Economic Commentary

What does research say about the effects of central bank balance sheet policies?

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SVERIGES RIKSBANK

Table of contents

Economic Commentaries

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Summary

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An analysis of the research literature shows that the average effects of central bank balance sheet policies on output and inflation are positive, that is, output and inflation increase when the central bank extends its asset purchases. This Economic Commentary is based on the analysis in Fabo et al. (2020), who review the effects of the balance sheet policies conducted in the euro area, the United States and the United Kingdom on economic developments found in the research literature. Since there is a particular shortage of research literature that describes the effects on a small open economy like Sweden, the analysis presented in this Commentary can be informative for small open economies as well.

The effects are on average two to three times greater in the United States than in the euro area and the United Kingdom, but there are significant variations in the effects measured in different studies. The differences in the effects of balance sheet policies across countries are not as large when we divide the studies according to which method was used or where they were published (in scientific journals or as working papers).

One reason why the effects may be different in Sweden, which is a small open economy, could be that the exchange rate channel is particularly important. In addition, balance sheet policies conducted in other countries may have a substantial impact on the Swedish economy.

1 Introduction

Central bank balance sheet policies consist of measures that affect the size of the central bank balance sheet. They have been used by many central banks in a situation where the policy rate began to approach a possible lower bound.[1] Recently the Riksbank and other central banks have announced a number of measures that will lead to an increase in the size of the central bank balance sheet. The purpose is to alleviate the effects of the coronavirus pandemic on the economy. At its monetary policy meeting in November, the Riksbank decided to purchase securities for up to SEK 700 billion up to 31 December 2021, in addition to the purchases made prior to the coronavirus pandemic. The purchases that have been implemented and announced include government bonds, treasury bills, covered bonds (mortgage bonds), municipal bonds and corporate securities (commercial paper and corporate bonds). The Riksbank's balance sheet has also increased because loans have been given to the banks. This is not the first time the Riksbank increases its balance sheet. During the period 2008 to 2010, the Riksbank granted loans to the banks to counteract the effects of the financial crisis. Between the years 2015 and 2017, the Riksbank purchased Swedish government bonds with the aim of making monetary policy more expansionary.

The measures can be expected to affect market rates, which in turn affect output, inflation and employment, for instance. How can we then know how effective these measures are? One means of addressing this question is to summarize earlier empirical studies.[2] There is a large degree of consensus in the literature on the effects of conventional monetary policy on the economy (see, for instance, Ramey, 2016). On the other hand, the effects of quantitative easing are more uncertain. This is partly because such measures have been carried out under a so far limited period of time. There is in particular a shortage of research literature describing the effects in a small open economy like Sweden.

This Economic Commentary is based on the meta-analysis in Fabo et al. (2020), who review the effects reported in the research literature of the balance sheet policies implemented in the euro area, the United States and the United Kingdom on economic conditions. The effects can differ across countries, partly as a result of the different monetary policy frameworks, the way the financial markets function or the way the central banks have designed their purchase programmes. The authors show that the effects are on average positive with regard to output and inflation, and greater in the United States than in the euro area and the United Kingdom. They focus on the differences in the results, depending on whether the studies were conducted by researchers at central banks or other institutions. This Economic Commentary divides the material differently. We show that the effects of quantitative easing vary, depending on

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[1] Bernanke (2020) argues that the central bank's asset purchases could contribute to compensating for the effects of the possible lower bound on the policy rate.

[2] A review of the literature can also be found in Borio and Zabai (2016), Bhattarai and Neely (2016) and CGFS (2019). Johnson et al. (2020) focuses on the literature on unconventional monetary policy in small open economies.

which method is used and on whether the study has been published as a working paper or in a scientific journal.[3] When we use these divisions, the differences in effects across countries are small, after outliers are excluded.

2   Data

We use a collection of the effects of balance sheet policies from 48 studies conducted using data for the euro area, the United States and the United Kingdom, which have been published as working papers or in scientific journals up to 2019, see Fabo et al. (2020). The central bank balance sheet policies involve purchases of government bonds and corporate and mortgage bonds, as well as loans to the banks and targeted long-term repo operations (LTRO). The data covers the balance sheet policies used during and after the financial crisis, as well as the measures used in the euro area between the years 2014 and 2018, with the aim of making monetary policy more expansionary.

To be able to compare the studies, we examine the effects of asset purchases that correspond to one per cent of GDP.[4] In total, we refer to 48 empirical studies that have been published up to the end of 2019. The studies report the effects on output and inflation.[5] All in all, the studies cover 58 observed effects on output and 53 on inflation, as some of the studies cover data for several countries. We chose to study the peak effects of asset purchases on output and the cumulative effect on the price level, that is the total effect on inflation.

The methods used to derive the effects of asset purchases differ between studies. Some studies use vector autoregressive (VAR) models, while other studies use so-called neo-Keynesian general equilibrium models (DSGE, Dynamic Stochastic General Equilibrium). VAR models consist of a system of relationships that describe the dynamics in the data, without necessarily being based on a clearly specified economic theory. The research literature describes several different ways of identifying the effects of balance sheet policies in VAR models and the results can vary, depending on which identification method is used.[6] DSGE models are normally based on certain predetermined assumptions of the economic motives behind the behaviour of individuals and firms, and the mechanisms through which balance sheet policies affect the economy are therefore clearer.[7]

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[3] Studies published in scientific journals after a peer-review process, where the publication is read and reviewed by experts on the subject before being accepted for publication. This is a type of quality check to ensure that the published research holds a high standard.

[4] It is also important to know how much the central banks purchase in relation to what is available on the market, but it is difficult to find exact data on this for all countries and all types of asset.

[5] Some studies use GDP, while others use industrial production as proxy for GDP. We do not discuss whether the effects are statistically significant, as this information is missing in several of the studies. Fabo et al. (2020) note that studies of balance sheet policies have on average found greater effects on both output and inflation in relation to the proportion of the authors who were central bank economists. But their results vary depending on the country, see Figure 1 and 2 in Appendix.

[6] Rossi (2020) reports how the effects of changes in the central bank balance sheet are identified in the time series models used in the literature.

[7] See Bhattarai and Neely (2016). In DSGE models, the parameters can either be calibrated to agree with earlier conclusions on how a particular economy functions, or estimated to provide the best adaptation to the historical development of a number of macroeconomic time series from the economy in question.

3 How can central bank balance sheet policies make monetary policy more expansionary?

Before we move on to the size of the effects of balance sheet policies, it may be interesting to list the channels through which the measures can be expected to work. Central bank balance sheet policies can make monetary policy more expansionary in several different ways. The different channels can also interact with one another. It is difficult to identify the precise channel in VAR models. In DSGE models, the assumptions are based on how the channels function with regard to economic theory and are thus clearer. However, these models usually focus only on one set of the channels.

- Signalling channel: the purchases signal an expansionary monetary policy going forward.
- Premium channel: the purchases reduce access to bonds, which push up bond prices so interest rates fall.
- Portfolio balance channel: the purchases can have contagion effects on prices of other assets.
- Liquidity channel: the purchases increase liquidity in the banking system.
- Exchange rate channel: the purchases lead to a weaker exchange rate.[8]

DSGE models usually focus on the premium channel or the portfolio balance channel. The few studies describing the effects of measures in small open economies also include the exchange rate channel.

4 The effects vary depending on the method used

Fabo et al. (2020) calculate that the average peak effect on output of measures corresponding to one per cent of GDP is 0.36 per cent in the United States, 0.22 per cent in the euro area and 0.12 in the United Kingdom. The average total effect on inflation is 0.21 percentage points in the United States, 0.11 in the euro area and 0.04 in the United Kingdom. The effects in the United States thus appear to be on average two to three times greater than in the euro area and the United Kingdom. One could therefore draw the conclusion, as do Fabo et al. (2020), that the measures have been more effective in the United States than in other countries. But the size of the effects also varies depending on which method is used to estimate the effects. Figures 1 and 2 show the effects for the three regions and the two methods in the form of box plots, which give a summary of the distribution of the effects among the different studies.

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[8] Alsterlind et al. (2015) and De Graeve and Lindé (2015) describe how the channels function in theory and De Rezende, Kjellberg and Tysklind (2015) study the announcement effects of the bond purchases decided during the period February to July 2015. See also Melander (Forthcoming).

Figure 1. Peak effects of measures corresponding to one per cent of GDP on output in the euro area, United States and United Kingdom, with VAR and DSGE models respectively

Percent
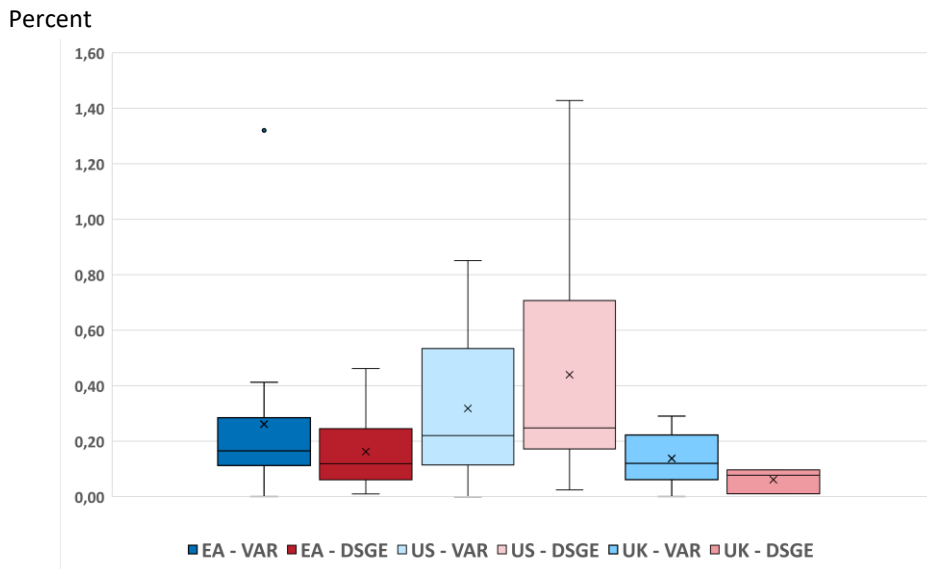
Note. There are 13 (9) studies using VAR (DSGE) models for the euro area, 13 (6) for the United States and 14 (3) for the United Kingdom. The box marks the first and third quartiles, the un-broken line and the cross inside the box marks the median and average, respectively. The vertical lines (whiskers) going out of the boxes mark the highest and lowest values of the observations not interpreted as outliers. Observations more than one and a half times the quartile distance from the box are regarded as outliers and marked with a dot.

Source: Data from Fabo et al. (2020).

Figure 1 shows the peak effect on the level of output in the euro area, the United States and the United Kingdom, divided into those using VAR or DSGE models. The effects are overall positive. There are major differences across countries with the DSGE models and minor differences across countries with the VAR models. The variation in the effects from the DSGE models for the United States is also large, and there are few studies with DSGE models for the United Kingdom.

The effects on inflation of the different studies is illustrated in Figure 2. Most of the results are positive. A few studies find a negative effect on inflation, but one cannot determine whether this is statistically significant. In the same way as for the effects on output, the variation across countries is relatively small with VAR models. Both the largest and the smallest effect in the studies using DSGE models can be found with regard to the United States, while the effects for the United Kingdom using DSGE models are roughly zero.[9]

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[9] For readers who are very familiar with the literature taken into account here, it may be interesting to note that the largest effects on output and the smallest effects on inflation can be found in Carlstrom, Fuerst and Paustian (2017). The largest effects on inflation can be found in Gertler and Karadi (2013).

Figure 2. Maximum effects of measures corresponding to one per cent of GDP on inflation in the euro area, United States and United Kingdom, with VAR and DSGE models respectively

Percentage points
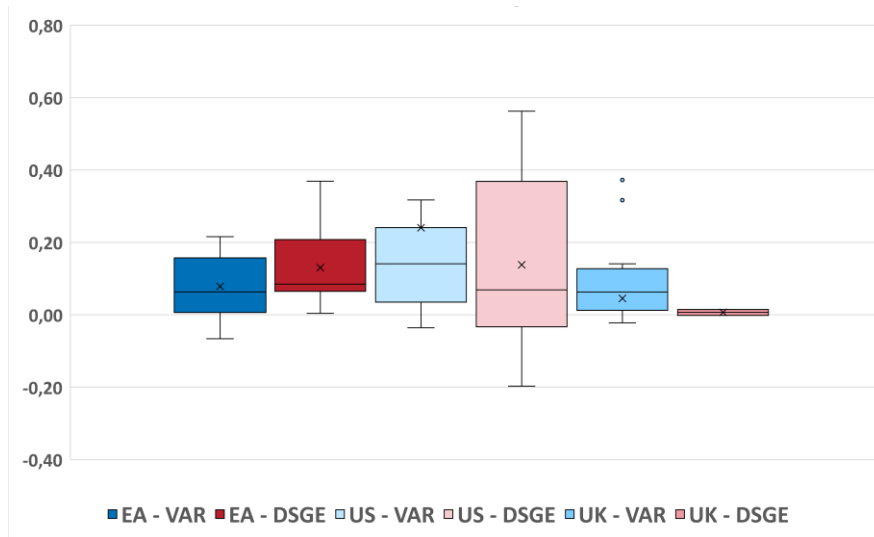
Note. There are 11 (10) studies using VAR (DSGE) models for the euro area, 12 (6) for the United States and 12 (2) for the United Kingdom. The box marks the first and third quartiles, the unbroken line and the cross inside the box mark the median and average, respectively. The vertical lines (whiskers) going out of the boxes mark the highest and lowest values of the observations not interpreted as outliers. Observations more than one and a half times the quartile distance from the box are regarded as outliers and marked with a dot. To clarify the box plot, we have removed an outlier for the United Kingdom with the VAR model (-0.65) and an outlier for the United States with the DSGE model (1.51).

Source: Data from Fabo et al. (2020).

5 The effects vary depending on where the studies are published

Studies that are published in scientific journals are examined by experts on the subject and ought therefore to have a higher quality than working papers. One question is whether the results in scientific articles and working papers differ in any systematic manner.

Figure 3 shows the peak effect on the level of output in the euro area, the United States and the United Kingdom, divided into these two groups. In the United States, the average effects are more like the median effects than in Figure 1, as the study that found the largest effect is regarded as an extreme value in this division of studies.[10]

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[10] If one excludes extreme values according to the method reported in the note to the figures, Chung et al. (2012), which was published in the Journal of Money, Credit and Banking, is the study that found the largest effect.

Unlike Figure 1, the effects for the United Kingdom are not as clearly smaller than those for the United States when one analyses each group.

Figure 3. Peak effects of measures corresponding to one per cent of GDP on output in the euro area, the United States and the United Kingdom in working papers (WP) and in studies published in scientific journals (Pub)

Per cent
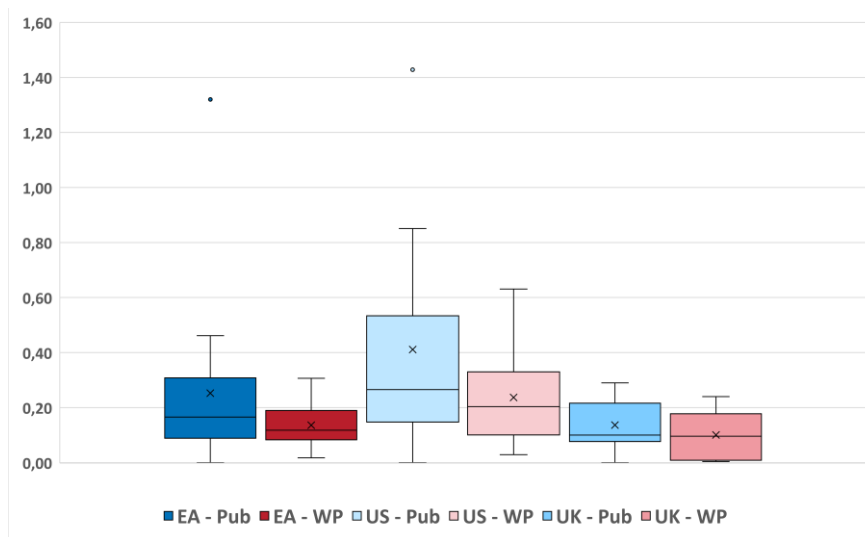
Note. There are 6 (16) studies published as WP (Pub) for the euro area, 6 (13) for the United States and 6 (11) for the United Kingdom. The box marks the first and third quartiles, the unbroken line and the cross inside the box mark the median and average, respectively. The vertical lines (whiskers) going out of the boxes mark the highest and lowest values of the observations not interpreted as outliers. Observations more than one and a half times the quartile distance from the box are regarded as outliers and marked with a dot.

Source: Data from Fabo et al. (2020).

The effects on inflation in the various studies are presented in Figure 4. The differences across countries are smaller than in Figure 2, both with regard to the median and the average and the effects in the United Kingdom are similar to those in the United States and the euro area.

It is thus not yet clear what effects balance sheet policies have on the economy, but the empirical studies reported in Fabo et al. (2020) find that balance sheet policies conducted in the euro area, the United States and the United Kingdom have largely had a positive effect on output and inflation. The average effects in the United States are two to three times greater than in the euro area and the United Kingdom if all studies are included, but the variation in the estimated effects is also greatest for the United States.

The differences in the effects of balance sheet policies across countries do not appear as large when we divide the studies according to the method used or where they

were published. This implies that the differences among the countries are to some extent explained by the selection of studies for the respective country, rather than differences in the estimated effects per se.

Figure 4. Total effects of measures corresponding to one per cent of GDP on inflation in the euro area, the United States and the United Kingdom in working papers (WP) and in studies published in scientific journals (Pub)
Percentage points
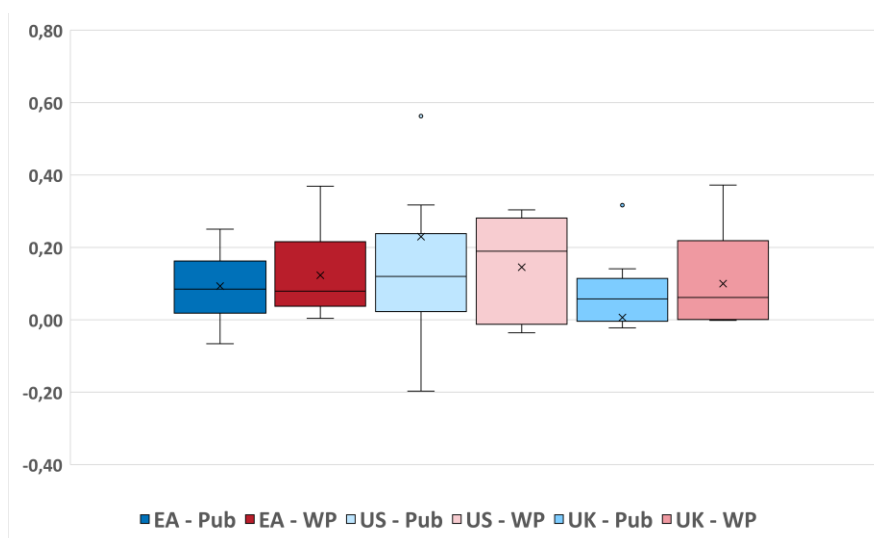
Note. There are 7 (14) studies published as WP (Pub) for the euro area, 5 (13) for the United States and 5 (9) for the United Kingdom. The box marks the first and third quartiles, the unbroken line and the cross inside the box mark the median and average, respectively. The vertical lines (whiskers) going out of the boxes mark the highest and lowest values of the observations not interpreted as outliers. Observations more than one and a half times the quartile distance from the box are regarded as outliers and marked with a dot. To make the figure easier to read, we have removed an outlier for the United States (1.51) and one for the United Kingdom (-0.65) in studies published in scientific journals.

Source: Data from Fabo et al. (2020).

6 Balance sheet policies abroad can affect the Swedish economy

Something important to note is that the studies we include here focus on more closed economies. The conclusions may therefore be different for Sweden, which is a small open economy. There is a shortage of research literature that considers the effects in a small open economy, where the exchange rate channel may be particularly important.[11]

De Rezende and Ristiniemi (2018) have measured the effects of the Riksbank's purchases of government bonds between 2015 and 2017, with the aid of a so-called

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[11] Kolasa and Wesolowski (2020) develop a DSGE model of a small open economy (which represents Poland) and a large economy, where the balance sheet measures can have effects via the exchange rate channel.

'shadow interest rate', which is an interest rate that can represent the overall effect of monetary policy, from both conventional and unconventional monetary policy. According to their analysis, the effect on inflation of the Riksbank's purchases corresponding to one per cent of GDP is 0.07 percentage points. The authors do not report the effects on output, but the effect on unemployment is -0.11 percentage points, that means a positive effect on the labour market and reasonably also on the real economy.

Even asset purchases abroad have a major impact on Sweden. Conventional monetary policy abroad can also affect the Swedish economy, but the research literature indicates that spillover effects from the unconventional monetary policy can be greater as a result of the effects it has on the financial markets.[12] In addition, it is more difficult to identify the effects of the Riksbank's asset purchases when central banks abroad conduct asset purchases at the same time as the Riksbank.

The limited literature on the spillover effects has found positive effects from the balance sheet policies conducted in the euro area and the United States on output in Sweden, while the effects on inflation may be negative.[13] However, these studies only cover the period prior to 2015. We need more studies before we can draw any conclusions regarding the effects of central bank balance sheet policies in Sweden and other small open economies.

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[12] See Alpanda and Kabaca (2020) and Kolasa and Wesolowski (2020).
[13] See Bluwstein and Canova (2016) and Chen et al. (2017).

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APPENDIX

Figure 1. Peak effects of measures corresponding to one per cent of GDP on output in the euro area, the United States and the United Kingdom depending on where the authors work
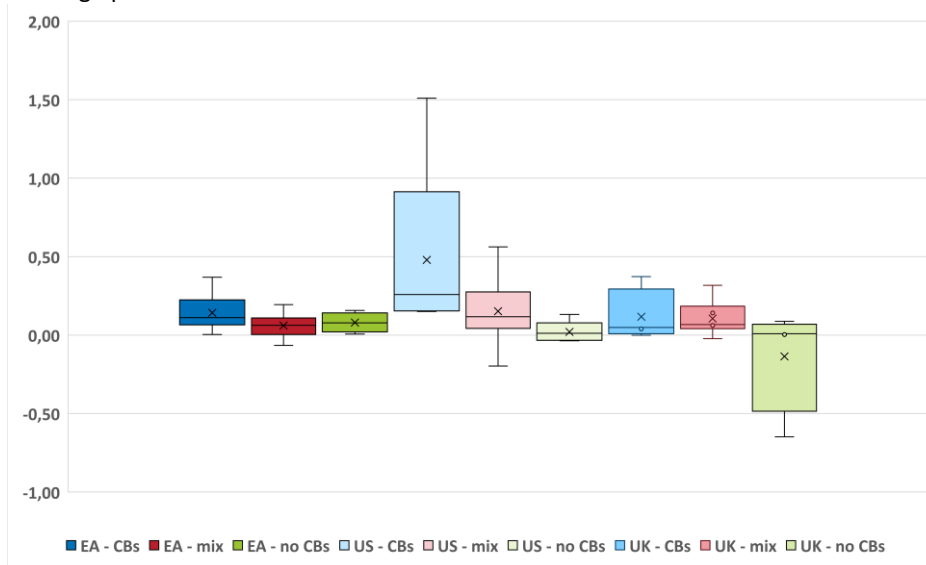
Per cent
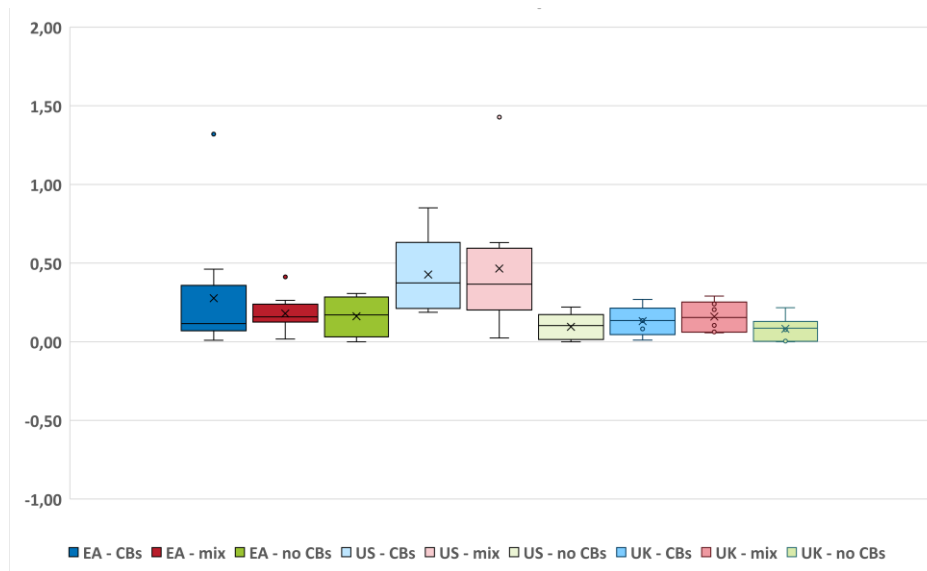
Note. There are 10 (8) [4] studies where all authors work at a central bank (where some of the authors work at a central bank) [where none of the authors work at a central bank] for the euro area, 6 (8) [5] for the United States and 5 (6) [6] for the United Kingdom (UK). The box marks the first and third quartiles, the unbroken line and the cross inside the box mark the median and average, respectively. The vertical lines (whiskers) going out of the boxes mark the highest and lowest values of the observations not interpreted as outliers. Observations more than one and a half times the quartile distance from the box are regarded as outliers and marked with a dot.

Source: Data from Fabo m.fl. (2020).

Figure 2. Total effects of measures corresponding to one per cent of GDP on inflation in the euro area, the United States and the United Kingdom depending on where the authors work

Percentage points

Note. There are 10 (7) [4] studies where all authors work at a central bank (where some of the authors work at a central bank) [where none of the authors work at a central bank] for the euro area, 5 (8) [5] for the United States and 4 (6) [4] for the United Kingdom (UK). The box marks the first and third quartiles, the unbroken line and the cross inside the box mark the median and average, respectively. The vertical lines (whiskers) going out of the boxes mark the highest and lowest values of the observations not interpreted as outliers. Observations more than one and a half times the quartile distance from the box are regarded as outliers and marked with a dot.

Source: Data from Fabo m.fl. (2020).