An economic recovery with little signs of inflation acceleration: Transitory phenomenon or evidence of a structural change?

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An economic recovery with little signs of inflation acceleration: Transitory phenomenon or evidence of a structural change?

IN-DEPTH ANALYSIS

Abstract
Inflation has been persistently below the inflation target of the ECB despite the ongoing economic recovery in the euro area. In this paper, we analyse whether the relationship between inflation and economic activity in the euro area has changed based on a review of the literature and discuss implications for monetary policy.
This document was requested by the European Parliament's Committee on Economic and Monetary Affairs.

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# CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>LIST OF ABBREVIATIONS</td>
<td>4</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
<td>5</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
<td>5</td>
</tr>
<tr>
<td>EXECUTIVE SUMMARY</td>
<td>6</td>
</tr>
<tr>
<td>1. INTRODUCTION</td>
<td>7</td>
</tr>
<tr>
<td>2. INFLATION AND ECONOMIC SLACK IN THE EURO AREA</td>
<td>8</td>
</tr>
<tr>
<td>2.1. Inflation in the euro area since the Global Financial Crisis</td>
<td>8</td>
</tr>
<tr>
<td>2.2. How large is economic slack in the euro area?</td>
<td>9</td>
</tr>
<tr>
<td>3. RELATIONSHIP BETWEEN INFLATION AND ECONOMIC ACTIVITY</td>
<td>12</td>
</tr>
<tr>
<td>3.1. How strong is the relationship between inflation and economic activity?</td>
<td>12</td>
</tr>
<tr>
<td>3.2. What is behind the changes in the Phillips curve relationship: Transitory or structural factors?</td>
<td>14</td>
</tr>
<tr>
<td>3.3. Factors behind inflation in the euro area: assessment and outlook</td>
<td>17</td>
</tr>
<tr>
<td>4. IMPLICATIONS FOR MONETARY POLICY</td>
<td>19</td>
</tr>
<tr>
<td>4.1. Ability of monetary policy to control inflation</td>
<td>19</td>
</tr>
<tr>
<td>4.2. Side effects of monetary policy</td>
<td>20</td>
</tr>
<tr>
<td>5. CONCLUSIONS</td>
<td>22</td>
</tr>
<tr>
<td>REFERENCES</td>
<td>24</td>
</tr>
</tbody>
</table>
LIST OF ABBREVIATIONS

CPI  Consumer price index
ECB  European Central Bank
GDP  Gross domestic product
HICP Harmonised index of consumer prices
LIST OF FIGURES

Figure 1: HICP inflation in the euro area 8
Figure 2: Euro area output gap estimates 10
Figure 3: Limits to production and capacity utilisation in the manufacturing sector 11

LIST OF TABLES

Table 1: Average Euro Area Inflation 9
EXECUTIVE SUMMARY

Background

- Euro area inflation has been persistently below the inflation target of the ECB despite an ongoing economic recovery.
- This raises the question whether the relationship between inflation and economic activity has changed.

Aims

- We analyse whether the relationship between inflation and economic activity in the euro area has changed based on a review of the literature and discuss implications for monetary policy.

Findings

- There are several obstacles when estimating the strength of the relationship between inflation and economic activity (or economic slack) via the Phillips curve, which explains the wide range of results in the literature.
- Overall, the evidence suggests that the relationship has indeed weakened, that it is currently weak, and that it varies over time.
- Factors behind the weakening of the relationship could be that inflation expectations are better anchored at the inflation targets of central banks and certain aspects of globalisation.
- Inflation has been persistently below target since the Global Financial Crisis. The amount of economic slack in the euro area is currently low and according to recent estimates, the output gap is closed, by and large. Overall, euro area inflation currently seems to be broadly in line with Phillips curve estimates.

Implications

- A weak and unstable relationship between inflation and economic activity can hamper the ability of central banks to control inflation, because this relationship describes one of the most important transmission channels of monetary policy. Moreover, it is becoming more difficult to assess the impact of monetary policy measures on inflation.
- A weak Phillips curve relationship also implies that central banks may have to accept inflation deviating from their inflation targets for longer periods of time because larger fluctuations in economic activity may be required to keep inflation on target and it is not obvious that fluctuations in economic activity are less costly in terms of economic welfare than fluctuations in inflation.
- Extended periods of extraordinary monetary policy measures – may be necessitated if the central bank’s control over inflation by ordinary means is reduced – could come with increased undesired side effects. These side effects include risks for financial stability and the misallocation of production factors, which could weigh on productivity and the long-run growth prospects of an economy.
- In consideration of all the challenges central banks have been facing since the Global Financial Crisis, it might be worth starting a discussion whether the current framework of inflation targeting is still optimal.
1. INTRODUCTION

Euro area inflation has been subdued and below the inflation target of the European Central Bank (ECB) for extended periods of time since the Global Financial Crisis.\(^1\) For most of this period, low inflation seemed to be in line with the weak economic development as the euro area entered a second recession associated with the sovereign debt crisis in some of its Member States. However, since 2016, economic activity in the euro area has picked up markedly and GDP growth has been accelerating, while inflation has remained persistently below target. Subdued inflation can simply indicate that the amount of economic slack in the euro area is still large, but since economic activity has picked up recently and since persistently low inflation has also been observed in other advanced economies, questions have been raised as to whether the relationship between inflation and real economic activity, typically measured via the Phillips curve, has weakened or even vanished. The importance of these questions for central banks can hardly be overestimated. For example, if this relationship has indeed become weaker, the effectiveness of monetary policy in controlling inflation may have weakened as well, as the Phillips curve describes one of the most important transmission channels of monetary policy towards inflation. Moreover, if it became more difficult for central banks to control inflation, this could be accompanied by larger business cycle fluctuations or other negative side-effects of monetary policy, such as risks for financial stability or misallocations of production factors. In the current situation, these negative side-effects may become more and more relevant as many central banks have already kept interest rates close to zero for a period of about ten years, and these risks are likely to increase the longer such a policy is in place. In this Briefing Paper, we address these questions and discuss implications for monetary policy.

We start by describing the main trends in inflation in the euro area since the Global Financial Crisis (Section 2). We also assess how large the amount of economic slack in the euro area currently is. Next, we discuss how strong the Phillips curve relationship between inflation and economic activity is and whether it has changed over time (Section 3). We also discuss the most important factors that are potentially behind changes in the Phillips curve, such as globalisation, anchored inflation expectations, or digitisation. In doing so, we also seek to give an assessment as to whether these factors have a structural or a temporary impact. Based on this assessment, we evaluate whether subdued inflation in the euro area is in line with economic activity and which other factors may have weighed on inflation. In Section 4, we discuss implications for monetary policy and take into account potentially negative side effects. Finally, we summarise our results and draw conclusions for monetary policy in the euro area (Section 5).

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\(^1\) The authors thank Kai Carstensen, Jonas Dovern, Klaus-Jürgen Gern, Stefan Kooths, Mewael F. Tesfaselassie, and Maik Wolters for highly valuable comments and suggestions.
2. INFLATION AND ECONOMIC SLACK IN THE EURO AREA

KEY FINDINGS

- Inflation has been persistently below the inflation target of the ECB since the Global Financial Crisis.
- The amount of economic slack in the euro area is currently low and according to current estimates, the output gap is closed, by and large.

We shortly describe recent inflation trends in the euro area (Section 2.1). In doing so, not only do we consider changes of the harmonised index of consumer prices (HICP inflation), which is the reference measure for the ECB inflation target, but also other relevant price measures, such as core inflation and the GDP deflator. Next, we assess the amount of economic slack in the euro area based on a comprehensive set of indicators (Section 2.2).

2.1. Inflation in the euro area since the Global Financial Crisis

The reference measure for the inflation target of the ECB is the HICP. The core rate of the HICP excludes energy and unprocessed food as the most volatile components of consumer prices and thereby may better capture medium-term domestic price pressure. Between 1999 and 2007 HICP inflation was close to the inflation target of the ECB of below but close to 2 percent (Figure 1). Since the beginning of the Global Financial Crisis, inflation was below 2 percent for most of the time. This is particular true for the period between 2014 and 2016 when core inflation declined to levels below 1 percent and energy prices substantially dropped also. As a consequence inflation was close to zero for some time, leading the ECB to take additional unconventional monetary policy measures to bring inflation back to target.

![Figure 1: HICP inflation in the euro area](image-url)

Sources: Eurostat; own calculations. Quarterly data, change over previous year.
The HICP inflation rate between 1999 and 2017 was 1.7 percent on average and thereby close to the inflation target of the ECB (Table 1). The core rate was somewhat lower on average (1.5 percent), indicating that inflation was partly driven by food and energy prices in this period. The GDP deflator, a more comprehensive measure of prices in the economy as it also captures prices other than consumer prices, stood also at 1.5 percent on average. However, average price increases were close to the inflation target in the period before the Global Financial Crisis but were on average below target afterwards with values of about 1 percent. Moreover, aggregate euro area inflation masks some heterogeneity across Member States with inflation being in tendency lower in countries that were hit harder by the sovereign debt crisis and higher in countries that were not directly affected by this crisis.

<table>
<thead>
<tr>
<th></th>
<th>Headline Inflation</th>
<th>Core Inflation</th>
<th>GDP Deflator</th>
</tr>
</thead>
<tbody>
<tr>
<td>1999-2008</td>
<td>2.2</td>
<td>1.8</td>
<td>2.0</td>
</tr>
<tr>
<td>2009-2017</td>
<td>1.2</td>
<td>1.2</td>
<td>1.0</td>
</tr>
<tr>
<td>1999-2017</td>
<td>1.7</td>
<td>1.5</td>
<td>1.5</td>
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**Source:** Eurostat; own calculations.

2.2. **How large is economic slack in the euro area?**

Subdued inflation could simply indicate that economic slack in the euro area is still large despite the ongoing economic recovery. The most important measure of economic slack is the output gap. However, the output gap cannot be observed but needs to be estimated. It is well-known that such estimates of the output gap exhibit a high degree of uncertainty and are frequently subject to large revisions (McMorrow et al. 2015; Orphanides and van Norden 2002). It is important to note that output gap estimates typically account for inflation, terms of trade, or wage growth, with output gap estimates tending to rise when price or wage increases are larger. The output gap estimates by the European Commission, by the OECD, and by the IMF for the euro area exhibit similar patterns, even though their levels deviate from each other by up to 1 percentage point from time to time (Figure 2). The most recent estimates indicate that economic slack was large during the Global Financial Crisis and the sovereign debt crisis. However, in 2017 the output gap was only slightly negative according to these estimates and it is expected to shrink further in 2018. The euro area estimates can mask a considerable degree of heterogeneity across Member States. The negative output gap between 2013 and 2016 was largely driven by those countries that were hit most severely by the sovereign debt crisis. However, in 2017, the output gap is closed, by and large, in most Member States according to these estimates by the European Commission.²

² However, according to OECD estimates, heterogeneity of output gaps across Member States is still substantial. For example, a strongly positive output gap in Germany is contrasted with negative output gaps in France, Italy, and Spain.
As output gap estimates are notoriously uncertain and sometimes subject to large revisions, for a comprehensive assessment of economic slack it is important to also take other indicators into consideration. This is particularly true at the current juncture because there is high uncertainty as to what degree recessions associated with financial crises (such as banking crises and sovereign debt crises) have permanent effects on the level of GDP, thus making it more challenging to decompose GDP into an output gap and potential output (Klär 2013). Survey data are particularly helpful in this regard, as they are typically not revised and may therefore offer a more reliable assessment in real-time. One of these measures is capacity utilisation in the manufacturing sector. According to this measure, capacity utilisation in the euro area has been steadily increasing for some years and is currently close to levels that were observed before the Global Financial Crisis (Figure 3). Another helpful measure is the share of firms reporting that a lack of demand is currently limiting their production because lack of demand should be closely related to economic slack. The share of such firms is currently at the lowest level since 1999. Finally, the share of firms reporting that it is becoming more difficult to hire required workers has been increasing recently, indicating a further rising degree of utilisation of economic resources.

Overall, the amount of economic slack in the euro area seems to be small and the survey indicators would even be in line with output gap estimates that are in positive territory at the current juncture.

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3 For the services sector, the amplitude of capacity utilisation is considerably smaller, but this measure has also increased recently, to the highest level since survey data for the services sector have become available in 2011.
Figure 3: Limits to production and capacity utilisation in the manufacturing sector

Source: European Commission, Industry Survey and Services Survey, as of January 2018. Quarterly data. Limits to Production (LTP): Share of firms reporting that a factor is limiting their production.
3. RELATIONSHIP BETWEEN INFLATION AND ECONOMIC ACTIVITY

KEY FINDINGS

- There are several obstacles to estimating the strength of the relationship between inflation and economic activity (or economic slack), which explains the wide range of results in the literature on the Phillips curve.
- Overall, the evidence suggests that the relationship has weakened, that it is currently weak, and that it varies over time.
- Factors behind the weak relationship could be that inflation expectations are better anchored at the inflation targets of central banks in addition to certain aspects of globalisation.
- In the euro area, inflation is currently broadly in line with the Phillips curve.

The Phillips curve describes the relationship between inflation and economic activity. Theories postulate that there is a short-run relationship between inflation and economic activity but that in the long-run they are uncorrelated (that the Phillips curve is vertical). The reason behind is that if agents are assumed to be rational (i.e., not suffering from money illusion), relative prices rather than absolute prices matter for real economic activity: If all prices and all wages change to the same degree, real economic activity should remain unchanged. As a consequence, monetary and real variables would be unrelated in the long-run. However, whether these strong implications indeed hold is part of ongoing discussions in the empirical and theoretical literature. For example, the more rational agents behave the weaker the Phillips curve relationship would be in the short-run as well. Moreover, there are also reasons, why the Phillips curve might not be vertical in the long-run (Snower 2015, Borio et al. 2015).

Against this backdrop, we discuss the empirical results in the literature on the Phillips curve relationship (Section 3.1). We proceed by discussing factors that could be behind changes in the Phillips curve relationship and assess whether these factors have a temporary or a structural impact (Section 3.2). Based on the results, we provide an assessment to what degree inflation is currently in line with economic slack in the euro area, and which other factors may have been relevant for euro area inflation (Section 3.3).

3.1. How strong is the relationship between inflation and economic activity?

The relationship between inflation and economic activity is typically measured via the Phillips curve. A simple specification of the Phillips curve

\[ \pi_t = aE_t\pi_{t+1} + \beta x_t + \epsilon_t \]

relates inflation \( \pi_t \) to expected future inflation \( E_t\pi_{t+1} \), to a measure of economic activity \( x_t \), and to an error term \( \epsilon_t \). The Phillips curve is an important ingredient of DSGE (dynamic stochastic general equilibrium) models, which are the workhorse models in monetary policy analysis. The Phillips curve can be augmented by other variables. For example, the explanatory power of the Phillips curve usually increases when lagged inflation is included. Lagged inflation can, for example, capture intrinsic inflation persistence or adaptive inflation expectations. Another extension that usually increases the explanatory power consists in considering fluctuations in commodity prices, e.g., by including import price inflation.
Numerous empirical studies investigated the relationship between inflation and economic activity in advanced economies. The studies offer a wide range of results. One reason behind this is that there are several reasonable specifications of the Phillips curve along the lines described above. Moreover, the results depend on the specific variables used and there are several variables available to measure each of inflation, inflation expectations, and economic activity. For example, inflation expectations can be measured via expectations of private households or professional forecasters and for different horizons. Economic activity (or economic slack) is typically measured by the output gap or the unemployment gap (putting a stronger focus on the role of wages for inflation) but sometimes also by GDP growth or survey data that aim to capture the amount of economic slack in the economy. Beyond the specification and variable selection there are also problems regarding identification of the effects of the determinants of inflation that contribute to the large variation of results in the literature. Therefore, the information that empirical investigations can provide about the relationship between inflation and economic activity at the aggregate level is limited (Mavroeidis et al. 2014). The problems in establishing a robust relationship between inflation and economic activity also becomes obvious when it comes to the forecasting properties of the Phillips curve. Phillips curves usually have poor forecasting properties; if anything they are only slightly better than simple univariate time-series models. For example, a recent study for the United States that accounts explicitly for time-series properties of inflation finds that the impact of both expectations and economic activity on inflation is small and that the Phillips curve has poor forecasting properties (Cecchetti et al. 2017).

Despite the wide range of different results there are some common findings in the literature. One common finding is that the relationship between inflation and economic activity has weakened in advanced economies. The weakening of this relationship was particularly pronounced during the 1980s and occurred by and large with the onset of the Great Moderation. Several studies also find that the relationship has further weakened in the period thereafter (BIS 2017, IMF 2013) while other studies find that the relationship has roughly been constant since then (Blanchard et al. 2015; Lodge and Mikolajun 2016). However, most studies find that the relationship in this period was weak and many studies do not even find a significant relationship.

Studies that focus on the euro area come to similar results. For example, the ECB (2013) empirically investigated the Phillips curve relationship for a set of different specifications using different measures of economic activity. They find that the relationship tends to be weak and that the results depend on the measure of economic activity. This result is confirmed by Lodge and Mikolajun (2016) and Gross and Semmler (2017). When using output gap estimates of the European Commission, these studies find a coefficient of the output gap in their Phillips curve specifications not higher than 0.2. This implies that if the output gap is at 1 percent, inflation is about 0.2 percentage points higher. Given that output gap estimates for the euro area fluctuate in the range between -3 and 3 percent, this indicates that the impact of economic slack in the euro area on inflation is limited even in periods of pronounced booms or recessions. The finding is also confirmed by studies that directly decompose fluctuations of inflation into contributions of different determinants. They find that the maximum absolute contribution of economic activity to inflation in the euro area was below 0.5 percentage points (Joint Economic Forecast 2017; Bobeica and Jarociński 2017). Some studies also indicate that the relationship between inflation and economic activity may increase again somewhat. The European Commission (2014) finds that at the end of their sample in 2014, the relationship has become somewhat stronger and Gross and Semmler

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4 See, e.g., BIS (2017), Blanchard et al. (2015), or IMF (2013).
(2017) find that the relationship is stronger in expansions than in recessions, albeit still weak even then.

Overall, the empirical literature as well as theoretical considerations point to a positive relationship between inflation and economic activity. However, the relationship seems to be weak and appears to vary over time.

3.2. What is behind the changes in the Phillips curve relationship: Transitory or structural factors?

We discuss factors that may impact on the relationship between inflation and economic activity. In this regard it is important to distinguish between temporary factors and factors that may have a structural or permanent effect. We discuss the effect of inflation expectations and their anchoring, the effects of globalisation, and the impact of digitisation.

Inflation expectations and anchoring of inflation expectations

One possible explanation why the relationship between inflation and economic activity has weakened is that central banks credibly committed themselves to an inflation target and that fluctuations in economic activity therefore have become less relevant for inflation (Bernanke 2010). This explanation is supported by the assessment that the relationship between inflation and economic activity apparently became weaker during the 1980s when central banks in many advanced economies started to put a stronger focus on stabilizing inflation and to credibly commit themselves to inflation targets. Since then, inflation rates in many advanced economies have fluctuated around the respective inflation targets and the volatility of inflation has declined. Moreover, inflation expectations of professional forecasters are well-anchored at the inflation targets of central banks and they seem to depend to a lesser degree on current inflation (IMF 2013).

However, the impact of well-anchored inflation expectations on the relationship of inflation and economic activity is difficult to gauge empirically. First, well-anchored inflation expectations do not automatically imply that the Phillips curve relationship weakens. Second, in empirical analyses of the Phillips curve, inflation expectations are frequently approximated by inflation expectations of professional forecasters one year ahead. However, these expectations are probably based on standard forecasting tools and therefore usually based on output gap estimates as well as on assumptions about commodity prices and exchange rates and are less related to the inflation target and the credibility of central banks. Finally, there is some evidence that inflation expectations of firms, which ultimately set prices, are not well-anchored, even though empirical information on inflation expectations of firms is scarce. Coibion et al. (2018) find that inflation expectations of firms in New Zealand have not become more anchored as a result of inflation targeting of the central bank, and that their inflations expectations are widespread. In this regard, Coibion and Gorodnichenko (2015) conclude that inflation did not decline more sharply in the United States in the course of the Global Financial Crisis (missing disinflation) mainly because inflation expectations of firms were not anchored but instead increased due to rising commodity prices.

Overall, from empirical as well as from theoretical considerations, it seems reasonable to assume that better anchored inflation expectations in many advanced economies contributed to the weakening of the Phillips curve relationship, even though this effect is difficult to quantify.

Globalisation

Globalisation is a multifaceted phenomenon, containing a number of distinct ways in which it could potentially influence inflation, the Phillips curve, and the transmission of monetary policy (see also Fiedler et al. 2015). To discuss the impact of globalisation, it is helpful to
distinguish between globalisation in a narrower sense (a shift in economic relations towards, e.g., increased international trade) and the influence of global factors (such as oil prices, global slack, etc.) on domestic economic conditions. Furthermore, globalisation encompasses rising international trade as well as financial integration. The effects of globalisation can either be temporary or structural in nature. In this respect, it is relevant that most central banks in advanced economies use a medium-term horizon for their inflation targets. This implies that temporary factors, such as fluctuations of the oil price, are not too much of a concern. Even a persistent change in inflation dynamics, for example an increase in international competition leading to downward price pressure, would by itself not pose a problem to a central bank that adjusts its monetary policy strategy accordingly. More problems could stem from changes that have permanent effects on the Phillips curve relationship and could impair the transmission channels of monetary policy.

Arguably the most prominent aspect of globalisation is the increase in international trade, which has been ongoing steadily for decades. In principle, declining import prices can impact inflation in three ways: first, there is a direct effect, since the CPI includes imported goods and services (see e.g. Mishkin 2007). Second, to the extent that cheaper imported goods can substitute domestic ones there will be an expenditure switching effect, such that people consume more of the imported goods, thereby increasing their weighting in the CPI. Third, in anticipating this expenditure switching effect, domestic firms will lower their own prices to forestall large reductions in sales (strategic price complementarities, Cwik, Müller, and Wolters 2011). These three effects are transitory in nature, with any change in import prices leading to a one-time adjustment in inflation. But insofar as import prices fall repeatedly because of continuously deepening globalisation, inflationary pressure might be dampened for quite some time and thereby affect the Phillips curve relationship, if these effects are not reflected in economic slack.

With regard to structural changes in the Phillips curve relationship and central banks’ ability to control inflation, increases in international trade can have a multitude of effects. First, for any given overall inflation rate, an increasing weight on imported goods exhibiting a relatively low rate of price increases would allow for higher domestic inflation. This could be a boon to central banks inasmuch it helps alleviating domestic downward rigidities, for example in wages (Rogoff 2006). Second, the effect of increased international competition is ambiguous: on the one hand, lower mark-ups could imply that firms will have to adjust prices immediately when their costs change, leading to a steeper Phillips Curve (Carney 2015). Furthermore, with the opening of factor markets to international competition, unions may lose market power, by which the flexibility of wages and prices increases. On the other hand, international integration and specialisation across countries may also lead to higher market power of local workers with particular skills (Rogoff 2006). In addition, intensified international competition could impair firms’ ability to adjust prices over the domestic business cycle, implying a flattening Phillips Curve (Carney 2015). Empirically, it is hard to measure which side dominates, but Helbling et al. (2006) provide some evidence that higher international competition tends to flatten the Phillips Curve. Third, globalisation could mean that the global business cycle generally becomes more important vis-à-vis domestic economic slack, implying a flattening of the Phillips Curve. This could not only happen due to actual trade in final goods but also because of direct and indirect competition in intermediate goods markets.

The fluctuations of commodity prices are an important contributor to the international co-movement of inflation (Carney 2015). Due to the considerable volatility in commodity prices (Anderton et al. 2009), a central bank credibly pursuing medium-term price stability may find it reasonable not to smooth out these temporary fluctuations but instead to allow for relatively high variances of inflation rates. Structurally, commodity prices might even provide a counterbalance to downward pressures on inflation dynamics stemming from other aspects of globalisation: emerging economies entering the world markets will increase demand for commodities, raising their prices (Pain et al. 2008) – at least as long as the supply of commodities does not adjust proportionately.
and the integration of global value chains (Auer 2017). While some empirical studies (as reviewed in Wynne and Martínez-García 2010) find an increase in the importance of global slack, others even doubt that global slack has any significant connection with domestic prices at all (Mishkin 2008). Regarding the euro area in particular, Calza (2009) suggests that global slack is not a major driver of inflation.

Increases in international trade should strengthen the influence of exchange rates on inflation via import prices. The exchange rate can therefore become an important channel through which a central bank’s reaction to domestic conditions can influence price developments. The strength of the exchange rate channel then depends on a number of factors including the share of imports, the pass-through of exchange rate changes towards import prices, and the degree of strategic price complementarities. Moreover, exchange rate fluctuations can be due to a number of underlying causes and the way domestic prices are affected is related to these causes. For example, Forbes et al. (2017) find for a panel of 26 countries that monetary policy shocks exhibit a higher pass-through than domestic demand shocks. For the euro area, Comunale and Kunovac (2017) also find that the pass-through following monetary policy shocks is comparatively large. Empirically, the pass-through of exchange rates is also dependent on the home currency: for the United States, it seems to be relatively low at around 25 percent, because of the high share of local currency pricing (Gopinath et al. 2010; Campa and Goldberg 2005; Gopinath 2015). For 12 euro area countries, Campa and Gonzales Minguez (2006) find an average pass-through of around 60 percent – with no structural change following the introduction of the euro. However, there may have been some decline in the pass-through rate compared to earlier times (for euro area evidence see di Mauro et al. 2008). Some evidence for the effect of increased foreign trade exposure on domestic producers’ price setting behaviour is provided by Chen et al. (2009).

In addition to trade, financial markets have also become increasingly integrated across the world, at least since the early 1990s. Traditionally, it was believed that central banks face a trilemma: without capital controls, an independent monetary policy is only possible under flexible exchange rates (Obstfeld and Taylor 2004). However, it was also argued (see Woodford 2010) that such flexible exchange rates would then almost always be a sufficient condition to ensure a central bank’s control over inflation, as long as there were no financial market imperfections and the central bank followed an inflation target. In contrast, Rey (2013) argues that there is a dilemma: independent monetary policy may well require the introduction of capital controls, independently of the exchange rate regime. This is because global monetary conditions, including capital and credit flows, are highly dependent on liquidity provision in financial centres (“global financial cycle”). This thesis is supported by empirical evidence from other researchers as well. For example, Forbes and Warnock (2012) find that global factors dominate domestic factors in driving capital flows. Georgiadis and Mehl (2015) also find a strong global component in domestic asset prices in the euro area and elsewhere. However, they add that there might be a counteracting effect on monetary policy effectiveness: to the extent that a country holds a large foreign asset position, there might be a wealth effect. A contractionary domestic monetary policy would cause the exchange rate to appreciate, thereby reducing the local currency value of foreign assets, which could reduce residents’ willingness to spend. Of course, a large foreign liability position might work in reverse and further reduce the effectiveness of monetary policy.

All in all, the effect of globalisation on the Phillips Curve is ambiguous. The increasing importance of global factors could make it more difficult to find empirically robust relationships between inflation and economic activity. More structural effects, such as a reduction in domestic agents’ ability to set wages and prices in accordance with business cycle conditions at home and a general increase in the importance of the global business cycle can lead to a weakening of the Phillips Curve. Some relief for monetary policy could be provided by the increased potency of the exchange rate channel in a world of higher import
shares. However, the more international business cycles co-move, the more difficult it becomes for central banks to affect prices via the exchange rate because then many central banks will have similar monetary policy stances.

**Digitisation**

One prominent trend in economies around the world in recent decades is the increasing importance of information technology. Riksbank (2015) points out three possible channels through which digitisation could impact inflation and the Phillips curve relationship. First, there is a direct negative effect on consumer prices, as rapid progress in information technology has made certain goods become much cheaper over time. Second, automation and productivity improvements could reduce firms’ costs and lead to lower inflation (however, it is noted that overall productivity actually seems to have slowed down recently). Third, the internet, and e-commerce in particular, may increase competitive pressure for domestic suppliers as it is now easier for foreign ones to reach their customers. Furthermore, customers may become more informed, for example because it is now easier to compare prices. This would put further downward pressure on prices. However, the Riksbank also points out that these channels should only lead to a temporary dampening of inflation – that is, if there is any effect at all, since it should be perfectly possible for a central bank to react to these changes with an adjustment in its monetary policy. Empirically, the impact of digitisation on inflation seems to be limited in any case. ECB (2015) reviews the evidence for the impact of increased e-commerce on consumer prices and finds only very small effects. Similarly, the Bank of Canada’s Charbonneau et al. (2017) argue that not only is the direct impact of cheaper information technology on CPI inflation negligible, but also that e-commerce is still too small to have any meaningful impact on overall price developments. Furthermore, the data do not yet show the theorised productivity increases from digitisation.

3.3. **Factors behind inflation in the euro area: assessment and outlook**

Figure 4 relates measures of inflation to output gap estimates in the euro area for the period between 1999 and 2018 based on annual data, including the forecast of the European Commission for 2018. This can be interpreted as a stylised Phillips curve that does not account, however, for other factors that may impact inflation, such as inflation expectations or commodity prices. By focussing on the GDP deflator and HICP core inflation as measures for inflation, we control to some extent for the impact of commodity prices because these two measures are typically less affected by commodity price fluctuations compared to HICP headline inflation. Even though these are rather stylised specifications of the Phillips curve they capture some of the main results in the literature reasonably well. The impact of the output gap on inflation is small. For example, if the output gap increases by 1 percentage point, HICP core inflation increases on average by about 0.2 percentage points. Moreover, the relationship between inflation and the output gap is weak: A given level of the output gap can be associated with very different levels of inflation. For most of the time since 2015, inflation has been below the level these stylized Phillips curves would predict. With regard to core inflation, this is particular true for the years 2015 and 2016. There are several factors that could explain this pattern. First of all, global capacity utilisation was low in this period, which may have weighed on prices of imported goods and services. Second, oil prices considerably declined in this period, thereby putting downward pressure on inflation. Even though the GDP deflator and core inflation account for these effects to some extent, pronounced and long-lasting declines in oil price can have a visible impact on these measures, as well (e.g. second-round effects). Third, in several member countries of the euro area, structural reforms were implemented that may weigh on inflation for some time. For example, labour market reforms could lead to temporary downward pressure on wages; but it is very difficult to account for these reforms when estimating the output gap. However, all of these factors seem to have lost steam recently, as global growth has picked up, oil prices have
increased and indicators for the labour market signal that supply shortages are increasing, indicating that wages will probably accelerate. Actually, inflation in 2017 was broadly in line with the Phillips curve relationship and is expected to be so in the year 2018, too.

**Figure 4: Phillips curve scatterplot: Output gap vs. inflation (1999-2018)**

Source: European Commission, Autumn Forecast 2017; Eurostat; own calculations. Annual data.
4. IMPLICATIONS FOR MONETARY POLICY

**KEY FINDINGS**

- A weak and unstable relationship between inflation and economic activity makes it more difficult for central banks to control inflation because this relationship describes one of the most important transmission channels of monetary policy. Moreover, it becomes more difficult to assess the impact of monetary policy measures on inflation.

- A weak Phillips curve relationship also implies that central banks may have to accept inflation to deviate from their inflation targets for longer periods of time. Moreover, larger fluctuations in economic activity may be required to keep inflation on target and it is not obvious that fluctuations in economic activity are less costly in terms of economic welfare than fluctuations in inflation.

- Extended periods of extraordinary monetary policy measures – may necessitated if the central bank’s control over inflation by ordinary means is reduced– could come with increased undesired side effects. These side effects include risks for financial stability and the misallocation of production factors, which could weigh on productivity and the long-run growth prospects of an economy.

Changes in the Phillips curve relationship and subdued inflation over an extended period of time can have several important implications for monetary policy. These implications depend on the deeper causes of the changes in the Phillips curve and not all of them are problematic for monetary policy. For example, if a weaker relationship between economic slack and inflation is due to a tighter anchoring of inflation expectations at the central bank’s inflation target it might become easier for monetary policy to control inflation. Other possibilities are more problematic for monetary policy. First, one of the most important transmission channels of monetary policy towards inflation is described by the Phillips curve. If the relationship between inflation and economic activity has weakened or is varying over time it becomes more difficult for central banks to control inflation. In fact, they would have to create larger changes in the output gap to create the same change of inflation. Moreover, if the relationship between inflation and the output gap is varying over time and thereby is more difficult to assess, it also becomes

4.1. Ability of monetary policy to control inflation

Usually it is assumed that monetary policy can have strong effects on demand but less so on supply. Therefore, if central banks change the stance of monetary policy they can influence the proportion of demand and supply and thereby in turn control inflation. If the relationship between inflation and the output gap becomes weaker, it becomes more difficult for central banks to control inflation. In fact, they would have to create larger changes in the output gap to create the same change of inflation. Moreover, if the relationship between inflation and the output gap is varying over time and thereby is more difficult to assess, it also becomes
more difficult to gauge the effect of a change of the of monetary policy stance on inflation. In this regard, it is relevant that both inflation deviating from target and output gap fluctuations can reduce welfare. One assumption behind the monetary framework of inflation targeting is that if inflation is at the inflation target (or close to it) the output gap is also closed (or close to zero). Therefore, in this framework there is no trade-off between bringing inflation close to target and closing the output gap. However, if the relationship between inflation and the output gap weakens and if there is even a trade-off, it could be optimal for monetary policy (in terms of economic welfare) to put a stronger focus on output gap stabilization. In terms of the Taylor rule (which relates the optimal interest rate for monetary policy to the deviation of inflation from its target and to the output gap) this would imply that central banks should think about putting a higher weight on output gap stabilisation and a lower weight on inflation stabilisation (Blanchard et al. 2015; IMF 2013). In turn, central banks would have to accept that inflation could deviate from the inflation target for longer periods of time.

4.2. Side effects of monetary policy

Monetary policy can have unintended side effects that are associated with economic costs or risks (White 2012). Usually, these costs are expected to be small, as during normal monetary cycles any particular monetary stance is held for a limited amount of time only (e.g., a few years). However, since the Global Financial Crisis, monetary policy seeks to stimulate economic activity by holding interest rates close to zero already for a period of about ten years, thus making considerations about potential side effects more important than in normal times. Moreover, side effects of monetary policy could become the more important, the less monetary policy is able to steer inflation in the short-run, for example because the transmission channel of monetary policy on economic activity is weaker, the effect of economic activity on inflation in terms of the Phillips curve is smaller, or because it is more difficult for monetary policy to assess the effects of its policy on future inflation due to time varying-effects.

One important side effect of expansionary monetary policy could be that it triggers financial imbalances and undermines financial stability by enhancing risk-taking (Drehmann et al. 2012; Rajan 2005, Maddaloni and Peydro 2011). Theoretical considerations and empirical evidence suggest that these risks increase the longer such a policy is in place (Kahn 2010, Maddaloni and Peydro 2011, 2012).

Moreover, there is increasing evidence that expansionary monetary policy or, more generally, loose financial conditions can contribute to the misallocation of resources and thereby dampen economic growth. One mechanism behind could be that in an environment of low interest rates and easy access to credit it is more likely that less productive firms attract more than proportional funding compared to more productive firms. Gopinath et al. (2018) show using a firm-level data set of Spanish firms that this mechanism contributed to a slowdown in productivity before the Global Financial Crisis. In this regard, loose financial conditions also hinder structural changes as it becomes more likely that de-facto bankrupt firms receive funding from banks that want to avoid write-offs ("zombification"). For example, Acharya et al. (2015) show for the euro area that the announcement of the OMT programme mainly led to an increase of credit to firms with low credit servicing ability in peripheral countries and that these loans did not stimulate investment or employment of these firms. Evidence for the "zombification" of firms in periods of very expansionary monetary policy was found for Japan, too (Caballero et al. 2008, Hoshi and Kashyap 2004).

There are also some potential side effects that are more specific to the euro area at the current juncture. For example, the ECB contributed with several measures to very low levels of interest rates for certain government bonds. In doing so, it may have contributed to the delay of implementing structural reforms in some countries that could have contributed to
stimulate economic growth and employment. Moreover, it may have contributed to government finances in some countries becoming structurally less sustainable as it lowered the pressure for consolidation. The latter makes an exit of the ECB from its expansionary monetary policy more difficult, as the ECB would hardly risk another sovereign debt crisis in some Member States if this exit would lead to strong increases in government bond yields.
5. CONCLUSIONS

**KEY FINDINGS**

- In consideration of all the challenges central banks have been facing since the Global Financial Crisis it might be worth starting a discussion whether the current framework of inflation targeting is still optimal.

- Such a discussion could take into account the weak Phillips curve relationship, potential trade-offs between stabilising inflation and output, and the role of undesired side effects of monetary policy.

The Phillips curve describes the relationship between inflation and economic activity. However, there is no unique Phillips curve as there are different measures for inflation and economic activity available. Moreover, the Phillips curve can be specified in different ways, for example when it comes to account for inflation expectations, inflation persistence or commodity prices. Furthermore, there are numerous potential factors that may have an impact on inflation, which means that it is extremely difficult to identify the impact of economic activity on inflation. All of this explains the wide range of different results of the empirical studies on the Phillips curve. Even though the results exhibit a wide range there are several patterns that emerge from this literature. First of all, the relationship between inflation and economic activity has weakened. However, while there is a large consensus that a considerable weakening has taken place during the 1980s, it is less obvious whether this relationship has further systematically weakened in the period since the mid-1980s. Second, the relationship between inflation and economic activity is weak. Several studies do not even find a significant relationship. Third, the relationship between inflation and economic activity seems to change over time. This implies that the relationship could possibly become stronger again in the future, at least temporarily.

All of this has important implications for monetary policy. First of all, the Phillips curve describes one of the most important transmission channels of monetary policy as changes in the stance of monetary policy are typically assumed to have an impact on demand, which in turn has an effect on inflation. If the Phillips curve relationship has weakened, this implies that it is more difficult for monetary policy to control inflation. Second, if the Phillips curve relationship has weakened, then monetary policy has to create larger fluctuations in demand implying larger business cycle fluctuations to bring inflation closer to its inflation target. However, one important assumption behind the adoption of inflation targeting has been that inflation targeting contributes to small fluctuations in inflation and output at the same time and thereby improves economic welfare. If this is not true, it is not obvious whether it is more welfare enhancing to stabilize inflation rather than output. Third, if the relationship between inflation and economic activity is unstable over time, it becomes more difficult for central banks to gauge which effects changes in the stance of monetary policy will have on inflation. Therefore, it may become more difficult to bring inflation back to target and central banks may have to accept longer periods in which inflation deviates from the inflation target. In this regard, it is important to note that there seem to be other obstacles for monetary policy currently at work, as well. There is increasing evidence that it is more difficult for monetary policy to stimulate demand and output in the aftermath of financial crises, which potentially contributed to the fact that monetary policy kept interest rates at very low levels for an unprecedented period of time. Moreover, there is increasing evidence that very low interest rates can have undesired side effects, and these side effects become stronger the longer a low interest environment prevails. These side effects include boom and bust cycles.
of asset prices, risks for financial stability, and the potential misallocation of production factors, which would weigh on productivity and the long-run growth prospects of economies.

In the face of all these challenges, the ECB followed its monetary paradigm of inflation targeting since the Global Financial Crisis, despite some adjustments to its policy compared to the period before this crisis. This is a reasonable strategy because a central bank can hardly change its monetary policy strategy ad-hoc as this could severely weigh on its credibility, which is one of the most important assets of a central bank. However, all of the challenges central banks are facing since the Global Financial Crisis, including the weak and potentially unstable Phillips curve relationship, call into question whether the monetary policy regime of inflation targeting really is the best monetary strategy when it comes to enhancing economic welfare. Therefore, it appears reasonable to intensify the discussion whether the monetary policy regime of inflation targeting can be improved. Several avenues for such a discussion have been proposed in the literature. One of these proposals is that central banks could put a stronger focus on stabilising output rather than exclusively focussing on inflation (Blanchard et al. 2015, IMF 2013). Moreover, central banks could put a stronger focus on financial stability, as the Global Financial Crisis has shown that financial instability can have far-reaching effects on output and employment (Borio 2017). Furthermore, central banks could take into account the effects of its policy on the misallocation of production factors, in particular in times when interest rates are already at very low levels for extended periods of times, as these misallocations could have far-reaching effects on the growth prospects of economies (Borio et al. 2015). One proposal that could account for these challenges is that central banks commit to hold inflation in a range rather than commit to a specific target value and to adjust this range and the target in accordance to the specific circumstances (Rosengren 2018).
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