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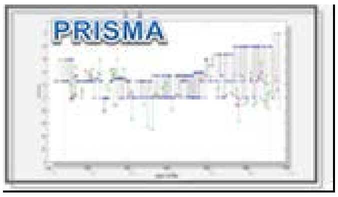
Micro price heterogeneity and optimal inflation



No 322

Price-setting Microdata Analysis Network (PRISMA)

This Occasional Paper contains research conducted within the Price-setting Microdata Analysis Network (PRISMA). PRISMA (2018-22) consisted of economists from the European Central Bank (ECB) and the national central banks (NCBs) of the European System of Central Banks (ESCB). PRISMA was coordinated by a team chaired by Luca Dedola (ECB) and consisting of Chiara Osbat (ECB), Peter Karadi (ECB) and Georg Strasser (ECB). Fernando Alvarez (University of Chicago), Yuriy Gorodnichenko (University of California Berkeley), Raphael Schoenle (Federal Reserve Bank of Cleveland and Brandeis University) and Michael Weber (University of Chicago) acted as external consultants (for further information, see Price-setting Microdata Analysis Network (PRISMA).

This work is part of a set of papers within the ECB's Occasional Paper Series, resulting from the report of the ECB's PRISMA network, which is summarised here.

Set of Occasional Papers related to the ECB's PRISMA network

No 319, "Price adjustment in the euro area in the low-inflation period: evidence from consumer and producer micro price data"

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Contents

Abstract

This paper discusses the normative implications of the micro evidence on heterogeneity in price setting gathered by the Price-setting Microdata Analysis Network (PRISMA) for the level of inflation that central banks should target. The micro price data underlying the consumer price index are used to estimate relative price trends over the product life cycle. Minimising the welfare consequences of relative price distortions in the presence of these trends requires targeting a significantly positive inflation rate in France, Germany and Italy: the steady-state inflation rate, jointly maximising welfare in all three countries, ranges from 1.1% to 1.7%. Other considerations not taken into account in the present paper may push up optimal inflation targets further. The welfare costs of targeting an inflation rate of zero, as suggested by monetary models ignoring relative price trends, or of targeting 4%, turn out to be substantial.

Keywords: optimal inflation target, relative price trends, welfare.

JEL codes: E31, E52.

1 Introduction

Research conducted within the Price-setting Microdata Analysis Network (PRISMA) documented a high degree of micro-level heterogeneity.[1] **This paper discusses how this heterogeneity affects conclusions on the level of the aggregate inflation rate that a welfare-maximising central bank should target.** The analysis helps to fill an important knowledge gap in the literature, which has so far provided few results on the normative policy consequences of the large scale, and many dimensions, of the heterogeneity observed in micro price data.

The previous literature has focused on the optimal price index that central banks should stabilise in the face of economic disturbances, emphasising that, when constructing this index, it is essential to account for the substantial differences in unconditional price change frequencies across economic sectors or regions. A benchmark result in this literature is the "stickiness principle", which requires monetary policy to be optimised in order to stabilise inflation rates, predominantly in sticky-price sectors, and in turn allows for greater fluctuation in inflation rates in flexible-price sectors (Aoki, 2001; Benigno, 2004). Eusepi et al. (2011) apply this principle to derive a cost of nominal distortions index (CONDI) that uses welfare-optimal weights to aggregate sectoral inflation rates into the optimal inflation index.[2] They show that CONDI inflation closely resembles measures of core inflation, and that a policy stabilising CONDI inflation is almost as successful in terms of maximising economic welfare as a fully optimal policy, which, however, is harder to implement.[3] More recent work extends the scope of the optimal inflation index beyond differences in sectoral price change frequencies to include further supply-side heterogeneity, and proposes optimal inflation indices that complement CONDI. Rubbo (2020), for example, considers heterogeneity in the position of a sector in the economy's production network, and Hoynck and Zhang (2021) consider heterogeneity in the degree of monopolistic competition, and hence average (desired) mark-ups, across economic sectors. Nevertheless, all these contributions point to the desirability of targeting an average inflation rate of zero in the respective optimal price index.

The analysis in this paper complements the CONDI literature by showing how micro heterogeneity affects the average level of the optimal inflation rate that central banks should target. This type of analysis may serve as a useful input into future strategy reviews that reassess the quantitative definition of the ECB's price stability mandate. In particular, this paper shows that significantly positive inflation rates are optimal when accounting for the micro-level evidence that nominal product prices of firms with heterogeneous productivity levels do not adjust flexibly over time. Work stream on the price stability objective (2021) argues that justifying significantly positive inflation targets is difficult, given previous sticky-price literature. Rather than

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[1] See Gautier et al. (2022).

[2] For related work, see Bragoli et al. (2016) and Petrella et al. (2019).

[3] See Work stream on inflation measurement (2021) on the cyclical properties of a CONDI built for the euro area.

targeting positive inflation, the well-known price stability result suggests that welfare-maximising central banks should target an inflation rate (of the appropriately defined price index) equal or very close to zero, in order to minimise misalignments in relative prices and quantities, and hence welfare losses due to nominal price stickiness. In most structural sticky-price models entertained by central banks, the reason for minimising price misalignments is a quantitatively important force in determining the level and choice of the optimal inflation target (see Schmitt-Grohé and Uribe, 2010). More recently, Adam and Weber (2019, 2023) argue that the reference point of zero optimal inflation is valid only for the specific case that abstracts from the presence of product lifecycles and their effect on relative product prices. In the more general case, which takes these life cycles into account, these authors argue that the optimal inflation rate, minimising relative price distortions with sticky nominal prices, should be significantly higher than zero.

This paper mainly summarises the results of Adam et al. (2022), who exploit micro price data underlying the official price indices in France, Germany and Italy in the period from 2015 to 2019, to show that life cycle trends in relative prices are indeed a relevant feature of euro area consumer prices in this period. Accounting for these product-level relative price trends, estimates for the optimal inflation rate that minimises relative price distortions range between 1.1% and 2.1% in France, 1.2% and 2.0% in Germany, 0.8% and 1.0% in Italy and 1.1% and 1.7% for a weighted average across the three countries considered.[4] These sizeably positive estimates suggest that, when accounting for a more realistic product structure, less weight should be placed on the zero-inflation normative benchmark for the euro area than previously thought. To a great extent, the positive target estimates at country level, and their heterogeneity across countries, are driven by positive and heterogeneous target estimates in the expenditure category containing non-energy industrial goods. In contrast, estimates of optimal inflation targets in other expenditure categories, such as food and services, contribute much less, or even negatively, to the positive target estimates at country level. Moreover, when accounting for life cycle trends in relative product prices in a structural model, targeting zero, rather than the estimated positive inflation rates, creates economically sizeable welfare costs.

It is essential to stress that the results presented here abstract from other important factors that influence the optimal inflation target.[5] These include the incidence of the effective lower bound on policy rates (Adam and Billi, 2006, 2007; Coibion et al., 2012; L'Huillier and Schoenle, 2022; Blanco, 2021); the desire to overcome downward rigidities in nominal wages (Kim and Ruge-Murcia, 2009); and a host of other structural factors potentially affecting the euro area economy.[6] A limited number of contributions consider either ex post firm heterogeneity (due to

4 For reasons explained in Adam et al. (2022), estimates for the optimal inflation rate are taken from sample periods that overlap as much as possible, but not perfectly, across the three countries considered.

5 Diercks (2019) contains a meta review of the literature.

6 Another important factor frequently seen as calling for above-zero inflation targets is the potential overstatement of the true inflation rate due to quality progress not taken into account (see Chapter 1). The arguments presented in this section are robust to this type of measurement bias (see Adam and Weber, 2023).

shocks, as in Blanco, 2021) or ex ante heterogeneity, in the form of strategic pricing complementarity between firms with different productivity levels (Santoro and Viviano, 2022). Thus, the results presented in this paper suggest that, if anything, inflation targets should be higher than previously thought, once the analysis also takes these additional factors into account. However, it remains non-trivial to quantify the exact contribution of these additional factors over and beyond the contribution from life cycle trends in relative product prices, since in most cases the new welfare trade-offs that monetary policy faces in determining the optimal inflation target will be non-linear. Therefore, this is an important area for future research.

The rest of the paper is structured as follows. The next section provides evidence on product turnover and describes how age trends in relative prices are estimated using euro area micro price data. Referring to previous theoretical arguments, Section 3 describes the consequences of this evidence for an optimal inflation target that minimises the welfare effects of relative price distortions resulting from nominal price stickiness and suggests a theory-consistent estimation approach. Section 4 provides estimation results at the euro area level, the country level, and the economic sector level, and explores their robustness to alternative specifications. Section 5 contains the conclusion.

2 Product turnover and age trends in relative prices

This section provides evidence on product turnover, and describes how age trends in relative product prices are estimated using monthly micro price data for the three largest euro area economies (France, Germany and Italy), which jointly accounted for almost two-thirds of euro area GDP in 2019. The data underly the euro area's Harmonised Index of Consumer Prices (HICP) and cover a considerably broader share of the expenditure basket in Germany (83.3%) and Italy (64.0%) than Dhyne et al. (2006).[7] The higher level of coverage puts cross-country comparisons on a better footing, which is one important contribution of PRISMA.

2.1 Sample definition and product turnover

Significant effort went into harmonising the data preparation and, as much as possible, the empirical approach across countries.[8] The analysis excludes interpolated price observations, as interpolation at the product level is often performed in ways that can seriously affect price trajectories at this level, biasing estimates of relative price trends. For reasons of limited data availability, the analysis also excludes most "centrally collected" prices and – in the case of France and Italy – rents. Furthermore, the analysis refines the product definition provided by national statistical institutes (NSIs), in order to prevent effectively different products from being implicitly treated as the same product. To this end, the price trajectory of a product is split when: prices are missing for more than one month; comparable or non-comparable product substitutions occur; or there is a change in either product quality or quantity.

[7] French micro price data are provided by the French national institute of statistics and economic research (*Institut National de la Statistique et des Études Économiques – INSEE*) via the *Centre d'Accès Sécurisé Distant*. German micro price data are provided by the Research Data Centre of the Federal Statistical Office and Statistical Offices of the Federal States, "Einzeldaten des Verbraucherpreisindex 2018", EVAS-Nummer 61111, 2010-19, DOI: 10.21242/61111.2010.00.00.1.1.0 to 10.21242/61111.2019.00.00.1.1.0. Italian micro price data are provided by the Italian National Statistical Institute.

[8] See Appendix B in Adam et al. (2022) for details.

Table 1

Descriptive statistics

(percentage points, unless otherwise stated)

	France		Germany		Italy	
	Country-specific sample	Harmonised sample	Country-specific sample	Harmonised sample	Country-specific sample	Harmonised sample
Number of five-digit COICOP expenditure categories	223	145	234	145	168	145
Covered expenditure share	67.2	43.2	83.3	42.5	64.0	56.3

Source: Adam et al. (2022).

The analysis considers two different samples of expenditure categories (classified according to the Classification of Individual Consumption According to Purpose, COICOP). The first sample is country-specific and maximises the number of expenditure categories in each country. The second sample considers a harmonised set of expenditure categories across countries. For both samples, Table 1 provides the number of expenditure categories, at five-digit COICOP level, and the share of the national consumption basket covered. While the country-specific sample in Table 1 covers the largest share of the national basket, it is not directly comparable across countries. Thus, meaningful cross-country comparisons are obtained from the harmonised sample, which rules out country differences being driven purely by taking country-specific sets of expenditure categories into account.

Table 2

Product turnover and average length of price spells in harmonised sample

(percentage points)

	France (2015-19)	Germany (2015-19)	Italy (2016-19)
Product entry rate	6.0	4.2	3.8
Product exit rate	3.5	3.7	4.3
Average length of price spells (in months)	31	28	22

The product entry and exit rates shown in Table 2 refer to the refined definition of products in the harmonised sample. They are sizeable, at close to 4% per month in most countries. Table 2 also reports the average length of price spells, as measured by the length of product life cycles, given the refined product definition. For the 145 five-digit COICOP categories in the harmonised sample, price spells persist, on average, for slightly longer than 20 months for Italy and close to 30 months for France and Germany. Taken together, these statistics suggest that, despite sizeable product turnover, product life cycles are long enough to reliably estimate a common trend in relative product prices for each of the large number of disaggregate expenditure categories considered.

2.2 Age trends in relative prices over product life cycles

Age trends in relative product prices are estimated at the eight-digit level of COICOP expenditure categories. In particular, we estimate the linear panel regression

$$ln\left(\frac{P_{jzt}}{P_{zt}}\right) = f_{jz} - ln(b_z)\ s_{jzt} + u_{jzt},$$

where b_z denotes the slope coefficient of interest.[9] The coefficient measures the (gross) average rate of relative price decline over the product lifetime in the eight-digit expenditure category z in a particular country. When $b_z > 1$, relative prices fall over the lifetime of products in category z. Furthermore, P_{jzt} denotes the price of product j in category z at time t, P_{zt} is the average price of products in this category, f_{jz} a product-specific and category-specific intercept term, s_{jzt} the in-sample age of product j and u_{jzt} a mean zero residual.

9 For France, official expenditure weights are only available at six-digit COICOP level. In this case, slope coefficient b_z is estimated at elementary level and averaged to six-digit COICOP level.

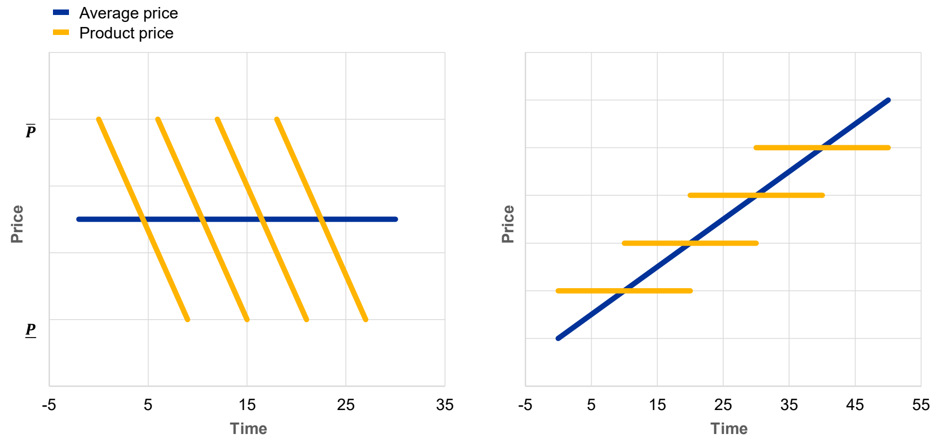
3 Consequences of relative price trends for optimal inflation

Minimising relative price distortions, in a setting where the decline in relative prices over the product lifetime is efficient and nominal prices are sticky, requires the central bank to target positive inflation. To summarise the arguments in Adam and Weber (2019), suppose that it is efficient that new products are initially expensive, when measured relative to the average price of a narrowly defined set of competing products, but become cheaper in relative terms over their lifetime. This may happen, for example, due to learning-by-doing effects, which give rise to productivity gains over the product lifetime. Consider two alternative approaches for implementing the efficient decline in relative product prices, as depicted in Chart 1.

In the first approach, depicted in the left panel of Chart 1, all newly entering products charge an high initial price $\bar{P}$ and subsequently cut their nominal price at a constant rate over the product lifetime, until they exit at a lower price $\underline{P}$. With constant product entry and exit rates, the cross-sectional distribution of product prices, and thus the average product price, is constant over time: there is zero inflation, even though the relative prices of all individual products decline over the product lifetime. Importantly, this setting requires ongoing adjustments of product prices that, when nominal prices are sticky, tend to happen inefficiently and will lead to price misalignments and thus welfare losses.

An alternative and preferable approach is to have constant nominal prices for existing products over time, as depicted in the right panel of Chart 1: individual prices then do not need to adjust. A decline in relative prices may nevertheless be implemented when newly entering products carry a higher (but also constant) price than the average existing product. In this way, relative prices decline, because the average product price keeps rising over time: there is positive inflation. Provided the inflation rate in the right panel equals the negative of the (efficient) rate of relative price decline in the left panel, individual prices do not need to adjust at all, which is desirable whenever prices are sticky, as it avoids price misalignments. A positive average rate of inflation thus helps to implement an efficient decline in relative prices over the product lifetime, without requiring adjustments to the prices of individual goods.

Chart 1
Relative price trends and the optimal inflation rate



The optimal inflation target must trade off the relative price distortions it generates across different expenditure categories. While Chart 1 assumes that the strength of the efficient relative price decline is identical across product categories, rates of relative price decline vary considerably across expenditure categories and countries (see the evidence presented in Sections 4.1 and 4.2 below). To a first-order approximation, the optimal inflation target for this more general setting is equal to the weighted average of the different rates of (efficient) relative price decline:[10]

$$\mathbf{\Pi}^{\star} \approx \sum_{z=1}^{Z} (\gamma_z/\gamma)\psi_z b_z, \qquad (1)$$

where $\mathbf{\Pi}^{\star}$ denotes the optimal (gross) target for aggregate inflation, ψ_z denotes the expenditure weight on category $z = 1, \dots Z$, γ_z/γ denotes the relative (gross) growth rate of category z, and where γ_z is the real growth rate of expenditures in category z and γ the real growth rate of the economy. Slope coefficient b_z denotes the rate of relative price decline in category z, which contributes to a positive aggregate inflation target, in line with the graphical arguments in Chart 1. Equation (1) is used to determine country-level optimal inflation targets. However, the linear structure embedded in equation (1) implies that one can aggregate the nationally optimal inflation targets further to the level of a currency union, using country-level expenditure weights and expenditure growth rates.

[10] See proposition 2 and lemma 1 in Adam and Weber (2023). While the approximate result in equation (1) applies to both time and state-dependent pricing models, the fully non-linear result on the optimal inflation target derived in Adam and Weber (2023) applies only to the (time-dependent) Calvo pricing model. The fully non-linear optimal inflation rate requires a more complicated weighting scheme for aggregating relative price trends across expenditure categories. Besides expenditure shares, this scheme also attributes more weight to categories with a larger degree of effective price stickiness, akin to the stickiness principle obtained in the CONDI literature. Obtaining reliable estimates for fully non-linear weights at the fine level of disaggregation considered here (eight-digit COICOP) is numerically demanding.

The efficient rate of relative price decline corresponds to the coefficient of interest in the panel regression outlined above. The efficient rate of relative price decline b_z in equation (1) can be estimated from the actual decline in relative prices, as observed in the micro price data, as price-setting and other frictions cause only level distortions to relative prices and leave their time trends unaffected.[11]

[11] See proposition 3 in Adam and Weber (2023).

4 Euro area estimates of optimal inflation rates

Optimal inflation targets estimated for the harmonised set of expenditure categories are significantly greater than zero in all three countries (Table 3). Thus, the presence of downward-sloping efficient relative price trends strongly affects the optimal inflation rate implied by the presence of nominal rigidities. The table also shows a considerable degree of heterogeneity across the three euro area countries. While the optimal target is 0.8% for Italy, the targets for France and Germany are one percentage point higher. This shows that in France and Germany, the weighted average rate of relative price declines is more than twice the rate in Italy.[12] Sections 4.1 and 4.2 below revisit the country differences in more detail.

Table 3
Baseline estimates

(percentage points)

	France (2015-19)	Germany (2015-19)	Italy (2016-19)	Euro area
Optimal inflation	1.8	1.8	0.8	1.5

Source: Adam et al. (2022).
Note: The euro area figure is computed as the weighted average of the three countries.

The weighted average of country-specific optimal inflation rates across the three countries is equal to 1.5%.[13] Thus, price stickiness alone justifies targeting significantly positive inflation rates, in order to minimise relative price distortions from nominally sticky prices in larger euro area economies. Estimates suggest that the prescription for optimal inflation shifts significantly from a previous level of zero to a level of 1% to 2% when allowing for product life cycles. Naturally, a full consideration of the optimal inflation rate must also take into account other aspects related to monetary stabilisation policy, such as the incidence of the effective lower bound on policy rates and the desire to prevent deflation in individual Member States.

4.1 Plausible ranges for target estimates

Robustness exercises show that plausible estimates for an optimal inflation target that minimises relative price distortions range between 1.1% and 2.1% in France, 1.2% and 2.0% in Germany, 0.8% and 1.0% in Italy and 1.1% and 1.7%

[12] According to the underlying theory, this could be the case because quality progress associated with product replacements is stronger in Italy and/or because productivity improvements over the product lifetime are weaker in Italy. Identifying which force is actually at play is difficult with the available price data alone, but is an interesting avenue for future research.

[13] The aggregation weighs the optimal inflation rates of individual countries with their respective 2019 consumption expenditure shares, which use final consumption expenditure by household for the year 2019. The resulting consumption shares are 42.2% for Germany, 31.1% for France and 26.7% for Italy. The weights used to aggregate the national estimates of b_z at eight-digit COICOP level consist of expenditure weights and relative growth weights (see equation (1) in Section 1.2) where the latter is quantitatively of the second order.

for the weighted average across the three countries.[14] In particular, estimated inflation targets decrease considerably for France (1.1%) and Germany (1.2%), but remain stable for Italy (0.8%) when moving from the baseline sample, which harmonises the set of expenditure categories across countries, to the sample that considers a country-specific set of expenditure categories. The sizeable declines for France and Germany reflect the fact that the harmonised sample covers a considerably smaller share of national consumption baskets (only 68.2% for France and 51% for Germany, versus 87.9% for Italy). In Germany, the decline is mostly due to the exclusion of expenditure and price information on rents in the harmonised sample. Their expenditure weight is sizeable (11.7%), but at the same time, their estimated relative price trends are well below the German baseline estimate of the optimal target in Table 3. In France, the decline in optimal inflation is mostly due to the inclusion of fresh food (plus some tobacco) categories when moving from the harmonised to the country-specific sample. Overall, the euro area optimal inflation target decreases from 1.5% to 1.1% when the country-specific sample is used.

4.2 Sectoral disaggregation of target estimates

Table 4

Estimates for optimal inflation targets for special aggregates

(percentage points)

	Food		Non-energy industrial goods		Services	
	Optimal inflation	Weight	Optimal inflation	Weight	Optimal inflation	Weight
France	0.2	30.9	4.9	34.5	0.1	34.3
Germany	-0.1	26.5	5.5	39.3	-0.9	34.0
Italy	0.0	26.4	2.6	34.4	-0.1	38.7

Source: Adam et al. (2022).

The positive optimal inflation rates at the aggregate level arise because, in the goods category, product prices decline substantially over the product lifetime in relative terms. Table 4 disaggregates country-specific estimates for the optimal inflation rates shown in Table 3 above to the level of broad expenditure categories, namely food, non-energy industrial goods and services. In all three countries, estimated inflation targets for food and services tend to be very close to zero. The only exception is the estimated rate for services in Germany, which is substantially negative and indicates that German services tend to become more expensive over their lifetime in relative terms. In each country, the weak relative price declines in food and services coexist with strong relative price declines in the goods category. Estimated optimal inflation rates for goods are close to 5% in France and Germany, and about half this level in Italy.

[14] See Table 4 in Adam et al. (2022) for details.

Table 5

Optimal inflation rates for three-digit COICOP categories (harmonised sample)

(percentage points)

	Weight	Optimal inflation rates			
		Average	France	Germany	Italy
Information processing equipment	2.82	11.75	11.11	9.32	18.27
Clothing	25.31	9.58	10.91	15.49	4.58
Footwear	6.47	6.83	11.43	6.06	4.10
Household appliances	4.42	5.04	5.98	2.27	8.04
Other recreational items	10.76	2.10	3.03	1.68	1.20
Personal care	9.20	1.82	1.41	3.08	1.11
Medical products, appliances/equipment	3.74	1.77	1.13	2.72	-0.07
Operation of personal transport equipment	3.55	1.55	2.06	3.11	-0.02
Personal effects n.e.c.	5.82	1.47	2.35	1.82	0.31
Furniture and furnishings	11.27	1.43	3.41	1.61	-0.02
Tools/equipment for house / garden	2.50	1.42	1.83	1.64	0.28
Household textiles	1.92	1.29	2.26	-0.26	2.13
Maintenance/repair of dwelling	1.72	0.86	0.86	1.62	-1.31
Goods/services for household maintenance	4.88	0.45	0.92	1.96	-0.80
Newspapers, books/stationery	1.50	0.04	0.76	-0.45	-0.86
Glassware, tableware/household utensils	3.13	-0.15	0.25	0.16	-1.21

Source: Adam et al. (2022).

For a more detailed breakdown, Table 5 reports optimal inflation rates for goods only, but at the finer three-digit COICOP level. The table shows the average expenditure weight (across the three countries) of a particular three-digit COICOP category in the goods category. Furthermore, it shows the optimal inflation rate for each three-digit COICOP category, once as the weighted average across all three countries and once for each country separately.[15]

The average optimal inflation rates in Table 5 are positive for all three-digit COICOP categories, except for one, with many rates being substantially positive. The category with the largest optimal inflation rate is “Audio-visual, photographic and information processing equipment” (abbreviated to “Information processing equipment”). This category includes electronic music and video appliances, as well as computer equipment. Arguably, this is an expenditure category in which technological and relative quality progress is very pronounced. The next-highest categories are “Clothing” and “Footwear”. They contain goods subject to “fashion effects” and goods for which technological constraints, such as outlets running into storage capacity limits at the turn of a season, underlie relative price declines. In these categories, the less pronounced trends in relative prices in Italy, compared with France and Germany, arise because seasonal price declines in Italian fashion are more synchronised than in the other two countries.[16] The fourth-

[15] The table reports all expenditure COICOP3 categories with an average expenditure share of goods of at least 1%, and sorts categories from the highest to lowest average optimal inflation rate.

[16] Note that, even if these products are traded, relative price trends may differ across countries while price indices across countries show the same inflation rate, so there are not necessarily arbitrage opportunities in terms of baskets of goods.

highest rate of relative price decline in Table 5 is reported for “Household appliances”, which arguably also feature considerable increases in product quality over time.

In the sample considered here, the expenditure category with the highest average optimal inflation rate across countries is underrepresented relative to its weight in the official basket, suggesting that aggregate optimal inflation rates estimated here are biased downwards. The expenditure weight of “Information processing equipment” is comparatively small: 2.8% in the harmonised sample. This is the case, not because these goods make up such a small share of the official expenditure basket, but rather because most prices in this category are centrally collected and hence not part of the sample considered here, as previously mentioned.

4.3 The welfare costs of sub-optimal inflation rates

One benefit of the structural economic model underlying the approach to estimating optimal inflation targets is the possibility of quantifying welfare effects from sub-optimal inflation rates, subject to the well-understood caveat that such welfare effects rely on specific structural assumptions.[17] Thus, equipped with country-level estimates for an optimal inflation target that minimises relative price distortions, the structural model can predict the welfare costs associated with actual inflation outcomes observed over the sample period in the three largest euro area countries.

Welfare losses quickly rise as the distance from the optimal target increases. Welfare costs turn out to be rather small, i.e. less than 0.5% of long-run consumption in present-value terms, when considering the overall welfare effects of the country-specific gap between actual and optimal inflation rates.[18] However, when considering a counterfactual situation in which the central bank targets zero inflation in line with the well-known price stability result, welfare costs can be substantial and may amount to several percentage points of consumption, depending on the precise estimate used for the optimal inflation target. In addition, an inflation rate significantly higher than the optimal rate would seriously affect welfare: a scenario with inflation permanently around 4% entails a cost of more than 10% of consumption.

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17 The quantitative results in this section rely on proposition 1 in Adam et al. (2022). Up to second order accuracy, the proposition characterises the welfare-equivalent consumption loss associated with a steady-state inflation rate that deviates from the country-specific optimal inflation rate. An important caveat is that this proposition holds in a setting in which heterogeneous efficient trends in relative prices, after weighting with relative growth weights, are sufficiently similar across expenditure categories. Country-specific welfare losses are aggregated using consumption shares, as before. The calibration of structural parameters required to compute welfare losses is described in Section 5 of Adam et al. (2022).

18 Aggregate welfare losses represent present-discounted (using a 1% annual real interest rate) welfare-equivalent consumption losses averaged across countries, again using consumption shares. The actual HICP inflation rate was 1.25% in Germany (2015-19), 1.01% in France (2015-19) and 0.8% in Italy (2016-19).

5 Conclusions

This paper shows that micro price data are essential to revisit core normative questions on how monetary policy is conducted. Accounting for product turnover and the consequences of product life cycles for relative price trends suggests that nominal price stickiness may justify targeting significantly positive inflation in the euro area, in contrast to the well-known price stability result. Thus, analysis that relies on micro price data may serve as an important input for future strategy reviews that reassess the quantitative definition of the ECB's price stability mandate.

Looking forward, the price stability implications for a number of other dimensions of heterogeneity have either not been explored at all or remain under-explored. One example is the role of strategic pricing complementarity between sticky-price firms with different productivity levels. Santoro and Viviano (2022) show that, in such a setting, productive firms are inefficiently small, while unproductive firms are inefficiently large, and that positive inflation is a very effective policy instrument to reduce this misallocation. Another example is the role of stationary, idiosyncratic shocks, which are essential to fit micro-level evidence on the distribution of price changes, as the literature has shown. In ongoing work, Nakov and Weber (2021) show that idiosyncratic shocks can have material implications for aggregate price stability.

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