Background Memo - Economic Policy Council

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Fiscal multipliers: a review

When the previous government of Juha Sipilä took power in 2015, the Finnish economy was experiencing its second recession in a decade and the level of output was still below where it was before the Financial Crisis. At the same time public debt had increased rapidly with no improvement in sight. The government announced and implemented a spending-based consolidation package of 4 billion EUR annually, along with some temporary spending increases (totaling 1 billion EUR over 2016–2018). The consolidation effort was to some extent undermined by tax cuts (totaling 800 million EUR by 2019), promised and delivered on the basis of an agreement by the labor market parties to improve cost competitiveness. Partly as a result of this package and other government policies, and partly as a reason of favorable international demand, output and employment growth picked up. This, along with fiscal consolidation, contributed to an improvement in public finances. On the other hand the government had also sought to improve the long-run outlook of fiscal sustainability through structural reforms such as the health care reform, but these efforts mostly failed.

The current government of Antti Rinne then entered office with a growing economy and a shrinking public deficit. In its programme the government announced a net increase in permanent spending by 1 billion EUR annually, which is for the most part (700 million EUR) funded through tax increases. The government also announced temporary spending increases totaling 3 billion EUR over 2020–2022, which is to be funded through sales of government assets. Additionally the government programme includes a mechanism for increasing spending if the economy enters a deep recession for reasons not related to the government's actions. The mechanism allows for extra spending of 1 billion EUR over 2020–2022.

The purpose of this memo is to review the recent literature on the output effects of fiscal policy to assist the Economic Policy Council in evaluating the fiscal policy announcements and measures of the Rinne government. The main questions are: i) what is the overall magnitude of fiscal multipliers, ii) what the relative magnitude of spending and tax multipliers is, and iii) do multipliers vary over the business cycle. The closely related literature on fiscal consolidations is also included. I will try to summarize research in this field to provide answers to these questions. There are some points of disagreement between different studies, and one key focus will be to understand why the studies disagree.

This memo reviews international literature, both theoretical and empirical, on these issues. If the question – the effect of fiscal policy on output – is ultimately empirical, and the context is an evaluation of fiscal policy in Finland, why bother with theoretical arguments or empirical experiences from other countries? The answer is that empirical research is limited to studying what has occurred historically, and the opportunities for identifying multipliers from historical data are scarce, especially so from a single country. Theoretical results also serve as a sanity check for

empirical results, which may be flawed for numerous reasons; and similarly empirical results from Finnish studies should be reflected against empirical results from elsewhere.

Although this memo aims to provide a general view of the literature, some issues receive more attention than other. The section on estimation focuses on identification, while more technical issues are not discussed even though these are quite important. The section on empirical results reviews extensively the recent literature on tax multipliers identified using narrative methods, as this has been perhaps the most active area of research in the recent years and has quite consistently provided results which differ from those obtained earlier using other methods.

Section 1 discusses some theoretical mechanisms which are useful when understanding empirical results from different studies and generalizing from them. Section 2 discusses the "deep" question of identification, as well as more technical issues related to estimating impulse responses and summarizing them as fiscal multipliers. Section 3 summarizes results from recent empirical studies. Section 4 concludes with possible areas for future applied research on Finnish multipliers.

1. Theory: demand, supply, and expectations

Fiscal policy concerns adjustments in taxes and expenditure, where expenditure can be consumption, investment, or transfer spending. The line between consumption and investment can be theoretically blurry, but in practice it is drawn by categories of national accounting.

Output, or gross domestic product, can be expressed as a sum of private consumption, public consumption, private investment, public investment, and net exports. Any effect of a fiscal shock on output runs through these variables. An increase in government consumption or investment enters directly into GDP, so whether their multiplier is larger or smaller than unity is determined by whether other items augment or offset the initial shock. Tax and transfer shocks change households' budget constraints and consequently their consumption decisions, and possibly also their labor supply and savings decisions.

How does a fiscal shock run through the economy, changing households' and firms' incentives and choices along the way? It is first useful to distinguish three mechanisms: demand, supply, and expectations. I will describe how fiscal policy works in two very simple models. Although these models are not used in policy analysis, they are helpful in understanding the mechanisms that are at play in those models that are actually used by central banks and finance ministries, for example.

The most basic Keynesian model postulates that output is determined by demand, and any increase in demand will also increase output. This model predicts that an increase in government consumption will directly increase GDP and disposable income, which in turn generates a demand increase, which in turn generates more output, and so on. For example, an increase in public construction increases production, but also the incomes of construction workers who then spend some of their new income, generating further increases in GDP and income. An increase in transfers or a decrease in taxes works similarly but misses out on the first round of direct effects. This model predicts that consumption (and investment) multipliers will be larger than tax or transfer multipliers, and that the multipliers will depend on households' marginal propensity to consume domestic goods (if a household receives one euro of extra income, by how much will its consumption on domestic goods increase). Notice that when the demand increase is directed towards foreign goods, the money "leaks out" of the economy without generating further increases in demand, unless the country can expect that an increase in foreign incomes increases the demand for its exports. Thus the model further predicts that fiscal multipliers will be lower in small open economies.

The previous model is simple. Whatever is demanded is produced, and households consume some fraction of whatever they earn. This obviously raises questions. What determines how much households decide to consume out of extra income? Where do the increases in labor and capital required for extra production come from? It is useful to contrast the simple Keynesian model with one that models the production function (how stuff gets made) and household decision-making (how much to work, consume, spend and save). The polar opposite of the simple Keynesian model is probably some type of a neo-classical growth model. With non-distortionary taxation tax shocks will have a zero multiplier. This is because forward-looking consumers who want to smooth their consumption paths will increase their saving rate in response to a deficit-financed tax cut as they understand that the deficit will be paid back later through tax increases. On the other hand when the government increases spending, households' tax burden increases, which decreases their lifetime wealth. This leads the households to increase their labor supply, which results in increased output.

It should be said that the neo-classical approach does allow for large multipliers if the production function is defined so that government spending is complementary to other inputs. If the economy produces ships using private capital and public harbors, an increase in public spending on harbor production will increase the supply of private capital as well, and will increase output. Also the effect of taxes on output will become larger in more realistic models with distortionary taxes.

Modern macroeconomic models which are used to analyze the output effects of fiscal policy more formally combine aspects of the two approaches, modeling deviations from assumptions such as perfect competition where it seems to be most useful in terms of fitting the data. Households make decisions concerning consumption, saving, and labor supply and take the future into account. Some of the households can, however, be more Keynesian in the sense that they consume by rule of thumb or live hand-to-mouth due to credit constraints. Production is determined by labor and capital inputs, but in the short run there may be nominal rigidities which constrain price changes or real rigidities such as investment adjustment costs. Taxes may be distortionary.

These models, which are usually called DSGE models, are then calibrated or estimated to produce results that match real-life data in terms of investment share, volatility of output, etc. After this, the models can be used to produce fiscal multipliers.[1]

2. Identification of output effects of fiscal policy

This section provides some background to understand how economists go about estimating the output effects of fiscal policy. As already noted in the beginning, this section focuses on identification. Although identification is important, more technical issues related to estimation of impulse response functions and transforming them into a scalar ("the multiplier") are also relevant. Some of these issues and their relevance to the results are discussed well by Ramey & Zubairy (2018) in the context of estimating business cycle-dependent multipliers.

Identification is distilling causation from mere correlation. There are numerous ways in which taxes and spending correlate with output that are not interesting to the policymaker who wants to

[1] Finally, it should be noted that it is not fiscal policy's output effects, but its welfare effects which are of ultimate interest. Although any model with microfoundations could, in principle, be used to analyze "welfare multipliers" in addition to output multipliers, very few studies do this (see Sims & Wolff 2018a,2018b for an exception). See also Woodford (2011).

understand the effects of different policy actions. Often output goes down when tax revenue goes down, which is understandable as taxes are collected from income and consumption. Sometimes spending might go up before output goes down as policymakers anticipate a coming recession and increase fiscal stimulus.

To identify the effects of fiscal policy shocks, researchers search for cases where taxes or public spending changed "exogenously", i.e. in a way that is not related to changes in economy. There are several approaches to this. All of them combine the correlations observed in the data with some outside information which restrict the correlations so that hopefully only the correlations of interest remain.

Each approach has its own drawbacks and advantages.

DGSE models, or structural macroeconometrics

The acronym DSGE refers to a broad class of macroeconomic models which are used to study short-run dynamics in the economy. Dynamic refers to the fact that decisionmakers in the economy – households, firms and the government – are forward-looking. They form expectations of the future, and these expectations shape their actions. Stochastic refers to the fact that sometimes unexpected things (shocks) happen, and then decisionmakers must adjust to these. General equilibrium refers to modeling the entire economy as opposed to a subsector such as the labor market, and that there are interactions between different markets and different decision makers across the entire economy.

A model is built by defining the decisionmakers' objectives (e.g. firms maximize profits), what constrains them (e.g. households have a finite amount of time to divide between leisure and work, technology constrains how firms combine inputs to produce output), and how they form expectations. The decision makers optimize, which simply means they maximize their objectives given the constraints they face. This results in optimality conditions, which (along with definitions, resource constraints and models for exogenous processes such as technological change) define the solution of the model, its equilibrium. This essentially means that all the building blocks of the model fit together, for example the level of consumption and prices are consistent with what households want to consume and what firms want to produce, and so on.

The model is taken to data, which means calibrating or estimating the theoretical parameters of the model. These parameters can describe, for example, how sticky prices are or the autocorrelation of export demand shocks. After the model is calibrated or estimated, it can be used to produce impulse responses to fiscal shocks (provided that fiscal policy is included in the model).

Finnish DSGE models include the Aino 2.0 model used by the Bank of Finland (Kilponen et al. 2016), and the Kooma model used by the Ministry of Finance (see Kuismanen et al. 2013 for the model code).

Structural vector autoregressions

Suppose you believe that DSGE models make too many assumptions you do not agree with, and you want to let the data speak for itself. A natural starting point is to define a vector autoregression (VAR). In an autoregressive process, a variable is defined as a function of its lagged values. In a vector autoregression a collection of variables (for example spending, taxes and output) variables are defined as functions of their own lagged values, and those of the other variables included in the model. To be more precise, such a model is called a reduced-form VAR, in contrast to other types of VARs we'll get to in a minute.

This model would describe how output responds to changes in government spending (and taxes). It would also describe how government spending is determined as a function of previous changes in spending and output, essentially estimating the "policy rule" typically followed by the government during the sample period. As this model describes real-world data, it will not fit the data perfectly. The difference between the estimated model's prediction and the data are the residuals, and these can be understood as shocks in the model. Any change in government spending not explained by past values of spending and output are the "shocks" that the model identifies from data.

The problem is that these shocks are not meaningful from a policy perspective, and this model is not informative of the effects of fiscal policy on output. The problem is that the model is defined in terms of lagged values, but it is likely that at least some variables respond to other variables "instantly", or within the same period (typically quarter in empirical applications). Because of this it is not clear what the shocks represent. The fiscal policy shock represented by the residual of the spending equation may just be a response of fiscal policy to an output shock happening at the same time. Because the shocks are not well-defined, the coefficients will not be either, and the model is not informative of fiscal multipliers.

Why not just let everything be a function of their own lagged values plus current values of all the other variables? The non-technical answer is that there's not enough information in the data to estimate this many parameters. To get something meaningful out of the model, restrictions have to be imposed upon it from outside the model, which results in what is called a structural VAR (SVAR). These restrictions are the identifying assumptions in SVARs.

There are many approaches to coming up with these identifying assumptions. Here I'll illustrate the issue using perhaps the most popular one, the Blanchard & Perotti (2002) approach, which restricts the contemporaneous relationships between different variables.[2] First, assume that discretionary fiscal policy takes more than a quarter to respond to output shocks. This means that policymakers cannot learn from an output shock, devise a fiscal response, and implement it within a single quarter. Given the lags in policymaking, this seems like a reasonable assumption. After this assumption, the fiscal policy residual in the VAR is either an exogenous fiscal policy shock, or an automatic response of fiscal policy to output. To control for the latter, "output elasticities" which describe the magnitude of the automatic responses need to be obtained from outside the data. Some outside information is required because simply estimating these parameters from quarterly data mixes the automatic response of fiscal policy to output and the contemporaneous response of output to fiscal variables. Blanchard & Perotti (2002) follow Giorno et al. (1995) who use institutional information (such as tax rates and unemployment benefit replacement rates) concerning the tax-and-spending systems of OECD countries. After this, the model is identified.

The Blanchard-Perotti method has been applied to Finnish data by Lehmus (2012) and extended to include regime-dependence (using the approach of Auerbach & Gorodnichenko 2012) by Keränen & Kuusi (2016).

Narrative identification of shocks

Both the DSGE and SVAR approaches impose restrictions on the data to "filter out" exogenous policy shocks from endogenous responses. An alternative approach is to use historical records to directly estimate policy shocks. The motivations of the policymakers presented in the historical texts contain information which can be used to label policy shocks as either exogenous or endogenous. Note that endogeneity here refers to endogeneity with respect to short-run output

[2] Others include long-run restrictions and sign restrictions. See Stock & Watson (2016) for a review.

fluctuations. After the exogenous shocks have been identified, impulse response functions can be estimated in different ways (these are discussed in the next section).

In the context of fiscal multipliers, Romer & Romer (2010) first applied this method to tax changes in post-WWII US. In their work, exogenous tax changes are typically those that are motivated by a desire to reduce debt or to increase long-run growth.

There are no studies which estimate multipliers for Finland using narrative identification. There are, however, panel studies which include Finland as one of the included countries for which shocks are identified. Riera-Crichton et al. (2016) look at VAT changes, and Guajardo et al. (2014) look at changes in government deficit using the series constructed by Devries et al. (2011), and Geerolf & Grjebine (2018) include Finnish property tax changes in their global panel.

In a large body of work documenting the effects of austerity, Alesina et al. (2019) also use narrative identification, but instead of quarterly or annual shocks, they identify the effects of multi-year plans. Fiscal policy changes, and perhaps austerity programs in particular, are often implemented over multiple consecutive years and contain different measures for example by combining spending and tax adjustments.

One pertinent issue which applies to both SVARs and narrative identification is possible anticipation of shocks. Researchers can augment variables (directly or by extracting factors from a large set of variables) which are forward-looking, such as news or financial market information.[3]

Cross-sectional fiscal multipliers

All of the approaches above estimate shocks over time, for example in post-WWII U.S. An alternative approach is to look for plausibly exogenous variation in public spending or taxation across regions. A typical study in this approach takes a national policy, shows how it has differential effects at the subnational level, and argues that after controlling for observables these differences are plausibly not related to the outcome (local output or employment, or that there exists an instrumental variable which is correlated with the differential effects of the national policy but is not related to the outcome in any other way.

As an example, numerous papers look at the local effects of a 2009 stimulus package in the US. The package was drafted early on in the recession, so it was not perfectly targeted towards those areas which were hit hardest. Chodorow-Reich et al. (2012) use pre-recession Medicaid spending as an instrumental variable, and Wilson (2012) and Conley & Dupor (2013) derive their instrument from the fact that part of the package consisted of highway construction spending which was allocated based on, for example, total vehicle miles traveled on federal highways.

The challenge with the policy-relevance and comparability of cross-sectional multipliers is that due to spillovers fiscal multipliers are likely to be different at the local and national levels. Chodorow-Reich (2019) provides a review of cross-sectional multipliers and also analyses differences between national and subnational multipliers.

For Finland, the only study using this approach is the ongoing work of Räsänen & Mäkelä (2019). As locally exogenous variation in public spending the authors look at Defence Force reform of 2012–2015 and the asylum seeker influx of 2015–2016.

[3] Lanne & Saikkonen (2013) propose an approach which incorporates forward-lookingness without extra variables.

3. Empirics: main findings from the recent literature

This section discusses the current state of empirical research concerning the output effects of fiscal policy. To motivate discussion it is useful to contrast two recent surveys on this issue. First, the meta-analysis of Gechert & Rannenberg (2018) summarizes its findings in the abstract as follows:

We find that spending multipliers are much higher (by about 0.7–0.9 units) during a downturn. Tax multipliers are not sensitive to the economic regime, and generally lower than spending multipliers. Finally, for all spending categories other than government consumption, the multiplier significantly exceeds one during downturns.

The more selective survey of Ramey (2019) on the other hand touches on the same issues as follows:

For multipliers on general government purchases, the evidence from developed countries suggests that they are positive but less than or equal to unity, meaning that government purchases raise GDP but do not stimulate additional private activity and may actually crowd it out. The bulk of the estimates across the leading methods of estimation and samples lie in a surprisingly narrow range of 0.6 to 1. However, this range widens once one distinguishes country characteristics, such as the exchange rate regime, and the type of government spending, such as infrastructure spending.

In sum, most time series estimates of tax rate change multipliers indicate that they are very large, at least –2 to –3. This contrasts with the results from estimated New Keynesian dynamic stochastic general equilibrium, where the multipliers (in absolute value) are typically below 1 and never higher than 1.5.

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The evidence for higher spending multipliers during recessions or times of high unemployment is fragile, and the most robust results suggest multipliers of one or below during these periods.

The purpose of this section is to try to understand where consensus exists, and why different approaches disagree where it does not.

The discussion largely follows and expands on the review of Ramey (2019), although the focus is on the recent literature on tax multipliers identified in recent narrative studies. The reason for this focus is that for spending multipliers there seems to be a stronger consensus on the "average" multiplier across different methods. Ramey (2019) summarizes this so that the general spending multipliers typically lie in the range 0.6-1.0. Spending multipliers can be higher or lower in certain conditions, although assessing such conditionalities is in most cases challenging. These conditionalities are discussed later in this section.

3.1. Tax multipliers: high multipliers from recent narrative studies

One consistent conclusion from the literature on tax multipliers is that narrative identification of tax shocks has tended to produce higher multipliers than time series identification. This is a conclusion that Ramey (2019) reaches and is also evident in Gechert & Rannenberg's (2018) dataset (see Table C1 in their paper). This section discusses the recent narrative literature and why it argues that implementations of the Blanchard-Perotti approach produce downward biased tax elasticity estimates.

Although the narrative literature has well identified the possible biases in the structural VAR approach using Blanchard-Perotti identification, an inconsistency vis-á-vis DSGE models remains, as these tend to produce modest tax multipliers (Coenen et al. 2012). It is to be hoped for that in the future reasons for the differences in the results of the narrative approach and the DSGE approach can be uncovered.

Much of the literature on narrative identification of tax shocks is based on Romer & Romer's (2010) work on post-WWII tax reforms in the US. There are also country-specific studies at least for the UK, Spain, Portugal, and Germany. Additionally there are studies using global panels of tax consolidation, VAT changes, and property tax changes.

Caldara & Kamps (2017) show how different assumptions concerning automatic stabilizers map to different fiscal multipliers. The authors also estimate these stabilizers using non-fiscal shocks and find that using these estimates instead of those typically used in the Blanchard-Perotti approach decreases the gap between tax and spending multipliers. Nonetheless spending multipliers generally remain larger than tax multipliers, with impact multipliers around 0.5 for tax shocks and 1 for spending shocks.

In an alternative approach and looking only at tax multipliers, Mertens & Ravn (2014a) also discuss the issue of the output tax elasticity parameter and argue that existing approaches in estimating it, result in a downward bias in tax multipliers.[4] Additionally the authors argue that shocks identified with a narrative approach tend to have measurement error, which in some specifications may cause attenuation bias which again results in underestimation of the multiplier. The authors find tax multipliers of around two on impact and rising up to three in the first two years.

Country-specific studies from the UK (Cloyne 2013), Germany (Hayo & Uhl 2013), Portugal (Pereira & Wemans 2015) and Spain (Gil et al. 2019) also support the view of strong negative output effects from tax shocks identified via the narrative approach. In these studies, the tax multiplier after two years of the shock ranges from about -1.7 to -2.7.

Riera-Crichton et al. (2016) study identification of tax shocks using a global panel of VAT tax hikes motivated by fiscal consolidation. In addition to methodological contributions relating to identification and measurement of tax shocks, the authors find a tax multiplier of around -3.5 after four quarters. Building on the work of Riera-Crichton et al. (2016) and Vegh & Vuletin (2015), Gunter et al. (2018) expand the sample to include non-developed countries and show that the output cost of tax increases is larger at higher levels of initial taxation, and that for Finland the implied multiplier is larger (in absolute value) than -4.

Geerolf & Grebjine (2018) create a narrative dataset of property tax shocks for 35 OECD countries, including Finland, and find tax multipliers in the range of -2 to -3.

Studying the effects of austerity, Guajardo et al. (2014) and Alesina et al. (e.g. 2019) agree that spending-based fiscal consolidation is more damaging to output than tax-based consolidation. The former argue that this is largely due to different monetary policy reactions, while the latter group of authors argue that controlling for monetary policy via short-term interest rates only mildly mitigates the difference between the output effects of the two types of consolidation. Alesina et al.

[4] This approach seems to be used also by Lehmus (2014), whose elasticity estimates are also used by Keränen & Kuusi (2016).

(2019) report that a 1-percent-of-GDP tax-based consolidation decreases GDP by 4 % after four years, whereas the same figure for spending-based consolidation is around zero.

Why would changes in taxation have such significant output effects, and how could tax multipliers be larger than spending multipliers? Identifying the output effects is often challenging enough and most studies do not discuss possible mechanisms of the multiplier, but there are two issues worth highlighting.

Using cross-sectional variation in the tax shocks identified by Romer & Romer (2010), Zidar (2018) finds that tax multipliers are larger when targeted towards the bottom of the income distribution. Although this is also consistent with the traditional Keynesian mechanism of lower-income individuals having higher marginal propensity to consume out of current income, Zidar notes that real wage responses indicate substantial labour supply responses. Although government transfers targeted towards the lower end of the income distribution may have similar direct effects on consumption, they tend to discourage labour supply.

In their study of fiscal consolidation episodes, Alesina et al. (2019) find that tax-based consolidation episodes have a stronger negative effect on business and consumer confidence. This is also consistent with the fact that they find tax-based consolidation having a strong negative effect on private investment, whereas spending-based consolidations have a zero or even a mildly positive effect on private investment.

It should be emphasized that although the tax multiplier estimates presented here are rather large in absolute value, alternative approaches using DSGE modelling or the structural vector autoregressions tend to produce smaller output effects for tax shocks. It is to be hoped for that future research will be able to reconcile the differences between the methods.

3.2. Conditionalities: possibly higher multipliers in recessions, smaller multipliers in small open economies in a currency union

Despite discussions surrounding “the fiscal policy multiplier”, there are strong reasons to believe that the output effects of fiscal policy vary across time periods and depend on a number of institutional and economic factors.

Fiscal multipliers being higher in recessions than in expansions is an intuitive and commonly held view that is a key justification of countercyclical fiscal policy. Theoretical modeling of this type of non-linearity is relatively scarce, largely due to the fact the DSGE models discussed earlier are typically solved using second-order approximations around a steady state. Exceptions are Michaillat (2014) who finds a countercyclical multiplier (fiscal policy effects being higher in recessions) for public employment, Sims & Wolff (2018a) who find a mildly countercyclical spending multiplier, and Sims & Wolff (2018b) who find a strongly *procyclical* tax multiplier.

The cyclicality of the spending multiplier has received considerable attention in empirical research and suggests that fiscal policy does indeed have stronger output effects in times of slack such as recessions, but Ramey (2019) argues that these results are somewhat fragile with respect to certain technical issues in estimation. These issues are discussed in detail by Ramey & Zubairy (2018), who discuss results of Auerbach & Gorodnichenko (2012) who find strongly countercyclical multipliers.

Auerbach & Gorodnichenko (2012) estimate state-dependent multipliers by estimating separate dynamics in recessions and expansions. Their model allows for partial feedback from fiscal policy to the state of the economy, but unless the fiscal policy shock lifts the economy out of a recession, the “recession multiplier” is calculated assuming the economy stays in a recession for at least 5 years in

their baseline specification. This assumption is problematic as recessions rarely last so long. Correcting for this and some other technicalities results in a lower cyclicality of the multiplier, and especially lower multipliers in recessions. The current view seems to be that fiscal multipliers are possibly mildly countercyclical but are still not very high in recessions.

There are numerous other conditionalities suggested by theoretical research. Dependence of fiscal multipliers on the monetary regime and trade openness seem to be most robust.

Although both DSGE models and time series evidence agree that spending multipliers are generally quite low, they can be when monetary policy is at the zero lower bound or when monetary policy otherwise accommodates fiscal stimulus. In this situation nominal interest rates are fixed over the short or medium term, and an increase in spending will increase inflation expectations and lower the real interest rate, further stimulating demand (see e.g. Christiano et al. 2011). Ramey & Zubairy (2018) use US data since 1889 and find that spending multipliers do indeed increase to 1.5 under zero lower bound when the rationing periods of WWII are excluded. Tax cuts, on the other hand, produce positive labour supply responses which tends to exacerbate the deflationary trap of the zero lower bound, although Mertens & Ravn (2014b) show that this depends on why the economy is at the zero lower bound. Coenen et al. (2012)

In a theoretical model Farhi & Werning (2016) show that despite some similarities, the situation between countries at the zero lower bound and countries in a currency union is different. For Finland, nominal interest rates are always fixed in the sense that Finland's fiscal policy will never be significant enough to move euro area inflation expectations and with them monetary policy rates. But crucially from Finland's perspective the nominal exchange rate is fixed as well. In this context an expansionary fiscal impulse leads to an increase in domestic inflation, which in turn results in a loss of competitiveness.

Consistent with the Keynesian dynamic discussed in the beginning, trade openness seems to dampen the output effects of fiscal policy. Support for this intuition is provided by the review of DSGE models by Coenen et al. (2012), by the panel study of Ilzetzki et al. (2013), and by the meta-analysis of fiscal multipliers of Gechert & Rannenberg (2018).

4. Going forward

Since the financial crisis, literature on fiscal multipliers has expanded rapidly. Researchers have incorporated new mechanisms into DSGE models, created new narrative series of tax shocks, and made efforts to understand the dependence on fiscal multipliers on the state and institutional features of the economy. Differences between the results of different studies are to some extent explainable by specific technical choices, while others, such as the difference between tax multipliers in DSGE models and narrative analyses, are more difficult to explain.

There seems to be somewhat of a consensus between different approaches that the output effects of government purchases are quite modest in normal times, and that for other forms of government spending the multiplier may well be higher. The effect of taxes on spending depends strongly on the empirical approach, with the large body of recent studies using narrative identification suggesting quite high effects across different countries and taxes. Additionally, the result that fiscal consolidation episodes tend to be more growth-friendly when implemented on the spending side vs. through taxes seems quite robust.

Taking Finland's specific features into account, demand-side mechanisms are likely to be mitigated by Finland being a small open economy in a currency union, as demand increases leak out through

imports and, to the extent that they remain in the country, increase prices which depresses export demand under fixed nominal exchange rates. The supply-side mechanisms, on the other hand, may be amplified by high rates of taxation in Finland.

There are five takeaways from recent international literature to applied studies on fiscal multipliers in Finland.

First, researchers should continue to pay attention to and test different technical assumptions discussed in the literature, as these may have a strong influence on the results concerning for example the cyclicality of the multipliers.

Second, more attention should be given to output tax elasticities when using the Blanchard-Perotti approach. Researchers should consider finding non-fiscal proxies to properly identify the output tax elasticity as in Caldara & Kamps (2017).

Third, there may be scope for generating a series of Finnish fiscal shocks using narrative identification. To my knowledge, no such series has been published or used. Very preliminary analyses of government budget proposals imply that income tax changes in Finland have tended to be either endogenous or tightly linked to other economic policies through co-ordinated bargaining (*tupo*). Therefore, non-income taxes might be a more fruitful source of exogenous variation in tax burden.

Fourth, there may be scope for estimating subnational multipliers, as in the ongoing work of Räsänen & Mäkelä (2019). Preliminary analyses using the SISU microsimulation model suggests that estimating subnational tax multipliers is difficult in the Finnish case, unless one finds a credible instrumental variable for municipal tax changes. This is because Finnish central government income tax changes are relatively small and, importantly, treat different regions of the country quite similarly because tax rates tend to be increased quite similarly across the income distribution (this feature is also highlighted by Matikka 2018).

Fifth, there are at least two DSGE models estimated using Finnish data, the KOOMA model used by the Ministry of Finance and the Aino model used by the Bank of Finland. It would be useful to learn what fiscal multipliers these two models produce, like the model comparison exercise of Coenen et al. (2012).

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