Heterogeneity of inflation in the euro area: more complicated than it seems

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Abstract

We document different measures of inflation heterogeneity in the euro area. We ask what mostly drives this heterogeneity and whether there is cause for concern. Heterogeneity in headline inflation has increased substantially, and way more than heterogeneity in core inflation. We argue that core inflation dispersion is largely driven by small countries, where inflation reversion is the most likely. We then discuss about monetary policy as a limiting or aggravating factor of inflation heterogeneity.

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CONTENTS

LIST OF ABBREVIATIONS

CEECs	Central and Eastern European countries
COICOP	Classification of individual consumption by purpose
CPI	Consumer price index
ECB	European Central Bank
EMU	Economic and Monetary Union
EU	European Union
GDP	Gross domestic product
HICP	Harmonised index of consumer prices
IQR	Interquartile range
PPI	Producer price index
PPPGDP	Purchasing power parity gross domestic product

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EXECUTIVE SUMMARY

- **Headline consumer inflation heterogeneity is at a historically high level in the euro area, but core inflation heterogeneity (excluding energy and food) is not.** This is true according to most measures of inflation dispersion: weighted standard deviation, or weighted interquartile range (IQR).

- **Nominal wage inflation and minimum wage inflation are positively correlated to headline consumer inflation, but not one-for-one.** This indicates no sign of a price-wage spiral in the euro area, at least so far. In fact, workers have been experiencing slower real wage growth where inflation is higher, suggesting that workers do not manage to bargain for wage increases to maintain the purchasing power of their wages, neither ex-ante (through inflation expectations) nor even ex-post, at least so far.

- **After we weight inflation dispersion across euro area countries for their relative size, inflation dispersion appears more limited and therefore mostly driven by small countries**.

- **We recall that in these small countries and, in particular in the Baltic countries, inflation upsurges have been followed by deflationary trends in the past**. This is a clear indication that monetary tightening by the ECB should have to be limited: Baltic countries only account for a small share of the euro area and they show fast mean-reversion in inflation rates after crises come to an end.

- **In theory, even in the best possible conditions, monetary policy would not necessarily be well suited to address underlying inflation heterogeneity.**

- **Monetary policy also likely has heterogeneous effects across different countries, and there is no a priori reason to expect a divine coincidence between the amount of needed tightening and the effectiveness of monetary policy across countries.** We show that empirically, aside from the Baltic countries, which have a higher share of floating rate loans as well as higher inflation, the share of floating rate loans is not systematically related to the inflation rate. Again, this suggests that monetary policy is not well suited to address inflation heterogeneity in the euro area.

1. INTRODUCTION

Inflation as measured by the harmonized index of consumer prices (HICP) has increased sharply in the euro area up to 10.6% annually in October 2022. In any case, inflation has increasingly exceeded the European Central Bank's (ECB's) 2% target since May 2021. This increase in inflation was largely unexpected and has caught the ECB by surprise, especially after the trough at the end of 2020 (with - 0.3% annual HICP inflation). The ECB had been worried about too low inflation and even deflation risks. In this context, the ECB Governing Council has recently decided on a third interest rate increase in a row (by 75 basis points) on 27 October 2022, after two interest rate increases on 8 September and 21 July.

The sharp increase in consumer price inflation has qualitatively been observed for all euro area countries, but there have also been very large discrepancies across Member States: in October, the inflation rate stood at 7.1% in France, and it was above 20% in the Baltic countries. These examples are not isolated and inflation rates are very heterogeneous across the euro area. Inflation heterogeneity is a special focus of this analysis.

What is the extent of inflation heterogeneity? Has it increased, decreased, or stayed constant? Does it matter whether we look at weighted or unweighted measures, headline or core inflation, or whether we look at consumer price or wage inflation[1]? What are the causes of such inflation heterogeneity, and should we worry? How does inflation heterogeneity relate to real wage heterogeneity? Should we worry about heterogeneous second-round effects coming from differential wage-price spirals? These are the questions we attempt to answer in this analysis.

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[1]   In Blot et al. (2022), we also discuss heterogeneity in production price index (PPI) inflation, which is less related to the practice of monetary policy, but feeds heterogeneity in consumer price index (CPI) inflation (see Benecka, 2022; Koester et al., 2021). Blot et al. (2022) report that the heterogeneity in PPI inflation tends to increase in the context of a crisis. All industries considered, the current increase of heterogeneity in PPI inflation does not appear to be disproportionate compared to that observed during the 2008-2009 crisis. The correlation between heterogeneity in PPI consumer goods and CPI industrial goods is unstable, however.

2. INFLATION HETEROGENEITY IN THE EURO AREA

"Inflation" has many different definitions in economics, and therefore takes many different forms. "Inflation" often refers to consumer price inflation, in which case there is a relative consensus as to what it means. This is, for example, the implicit definition used by the ECB, alongside all central banks around the world which equate "inflation" to "consumer price inflation", although the precise meaning of this is still subject to some degree of controversy[2] (see Box 1). There are, however, other potential definitions of inflation such as wage or producer price inflation.

Box 1: What do we mean by "inflation"?

> According to the July 2021 outcome of the ECB's strategy review, the Governing Council considers HICP as "the appropriate measure for assessing the achievement of the price stability objective", and so we shall mostly focus on that indicator. However, we also believe that is far from being the only relevant indicator for the proper conduct of monetary policy. In the following, we complement the analysis of headline HICP inflation with that of core inflation, as well as with other potential definitions of inflation, such as nominal wage inflation, real wage inflation, or production prices.

2.1. Headline and core inflation heterogeneity

In this section, we analyse in some depth consumer price inflation heterogeneity using different measures of dispersion. We first measure heterogeneity using the standard deviation, and then investigate the robustness of our findings to other commonly-used measures of heterogeneity.

2.1.1. Heterogeneity as measured by the standard deviation

The most standard way to assess cross-country heterogeneity for a given economic variable is to compute the standard deviation of this variable, as it captures the dispersion: the higher the standard deviation, the larger is the dispersion around the mean.

Figure 1 plots headline inflation ("All-items HICP" according to the classification of individual consumption by purpose (COICOP) classification, in black) as well as core inflation ("Overall index excluding energy, food, alcohol and tobacco", according to the COICOP classification in dashed red line) using unweighted standard deviations.

Unweighted standard deviations imply that Germany and France carry as much weight in the computation of the standard deviation as, for instance, Malta and Cyprus. Weighted standard deviations (Figure 2), on the contrary, assign a weight of 28.3% to Germany, 20.5% to France but only 0.2% to Cyprus and 0.1% to Malta in 2022, which is the weight that these countries have in Eurostat's computation of the overall HICP price index at the euro area level. As one can see, using unweighted standard deviations leads to higher estimates of the extent of inflation heterogeneity, as well as of its variation over time. One can also see that unweighted standard deviation of headline inflation is currently at a historical high in the euro area, while core inflation is at a high level but one which is actually comparable to the heights that were reached during the previous energy price increases in 2008.

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[2] There may be slight differences on the precise indicator targeted by central banks. For instance, in the United States, the Federal Reserve focuses on the price consumer expenditure deflator.

Weighted standard deviations in Figure 2 are also very high for headline inflation: in fact, headline inflation heterogeneity is much higher than it was in 2008: the level of the standard deviation is currently around 3%, while it was just a bit higher than 1% in 2008. In contrast, core inflation heterogeneity has a very different pattern, and it does not appear to be at a particularly high level historically: the current level of core inflation heterogeneity was previously reached several times between 2001 and 2003, for example.

Figure 1: Unweighted standard deviation of inflation rates
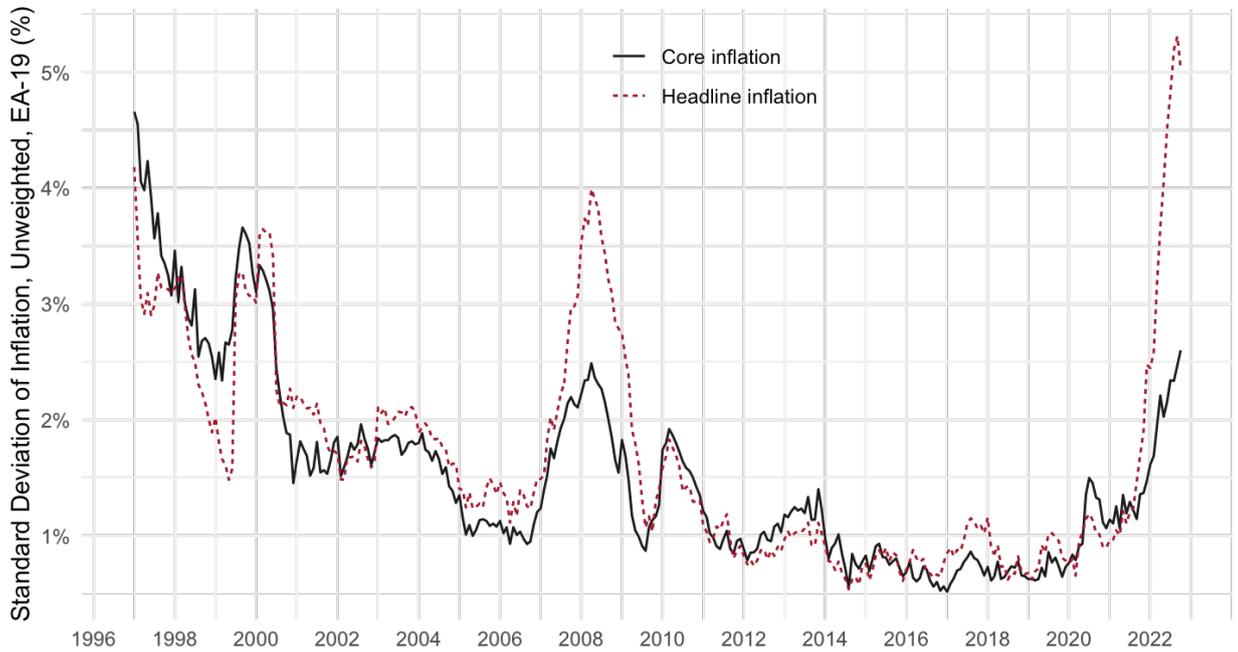
Source: Eurostat, authors' calculations.

Figure 2: Weighted standard deviation of inflation rates
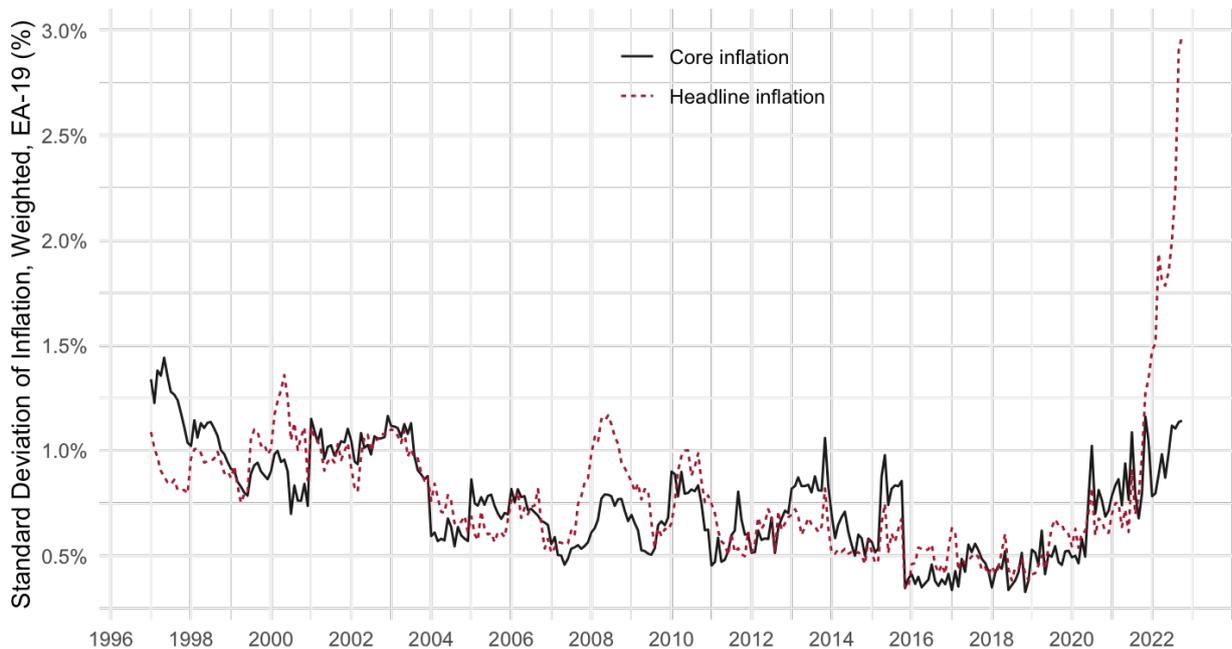
2.1.2. Other measures of heterogeneity

Weighted standard deviations show that headline inflation has become more heterogeneous, but that core inflation is not particularly heterogeneous during our current inflationary episode, at least at this stage. We now test for the robustness of this result using another measure of dispersion such as the (weighted) interquartile spread (IQR). Figure 3 shows the alternative measure of inflation heterogeneity for headline inflation, and Figure 4 shows the alternative measure of inflation heterogeneity for core inflation.

The (weighted) IQR, which is the difference between the 75th percentile of the distribution of inflation and the 25th percentile of the distribution of inflation, shows a similar pattern as the standard deviation: headline inflation is at a historically high level of dispersion, while core inflation is not. This confirms the findings in section 2.1.1., which are therefore robust to the use of another measure of inflation heterogeneity.

2.1.3. Taking stock

Therefore, what can we say about inflation heterogeneity? Has it risen or not? Which of the two indicators (headline or core) is more relevant for monetary policy is a long-standing debate among policymakers as well as academics. On the one hand, headline inflation is explicitly in the ECB's target (see Box 1). On the other, core inflation is a key inflationary indicator for monetary policymakers (Roger, 1998; Rich and Steindel, 2005; Wynne, 1999). Core inflation may refer to two alternative concepts: the persistent component and the generalised component of inflation. In the footsteps of Friedman (1963), core inflation can be viewed as the persistent component of measured inflation or "a steady inflation, one that proceeds at a more or less constant rate", contrasting with "an intermittent inflation, one that proceeds by fits and starts". The importance of the distinction is that the steady or persistent component of inflation will tend to be incorporated into expectations. Alternatively, core inflation can be viewed as the generalised component of measured inflation or "…the rate at which the general level of prices in [the] economy is changing" (Flemming, 1976).

In this conception, relative price shocks are regarded as "noise", blurring the more general or "underlying" evolution of prices. Very often, central bankers tend to consider core inflation in such a manner, defining core inflation as the aggregate inflation excluding items whose price movements are deemed likely to distort or obscure the more general trend of other prices (Roger, 1998; Wynne, 1999). If the changes in relative prices are temporary in character (e.g., as a consequence of seasonal influences on fresh food prices), the impact on the measured inflation rate should be temporary. Consequently, relative price shocks should typically be associated with transient changes in inflation while the generalised or common component should tend to be more persistent. As a proxy of core inflation, we have followed the common practice consisting of using the CPI inflation series excluding food and energy items (Wynne, 1999). Such a practice has demonstrated the ability to match the mean rate of aggregate inflation and track movements in its underlying trend (Rich and Steindel, 2005).

2.1.4. Changing euro area composition

The previous measures may be biased, as not all the 19 countries have been member countries of the euro area since 1999. For instance, inflation was already very high in 2008-2009 in the Baltic countries, but those countries had not yet entered the euro area. Correcting for the composition of countries in "real-time" may better capture the true dynamic of heterogeneity since 1999 and may also provide some insights into structural heterogeneities related to the enlargement of the euro area.

Figure 3: Alternative measures of inflation heterogeneity (headline inflation)
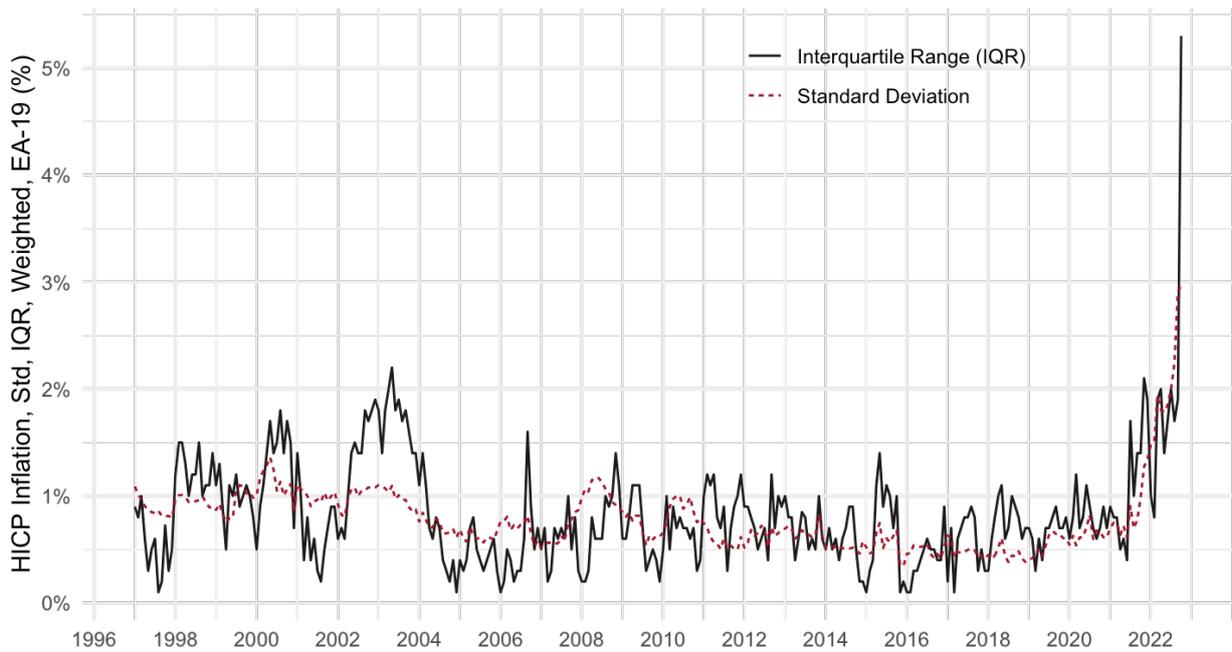
Source: Eurostat, authors' calculations.

Figure 4: Alternative measures of inflation heterogeneity (core inflation)
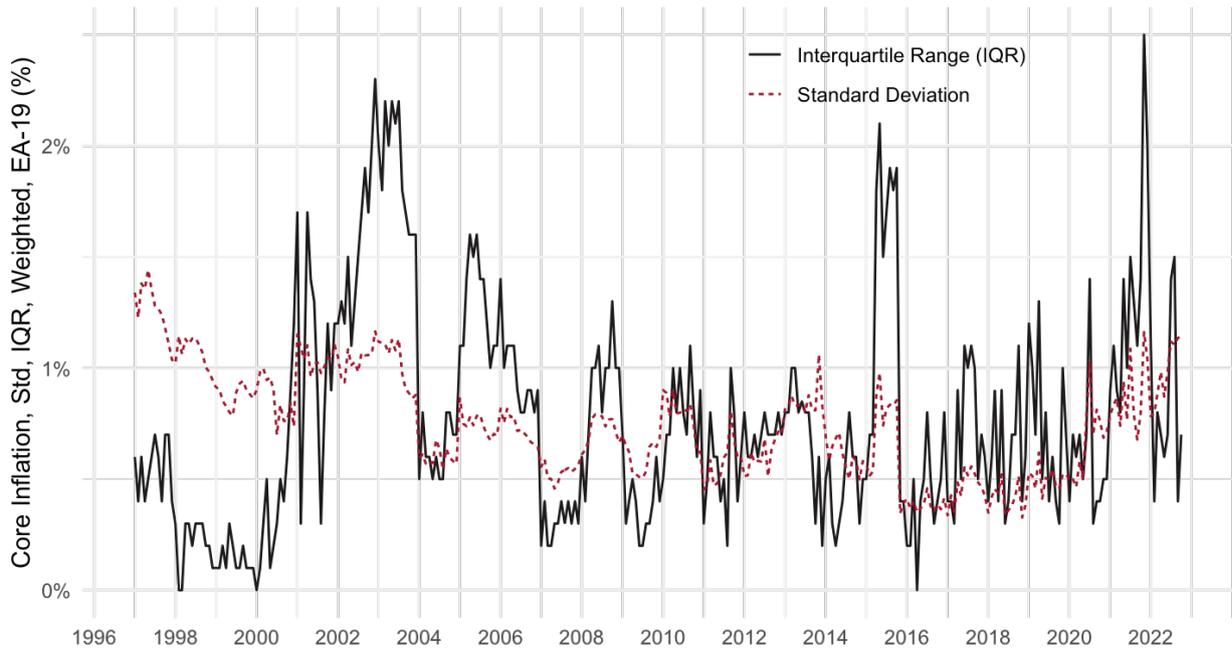
Source: Eurostat, authors' calculations.

The recent upsurge in heterogeneity is now even more striking compared to what has been observed from 1999 to 2020 (Figure 5). Over the past, the standard deviation reached a peak at 1.5 in May 2010,

much less than the 5 percentage points dispersion observed since the summer 2022. As the indicator calculated here is unweighted, it over-weights the rise of inflation in small countries. Consequently, it is worth calculating the dispersion over a subsample of the five biggest countries – Germany, France, Italy, Spain and the Netherlands – which are also members of the euro area since 1999.[3] Even with the EUZ-5 indicator, we observe that heterogeneity has recently risen in the euro area. Inflation is indeed twice higher in the Netherlands (16.8% in October) than in France (7.1%). The high inflation rate in the Baltic countries does not account for all heterogeneity in the euro area. It may be observed that after the integration of the last Baltic country – Lithuania in 2015 – dispersion was not higher on average until 2020 compared to the previous composition of countries (EUZ-18). The three Baltic countries do not structurally increase heterogeneity but may contribute to some spikes notably when energy prices increase.

Figure 5: Historical dispersion of headline inflation in the euro area
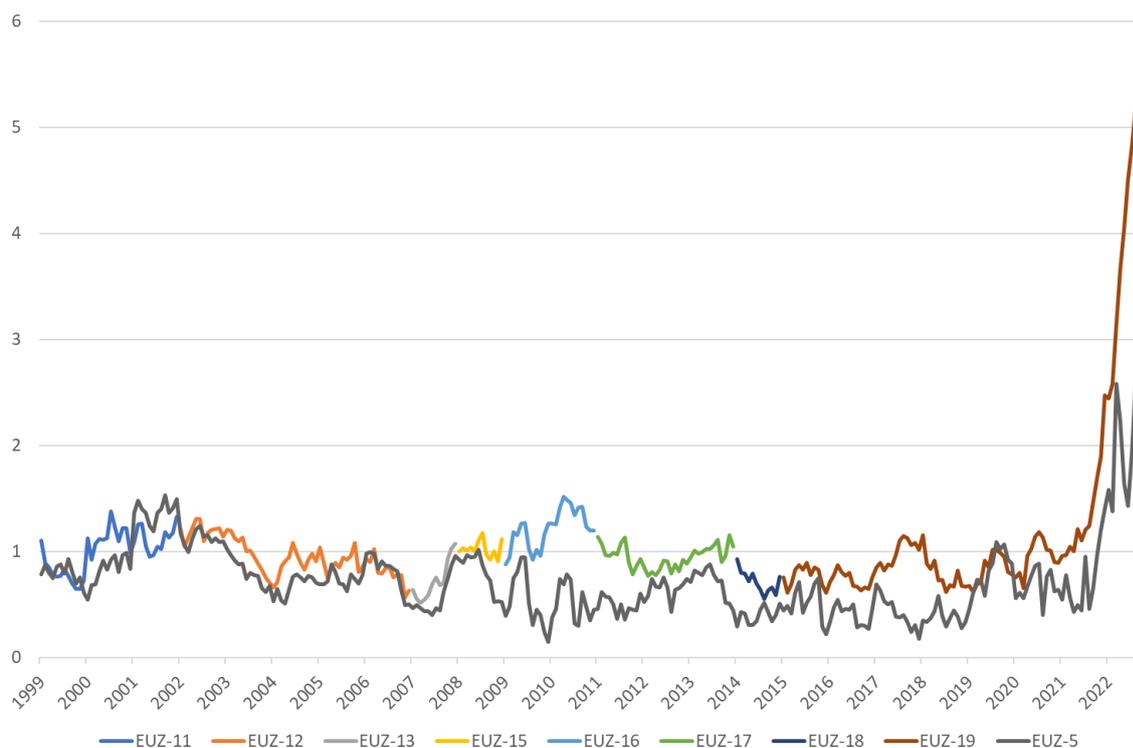
Source: Eurostat.

Notes: Dispersion is measured by the unweighted standard deviation. EUZ-11,…, EUZ-19 accounts for the change in the number of countries adopting the euro. EUZ-5 is the euro area with the five largest countries only.

Measured with the core inflation rate, the standard deviation is almost half compared to headline inflation but has also increased recently. However, we may notice here a significant difference when the dispersion is calculated for the EUZ-5 (Figure 6), as it appears that the current heterogeneity among the five largest euro area countries does not exceed its long-run average. Actually, most of the dispersion in the euro area would be related to the high level of core inflation in the Baltic countries and in Slovakia, that is the Central and Eastern Europe countries (CEECs) except Slovenia. In these four countries, the unweighted average inflation stood at 10.6% in September against 5.5% for the rest of the euro area countries. A first insight from the more common indicator of inflation suggests that the

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[3]   The choice of these five countries is also relevant because it includes countries considered as part of the "core" (Germany and the Netherlands) and countries at the "periphery" of the euro area (Italy and Spain) while France would be representative of the average.

current upsurge in the heterogeneity of inflation is notably driven by energy and food prices. Heterogeneity remains even when excluding these two components of the price index, notably stemming from the role of CEECs.

Figure 6: Historical dispersion of the core inflation in the euro area
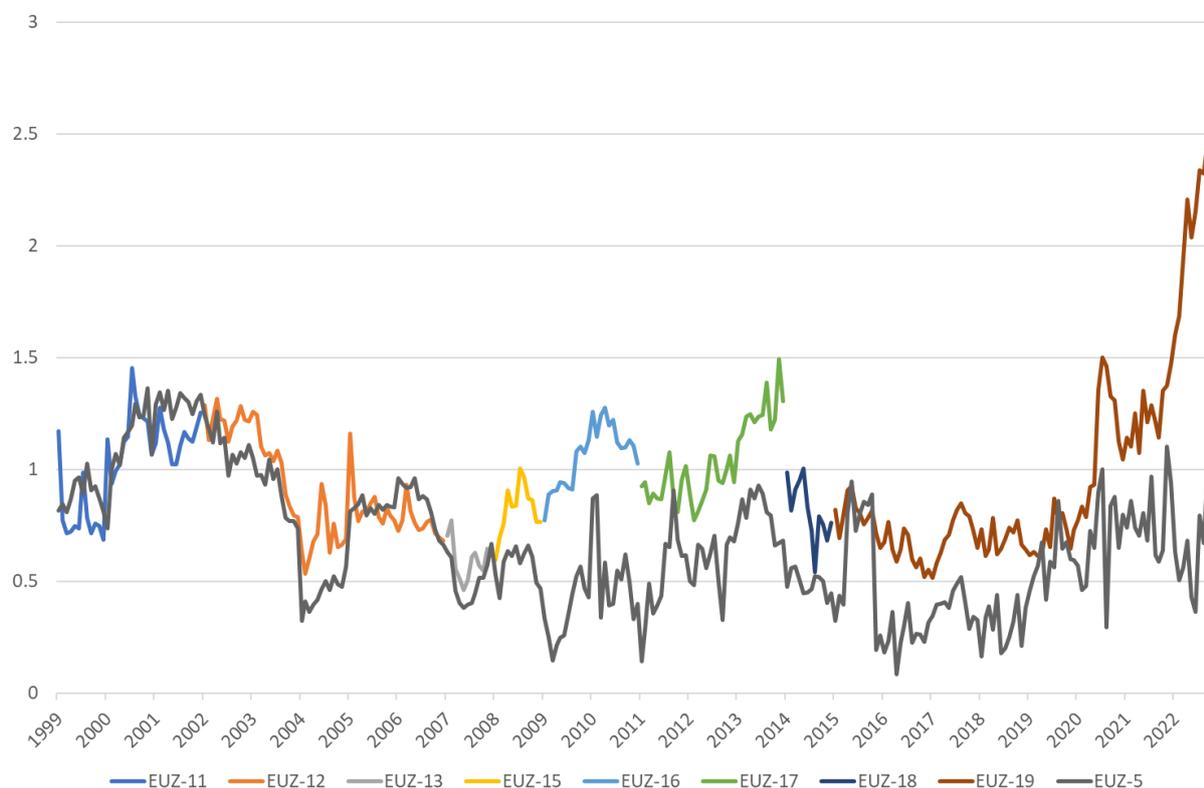
Source: Eurostat.

Notes: Dispersion is measured by the unweighted standard deviation. EUZ-11,…, EUZ-19 accounts for the change in the number of countries adopting the euro. EUZ-5 is the euro area with the five largest countries only.

2.2. Where does consumer price heterogeneity come from?

Section 2.1. has shown that the bulk of inflation heterogeneity is in headline inflation, while there is not much heterogeneity in core inflation. This alone should suggest that much of the "action" is actually taking place in energy and food. This intuition is strongly confirmed in Figure 7, which shows the contribution of energy to inflation on the x-axis and total inflation on the y-axis (these are the latest available data from October 2022): one can see from this graph that there is a strong and significant positive correlation between how much energy contributes to inflation and how much inflation there is overall. Similarly, Figure 8 shows an even stronger relationship of total inflation with energy, food, transport and catering contributions to inflation[4].

The importance of energy prices for heterogeneity in inflation rates is confirmed across the euro area, the products with the largest weighted standard deviation (according to the COICOP classification) are electricity, gas and other fuels (with different levels of disaggregation) as well as international flights (whose price depends a lot on the price of a barrel of oil, since it is very correlated to jet fuel prices). Of

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[4] Food prices are also present in restaurant prices, hence the inclusion of catering here, though including just food would not change the results much.

course, this begs the question: where does differential heterogeneity in energy (and food) contributions to inflation come from?

Figure 7: The contribution of energy drives inflation also in the cross-section
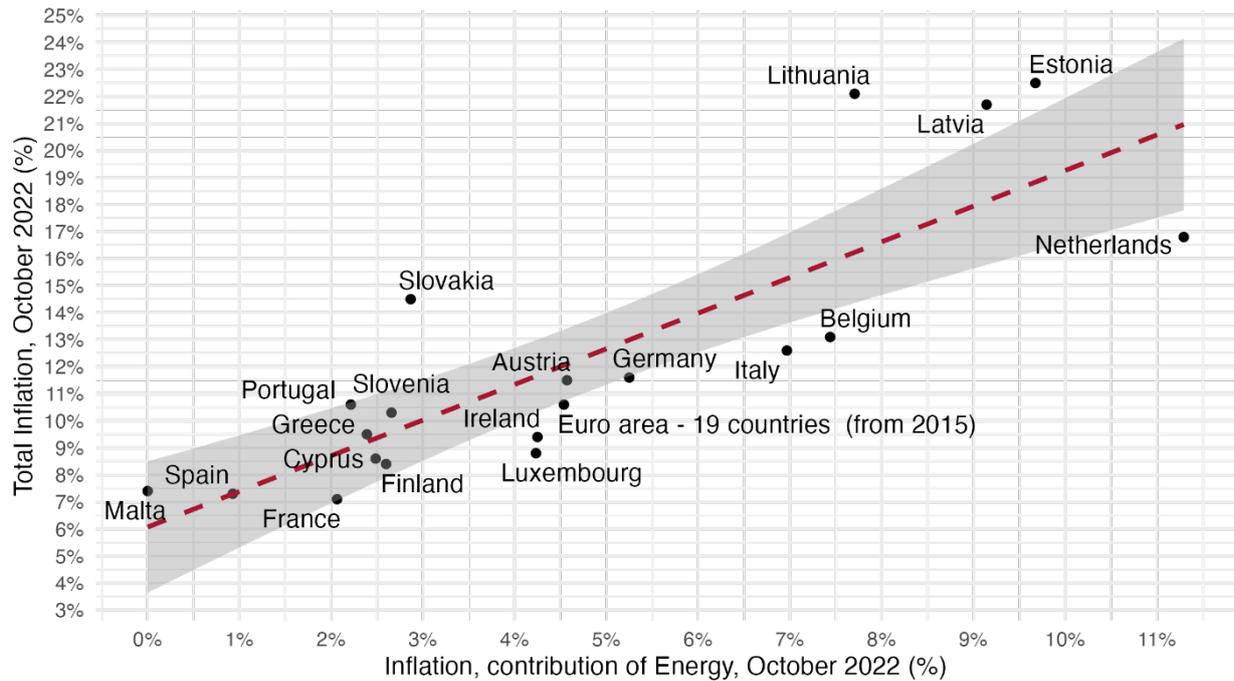
Source: Eurostat, authors' calculations.

Figure 8: Energy, food, catering explains even more
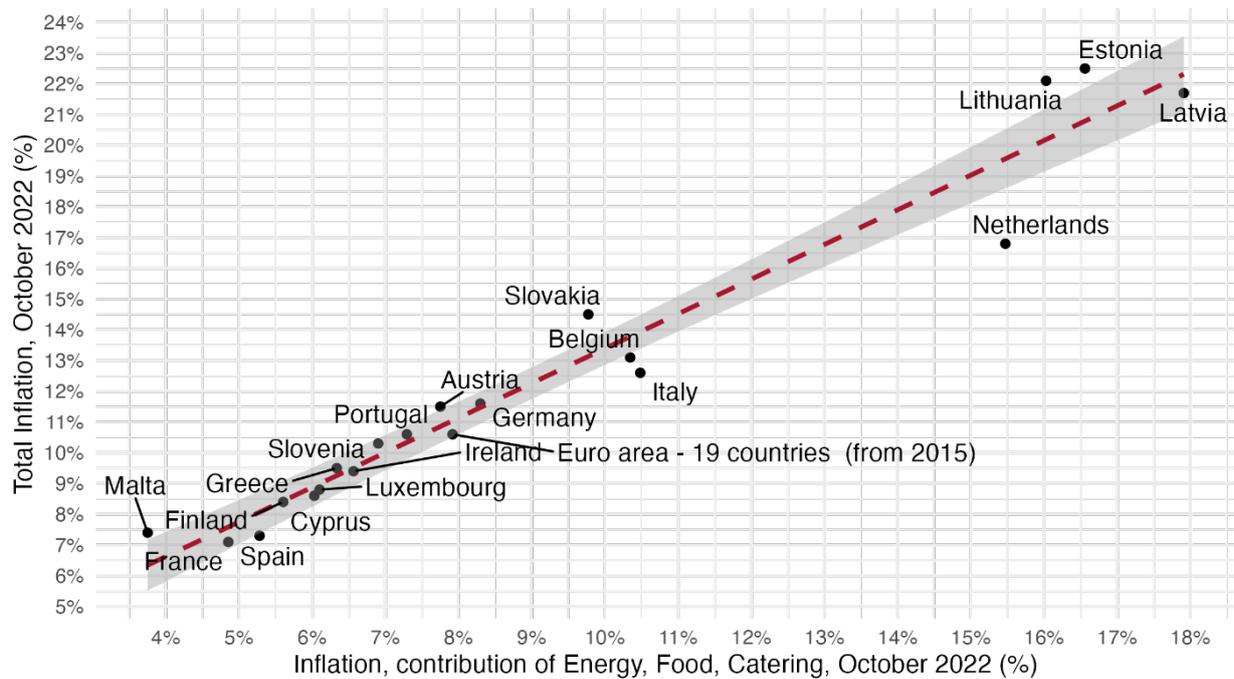
Source: Eurostat, authors' calculations.

2.3. Reasons behind inflation heterogeneities

There are many reasons why such large inflation heterogeneities exist across countries. To quote a few, dispersion of the inflation rate may stem from:

- Differences in the weight of food and energy products in the CPI basket;
- Differences in the degree of competition in goods and service markets;
- Higher supply problems in CEECs (in particular in the Baltic states) as a consequence of the sanctions imposed on Russia for its military aggression of Ukraine;
- Differences in the inflation-wage spiral related to the labour market institutions.

In what follows, we examine in a little more detail each of the explanatory factors, except the latter which we will discuss in section 3.

As reported in Table 1, the average weight of energy in the CPI basket is indeed higher for CEECs compared to the rest of the euro (13.4% against 9.2%), explaining why inflation has increased more sharply in those countries in the context of the energy crisis. With respect the weight of food in the basket CPI, there is no difference between the two sub-groups.

Albeit decreasing over the time, energy intensities, measured by the ratio of primary energy to gross domestic product (GDP), are remaining higher in CEECs than in other euro area countries, reaching in 2019, respectively, 3.67 and 2.80 megajoule MJ/USD, 2017 PPP GDP (Table 2). The legacy from the socialist period in terms of production technologies is still present, although vanishing. Due to the need of fostering the green transition, we can reasonably expect that energy intensities of CEECs will continue to converge towards Western standards in the near future, thus suppressing one source of inflation heterogeneities.

Competition in goods and services markets also have an important impact on the speed, frequency and size of price adjustments in the euro area countries (Vermeulen et al., 2012; Gautier et al.,2022; Jouvanceau, 2022). To the extent that the degree of competition differs between euro area countries, it contributes to inflation heterogeneities. In particular, a higher degree of concentration in the retail sector seems to be associated with more frequent adjustment in prices (Vermeulen et al., 2012; Gautier et al., 2022). Interestingly for our purpose, Table 3 shows that changes in consumer prices are both more frequent and sizeable in CEECs than in other euro area countries, a finding that explained why CEECs (and even more so of the Baltic States) had the capacity to move core inflation quickly and strongly into negative territory in 2010, after the price hikes of 2007 and 2008 (Figure 9). This suggests that the ECB should not give too much importance to the high inflation rates in these countries, since they only account for a small share of the euro area *and* inflation hikes may be reverted once the energy crisis has come to an end.

The differentiated impact of the sanctions imposed on Russia for its military aggression on Ukraine also explains some amount of the inflation heterogeneity between euro area countries. In particular, due to their historical links with Russia, the Baltic States have been even more strongly affected by supply chain disruptions. Albeit steadily decreasing, the share of Russia in the total imports still stood in 2021 at 10.4 % for Estonia, 8.9 % for Latvia and 11.6 % for Lithuania (Swedbank, 2022). Energy products account for 34% of imports from Russia in Latvia, 54% in Estonia and 68% in Lithuania. Alongside energy products, there are many products for which a large share comes from Russia: fertilisers, wood,

stones, base or precious metals, etc. By contrast, the share of Russia in the total imports of Slovakia, and even more so of Slovenia, is lower: 6.9% and 0.97% respectively.[5]

Table 1: Energy and food weights in the HICP (in %)

	Energy & Food	Energy	Food
Euro area	14.9	10.1	4.8
CEEC	18.2	13.4	4.7
Euro area excluding CEEC	14.0	9.2	4.8

Source: Eurostat.

Table 2: Energy intensity (in MJ)/USD, 2017 PPPGDP)

	2000	2015	2019
Euro area	4.94	3.45	3.13
Of which CEEC	6.68	4.13	3.67
Of which other euro area countries	3.88	3.05	2.80

Source: World Bank, own computations.

Note: Unweighted average. Energy intensity is defined as the ratio between primary energy supply and gross domestic product measured at purchasing power parity. Energy intensity is an indication of how much energy is used to produce one unit of economic output.

Table 3: Frequency and size of price changes in the euro area (over 2010-2019), in % *

	Including sales				Excluding sales			
	Freq. price changes	% price increases	Median increase	Median decrease	Freq. price changes	% price increases	Median increase	Median decrease
Euro area**	13.3	64.7	10.2	12.7	8.8	69.6	7.4	8.8
CEECs***	15.2	62.4	13.3	14.4	9.0	68.7	9.6	9.2
Other euro area****	12.5	65.6	9.0	12.1	8.7	69.9	6.6	8.7

Source: Gautier et al. (2022).

Note: * Unweighted average. **Euro area is made of Austria, Belgium, France, Germany, Greece, Italy, Latvia, Lithuania, Luxembourg, Slovakia and Spain. *** CEECs are composed of Latvia, Lithuania and Slovakia. **** Euro area minus CEECs: Austria, Belgium, France, Germany, Greece, Italy, Luxembourg and Spain.

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[5]   Source: Slovakia: https://tradingeconomics.com/slovakia/imports-by-country;
      Slovenia: https://tradingeconomics.com/slovenia/imports-by-country.

Figure 9: Core inflation in the euro area (unweighted average for sub-groups)
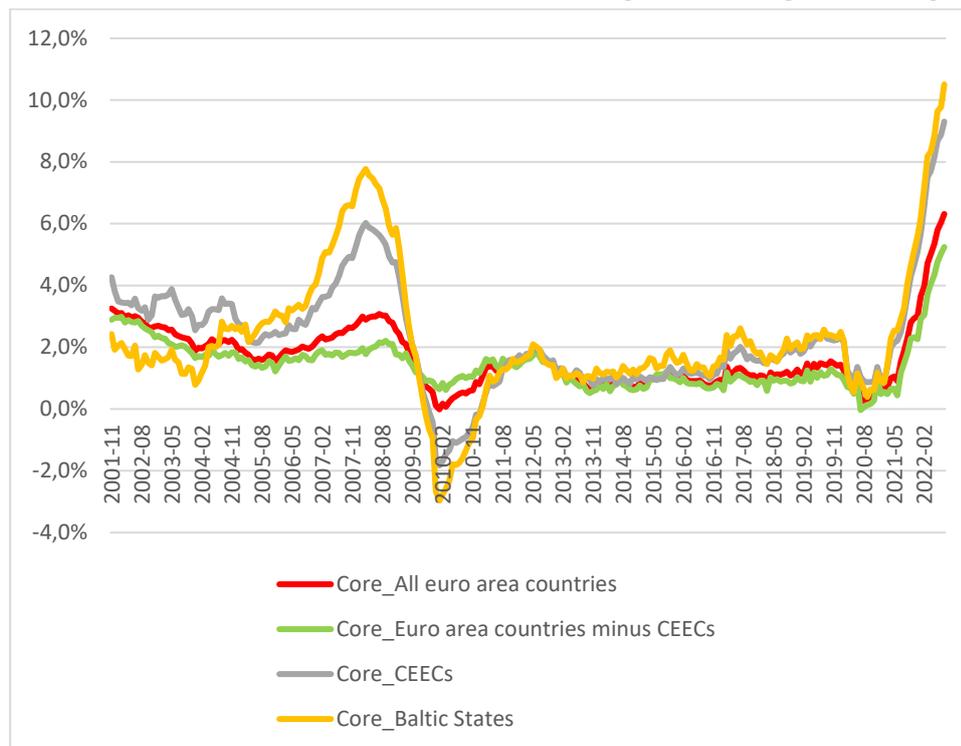
Source: Eurostat, authors' calculations.

2.4.   Heterogeneity in nominal and real wage inflation, and growth in disposable income

Some definitions of "inflation" assume that there is no inflation if there is no general increase in both prices and wages. According to this definition, inflation heterogeneity may also be found in wage inflation, and it is in any case interesting to look at nominal wages, just as much as it is interesting to study consumer prices on their own.

A related question is whether consumer price inflation necessarily implies a drop in purchasing power, as the public perception often has it.[6] To answer this question, a first pass is to look at real wage inflation which amounts to investigating whether nominal wage inflation is larger than consumer price inflation. However, we shall see that this gives a very incomplete picture of the overall situation: what needs to be looked at is the growth in real disposable income which includes all public transfers, not just those reflected in inflation numbers.

2.4.1.   Heterogeneity in overall nominal wage inflation

Let us distinguish between minimum wage inflation and overall wage inflation. Minimum wages are sometimes indexed to protect the poorest workers from a loss of their purchasing power due to inflation. It is often an integral part of a minimum wage scheme: there is no point in having a minimum wage if minimum wages are not indexed in some way, since this would then imply that the minimum wage would become less and less binding over time.

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[6]   This is also a way to justify that central banks attempt to contain consumer price inflation.

Unfortunately, data are lacking with regards to the details of such indexation schemes across countries[7]. Such data are nonetheless very important for assessing the importance of second-round effects across euro area countries, and for the proper conduct of monetary policy in the euro area. Without such detailed data on legal arrangements, we use data from Eurostat on minimum wage growth to measure the level of indexation empirically. Table 4 shows minimum wages in the second semester of 2021 (2021S2), and the first and second semesters of 2022 (2022S1 and 2022S2), and yearly growth in minimum wages between 2021S2 and 2022S2, across European countries for which Eurostat reports minimum wage arrangements. Figure 10 confirms that there exists a correlation between minimum wage increases across euro area countries.

Apart from Belgium and Luxembourg, workers who are not on minimum wages do not benefit from automatic indexation schemes in the euro area (although details vary, and, again, more data on indexations would be very useful). Data on wages are also scarce and available only with a substantial lag so we can only look at the evolution of nominal wages up until the second quarter of 2022 (2022-Q2). Again, Figure 11 shows a positive correlation between nominal wage increases and total inflation. Note that this correlation potentially goes both ways: workers seek to bargain for higher wages when inflation is higher but, in turn, these higher wages can eventually show up in prices, thus feeding consumer-price inflation. The same is true for minimum wages.

This phenomenon is sometimes called the "wage-price spiral" although if the pass-through of wages to prices is less than one-for-one, which is likely the case theoretically (just because labour is not the only component of costs) and appears to be the case empirically (since the slope of the relationship between consumer price inflation and nominal wage inflation is less than 1), then it is not really a "spiral" because each round of wage and price increases gets smaller and smaller, so there is no spiralling of inflation through such a mechanism alone. Having said that, it remains true that the higher the correlation between price and wages, the more persistent the price inflation.

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[7]   Most recent detailed information on indexation comes from Checherita-Westphal (2022) but is limited to *public* wage, not minimum wage.

Table 4: Minimum wages in the second semester of 2021 (2021S2), and the first and second semesters of 2022 (2022S1 and 2022S2), and yearly growth in minimum wages between 2021S2 and 2022S2

Geo	2021S2	2022S1	2022S2	% growth
Lithuania	642 €	730 €	730 €	13.7%
Belgium	1625.72 €	1658.23 €	1842.28 €	13.3%
Estonia	584 €	654 €	654 €	12%
Greece	758.33 €	773.5 €	831.83 €	9.7%
Germany	1602 €	1638 €	1744 €	8.9%
Portugal	775.83 €	822.5 €	822.5 €	6%
France	1554.58 €	1603.12 €	1645.58 €	5.9%
Spain	1108.33 €	1125.83 €	1166.67 €	5.3%
Luxembourg	2201.93 €	2256.95 €	2313.38 €	5.1%
Slovenia	1024.24 €	1074.43 €	1074.43 €	4.9%
Slovakia	623 €	646 €	646 €	3.7%
Netherlands	1701 €	1725 €	1756.2 €	3.2%
Ireland	1723.8 €	1774.5 €	1774.5 €	2.9%
Malta	784.68 €	792.26 €	792.26 €	1%
Latvia	500 €	500 €	500 €	0%

Source: Eurostat; Authors' calculations.

Note: When the minimum wage is paid for more than 12 months per year (as in Greece, Spain and Portugal, where it is paid for 14 months a year), data have been adjusted to take these payments into account. The minimum wage is then calculated as follows: (monthly rate x 14) / 12.

Figure 10: Correlation between minimum wage increases and total inflation
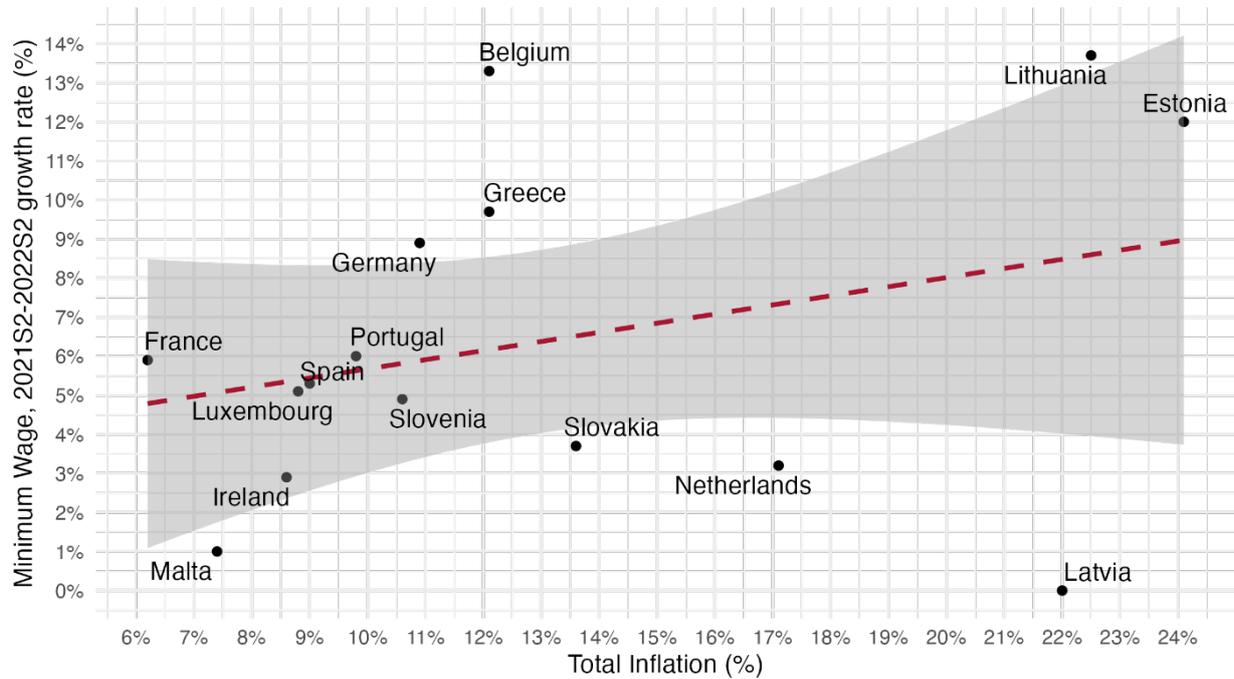
Source: Eurostat, authors' calculations.

Figure 11: Correlation between nominal wage inflation and consumer price inflation
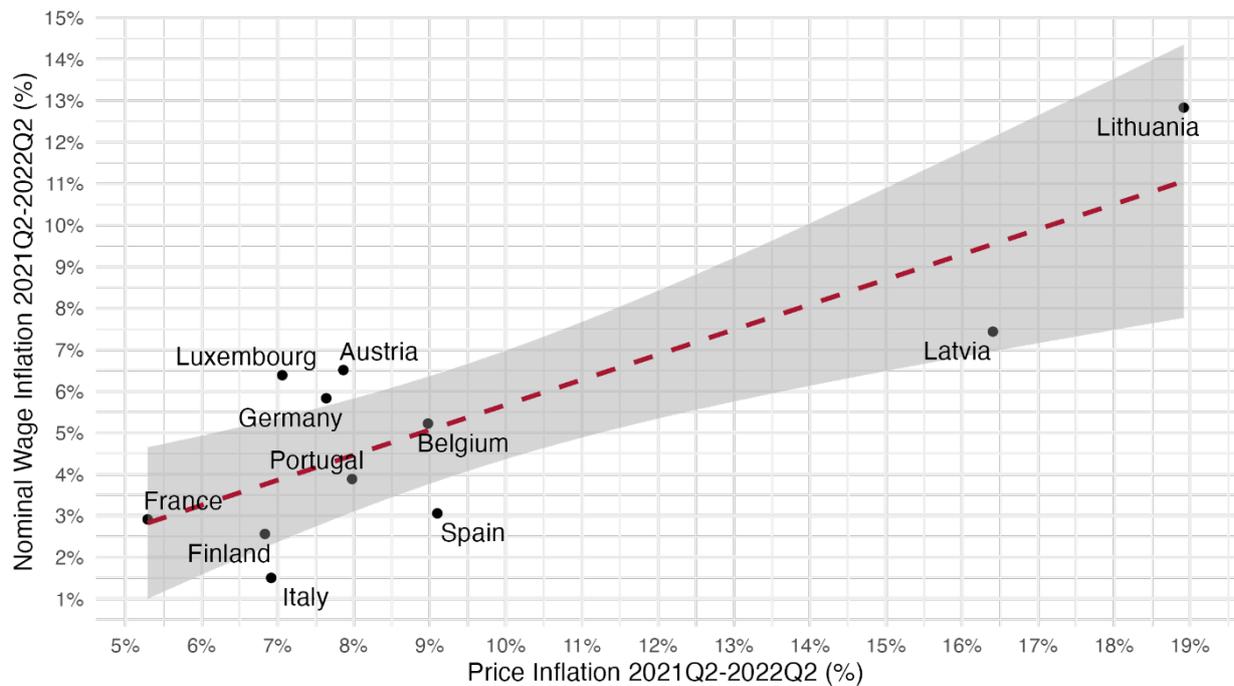
Source: Eurostat, authors' calculations.

2.4.2.   Heterogeneity in real wage inflation

Since nominal wage inflation is higher where consumer price inflation is also higher, what can we say about real wages? Here, the less than one-for-one indexation is confirmed, as it is shown in Figure 12: real wages are in fact much lower where inflation is higher. Thus, although the increase in nominal wage is higher in countries with higher inflation, this is also where there is a greater loss in households' disposable income, at least if we limit ourselves to wages and abstract from additional measures such as transfers which might otherwise be taken to mitigate the inflationary shock. Regarding monetary policy, the substantially less than one-for-one indexation of nominal wages implies that the risk of a wage-price spiral in countries with higher inflation is rather contained.

Figure 12: Correlation between real wage inflation and consumer price inflation
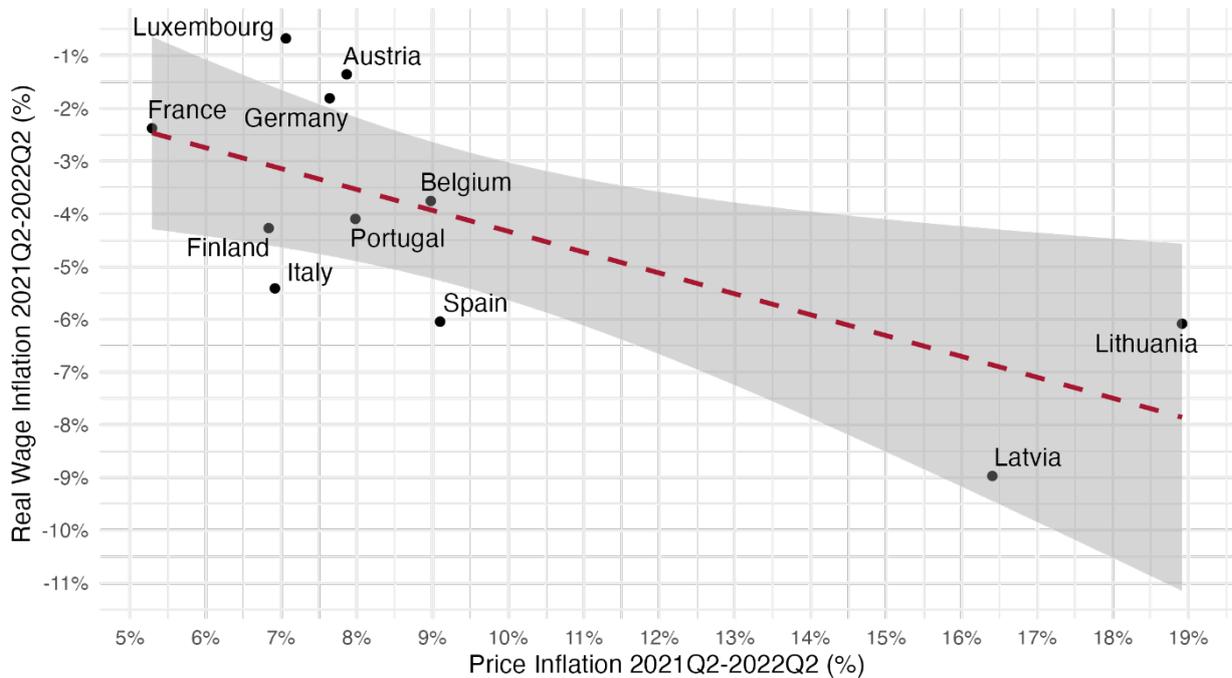
Source: Eurostat, authors' calculations.

3. HOW DO THE TRANSMISSION CHANNELS OF MONETARY POLICY INTERACT WITH INFLATION HETEROGENEITY?

As we have documented above, the heterogeneity might be less important when thoroughly analysed. Besides, there may be multiple causes of the cross-country differences in inflation rates, which makes the task of the ECB more difficult. Even if it is undoubtedly an issue for the euro area, the common monetary policy may not be the best tool to handle such a heterogeneity. The implementation of monetary policy mostly relies on a single instrument: the interest rate set by the ECB for the euro area as a whole. It would be a divine coincidence if one instrument was able to achieve the 2% objective in the euro area and to reduce heterogeneity among countries. Furthermore, monetary policy per se may also be a source of heterogeneity should it be asymmetrically transmitted in the euro area. It is indeed widely acknowledged that the Economic and Monetary Union (EMU) is an incomplete monetary union. Neither labour markets, nor financial markets – notably retail banking markets – are fully integrated. There are also important differences in industrial specialisations, financial structures, housing finance and degrees of openness. Because of these structural heterogeneities, the transmission of monetary policy to the output and the inflation rate in the euro area is very asymmetric.

3.1. What do we know about the transmission of monetary policy?

The issue of asymmetric monetary policy transmission has been considered at the early stage of EMU. Despite the convergence criteria set up in the Maastricht Treaty in 1992, there was uncertainty about the effect of the now common monetary policy on economic activity across countries. For instance, with pre-EMU data, Ehrmann (2000) estimates the GDP and inflation responses to monetary policy for 13 European countries, not necessarily members of EMU. He showed that, compared to other countries, monetary policy had stronger effects on the output and the inflation rate in Germany. Among the four largest future EMU countries, the weakest effect was observed in France, whereas in Italy and Spain the output responses were close. However, Boivin et al. (2008), still for the pre-EMU period, reported a stronger output response in Italy and Spain. More recently, Burriel and Galesi (2018) report that the output and price responses to an increase in the ECB balance sheet are strongest in the Baltic countries. The ECB's unconventional measures would have had more expansionary output effects in Germany than in France and Italy and only small and not significant effects in Spain. Regarding prices, the response would have been much more substantial in Spain and France, even if the difference with the response of price in Germany and Italy is not statistically significant.

3.2. Asymmetric transmission of monetary policy and structural heterogeneities

Some papers have also attempted to relate asymmetries in the effect of monetary policy with structural characteristics of each country. For example, Dedola and Lippi (2005) and Peersman and Smets (2005) consider the role of industrial specialisation. If the effect of monetary policy is different across industries, it may contribute to the asymmetric output response among countries. For five countries – Germany, France, Italy, the United Kingdom and the United States – Dedola and Lippi (2005) find that all cross-country differences in the output effect are explained by the industrial specialisations of countries rather than by country-specific effects. Beyond industrial specialisation, the transmission of monetary policy crucially hinges on the role of the financial markets.

Calza et al. (2013) show that the response of consumption to a contractionary shock is stronger for countries with a higher share of variable rate mortgages. According to the ECB, the countries with the highest share of floating rates are Cyprus, Finland, Lithuania, Latvia and Estonia. Among the five largest countries, banks grant more loans with a floating rate in Italy and Spain, respectively 75.4 and 70.4% of

new loans on average since the beginning of 2022. Comparatively, it reaches only 32.9% for France and 60% in Germany. As a consequence, the interest rate on the outstanding amount of consumption loans has increased by 0.2 percentage points (p.p.) from December 2021 to September 2022 in Italy and 0.16 p.p. in Spain. The rise is limited to 0.07 p.p. in France and 0.1 p.p. in Germany.

For the mortgage credits, where the maturity of loans is much higher on average, the interest rate increase since December is 0.24 p.p. and 0.4 p.p. in Italy and Spain, respectively, against a small reduction of the same interest rates. The rise in mortgage payments will be stronger in Italy and Spain than in France and Germany, which may weigh down on households' expenditures leading to an "all else equal" stronger effect of monetary policy. Are these countries also those experiencing the highest inflation? In that case, we would expect that the tightening of monetary policy would have larger effects in countries with the highest inflation rate. This would notably be the case for the Baltic countries as shown in Figure 13 and Figure 14. Excluding these countries would reduce the correlation between the share of floating rates and the level of inflation rate. Thus, the ECB may not rely on a divine coincidence that the current tightening would also mitigate heterogeneity in the inflation rates.

Figure 13: Share of floating rates for households and total inflation
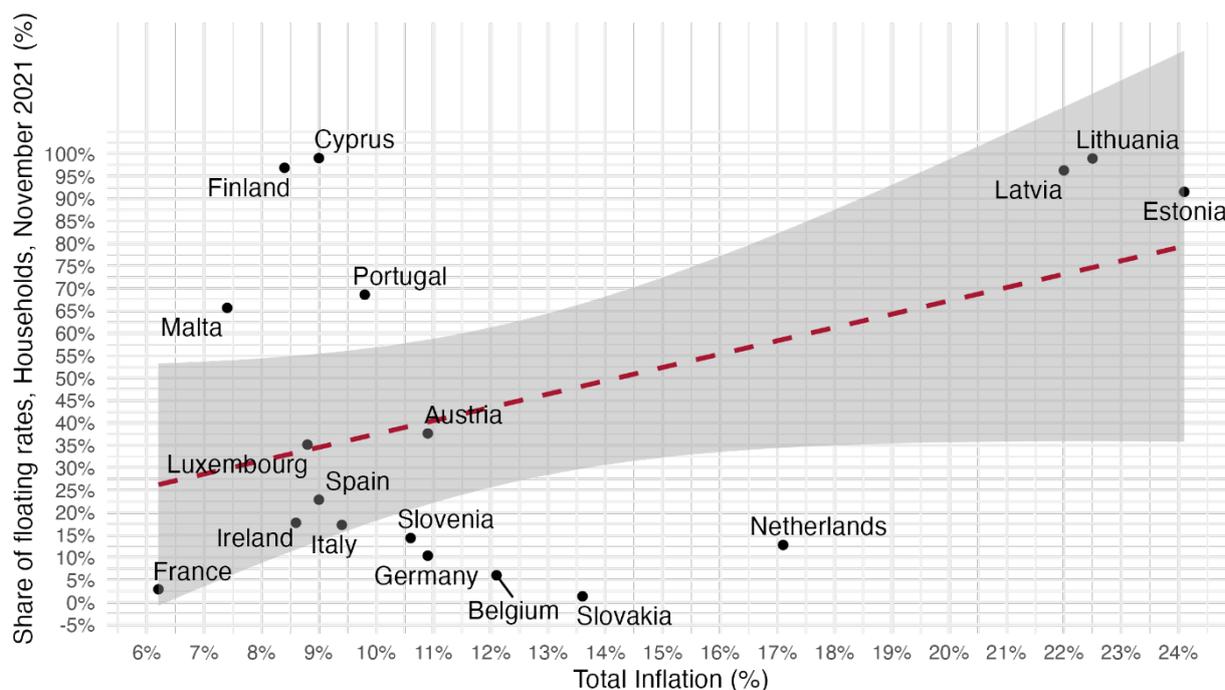
Source: ECB, authors' calculations.

Figure 14: Share of floating rates for households and firms and total inflation
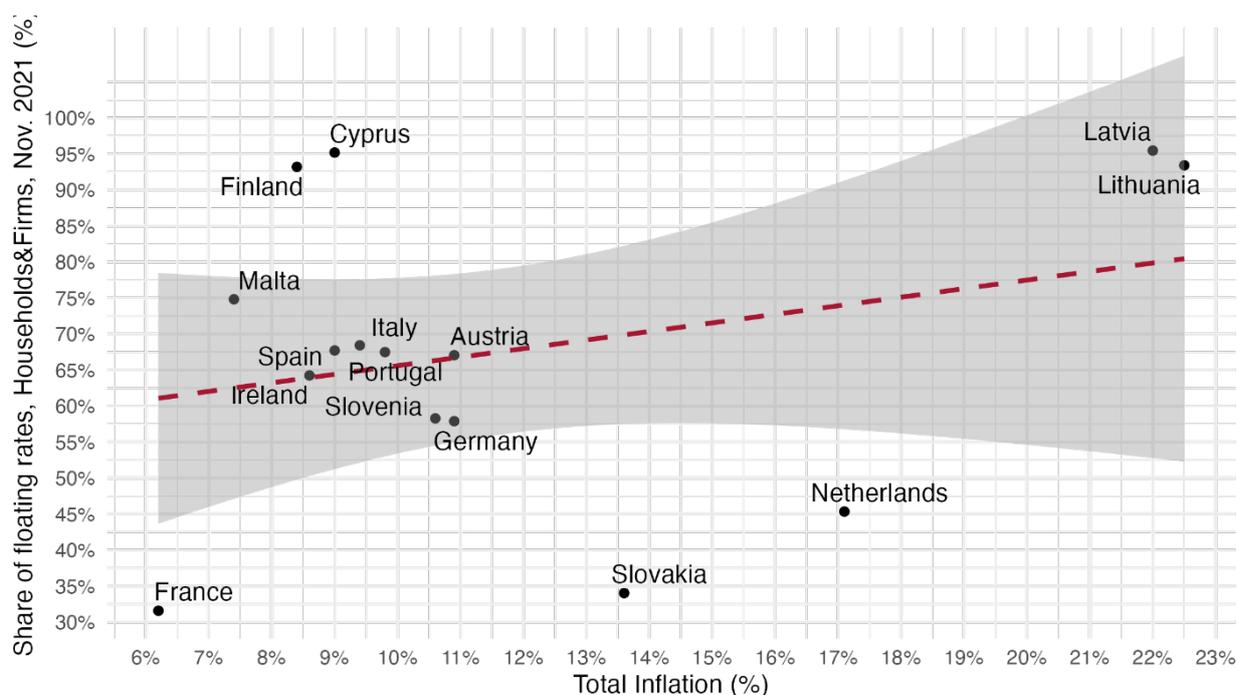
Source: ECB, authors' calculations.

Furthermore, the transmission of monetary policy does not only hinge on the share of variable loans. Even if interest rate increases reduce the households' disposable income, some of them may cushion the shock through a decrease in saving. Actually, when the mortgage contract has a floating rate,

households' expenditures would be cut if households were liquidity-constrained.[8] Almgren et al. (2022) confirm the role of liquidity constraints as an explaining factor of the difference in the cumulated or the peak effect of monetary policy in the euro area. For instance, the strongest effect of monetary policy in Latvia coincides with a higher share of liquidity-constrained or "hand-to-mouth" households in this country. Finally, beyond industrial specialisation and financial structures, Georgiadis (2014) also accounts for the role of labour markets in the transmission of monetary policy assuming that more rigid nominal wages imply a weaker reaction of marginal costs and price to a monetary policy shock and a stronger response of output. He finds that asymmetries in the short-term may arise from industry specialisations while in the medium-term they stem from financial structures and labour market rigidities.

3.3.   Monetary policy and inequality

The lowest quintiles are hurt disproportionately more by the inflation shock, which is by now a matter of consensus among economists (see e.g., Geerolf et al., 2022). The intuition is quite simple: food and energy represent a higher share of consumption (and income) for low-income households than for high-income households.

To the extent that unemployment also hurts the poor disproportionately, the poorest households would be hurt twice after an inflation shock: initially by the energy and food price shocks in itself, and a second time by the recession brought about or deepened by monetary policy[9].

Would the poorest households be helped if inflation was being kept at a lower level? In addition, to the extent that monetary policy is actually successful in mitigating inflationary pressures, would fighting inflation be more effective for the poor than for the rich? In a recent contribution, Creel and El Herradi (2022) show that contractionary monetary policy by the ECB tends to increase income inequality, although the impact is small

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[8]   The HANK (Heterogeneous Agent New Keynesian) literature disentangles between agents who face no liquidity constraint and can smooth income shocks by adjusting their saving and agents with liquidity constraints who cannot draw on their saving either because they have no financial wealth – poor households – or because their wealth is invested in illiquid assets. Liquidity constrained households have consequently a higher marginal propensity to consume and cut in their expenses when their income decreased because of higher mortgage payments.

[9]   The impact of recessions on inequality has been documented by Heathcote et al. (2010) in the US.

4. CONCLUSION

In this paper, we document inflation heterogeneity in terms of HICP inflation, core inflation, nominal and real wage inflation. We ask what mostly drives this heterogeneity and whether we believe that there is cause for concern. We find that energy and food prices are the main drivers of inflation dispersion, and, at the same time, they account for the highest contribution to inflation.

We show that inflation heterogeneity reflects heterogeneity in energy mixes between countries, which we do not find to be concerning *per se*. We highlight two important facts. First, when we weight inflation dispersion across euro area countries for their relative size, inflation dispersion appears limited and therefore mostly driven by small countries. Second, we show that in these countries and, primarily among them in the Baltic countries, inflation upsurges have been followed by deflationary trends in the past. This is a clear indication that monetary tightening by the ECB should have to be limited: Baltic countries only account for a small share of the euro area and they show fast mean-reversion in inflation rates after crises come to an end.

Taking a broader view, inflation has recently subsided in the US in October 2022 according to the 10 November 2022 release, now at 7.7% since last year. All things equal, this should lead to a relative easing of US monetary policy, reduce upward pressures on the dollar (at the announcement of the CPI release, the US dollar was sharply down) and downward pressures on the euro. In turn, this turning point should reduce inflationary pressures in the euro area, possibly making further tightening of monetary policy redundant.

Constructively, we call for additional data collection efforts to be undertaken by the European Commission, Eurostat and the ECB. Indeed, we know very little about various types of indexations which affect the diffusion of the inflationary process throughout the economy.

As we have repeatedly emphasised, inflation coming from potential second-round effects (wage indexation) is very different in nature from the shock to inflation that the euro area is currently experiencing. There is very little that the ECB can do to alleviate the loss in purchasing power arising from imported inflation.

REFERENCES

- Almgren, M., Gallegos, J. E., Kramer, J. and Lima, R. (2022). "Monetary policy and liquidity constraints: Evidence from the euro area". *American Economic Journal: Macroeconomics*, 14(4), 309-40.

- Benecka, S. (2022). "How have firms' price increases contributed to the current inflation in the euro area?," Occasional Publications - Chapters in Edited Volumes, in: *CNB Global Economic Outlook - September 2022*, pages 14-18, Czech National Bank.

- Blot, C. and Creel, J. (2022). "*Soft or strong: the art of monetary tightening*", publication for the Committee on Economic and Monetary Affairs, Policy Department for Economic, Scientific and Quality of Life Policies, European Parliament, Luxembourg, 2022. https://www.europarl.europa.eu/cmsdata/253887/QA-09-22-491-EN-N.pdf

- Blot, C., Creel, J., Geerolf, F. and Levasseur, S. (2022). "Inflation dispersion in the euro area: a matter of measurement", mimeo.

- Boivin, J., Giannoni, M. P. and Mojon, B. (2008). "How has the euro changed the monetary transmission mechanism?". *NBER macroeconomics annual*, 23(1), 77-126.

- Burriel, P. and Galesi, A. (2018). "Uncovering the heterogeneous effects of ECB unconventional monetary policies across euro area countries". *European Economic Review*, 101, 210-229.

- Calza, A., Monacelli, T. and Stracca, L. (2013). "Housing finance and monetary policy". *Journal of the European Economic Association*, 11(suppl_1), 101-122.

- Checherita-Westphal, C. (2022). "Public wage and pension indexation in the euro area", published as part of the ECB Economic Bulletin, Issue 1/2022. https://www.ecb.europa.eu/pub/economic-bulletin/html/eb202201.en.html

- Creel, J. and El Herradi, M. (2022). "Income inequality and monetary policy in the euro area". International Journal of Finance and Economics, forthcoming, https://doi.org/10.1002/ijfe.2688.

- Dedola, L. and Lippi, F. (2005). "The monetary transmission mechanism: evidence from the industries of five OECD countries". *European Economic Review*, 49(6), 1543-1569.

- Di Maggio, M., Kermani, A., Keys, B. J., Piskorski, T., Ramcharan, R., Seru, A. and Yao, V. (2017). "Interest Rate Pass-Through : Mortgage Rates, Household Consumption, and Voluntary Deleveraging". *American Economic Review*, *107*(11), 3550-3588. https://doi.org/10.1257/aer.20141313

- Ehrmann, M. (2000). "Comparing monetary policy transmission across European countries". Weltwirtschaftliches Archiv, 136(1), 58-83.
- Flemming, J. (1976). "*Inflation*", Oxford University Press (London)

- Friedman, M. (1963). "*Inflation. Causes and consequences*", Asia Publishing House (New York).

- Gautier, E., Conflitti, C., Faber, R., Fabo, B., Fadejeva, L., Jouvanceau, V., Menz, J.-O., Messner, T., Petroulas, P., Roldan-Blanco, P., Rumler, F., Santoro, S., Wieland, E. and Zimmer, P. (2022). "New Facts on Consumer Price Rigidity in the Euro Area", *Banque de France Working Papers*, June 2022, WP #878, June. https://publications.banque-france.fr/en/new-facts-consumer-price-rigidity-euro-area

- Geerolf, F., Timbeau, X. and Allègre, G. (2022). "*Social Impact of the War in Ukraine (SIWU)*", https://github.com/OFCE/SIWU

- Georgiadis, G. (2014). "Towards an explanation of cross-country asymmetries in monetary transmission". *Journal of Macroeconomics*, 39, 66-84.

- Heathcote, J., Perri, F., and Violante, G. L. (2010). "Unequal we stand: An empirical analysis of economic inequality in the United States, 1967–2006". Review of Economic dynamics, 13(1), 15-51.

- Jouvanceau, V. (2022). "Producer and consumer price rigidity: the case of Lithuania", *Working Paper Series*, Central Bank of Lithuania, WP n°27. https://www.lb.lt/en/publications/producer-and-consumer-price-rigidity-the-case-of-lithuania

- Koester G., Rubene, I., Gonçalves, E. and Nordeman, J. (2021). "Recent developments in pipeline pressures for non-energy industrial goods inflation in the euro area". *Economic Bulletin* Issue 5, 2021, ECB Publications. https://www.ecb.europa.eu/pub/economic-bulletin/focus/2021/html/ecb.ebbox202105_07~d799754f4e.en.html

- Levasseur S. (2011). "Labour market adjustments in Estonia during the global crisis", *OFCE Working Paper*, WP 25/2011. https://hal-sciencespo.archives-ouvertes.fr/hal-01069525/document

- Peersman, G., and Smets, F. (2005). "The industry effects of monetary policy in the euro area". *The Economic Journal*, 115(503), 319-342.

- Rich, R. W. and Steindel, C. (2005), "A Review of Core Inflation and an Evaluation of its Measures". FRB of New York Staff Report No. 236, http://dx.doi.org/10.2139/ssrn.873860

- Roger R. (1998), "Core inflation: concepts, uses and measurement", *Reserve Bank of New Zealand Discussion Paper*, 1998.

- Vermeulen P., Dias, D., Dossche, M., Gautier, E., Hernando, I., Sabbatini, R. and Stahl S. (2012). "Price setting in the Euro area: Some stylized facts from individual producer price data", *Journal of Credit, Money and Banking*, Volume 44, Issue 8, December 2012, Pages 1631-1650.

- Wynne, M. A. (1999). "Core inflation: a review of some conceptual issues", *ECB Working Paper*, No. 5, European Central Bank (ECB), Frankfurt.

We document different measures of inflation heterogeneity in the euro area. We ask what mostly drives this heterogeneity and whether there is cause for concern. Heterogeneity in headline inflation has increased substantially, and way more than heterogeneity in core inflation. We argue that core inflation dispersion is largely driven by small countries, where inflation reversion is the most likely. We then discuss about monetary policy as a limiting or aggravating factor of inflation heterogeneity.