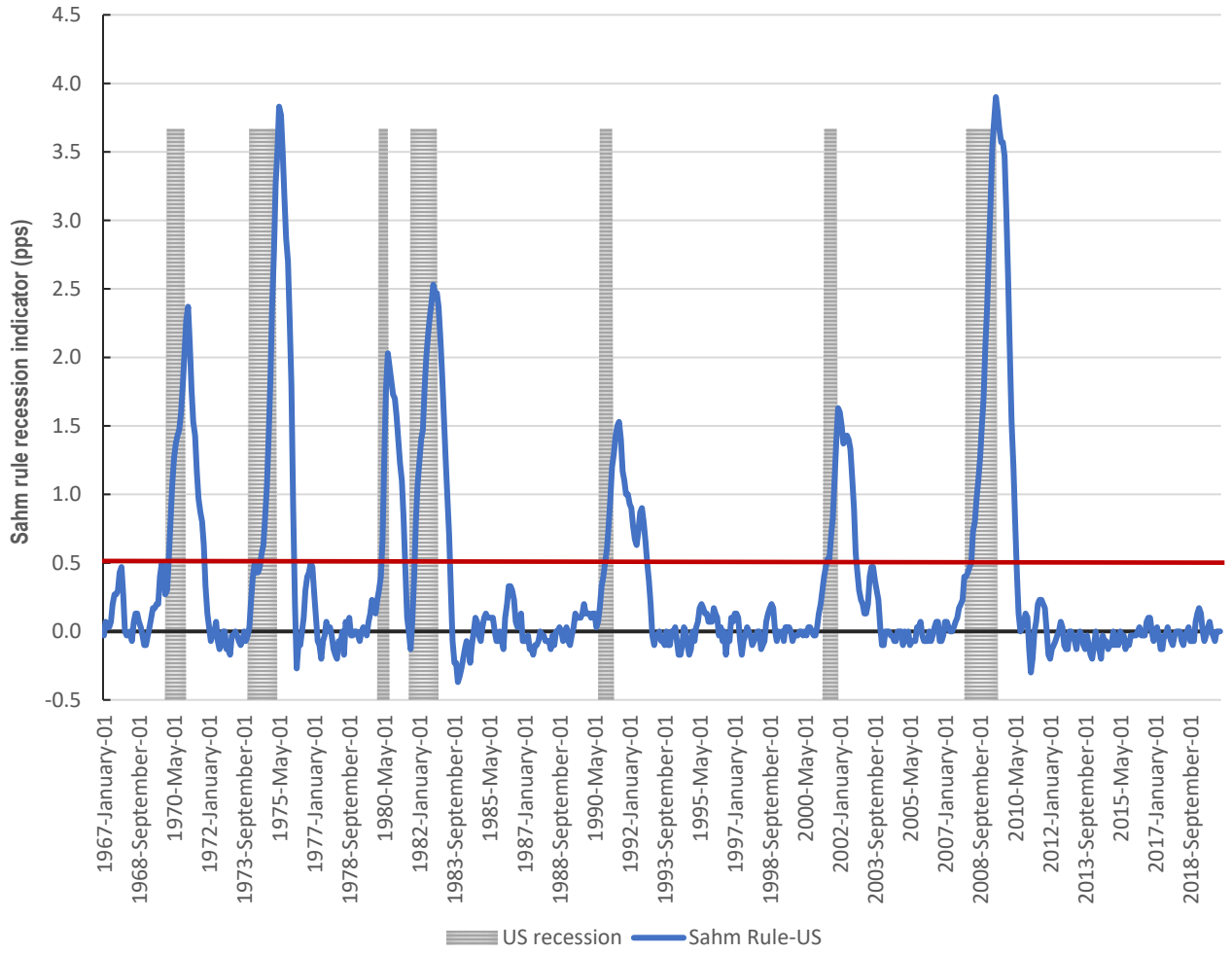
Charts 1 and 2 illustrate the Sahm Rule for the United States and Canada, respectively. In each chart, the blue line is the difference between the 3-month moving average unemployment rate relative to the previous 12-month low (the Sahm Rule), the grey areas are recessions dated by the National Bureau of Economic Research (United States) and the C. D. Howe Institute (Canada) and the red line represents the 0.5 pps threshold trigger suggested by Sahm (2019). As Chart 1 illustrates, when the Sahm Rule crosses the 0.5 pps trigger, the US economy enters a recession.

Chart 2 illustrates the same Sahm Rule and 0.5 pps threshold trigger for Canada. The Sahm Rule for Canada appears less predictive of dated recessions than that for the United States.[6] Of the five recessions in Chart 2, the Sahm Rule for Canada would have been immediately followed by a recession only in the first and last occurrence. The Sahm Rule would have indicated a recession for the remaining three cases with a lag. However, the rule would have also indicated two additional recessions not dated

[6] This may, however, reflect difficulties and differences in how recessions are dated rather than differences in how the Sahm Rule is correlated with latent economic activity between the two countries.

as such by the C. D. Howe Institute. This simple exercise suggests that policy-makers need to be cautious in designing an appropriate rule and trigger and that these may be country specific. One potential next step could be to explore how much the different moving average horizons of the unemployment rate can reveal about economic activity in Canada. For example, it seems plausible that differences in EI programs between Canada and the United States may affect the sensitivity of the Sahm Rule.

Chart 1: Sahm Rule—United States

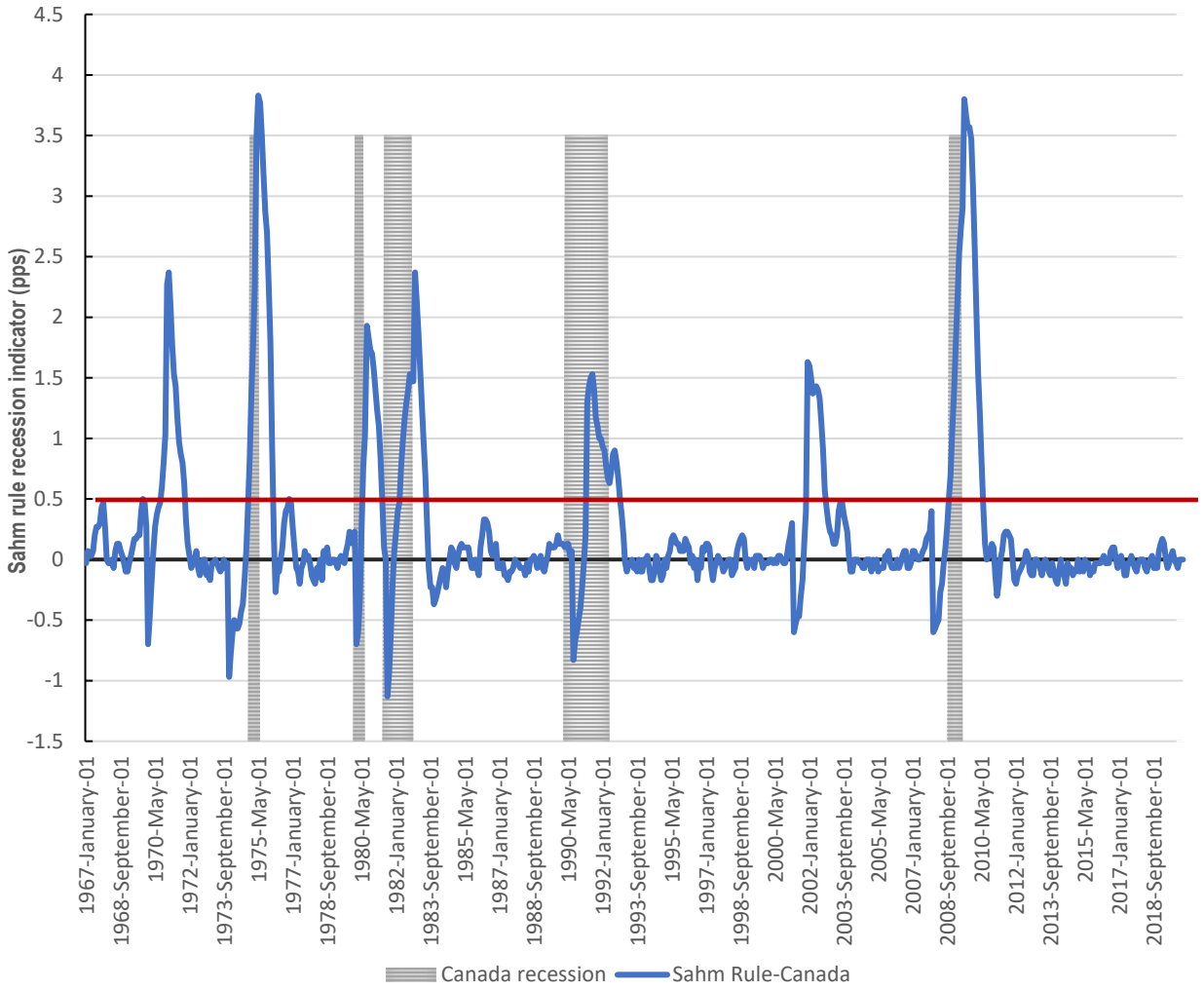


Note: The blue line is the difference between the 3-month moving average unemployment rate relative to the previous 12-month low (the Sahm Rule); the grey areas are recessions dated by the National Bureau of Economic Research; and the red line represents the 0.5 pps threshold trigger suggested by Sahm (2019).

Sources: Federal Reserve Economic Data, Federal Reserve Bank of St.Louis and National Bureau of Economic Research

Last observation: February 2020

Chart 2: Sahm Rule—Canada



Note: The blue line is the difference between the 3-month moving average unemployment rate relative to the previous 12-month low (the Sahm Rule); the grey areas are recessions dated by the C. D. Howe Institute; and the red line represents the 0.5 pps threshold trigger suggested by Sahm (2019).
Sources: Statistics Canada, C.D. Howe Institute and authors' calculations
Last observation: February 2020

The second challenge of automating a fiscal response is ensuring that the fiscal stimulus is effective. Given that the effectiveness of fiscal stimulus may itself be state-contingent, a one-size-fits-all stimulus package may sacrifice efficacy for expediency. State-contingent responses should be triggered only in severe episodes to avoid too frequent adjustments, and the instruments used should generate high multipliers to ensure maximum impact. The goal of a state-contingent non-discretionary fiscal expenditure is to provide a temporary boost to aggregate demand. Thus, expenditures should be directed to programs that can be rapidly deployed and that have large anticipated short-run multipliers. This is perhaps easier said than done. Infrastructure spending is an unlikely candidate because they usually require lengthy procurement and planning periods that would delay any impact. As well, Canada imports a large share of the durable goods it consumes, which implies a lower multiplier for broad-

based tax reductions. Corporate tax reductions have very low multipliers in Canada. For Canada, the highest short-run multipliers have generally been associated with tax credits for housing and renovations and welfare expenditures. One concern with housing and renovation tax credits is that they may encourage unproductive investment.[7]

2.3. Discretionary fiscal stimulus

The prevalent view in the past has been that discretionary fiscal policy either is entirely ineffective because of Ricardian equivalence or has harmful side effects such as crowding out private investment (Furman 2016). However, recent evidence suggests that fiscal stimulus can have positive effects on economic activity. A common approach to assessing the effects of discretionary fiscal policy on economic activity is to study the reaction of output to exogenous (unpredicted) changes in fiscal policy—the fiscal multiplier. A fiscal multiplier greater than 1 (less than 1) suggests that changes in fiscal policy are expansionary (contractionary) for economic activity. We next review some of the existing evidence on fiscal multipliers.

Aggregate versus local fiscal multipliers

Measuring the size of fiscal multipliers is challenging because researchers typically must rely on untestable assumptions to estimate fiscal multipliers from the data. Recent research has advanced along two approaches to study the fiscal multipliers.

One approach uses an aggregate macroeconomic time series and identifies government spending shocks either through narrative or using structural vector autoregression (SVAR) methods.[8] These "aggregate multipliers" theoretically capture general equilibrium effects, and the resulting estimates are interpreted as the result of exogenous changes in fiscal policy. One challenge in estimating aggregate multipliers is accounting for the response of monetary policy.

A second approach exploits cross-sectional variation in fiscal policies to estimate the effect on regional economic activities. These latter estimates, known as "local multipliers," are based on the impacts of fiscal shocks at lower levels of aggregation within larger entities. Local multipliers can potentially overcome some of the issues facing the time series approach, such as endogeneity or reverse causality of government spending, monetary policy accommodation, weak identification and mis-specification of the model structure (for a recent survey, see Chodorow-Reich 2019).

Aggregate and local fiscal multipliers also do not measure the same object, and comparing local multiplier estimates with aggregate estimates is not straightforward. Higher expenditure-switching and income leakage can lead to smaller local multipliers relative to the relevant aggregate multipliers, while higher factor mobility can lead to the opposite. Local multipliers are also theoretically unaffected by

[7] Targeting housing and renovation tax credits in specific sectors may alleviate concerns about unproductive investment. For example, energy-efficient upgrades to housing may reduce peak energy demand and lower costs for other energy consumers, such as industry.

[8] The narrative approach to identifying fiscal policy changes involves studying the timing of changes to the text of fiscal policy, such as announcements or legislative changes. The SVAR approach identifies spending shocks by imposing structure on the order in which expenditures affect aggregate output.

monetary policy because it is common across all regions, whereas aggregate multipliers may be more likely to be affected by monetary policy. Moreover, many cross-sectional estimates report employment multipliers rather than output multipliers, largely because of data availability, complicating comparisons between the two sets of estimates (see Chodorow-Reich 2019).

Spending-based, tax-based and transfer-based fiscal multipliers

Despite significant differences in samples and identification methods, the literature using the aggregate approach agrees on a range between 0.9 and 1.3 for the average output multiplier of government purchases in developed countries (see, e.g., Caldara and Kamps (2017) and Ramey (2019) for recent surveys).[9] These figures typically average out responses in expansionary and recessionary periods and in periods of accommodative and tight monetary policy.[10]

Estimates of local multipliers typically lie at the higher bound of the aggregate approach. Studies incorporating the effects of fiscal spillovers suggest that the local multiplier associated with defense spending lies at 1.65 (see, e.g., Auerbach, Gorodnichenko and Murphy 2020; Nakamura and Steinsson 2014). Dupor and Guerrero (2020) find that the output multiplier associated with government-financed health care expenditures is 1.7. Chodorow-Reich (2019) finds an output multiplier of 1.5 associated with the instruments in *American Recovery and Reinvestment Act of 2009* (ARRA) in the United States.

The evidence on multipliers of tax rate change is less uniform. Studies using narrative methods that rely on using historical accounts to find exogenous tax changes often report very high multipliers between -2 and -3 (Romer and Romer 2010; Mertens and Ravn 2013; Guajardo, Leigh and Pescatori 2014). However, studies that use estimated or calibrated structural macroeconomic models typically find smaller multipliers below 1 for both labour and capital tax multipliers.

An ongoing strand of the literature assesses whether a fiscal expansion that is targeted to a specific sector or group of the population may amplify its aggregate effects.[11] Some studies show that targeted transfer programs may be more effective than government purchases in supporting aggregate demand (Oh and Reis 2012; McKay and Reis 2016). Output multipliers for targeted transfers distributed during the global financial crisis when the nominal interest rate was at the ELB (e.g., the ARRA in the United States) range from 1 to 1.5 (see, e.g., Coenen et al. 2012; Giambattista and Pennings 2017). The

[9] The Bank of Canada's projection models ToTEM and LENS suggest that the government spending multiplier lies in the range of 0.9 to 1.3. The multipliers are sensitive to the assumed period of monetary policy inaction and to the assumed level of household indebtedness in the models.

[10] Evidence on investment expenditures typically reports higher multipliers because government capital is complementary to private capital. However, investment spending is typically not implemented in a timely manner and the benefits from such a stimulus may only accrue in the longer term (see Zubairy 2014). For a review of the effects of government investment in the United States, particularly in the form of public transportation spending, see Leduc and Wilson (2012).

[11] In the context of multiple interconnected sectors, the aggregate spending multiplier has been found to depend on the sectoral origin of government purchases. The response is larger for spending shocks in sectors with a smaller contribution to private final demand and in those located downstream in the production network (see Bouakez, Rachedi and Santoro 2020; and Smets, Tielens and Hove 2018).

multiplier of US unemployment-benefit extensions deployed under the *Coronavirus Aid, Relief, and Economic Security Act* is estimated to be 1.0 (see Faria-e-Castro 2020; Bayer et al. 2020).

The state-dependence of fiscal shocks

Whether fiscal multipliers are larger during recessions than during other parts of the economic cycle appears to be an open question. Some evidence supports the view that the effect of fiscal policy is stronger during a downturn (Barro and Redlick 2011; Auerbach and Gorodnichenko 2012, 2013; Fazzari, Morley and Panovska 2015), although this view is challenged by Ramey and Zubairy (2018). The estimates of multipliers during recessions or times of high unemployment seem to be fragile and tend to be equal to or lower than 1 when focusing on the most robust results. For Canada, Owyang, Ramey and Zubairy (2013) show that two-year-cumulative multipliers during periods of low unemployment are 0.4, while they are 1.6 for periods of high unemployment. For tax rate change multipliers, the estimates are found to be larger during expansions than during downturns.

Another strand of the literature considers how monetary policy affects government spending multipliers. Structural macroeconomic models suggest that when interest rates are close to the ELB, fiscal stimulus can be more effective than in normal times (e.g., Cogan et al. 2010; Christiano, Eichenbaum and Rebelo 2011; Coenen et al. 2012). During normal times, monetary policy may partially offset fiscal policy by adjusting the policy interest rate; however, this channel is not operative near the ELB. Empirical evidence for the United States and Japan supports this view, with multipliers at the ELB estimated to be around 1.5 (Miyamoto, Nguyen and Sergeyev 2018; Ramey and Zubairy 2018).

Some studies also distinguish fiscal multipliers depending on the type of budget financing. For example, Mountford and Uhlig (2009) focus on fiscal shocks associated with deficit spending, deficit-financed tax cuts and a balanced budget spending expansion. They find that deficit-financed tax cuts work best among these three scenarios, with a maximal present value multiplier of 5, five years after the shock. Other studies—Canova and Pappa (2011) and Priftis and Zimic (2021)—find evidence that multipliers depend on how the fiscal spending is financed and on the responses of the real interest rate. Priftis and Zimic (2021) suggest that higher multipliers can be obtained if debt is issued abroad because the increase in government borrowing does not then crowd out domestic private investment. Chodorow-Reich (2019) finds that the mean local multiplier of 1.8 reported above translates to a national multiplier of about 1.7 if it is deficit-financed and in the absence of a monetary policy response.

Basso and Rachedi (2020), using variation across different states in the United States, find that spending multipliers depend on demographics and are in the range between 1.27 and 1.65, with higher estimates in US states with younger populations. Simon (2019) documents that age is a key driver of consumption adjustment to government spending shocks, with the responses of younger households being significantly larger, regardless of their income level or debt position. The transmission channel relies on differences in skill accumulation over the life cycle. Although all individuals work more following a fiscal stimulus, young people raise their productivity faster than their prime-age counterparts. The increase in labour demand for young workers boosts their wages, thus stimulating their consumption.

Optimal design and implications for monetary policy

One circumstance when fiscal policy may be particularly effective in complementing the stabilization efforts of monetary policy is when the latter is operating near the ELB (Feldstein 2002). Below, we provide a review of insights from the theoretical literature on the optimal design of fiscal policy in a liquidity trap.

Recent research suggests that the optimal pattern of government spending when monetary policy is at the ELB and the economy is in a liquidity trap is to raise spending above the natural level, then reduce it below this level and eventually return it to the natural level (Werning 2011; Schmidt 2013; Nakata 2016). The increase in government spending during a liquidity trap mitigates the decline in aggregate demand and results in weaker deflationary pressure.

Correia et al. (2013) propose unconventional fiscal policy that relies on adjusting distortionary taxes to replicate the effects of negative nominal interest rates when monetary policy is at the ELB. A credible commitment to progressively increase consumption taxes would stimulate private demand by discouraging saving. Other taxes may be adjusted to correct the undesirable effects of consumption tax changes. Reductions in labour tax rates prevent real marginal costs of production from rising. A capital subsidy is required to prevent a decline in investment.

The unconventional fiscal policy proposed by Correia et al. (2013) operates similarly to monetary policy forward guidance. D'Acunto, Hoang and Weber (2019) argue and provide empirical evidence that unconventional fiscal policy is more effective than forward guidance because the former does not require sophisticated knowledge of economic theory to be understood by individuals. Furthermore, unconventional fiscal policy does not incur the cost of committing to potentially sub-optimal future stabilization.

2.4. Government credit policies

Government credit policies include credit programs to extend credit to certain borrowers and market segments and to implicitly or explicitly guarantee the obligations of government sponsored enterprises. They can be used as a countercyclical policy tool or can be implemented as automatic stabilizers when participation rates and loan accounts change during periods of financial market distress. Relatively little work has been done on government credit policies in analyses of the macroeconomic effects of fiscal policies. Though it would be important to consider the stimulus effects of these programs, how effective they may be and how much this channel can be scaled up remain open questions.

In Canada, Export Development Canada provides insurance for trade financing of exporting companies and their trading partners. Business Development Bank of Canada provides direct loans to small businesses, and Canada Mortgage and Housing Corporation guarantees the mortgage payment for financial institutions. In addition, Farm Credit Canada provides access to capital to farming operations.

Transmission channels

Credit policies affect macroeconomic outcomes by improving the terms and expanding access to credit for firms and households. There are two main channels: (1) an elasticity channel (intensive margin),

whereby the demand for loans increases when the costs of borrowing fall; and (2) a credit-expansion channel (extensive margin), whereby individuals who had been unable to borrow are able to do so when a direct government loan or a government loan guarantee is made available. As shown by Correia et al. (2018), credit policies (subsidies) that reduce the credit spreads can be effective in mitigating economic downturns associated with high and volatile credit spreads, such as the Great Recession. Moreover, when the credit spread is high but the further cut of policy rate is prevented by the ELB, credit subsidies stand out as the natural policy tool to lower the lending rate.

As a result, credit policies share characteristics of both fiscal and monetary policies (Lucas 2016). As government expenditure, credit policies are fiscal in nature. However, by lowering interest costs, credit policies increase lending to households and firms, similarly to the effect of monetary stimulus. Gale (1991) and Lucas (2016) provide theoretical models that include frictional financial intermediation (because of asymmetric information between borrowers and lenders) in which government credit policies are welfare enhancing.[12] Ahnert and Kuncl (2019) suggest that the self-selection of relatively lower-quality loans into government-backed credit guarantees (loan insurance) provides a positive externality on the liquidity of uninsured loans. Therefore, both the insured and uninsured loan markets achieve higher liquidity. Furthermore, government credit guarantees are more efficient than outright purchases of assets in the secondary markets.

Effectiveness, costs and scalability of the programs

Government credit subsidy programs appear to have played an important role during economic downturns that are accompanied by severe financial market distress. The benefits of direct loans by governments over intermediation by private banks include a reduction of non-performing loans of banks and a guarantee that loans will flow regardless of the stress in the banking system. Lucas (2016) estimates the fiscal multiplier of a variety of government credit policies in the United States by applying the appropriate fiscal multipliers estimated in the literature to the different types of loans. The estimated stimulus effects of these policies ranged from 0.7 percent to 4 percent of US GDP in 2010.[13] In Canada, the government-guaranteed credit programs, including the Business Credit Availability Program and Insured Mortgage Purchase Program, supported the Canadian economy during the Great Recession (Meh and Poloz 2018). In Korea, the Korea Credit Guarantee Fund and Korea Technology Finance Corporation, two public financial institutions, increased their funding for credit guarantees drastically to support small- and medium-sized enterprises. These measures, according to Sharma (2013), contributed to the fast recovery of the Korean economy.

Though it would be important to take the stimulus effects of these programs into account, the benefits need to be weighed against the costs of the programs. Assessing costs for credit-related activities is more complicated than for most non-credit fiscal policies because loans and loan guarantees involve uncertain cash flows that extend over many years. However, in evaluating the effects of these credit programs, it is important to explicitly consider their financing costs. Gale (1991) finds that existing credit

[12] The models are based on Stiglitz and Weiss (1981) and Rothschild and Stiglitz (1976).

[13] Lucas (2016) finds that these credit subsidies provide powerful stimulus to the economy of a magnitude similar to the ARRA. However, it is important to keep in mind that a large amount of uncertainty exists around these estimates.

subsidies in the United States raise private investment by between 0 percent and 4 percent although these subsidies were typically costly in terms of welfare (roughly 0.3–0.4 percent of GDP) because of the financing costs of these programs.

Government credit policies also tend to cause inefficiencies, including two crowding-out effects. First, government borrowing may reduce credit supply to private lenders. Second, borrowing by individuals or firms targeted by the credit guarantees could crowd out borrowing by those not targeted. Larraín and Quiroz (2006) investigate the impact of the Partial Credit Guarantee Fund (FOGAPE) in Chile. Their findings indicate that FOGAPE increased the supply of credit through additional loans that would not have been made without the credit guarantee scheme.

How efficiently credit is allocated across firms also matters. Bai, Hsieh and Song (2016) study China's credit expansion during the 2008–09 global financial crisis and show that credit increased mostly to large and well-connected state-owned enterprises rather than to more productive and constrained private-sector firms. This led to an increase in the misallocation across firms and a slowdown in productivity growth. Similarly, Bonomo, Brito and Martins (2015) show that the expansion of earmarked and government-owned bank loans in Brazil after the 2009–10 crisis had insignificant impact on investment because they were mainly directed at established firms. Brown, Earle and Morgulis (2015) analyze loan data from the Small Business Administration and find that small and mature firms would not grow even if they had better access to finance. This is because they are the least financially constrained. Instead, the young and fast-growing firms benefit the most from better financial access. The effects of the credit expansion could also depend on its persistence and its targeted industry (Bi, Cao and Dong 2018).[14]

The existing credit programs are sizable in some countries.[15] However, the scope to benefit households and firms remains unclear as the effects of scaling up this channel are uncertain. Lucas (2016) shows that, except during the 2008–09 global financial crisis, there is little cyclical variation in the pattern of new loan origination.

3. Complementarities in a small open economy versus a closed economy

This section discusses the specific considerations and implications of conducting fiscal policy in a small open advanced economy, such as Canada.

3.1. Effectiveness of fiscal policy

Based on evidence from general government expenditures in 44 countries, Ilzetzki, Mendoza and Vegh (2013) document that:

[14] Using a quantitative model calibrated to the Chinese economy and stimulus in the global financial crisis, Bi, Cao and Dong (2018) show that a more persistent credit expansion targeting the infrastructure sector could lead to lower output because of the crowding-out of private production.

[15] According to Gale (1991), in a typical year between 1980 and 1987, the US federal government subsidized, guaranteed or directly extended more than one-third of all borrowings from the private sector.

i. the output effect of an increase in government consumption is larger in industrial than in developing countries
ii. the fiscal multiplier is relatively large in economies operating under predetermined exchange rates, but it is zero in economies operating under flexible exchange rates
iii. fiscal multipliers in open economies are smaller than in closed economies
iv. fiscal multipliers in high-debt countries are negative

Hence, for Canada, an open economy with a flexible exchange rate, findings (ii) and (iii) point to the presence of small fiscal multipliers. However, since it is also an advanced economy with moderate debt levels, findings (i) and (iv) suggest that Canadian fiscal multipliers may be positive nevertheless.[16]

The traditional Mundell-Fleming paradigm postulates that fiscal policy is most effective under fixed exchange rates and less powerful under flexible exchange rates.[17] Moreover, in an environment in which monetary policy is more frequently operating around the ELB, the uncovered interest rate parity condition implies that flexible exchange rates are expected to have little variation. This suggests that during prolonged periods of monetary policies near the ELB, fiscal policy may be more effective even for flexible exchange rate regimes. Lessons from examining fiscal multipliers in fixed currency regimes, such as a monetary union, may be relevant to gauge the effects of fiscal policies during such ELB episodes. In particular, foreign-financed fiscal spending multipliers may be larger than 1 for small economies in currency unions (Farhi and Werning 2016).[18]

Evidence on automatic stabilizers in small open economies comes from Dolls, Fuest and Peichl (2012) and Kumhof and Laxton (2013), as well as from Meh and Poloz (2018), who explicitly examine the case of Canada. Using microsimulation models for the tax-and-transfer systems of 19 European countries and the United States, Dolls, Fuest and Peichl (2012) consider the possibilities that domestic output might depend heavily on export demand and that higher domestic demand might partly lead to higher imports. In their sample, the authors find a positive correlation of 0.51 between openness and the strength of automatic stabilizers. Moreover, Kumhof and Laxton (2013) argue explicitly in favour of automatic stabilizers in small open economies and show that "tax revenue gap rules" deliver sizable welfare gains relative to "balanced budget rules." In addition, the authors state that the associated gains are achieved at a very modest cost in terms of fiscal instrument volatility and that the preferred fiscal instruments are transfers, consumption taxes and labour income taxes.

[16] The fact that multipliers are smaller than 1 is also supported by Kilponen et al. (2015). The authors simulate 15 structural models of the European System of Central Banks to evaluate the impact of fiscal policy across different countries. The authors find that under standard monetary policy assumptions, short-run multipliers are smaller than 1 in absolute terms in most models, regardless of the fiscal instrument, the considered country or the nature of the fiscal shock.

[17] The reason for this is that under flexible exchange rates, a fiscal policy action affects the exchange rate, which, in turn, triggers a reaction of the components of aggregate demand that are sensitive to the exchange rate. A fiscal expansion, for example, would increase the domestic interest rate and, via the inflow of foreign capital, appreciate the domestic exchange rate. As a result, the international competitiveness of the domestic economy would fall and eventually reduce net exports. Hence, because of this "crowding out" effect under flexible exchange rates, a fiscal expansion will be less effective in stimulating the domestic economy.

[18] More generally, in a broad heterogeneous sample, studies have shown foreign-financed fiscal multipliers to be greater than domestic-financed fiscal multipliers (Priftis and Zimic 2021).

Using the Bank of Canada's projection model ToTEM, Meh and Poloz (2018) examine whether automatic fiscal stabilizers in Canada are strong enough to reduce potential limitations of monetary policy arising from the global financial cycle. In response to a foreign demand shock that causes the output gap to fall 1 percent, the model shows that current automatic stabilizers are strong enough to lean against the shock but are unable to counteract it meaningfully.[19]

3.2. Beyond domestic shocks

Whether economic shocks are domestic or foreign may also matter for fiscal and monetary policy in open economies. An open economy may require a focus of fiscal policy on stabilizing external shocks relative to achieving its domestic objectives. Rodrik (1998) documents a positive relationship between openness and government size and argues that economies exposed to foreign trade require larger fiscal expenditures to insure the domestic economy against foreign shocks.[20] The IMF (2015) suggests that an increase in trade flows by 10 percent of GDP is associated with a doubling of the dampening effect of government size[21] on growth volatility. Relatedly, Benigno and De Paoli (2010) show in a small open economy framework with a terms-of-trade externality that the optimal tax rate is not constant, even when prices are flexible.

The maturity composition and denomination of government debt may also matter for open economies. If a small open economy faces an elevated debt-to-GDP ratio and its debt is mainly held by foreigners, the government might find itself forced to rely on a tighter fiscal policy stance than domestic conditions warrant in order to reduce the debt burden and mitigate default concerns of foreign investors. In this context, Frankel, Vegh and Vuletin (2013) show that emerging and developing economies are likely to implement procyclical fiscal policies. The authors cite imperfect access to international credit markets and the lack of financial depth in the domestic economy as reasons that force governments of such countries to cut spending and raise taxes. However, once emerging market economies "graduate" and the quality of their institutions improves, their fiscal policy appears to become more countercyclical.[22]

[19] In the example considered, the key monetary policy rate falls by 175 basis points to keep inflation on target. Having automatic fiscal stabilizers operating reduces the required decline in the policy rate by only about 20 bps. If automatic fiscal stabilizers were about four times as powerful, 75 basis points of the adjustment were to come from fiscal policy and monetary policy would have had to respond only by 100 basis points.

[20] Using a small open economy model calibrated to the Canadian economy, Macklem (1993) shows that fiscal policy can be used to dampen the short-run effects of terms-of-trade disturbances on consumption. However, potential side-effects of this policy use include current account imbalances and the reallocation of production factors between sectors.

[21] Government size refers to the ratio of general government expenditure to GDP.

[22] A similar set of arguments is made by Bauducco and Caprioli (2014), who introduce limited commitment into a standard optimal fiscal policy model in small open economies and show that (i) the volatility of tax revenues over GDP is higher in emerging than in developed economies, (ii) fiscal policy is procyclical in emerging economies and (iii) emerging economies may "graduate" from procyclical fiscal policy and adopt countercyclical policies in the long run.

4. Discussion

One theme that recurs in the literature reviewed thus far is that the benefits of fiscal and monetary complementarity are likely larger when either policy-maker faces constraints in their response to an economic shock, such as the ELB for monetary policy during the global financial crisis. This raises the question of whether there are other episodes in which the benefits from complementary fiscal and monetary policy are heightened.

In times of an economic crisis, a country's economy deteriorates significantly. This is manifested in a serious decline in production, bankruptcy of enterprises, rising unemployment and a general lack of confidence in the future. Although there is no common definition of what constitutes a crisis, prolonged recessions, such as the global financial crisis and its aftermath the Great Recession, or sharp contractions in economic activity, such as the Great Depression in the 1930s, are generally accepted as economic crises. In these situations, more importance is given to policy interventions. Economic crises could also prompt unconventional actions by monetary and fiscal policy-makers.

A key factor in assessing the appropriateness of complementary policies is the extent to which the contraction is driven by aggregate demand or aggregate supply. Monetary policy tools operate most effectively on aggregate demand through adjustment of intertemporal prices and/or liquidity, smoothing the demand shock over time. In contrast, aggregate supply shocks, particularly long-lasting shocks, may be more difficult to smooth using monetary policy tools, depending on the monetary policy anchor, because the productive capacity of an economy is affected. As an example, an economic contraction caused by a public health closure of parts of an economy should, in the absence of an aggregate demand change or monetary policy response, be inflationary. The outcome for inflation, and inflation expectations, will depend on the extent to which the public health crisis lowers aggregate demand and beliefs about the length of the closure. It is important to recognize that monetary and fiscal policy may react contemporaneously in such situations, each according to their mandates. These interventions may be complementary in the sense that both are acting at the same time to stabilize economic activity without coordinating such interventions to be purposefully complementary. The optimality of designing complementary policy may, in such situations, occur after the period of the crisis if one or both of monetary policy and fiscal policy face unanticipated future constraints.

The COVID-19 economic contraction is such a scenario of a sharp contraction that may require a different policy prescription than less severe shocks. Public health policy aimed at flattening the infection curve inevitably steepens the macroeconomic recession curve, as the cut-back on consumption and work exacerbates the size of the recession caused by the epidemic (Eichenbaum, Rebelo and Trabandt 2020; Gourinchas 2020). To mitigate the impact of the severe economic shock, monetary policy has a vital role to play in guaranteeing the liquidity of the financial system. A fiscal policy response is required to expand the capacity of the health care system and to support households and firms at risk because of the economic fallout from the coronavirus shock. In general, fiscal policy is better equipped when the impacts of the economic crisis are heterogeneous, such as during the current pandemic, because they can be designed to support the most vulnerable. For example, a combination of fiscal policies in the form of unemployment insurance and payroll subsidies can work in tandem to mitigate the negative impacts of the epidemic by catering to different segments of the productivity ladder (Birinci

et al. 2020). In contrast, monetary policy is a broader macroeconomic policy tool, even when it is not constrained by the ELB.

Targeted government transfers provide otherwise illiquid households with cash that they can spend to sustain or temporarily increase their consumption.[23] Such temporary transfer programs support aggregate demand to the extent that they reach the households most severely affected by the pandemic and the resulting lockdown, such as low-wage temporary workers and employees in service industries and in smaller firms.

Bayer et al. (2020) study the transfer multipliers in the United States and find that transfers conditional on being unemployed much more effectively stimulate economic activity than unconditional transfers. Some argue that standard fiscal stimulus might be less effective than usual because shutting down some sectors mutes the multiplier feedback effect (Guerrieri et al. 2020). In terms of measuring the effectiveness of fiscal measures in this context, it is not clear whether the traditional concept of the GDP multiplier is appropriate, as the shut down of economic activity is an intentional response for public health reasons. Focusing on consumption and household income multipliers, Faria-e-Castro (2020) suggests that unemployment insurance benefits are the most effective fiscal tool to stabilize income for borrowers in the United States. In general, though, discretionary fiscal expenditures may be associated with uncertainty over their timing and implementation. In the context of a severe economic crisis, implementation lags can be made worse by attempts to better target policies (Faria-e-Castro 2020; Mankiw 2020). High levels of household and/or government debt may also weigh on economic activity and lower the natural rate of interest if savers have lower propensities to consume out of income than borrowers, which empirically appears to be the case (Mian, Straub and Sufi 2020). Conventional monetary and fiscal policy may be less effective, and policies that reduce inequality may be required to escape debt traps. Similarly, if recessions lower labour productivity and employment and credit markets impose collateral constraints, such as may occur during pandemics, then targeted transfers, such as wage subsidies, may contain layoffs during the most acute phase of a recession and keep the economy close to its full employment level (Céspedes, Chang and Velasco 2020).

The optimal design of complementary policies during crises will likely be episode specific for three reasons. The first reason is that generally few existing models are designed to address the optimal policy response because the economic shock has not been foreseen. If models do exist, they are generally not developed enough to address optimal policy design. The second reason is that the exit path from the episode is likely episode specific. For example, fiscal borrowing may be constrained by expectations of debt sustainability, which, in turn, may depend on current debt-to-GDP levels. The third reason is that there are generally imperfect historical parallels, so any data necessary to calculate elasticities and to evaluate trade-offs is missing.

If fiscal policy responses to a crisis result in a significant increase in public debt, a coordinated fiscal and monetary strategy may be optimal, with monetary policy aimed at inflating away a fraction of debt through a controlled rise of inflation (Bianchi, Faccini and Melosi 2020). While this strategy in theory separates the issue of long-run fiscal sustainability from a stabilization policy, the inflation targeting

[23] In Canada, the main targeted transfer programs for the first wave of the COVID-19 pandemic are the Canada Emergency Wage Subsidy (CEWS) and the Canada Emergency Response Benefit (CERB).

framework and central bank independence could be undermined by a lack of future commitment to this policy. It is unlikely that inflation will significantly lower the debt burden (Hilscher et al. 2014) unless the changes in the inflation target are essentially permanent (Krause and Moyen 2016).[24] Even as debt burdens increase, the ability of inflation to make a substantial contribution to fiscal sustainability is generally not strong enough for large systematic deviations of inflation from its target to be an optimal policy (Schmitt-Grohe and Uribe 2004; Faraglia et al. 2013). Thus, the scope for monetary policy to accommodate fiscal debt burdens by increasing inflation appears to be limited. Other channels through which the central bank can influence the government's budget constraint are also unlikely to be effective (Reis 2019).

[24] Hall and Sargent (2011) suggest that, over the postwar period from 1945 to 2009, while the US government has at times inflated away its debt, the magnitudes were small.

References

Acharya, S. and K. Dogra. 2020. "Understanding HANK: Insights from a PRANK." *Econometrica* 88 (3): 1113–1158.

Adam, K. and R. Billi. 2007. "Discretionary Monetary Policy and the Zero Lower Bound on Nominal Interest Rates." *Journal of Monetary Economics* 54 (3): 728–752.

Agrawal, A. K. and D. Matsa. 2013. "Labor Unemployment Risk and Corporate Financing Decisions." *Journal of Financial Economics* 108 (2): 449–470.

Auclert, A. 2019. "Monetary Policy and the Redistribution Channel." *American Economic Review* 109 (6): 2333–2367.

Auerbach, A. J. and D. Feenberg. 2000. "The Significance of Federal Taxes as Automatic Stabilizers." *Journal of Economic Perspectives* 14 (3): 37–56.

Auerbach, A. J. and Y. Gorodnichenko. 2012. "Measuring the Output Responses to Fiscal Policy." *American Economic Journal: Economic Policy* 4 (2): 1–27.

Auerbach, A. J., Y. Gorodnichenko and D. Murphy. 2020. "Local Fiscal Multipliers and Fiscal Spillovers in the United States." *IMF Economic Review* 68 (1): 195–229.

Bai, C., C. Hsieh and Z. M. Song. 2016. "The Long Shadow of a Fiscal Expansion." *Brookings Papers on Economic Activity* (Fall).

Baily, M. N. 1978. "Some Aspects of Optimal Unemployment Insurance." *Journal of Public Economics* 10 (3): 379–402.

Barro, R. J. and C. J. Redlick. 2011. "Macroeconomic Effects from Government Purchases and Taxes." *Quarterly Journal of Economics* 126 (1): 51–102.

Basso H. and O. Rachedi. 2020. "The Young, the Old, and the Government: Demographics and Fiscal Multipliers." *American Economic Journal: Macroeconomic*s (forthcoming).

Bauducco, S. and F. Caprioli. 2014. "Optimal Fiscal Policy in a Small Open Economy with Limited Commitment." *Journal of International Economics* 93 (2): 302–315.

Baunsgaard, T. and S. A. Symansky. 2009. "Automatic Fiscal Stabilizers." International Monetary Fund Staff Position Note No. 2009/23.

Bayer, C., B. Born, R. Luetticke and G. Mueller. 2020. "The Coronavirus Stimulus Package: How Large Is the Transfer Multiplier?" Mimeo.

Benabou, R. 2002. "Tax and Education Policy in a Heterogeneous Agent Economy: What Levels of Redistribution Maximize Growth and Efficiency?" *Econometrica* 70 (2): 481–517.

Benigno, G. and B. De Paoli. 2010. "On the International Dimension of Fiscal Policy." *Journal of Money, Credit and Banking* 42 (8): 1523–1542.

Bernanke, B. 2016. "Monetary Policy in the Future." In *Progress and Confusion: The State of Macroeconomic Policy*, edited by O. Blanchard, R. Rajan, K. Rogoff and L. H. Summers, 129–134. Cambridge, MA: The MIT Press.

Bi, H., Y. Cao and W. Dong. 2018. "Non-performing Loans, Fiscal Costs and Credit Expansion in China." Bank of Canada Staff Working Paper No. 2018-53.

Bianchi, F., R. Faccini and L. Melosi. 2020. "Monetary and Fiscal Policies in Times of Large Debt: Unity is Strength." National Bureau of Economic Research Working Paper No. 27112.

Birinci, S., F. Karahan, Y. Mercan and K. See. 2020. "Labor Market Policies During an Epidemic." Federal Reserve Bank of St. Louis Working Paper No. 2020-024C.

Blanchard, O. 2000. "Commentary." *Economic Policy Review*, Federal Reserve Bank of New York, April.

Blanchard, O., G. Dell'Ariccia and P. Mauro. 2010. "Rethinking Macroeconomic Policy." *Journal of Money, Credit and Banking* 42 (s1): 199–215.

Bonomo, M., R. D. Brito and B. Martins. 2015. "The After-Crisis Government-Driven Credit Expansion in Brazil: A Firm Level Analysis." *Journal of International Money and Finance* 55: 111–134.

Bouakez, H., O. Rachedi and E. Santoro. 2020. "The Government Spending Multiplier in a Multi-Sector Economy." Mimeo.

Brown, J., J. Earle and Y. Morgulis. 2015. "Job Creation, Small vs. Large vs. Young, and the SBA." National Bureau of Economic Research Working Paper No. 21733.

Caldara, D. and K. Kamps. 2017. "The Analytics of SVARs: A Unified Framework to Measure Fiscal Multipliers." *Review of Economic Studies* 84 (3): 1015–1040.

Canova, F. and E. Pappa. 2011. "Fiscal Policy, Pricing Frictions and Monetary Accommodation." *Economic Policy* 26 (68): 557–598.

Céspedes, L. F., R. Chang and A. Velasco. 2020. "The Macroeconomics of a Pandemic: A Minimalist Model." National Bureau of Economic Research Working Paper No. 27228.

Chetty, R. 2006. "A General Formula for the Optimal Level of Social Insurance." *Journal of Public Economics* 90 (10-11): 1879–1901.

Chodorow-Reich, G. 2019. "Geographic Cross-Sectional Fiscal Spending Multipliers: What Have We Learned?" *American Economic Journal: Economic Policy* 11 (2): 1–34.

Christiano, L., M. Eichenbaum and S. Rebelo. 2011. "When Is the Government Spending Multiplier Large?" *Journal of Political Economy* 119 (1): 78–121.

Coenen, G., C. J. Erceg, C. Freedman, D. Furceri, M. Kumhof, R. Lalonde, D. Laxton, J. Lindé, A. Mourougane, D. Muir, S. Mursula, C. de Resende, J. Roberts, W. Roeger, S. Snudden, M. Trabandt and J. in't Veld. 2012. "Effects of Fiscal Stimulus in Structural Models." *American Economic Journal: Macroeconomics* 4 (1): 22–68

Cogan, J. F., T. Cwik, J. B. Taylor and V. Wieland. 2010. "New Keynesian versus Old Keynesian Government Spending Multipliers." *Journal of Economic Dynamics and Control* 34 (3): 281–295.

Conesa, J. C. and D. Krueger. 2006. "On the Optimal Progressivity of the Income Tax Code." *Journal of Monetary Economics* 53 (7): 1425–1450.

Correia, I., F. De Fiore, P. Teles and O. Tristani. 2018. "Credit Subsidies." *Journal of Monetary Economics* (forthcoming).

Correia, I., E. Farhi, J. P. Nicolini and P. Teles. 2013. "Unconventional Fiscal Policy at the Zero Bound." *American Economic Review* 103 (4): 1172–1211.

D'Acunto F., D. Hoang and M. Weber. 2019. "Managing Households' Expectations with Simple Economic Policies." University of Chicago Becker Friedman Institute for Economics Working Paper No. 2019-106.

Di Maggio, M. and A. Kermani. 2016. "Unemployment Insurance as an Automatic Stabilizer: The Financial Channel." National Bureau of Economic Research Working Paper No. 22625.

Dolls, M., C. Fuest and A. Peichl. 2012. "Automatic Stabilizers and Economic Crisis: US vs. Europe." *Journal of Public Economics* 96 (3-4): 279–294.

Dupor, B. and R. Guerrero. 2020. "The Aggregate and Local Economic Effects of Government Financed Health Care." Mimeo.

Eichenbaum, M. 2018. *Talk Given at the G7 Meeting, Montebello, Quebec*, February 7.

Eichenbaum, M., S. Rebelo and M. Trabandt. 2020. "The Macroeconomics of Epidemics." National Bureau of Economic Research Working Paper No. 26882.

Elmendorf, D. and J. Furman. 2008. "If, When, How: A Primer on Fiscal Stimulus." A Hamilton Project Discussion Paper, January 10.

Evans, G. W., E. Guse and S. Honkapohja. 2008. "Liquidity Traps, Learning and Stagnation." *European Economic Review* 52 (8): 1438–1463.

Faraglia, E., A. Marcet, R. Oikonomou and A. Scott. 2013. "The Impact of Debt Levels and Debt Maturity on Inflation." *The Economic Journal* 123 (566): F164–F192.

Farhi, E. and I. Werning. 2016. "Fiscal Multipliers: Liquidity Traps and Currency Unions." In *Handbook of Macroeconomics* 2: 2417–2492.

Faria-e-Castro, M. 2020. “Fiscal Policy During a Pandemic.” Federal Reserve Bank of St. Louis Working Paper No. 2020-0006.

Fazzari, S. M., J. Morley and I. Panovska. 2015. “State-Dependent Effects of Fiscal Policy.” *Studies in Nonlinear Dynamics and Econometrics* 19 (3): 285–315.

Fedelino, A., A. Ivanova and M. Horton. 2005. “Computing Cyclically Adjusted Balances and Automatic Stabilizers.” International Monetary Fund Technical Notes and Manuals 09/005.

Feldstein, M. 2002. “Commentary: Is There a Role for Discretionary Fiscal Policy?” In *Rethinking Stabilization Policy*. Kansas City: Federal Reserve Bank of Kansas City.

Feldstein, M. 2007. “How to Avert a Recession.” *Wall Street Journal*, December 5.

Ferriere, A. and G. M. Navarro. 2018. “The Heterogeneous Effects of Government Spending: It’s All About Taxes.” Board of Governors of the Federal Reserve System International Finance Discussion Paper No. 1237.

Frankel, J. A., C. A. Vegh and G. Vuletin. 2013. “On Graduation from Fiscal Procyclicality.” *Journal of Development Economics* 100 (1): 32–47.

Furman, J. 2016. “The New View of Fiscal Policy and Its Application.” In *Conference: Global Implications of Europe’s Redesign*, New York, October 5.

Gale, W. D. 1991. “Economic Effects of Federal Credit Programs.” *American Economic Review* 81 (1): 133–152.

Gali, J. 2020. “Helicopter Money: The Time Is Now.” VoxEU.org, March 17.

Giambattista, E. and S. Pennings. 2017. “When Is the Government Transfer Multiplier Large?” *European Economic Review* 100 (C): 525–543.

Golosov, M., M. Troshkin and A. Tsyvinski. 2016. “Redistribution and Social Insurance.” *American Economic Review* 106 (2): 359–386.

Gourinchas, P. -O. 2020. “Flattening the Pandemic and Recession Curves.” Mimeo.

Gray, D. and C. Busby. 2016. “Unequal Access: Making Sense of EI Eligibility Rules and How to Improve Them.” *C. D. Howe Institute Commentary* 450.

Graziano, M. and G. Thwaites. 2019. “The Effect of Automatic Stabilisers in the UK.” *Recession Ready? Assessing the UK’s Macroeconomic Framework*. Resolution Foundation.

Guajardo, J., D. Leigh and A. Pescatori. 2014. “Expansionary Austerity? International Evidence.” *Journal of the European Economic Association* 12 (4): 949–968.

Guerrieri, V., G. Lorenzoni, L. Straub and I. Werning. 2020. “Macroeconomic Implications of COVID-19: Can Negative Supply Shocks Cause Demand Shortages?” National Bureau of Economic Research Paper No. 26918.

Hall, G. and T. Sargent. 2011. “Interest Rate Risk and Other Determinants of Post-WWII US Government Debt/GDP Dynamics.” *American Economic Journal: Macroeconomics* 3 (3): 192–214.

Heathcote, J., K. Storesletten and G. L. Violante. 2017. “Optimal Tax Progressivity: An Analytical Framework.” *Quarterly Journal of Economics* 132 (4), 1693–1754.

Hills, T., T. Nakata and S. Schmidt. 2019. “Effective Lower Bound Risk.” *European Economic Review* 120.

Hsu, J. W, D. A. Matsa and B. T. Melzer. 2018. “Unemployment Insurance as a Housing Market Stabilizer.” *American Economic Review* 108 (1): 49–81.

Ilzetzki, E., E. G. Mendoza and C. A. Vegh. 2013. “How Big (Small?) Are Fiscal Multipliers?” *Journal of Monetary Economics* 60 (2): 239–254.

International Monetary Fund Fiscal Affairs Department. 2015. “Now Is the Time: Fiscal Policies for Sustainable Growth.” *Fiscal Monitor*, April 15.

Kekre, R. 2021. “Unemployment Insurance in Macroeconomic Stabilization.” University of Chicago, Becker Friedman Institute for Economics Working Paper No. 2021-28.

Kilponen, J., M. Pisani, S. Schmidt, V. Corbo, T. Hledik, J. Hollmayr, S. Hurtado, P. Júlio, D. Kulikov, M. Lemoine, M. Lozej, H. Lundvall, J. R. Maria, B. Micallef, D. Papageorgiou, J. Rysanek, D. Sideris, C. Thomas and G. De Walque. 2015. “Comparing Fiscal Multipliers Across Models and Countries in Europe.” European Central Bank Working Paper No. 1760.

Krause, M. and S. Moyen. 2016. “Public Debt and Changing Inflation Targets.” *American Economic Journal: Macroeconomics* 8 (4): 142–176.

Krueger, D. and A. Ludwig. 2013. “Optimal Progressive Labor Income Taxation and Education Subsidies When Education Decisions and Intergenerational Transfers Are Endogenous.” *American Economic Review* 103 (3): 496–501.

Kumhof, M. and D. Laxton. 2013. “Simple Fiscal Policy Rules for Small Open Economies.” *Journal of International Economics* 91 (1): 113–127.

Larraín, C. and J. Quiroz. 2006. “Estudio para el fondo de garantía de pequeños empresarios.” Mimeo.

Leduc, S. and D. Wilson. 2012. “Roads to Prosperity or Bridges to Nowhere? Theory and Evidence on the Impact of Public Infrastructure Investment.” In *National Bureau of Economic Research Macroeconomics Annual* 27: 89–142.

Library of Parliament. 2015. “Legislating a Balanced Budget: Requirements in Canada and Abroad.” HillNotes: Research and Analysis from Canada’s Library of Parliament, June 30.

Lucas, D. 2016. “Credit Policy as Fiscal Policy.” *Brookings Papers on Economic Activity* 47 (1): 147.

Macklem, R. T. 1993. “Terms-of-Trade Disturbances and Fiscal Policy in a Small Open Economy.” *Economic Journal* 103 (419): 916–936.

Mankiw, G. 2020. “A Proposal for Social Insurance During the Pandemic.” Greg Mankiw’s Blog: Random Observations for Students of Economics, March 23.

Mertens, K. and M. O. Ravn. 2013. “The Dynamic Effects of Personal and Corporate Income Tax Changes in the United States.” *American Economic Review* 103 (4): 1212–1247.

Mian, A. R., L. Straub and A. Sufi. 2020. ”Indebted Demand.” National Bureau of Economic Research Working Paper No. 26940.

Mirrlees, J. A. 1971. “An Exploration in the Theory of Optimal Income Taxation.” *Review of Economic Studies* 38 (2): 175–208.

Miyamoto, W., T. L. Nguyen and D. Sergeyev. 2018. “Government Spending Multipliers Under the Zero Lower Bound.” *American Economic Journal: Macroeconomics* 10 (3): 247–277.

Mountford, A. and H. Uhlig. 2009. “What Are the Effects of Fiscal Policy Shocks?” *Journal of Applied Econometrics* 24 (6): 960–992.

McKay, A. and R. Reis. 2016. “The Role of Automatic Stabilizers in the U.S. Business Cycle.” *Econometrica* 84 (1): 141–194.

McKay, A. and R. Reis. 2020. “Optimal Automatic Stabilizers.” *Review of Economic Studies* (forthcoming).

Meh, C. and S. Poloz. 2018. “Investing in Monetary Policy Independence in a Small Open Economy.” In *Monetary Policy Spillovers in a Financially Integrated World*, 64–80. Proceedings of the Danmarks Nationalbank–BIS Conference, September 7–8. Copenhagan: Danmarks Nationalbank and Bank for International Settlements.

Nakamura, E. and J. Steinsson. 2014. “Fiscal Stimulus in a Monetary Union: Evidence from U.S. Regions.” *American Economic Review* 104 (3), 753–792.

Nakata, T. 2016. “Optimal Fiscal and Monetary Policy with Occasionally Binding Zero Bound Constraints.” *Journal of Economic Dynamics and Control* 73, December 2016, Pages 220–240.

Oh, H. and R. Reis. 2012. “Targeted Transfers and the Fiscal Response to the Great Recession.” *Journal of Monetary Economic*s 59 (supplement): 50–64

Owyang, M., V. Ramey and S. Zubairy. 2013. "Are Government Spending Multipliers Greater during Periods of Slack? Evidence from Twentieth-Century Historical Data." *American Economic Review* 103 (3): 129–134.

Parker, J. A., N. S. Souleles, D. S. Johnson and R. McClelland. 2013. "Consumer Spending and the Economics Stimulus Payments of 2008." *American Economic Review* 103 (6): 2530–2553.

Poloz, S. S. 2016. "The Doug Purvis Memorial Lecture—Monetary/Fiscal Policy Mix and Financial Stability: The Medium Term Is Still the Message." Bank of Canada Staff Discussion Paper No. 2016–13.

Priftis, R. and S. Zimic. 2021. "Sources of Borrowing and Fiscal Multipliers." *The Economic Journal* 131 (633): 498–519.

Ramey, V. A. 2019. "Ten Years After the Financial Crisis: What Have We Learned from the Renaissance in Fiscal Research?" *Journal of Economic Perspectives* 33 (2): 89–114.

Ramey, V. A. and S. Zubairy. 2018. "Government Spending Multipliers in Good Times and in Bad: Evidence from US Historical Data." *Journal of Political Economy* 126 (2): 850–901.

Reis, R. 2019. "Can the Central Bank Alleviate Fiscal Burdens?" The Oxford Handbook of the Economics of Central Banking, edited by D.G. Mayes, P.L. Siklos and J.-E. Sturm. Oxford University Press.

Rodrik, D. 1998. "Why Do More Open Economies Have Bigger Governments?" *Journal of Political Economy* 106 (5): 997–1032.

Romer, C. D. and D. H. Romer. 2010. "The Macroeconomic Effects of Tax Changes: Estimates Based on a New Measure of Fiscal Shocks." *American Economic Review* 100 (3): 763–801.

Rothschild, M. and J. Stiglitz. 1976. "Equilibrium in Competitive Insurance Markets: An Essay on the Economics of Imperfect Information." *Quarterly Journal of Economics* 90 (4): 629–649.

Sahm, C. 2019. "Direct Stimulus Payments to Individuals." In *Recession Ready: Fiscal Policies to Stabilize the American Economy*, edited by H. Boushey, R. Nunn and J. Shambaugh, 67–92. Brookings Institution.

Schembri, L. 2018. "Anchoring Expectations: Canada's Approach to Price Stability." Remarks at the Manitoba Association for Business Economists, Winnipeg, Manitoba, February 15.

Schmidt, S. 2013. "Optimal Monetary and Fiscal Policy with a Zero Bound on Nominal Interest Rates." *Journal of Money, Credit and Banking* 45 (7): 1335–1350.

Schmitt-Grohé, S. and M. Uribe. 2004. "Optimal Fiscal and Monetary Policy Under Sticky Prices." *Journal of Economic Theory* 114 (2): 198–230.

Sharma, S. D. 2013. "How South Korea Weathered the 2008 Financial Crisis." *Global Asia* 8 (1).

Sheiner, L. and M. Ng. 2019. “How Stabilizing Has Fiscal Policy Been?” In *Recession Ready: Fiscal Policies to Stabilize the American Economy*, edited by H. Boushey, R. Nunn and J Shambaugh, 49–66. Brookings Institution.

Simon, L. 2019. “Fiscal Stimulus and Skill Accumulation over the Life Cycle.” European University Institute, Mimeo.

Smets, F., J. Tielens and J. V. Hove. 2018. “Pipeline Pressures and Sectoral Inflation Dynamics.” National Bank of Belgium Working Paper No. 351.

Solow, R. M. 2002. “Is Fiscal Policy Possible? Is It Desirable?” Presidential address to the XIII World Congress of the International Economic Association, Lisbon, September.

Solow, R. M. 2005. “Rethinking Fiscal Policy.” *Oxford Review of Economic Policy* 21 (4): 509–514

Stiglitz, J. E. and A. Weiss. 1981. “Credit Rationing in Markets with Imperfect Information.” *American Economic Review* 71 (3), 393–410.

Varian, H. R. 1980. “Redistributive Taxation as Social Insurance.” *Journal of Public Economics* 14 (1): 49–68.

Werning, I. 2011. “Managing a Liquidity Trap: Monetary and Fiscal Policy.” National Bureau of Economic Research Working Paper No. 17344.