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EURO CHANGEOVER AND INFLATION PERCEPTION

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ABSTRACT

This thesis examines whether Italy experienced a distinctive shift in inflation dynamics around the euro cash changeover (2002) relative to selected Eurozone member states. The analysis uses Eurostat harmonised annual HICP data disaggregated by COICOP consumption divisions for Italy, Germany, France, and Spain over 1996–2008.

Descriptive evidence indicates only a moderate post-2002 change in Italy’s aggregate inflation alongside pronounced sectoral heterogeneity. The empirical strategy combines Chow break tests, fixed-effects panel models, and robustness specifications to assess structural change and relative differentials.

Overall, the findings support a cautious conclusion: detectable change is present, but Italy does not emerge as a clear positive outlier in measured inflation, with implications for the perceived-inflation debate.

IL PASSAGGIO ALL'EURO E LA PERCEZIONE DELL'INFLAZIONE

ABSTRACT IN ITALIANO

Questa tesi esamina se l'Italia abbia sperimentato un cambiamento distintivo nelle dinamiche inflazionistiche in corrispondenza dell'introduzione del contante in euro, avvenuta nel 2002, rispetto ad alcuni Stati membri selezionati dell'Eurozona. L'analisi utilizza dati annuali armonizzati Eurostat relativi all'HICP, disaggregati per divisioni di consumo COICOP, per Italia, Germania, Francia e Spagna nel periodo 1996–2008.

L'evidenza descrittiva indica, per l'Italia, solo una variazione moderata dell'inflazione aggregata dopo il 2002, accompagnata tuttavia da una marcata eterogeneità settoriale. La strategia empirica combina test di Chow per l'individuazione di break strutturali, modelli panel a effetti fissi e specificazioni di robustezza, al fine di valutare la presenza di cambiamenti strutturali e differenziali relativi tra Paesi.

Nel complesso, i risultati supportano una conclusione prudente: sebbene sia riscontrabile un cambiamento, l'Italia non emerge come un chiaro outlier positivo in termini di inflazione misurata, con implicazioni rilevanti per il dibattito sull'inflazione percepita.

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1. Introduction

1.1 Context and motivation

January 2002 can be regarded as one of the most important dates in the economic history of Europe. Euro coins and banknotes were introduced across the Eurozone, following a long process of monetary integration and after the official launch of the single currency in 1999.

In addition to its institutional relevance, the euro changeover was soon followed by a broad debate over prices and inflation. Consumers began to believe that this monetary transition had significantly increased the cost of living, even as official statistics and inflation indicators often appeared more moderate (Angelini & Lippi, 2006; Ehrmann, 2006; Sturm et al., 2009).

Among the major countries that experienced the cash changeover, Italy represents one of the most relevant cases. Italian public opinion often linked the euro to a considerable decrease in households' purchasing power. A large body of studies has examined this issue; the gap between measured and perceived inflation can be explained by several factors, such as difficulties for consumers in remembering pre-euro prices and greater price increases in frequently purchased goods (Angelini & Lippi, 2006; Cestari et al., 2007).

The relevant empirical literature generally finds that the aggregate inflation effect of the changeover was limited and concentrated in specific sectors, rather than affecting the entire consumption basket to the same extent (Ehrmann, 2006; Sturm et al., 2009).

1.2 Research problem

The thesis investigates whether the euro cash changeover represented a meaningful shift in Italian inflation dynamics after 2002 and whether comparable Eurozone countries experienced similar developments. Existing studies generally do not support the view that the euro transition generated a large and persistent inflation surge across member states (Sturm et al., 2009).

Italy, Germany, France, and Spain adopted the euro simultaneously and constitute the countries included in the analysis, since the changeover cannot be treated as a country-specific shock. The research problem is therefore framed in comparative rather than purely national terms.

For this reason, the thesis does not attempt to estimate a pure causal effect of the euro on Italian inflation. Instead, it examines whether Italian inflation patterns after 2002 evolved differently from those observed in the benchmark countries (Sturm et al., 2009).

1.3 Research questions and contribution

The analysis is guided by two main research questions that constitute the core of the empirical focus:

*Did Italian inflation display a structural change around the 2002 euro cash changeover?
Did Italy experience stronger post-2002 inflation dynamics, relative to Germany, France, and Spain?*

The thesis contributes to the existing literature in three main ways. First, it does not analyse Italy in isolation but places the Italian case within a comparative Eurozone framework. Second, the empirical strategy is based on annual average HICP data from Eurostat for the period 1996-2008, using both the aggregate index and the disaggregated COICOP categories, to understand whether inflation patterns were broad-based or concentrated in target sectors. Third, the empirical findings on measured inflation are linked to the literature on perceived inflation, used as a tool to contextualise the results.

This choice reflects the fact that previous studies have already examined the mismatch between official and perceived inflation in detail, whereas the Italian case still benefits from a structured comparative assessment against major benchmark countries (Cestari et al., 2007; Dziuda & Mastrobuoni, 2005).

1.4 Structure of the thesis

After the introduction, Chapter 2 reviews the relevant literature on the euro cash changeover, inflation dynamics, and the gap between measured and perceived inflation. Chapter 3 presents the dataset used for the econometric analysis and explains the choice of countries, years, and price categories. Chapter 4 describes the empirical methodology. Chapter 5 discusses the main empirical findings, the robustness checks, and their economic interpretation in relation to the research questions. Chapter 6 focuses on the limitations of the empirical strategy, while Chapter

7 concludes by summarising the main results and relating them to the literature on perceived inflation.

2. Literature review

2.1 The euro cash changeover and the inflation debate

As discussed in Chapter 1, the existing literature on the euro cash changeover emphasises two main questions: did the introduction of euro banknotes and coins generate a significant increase in inflation? To what extent, and why, did European consumers perceive a stronger rise in prices than that suggested by official statistics?

Cornille and Stragier (2007) and Ercolani (2010) argue that inflation remained moderate after the currency transition. Their results indicate that abnormal price movements around January 2002 were limited in aggregate terms and more pronounced in a restricted set of goods and services.

The sectoral distribution of price changes is important, since it shifts the focus toward specific product categories that were more exposed to price adjustments. This is particularly relevant because even limited price changes in visible sectors may have contributed to a disproportionate public perception of inflation.

In relation to this issue, Mastrobuoni (2004) suggests that consumers tend to base their judgments on the prices of the most frequently purchased goods and do not take into account the overall behaviour of the full consumption basket. From a cross-country perspective, Döhring and Mordonu (2007) show that inflation perceptions in the euro area deviated from measured inflation, and that this divergence persisted in several member states.

Overall, the relevant literature indicates that the euro cash changeover should not be interpreted as a generalised and uniform shock. A balanced interpretation of post-2002 price dynamics requires attention to the sectoral distribution of price changes and to the distinction between measured and perceived inflation. This distinction provides the broader framework for the discussion of the Italian case in the next section.

2.2 The Italian case and measured inflation

The Italian public debate focused on the substantial increase in the cost of living and the associated decline in households' purchasing power. The relevant literature, however, suggests a more complex interpretation. Measured inflation, sector-specific price dynamics, and consumer perceptions did not always move in the same direction.

Del Giovane and Sabbatini (2005) argue that this divergence became particularly large and persistent after the introduction of euro banknotes and coins. This point is especially relevant because it shows that the Italian case cannot be explained simply by a hidden increase in actual inflation. In addition, after 2002, Italy experienced a large number of price changes and stronger increases for more frequently purchased goods, which supports the thesis's focus not only on the aggregate consumption category but also on the disaggregated COICOP sectors.

Caporale, Girardi, and Ventura (2011) provide a complementary perspective focused on sellers' pricing behaviour. Their results suggest that, after the changeover, Italian retailers increased the number of price adjustments; the changeover effect, according to their estimates, was approximately 40% of the official inflation rate. This evidence is important because it documents a measurable change in pricing behaviour without implying that official statistics failed to capture the phenomenon.

Evidence on Italian restaurants, discussed by Gaiotti and Lippi (2004), suggests that price increases around the changeover were significant, but not entirely exceptional when compared with the broader upward trend observed between the late 1990s and 2003. What distinguished 2002 was, above all, the increase in the proportion of restaurants that changed prices, rather than an unprecedented rise in the size of the changes. More broadly, the evidence is consistent with stronger price pressures in some services and with a wider diffusion of price revisions across categories.

A further aspect is highlighted by Mostacci and Sabbatini (2003), who are cited in the Italian literature as a reference on consumer price rounding. Although this line of research does not support the idea of a generalised inflationary shock, it reinforces the view that the conversion process may have contributed to anomalous price movements in specific cases, thereby increasing public concerns about the inflationary effects of the euro.

Overall, the existing literature suggests that the Italian changeover should not be interpreted as a simple case of official mismeasurement. A more balanced interpretation is that moderate aggregate inflation coexisted with more visible price adjustments in selected sectors and with a persistent divergence between measured and perceived inflation. For this reason, the Italian case provides a particularly relevant basis for a comparative analysis of post-2002 inflation dynamics across Eurozone countries.

2.3 Perceived inflation and consumer perceptions

As the European Central Bank (2007) explains, the Harmonised Index of Consumer Prices (HICP), which represents the dataset used for the thesis analysis, and survey-based inflation perceptions differ in nature; therefore, they cannot be directly compared.

After the introduction of euro banknotes and coins in 2002, euro area HICP inflation did not increase significantly, and price changes remained positive but moderate. In contrast, perceived inflation rose sharply and remained above the pre-changeover level for a long period. This evidence should not be interpreted as an inaccuracy in official price statistics, but rather as the result of mechanisms such as imperfect price memory and consumer inattention.

One of the main conclusions emerging from the literature is that consumers do not evaluate inflation and price changes by considering the whole consumption basket in the same way that official indices do. In relation to this topic, Jungermann et al. (2007) argue that perceived inflation is strongly influenced by behaviourally relevant factors such as purchase frequency, loss aversion, and reference prices. The results of this study show that increases in the most frequently purchased goods strongly influence consumer perceptions, and a slight rise in prices in these sectors can alter them. Their experimental evidence supports the idea that individual judgments of inflation are shaped not only by observed price changes but also by how consumers process and remember these changes.

Another aspect that emerges across studies, as Lamla and Lein (2015) explain, is the role of the information environment in shaping consumers' views. Media reporting can have a remarkable impact on consumers' judgments about price developments.

These results, as a whole, imply that the post-2002 debate cannot be studied solely through official price data but must also account for the cognitive and informational mechanisms through which households interpreted price changes.

2.4 Gap in the literature and positioning of the thesis

The literature reviewed so far can be summarised in three main conclusions. First, the euro changeover does not appear to have caused a large and generalised increase in aggregate inflation across the Eurozone. Second, when price changes are observed, they tend to be more visible in specific sectors and consumption categories than in the overall consumption basket. Third, the literature on the divergence between perceived and measured inflation is one of the most debated aspects of the changeover, especially in countries where consumers associate the euro with a decline in purchasing power (European Central Bank, 2007; Sturm et al., 2009).

Despite these contributions, the literature still leaves room for a more structured comparative analysis. The thesis first examines the Italian case and then broadens the focus to a cross-country perspective.

Finally, perceived inflation is treated as a complementary interpretative dimension rather than as the central object of the empirical analysis. In this way, it aims to provide a more balanced assessment of the Italian case by combining descriptive evidence, structural break analysis, and panel fixed-effects (Del Giovane & Sabbatini, 2005; Ercolani, 2010).

3. Data

3.1 Data source

The empirical analysis is based on the annual Harmonised Index of Consumer Prices (HICP) (base 2015 = 100) published by Eurostat. The HICP is constructed on a harmonised methodological framework and common definitions across EU member states, thereby ensuring cross-country comparability of consumer price inflation (Eurostat, 2024).

The choice of annual averages is consistent with the focus on medium-run inflation dynamics, although short-lived effects concentrated around 2002 may be attenuated by annual data.

The original Eurostat file was imported and reorganised into long format, so that each observation corresponds to a unique country-COICOP category-year combination, along with the associated HICP value.

Data integrity checks included: duplicate detection by country, category, and year; verification of completeness for the period 1996-2008; and consistency of the COICOP labels.

3.2 Sample selection

The empirical sample covers the period from 1996 to 2008. As previously discussed in Chapter 1, the Eurozone countries included in the analysis, other than Italy, are Germany, France, and Spain. They represent large, comparable Eurozone economies and therefore provide meaningful benchmarks for evaluating the first and second research questions.

Since all countries in the sample adopted the euro in 2002, the focus is on a relative comparison (Italy vs. other Eurozone countries) rather than an evaluation against a non-euro counterfactual.

The dataset was organised at the country $\times$ sector $\times$ year level, where each sector corresponds to a specific COICOP consumption category. It includes the overall HICP index (CP00 / All-items HICP) and the 12 COICOP divisions (CP01–CP12), for a total of 13 consumption aggregates.

The panel is balanced and contains 676 observations (4 countries $\times$ 13 categories $\times$ 13 years). Because the main inflation measure is constructed with a one-year lag, the first annual observation for each panel unit is lost; as a result, the estimation sample used in panel regressions contains 624 observations and covers 1997–2008.

Using a sector-level panel increases the number of observations relative to a purely aggregate country-level analysis, allowing the thesis to assess whether any post-2002 divergence was broad-based or concentrated in specific categories. This is an important aspect given the sectoral heterogeneity emphasised in the changeover literature (Ercolani, 2010; Sturm et al., 2009).

3.3 Variables and COICOP categories

The raw dataset obtained from Eurostat reports annual average HICP indices, which are price levels rather than inflation rates. Given the focus of the analysis, an inflation proxy was constructed using the annual logarithmic change:

$$infl_log_t = 100 \times (\ln(HICP_t) - \ln(HICP_{t-1}))$$

Where $HICP_t$ denotes the annual average HICP index at year t .

This transformation is useful for approximating the annual percentage inflation rate while ensuring comparability across series. As a robustness check, an alternative year-on-year percentage change measure is also calculated:

$$infl_yoy_t = 100 \times \left(\frac{HICP_t}{HICP_{t-1}} - 1 \right)$$

The base year (2015 = 100) does not affect these change-based measures. Therefore, the index base affects the scale of HICP levels, but not the interpretation of the inflation results.

The key explanatory variable in the comparative analysis is an interaction that identifies Italy in the post-changeover period. The empirical design uses a dummy equal to 1 for Italian observations from 2002 onwards and 0 otherwise (Italy $\times$ Post).

This interaction helps determine whether Italy shows a relative change in inflation dynamics after the cash changeover compared to the benchmark countries previously mentioned, conditional on the fixed-effects included in the empirical specifications.

In addition, the dataset also defines a panel identifier at the country $\times$ COICOP level (panel_id), which clusters standard errors and accounts for within-panel dependence.

For extended robustness specifications, real GDP growth, unit labour cost growth, and unemployment rate are used as macroeconomic controls, merged at the country-year level.

The list of the COICOP categories of the analysis (CP00 and CP01–CP12) is provided in Appendix A (Table A.1).

3.4 Why is this dataset appropriate?

The selected dataset is appropriate for three main reasons. First, the HICP is harmonised and thus comparable across countries, which is fundamental for analysing the Italian case alongside other Eurozone members. Second, given the emphasis in the literature on the heterogeneity of inflation dynamics across different consumption baskets, the dataset incorporates annual data for the 13 COICOP categories (Ercolani, 2010; Sturm et al., 2009). The disaggregation enables the study of both overall inflation and sector-specific variation around the 2002 changeover. Third, the panel structure aligns with the empirical strategy by allowing the combination of descriptive evidence, structural break analysis, and fixed-effects panel regression.

In conclusion, the use of annual averages implies a trade-off: annual frequency supports medium-run comparisons and matches the availability of annual macro controls, but it reduces the time dimension.

Once fixed effects and clustered standard errors are introduced, statistical power becomes more limited, and confidence intervals can widen. This consideration motivates a cautious interpretation of statistical significance and is further discussed in the limitations section.

4. Methodology

4.1 Research design and identification logic

The empirical strategy proceeds from descriptive evidence to formal inference and robustness checks. Because all countries included in the empirical study are Eurozone members, the results should be interpreted as relative within-euro-area differentials, not as a pure causal estimate of the euro's effect.

This chapter is organised into five main steps: (i) defining the descriptive evidence and data preparation for Italy, (ii) illustrating the strategy to compare the selected country, (iii) examining whether a structural break around 2002 is statistically detectable, (iv) presenting the comparative model with fixed-effects and robustness checks, and finally (v) providing the empirical tools used to validate the result, thus combining event-studies and placebo tests to assess the credibility of the empirical design.

4.2 Data preparation and descriptive evidence for Italy

The analysis focuses on (i) the aggregate index CP00 (All-items HICP) and (ii) the 12 COICOP divisions CP01–CP12 to identify key patterns for Italy.

As explained in Chapter 3, an inflation proxy is constructed using the annual log change:

$$infl_log_t = 100 \times (\ln(HICP_t) - \ln(HICP_{t-1}))$$

As a robustness measure, an alternative year-on-year percentage change is also calculated:

$$infl_yoy_t = 100 \times \left(\frac{HICP_t}{HICP_{t-1}} - 1 \right)$$

Descriptive plots and a pre/post summary around 2002 are used to assess whether Italy shows a clear shift in both the aggregate index and the 12 COICOP categories.

Step 1 is descriptive and does not provide causal identification.

4.3 Cross-country descriptive comparison (France, Germany, Spain)

The second step extends the descriptive analysis to the benchmark countries. The same measures and plots are replicated for CP00 and COICOP divisions, and pre/post summaries are computed for each country.

The aim is to assess whether any post-2002 patterns observed for Italy are shared across the Eurozone and to motivate the use of a panel framework to account for common time shocks and structural differences across countries and sectors.

4.4 Structural break tests (Chow test at 2002)

Step 3 focuses on implementing a Chow test with a known breakpoint between 2001 and 2002 to formalise the possibility of a discontinuity around the cash changeover (i.e., the sample is split into 1996–2001 versus 2002–2008). The test is applied to both CP00 and the sectoral classifications.

For each country–category series, the model is specified on log price levels with a linear time trend:

$$\ln(HICP_t) = \alpha + \beta_t + u_t$$

The Chow test is relevant because it evaluates whether the estimated parameters α and β differ before and after the breakpoint.

Rejection of the null hypothesis indicates a statistically significant change in the trend's level or slope around 2002. Because the test is applied to log price levels with a linear trend, rejection of the null indicates parameter instability, but does not distinguish between a break in level and a break in slope.

For this reason, the Chow results are used as complementary evidence rather than as definitive proof of a changeover-specific mechanism.

4.5 Comparative panel models with fixed effects (baseline specification)

To study the second research question based on relative divergence, the core empirical strategy uses fixed-effects panel models on country-sector-year data. The unit of observation is (c, s, t) , where c denotes the country, s the COICOP category, and t the year.

The baseline specification is:

$$\text{infl_log}_{c,s,t} = \beta (\text{Italy}_c \times \text{Post}_t) + \alpha_c + \gamma_s + \delta_t + \varepsilon_{c,s,t}$$

where Post_t is explicitly defined as:

$$\text{Post}_t = \begin{cases} 1, & \text{if } t \geq 2002 \\ 0, & \text{otherwise} \end{cases}$$

Country fixed effects α_c capture time-invariant differences across countries, sector fixed effects γ_s capture persistent differences across consumption categories, year fixed effects δ_t capture common shocks, and $\varepsilon_{c,s,t}$ is the error term.

The coefficient β measures the post-2002 differential for Italy relative to the other selected Eurozone member states, conditional on fixed effects.

A positive β would indicate that Italy's inflation proxy increased more than those of the benchmark countries in the post period; a negative β would indicate relatively lower inflation dynamics in Italy.

Standard errors are clustered primarily at the panel level ($\text{country} \times \text{sector}$) to account for serial correlation and within-panel dependence.

Results clustered at the country level are reported as sensitivity checks, but inference with very few clusters (four countries) can be unstable; therefore, conclusions rely primarily on the panel-level clustering.

4.6 Robustness checks: alternative outcomes, samples, and macro controls

Three robustness checks are implemented to assess the stability of the findings. First, the baseline *infl_log* outcome is replaced by *infl_yoy* to verify that results do not depend on the exact inflation proxy. Second, alternative samples are considered, such as: CP00-only models that focus on the aggregate index, and sectors-only models that exclude CP00 to ensure results are not driven by the aggregate series. Third, three annual macroeconomic controls are included: real GDP growth, unit labour cost growth, and unemployment rates, all merged at the country-year level.

They are used to assess whether the Italy $\times$ Post differential is stable once other macroeconomic conditions are taken into account. Specifications with contemporaneous and lagged controls are considered.

4.7 Dynamic evidence and falsification: event study and placebo tests (annual)

To complement the baseline specification, the final empirical step estimates an event-study model centred on 2002:

$$infl_log_{c,s,t} = \sum_{k \neq -1} \beta_k (Italy_c \times \mathbf{1}(rel_year_t = k)) + \alpha_c + \gamma_s + \delta_t + \varepsilon_{c,s,t}$$

rel_year_t indexes years relative to 2002 and $k = -1$ represents the reference year. The coefficients β_k describe how the Italy-benchmark differential evolves over time relative to the year 2001.

Finally, two placebo tests are introduced to evaluate whether the empirical design mechanically produces spurious “effects”:

- Timing placebo: assigning treatment status to Italy from 2000 onward.
- Country placebo: assigning treatment status to Germany in 2002.

5. Empirical results and economic interpretation

5.1 Descriptive evidence for Italy around the 2002 cash changeover

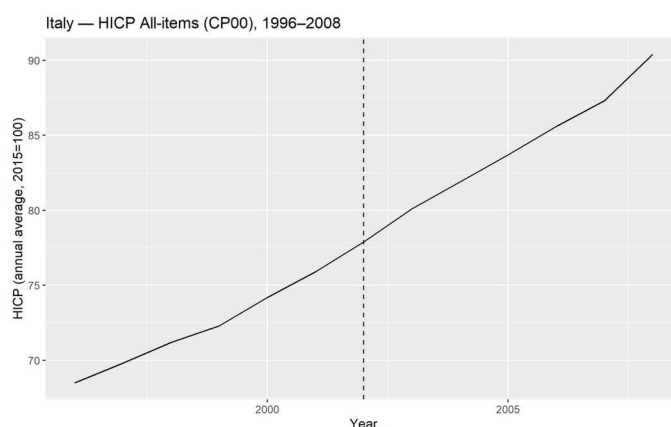
5.1.1 Presentation of the results

At the aggregate level, the Italian All-items HICP displays a broadly regular upward trajectory throughout the sample period. The visual inspection of the series does not reveal a sharp discontinuity in the index level at the year 2002.

This first result is important because it shows that the euro cash changeover was not associated with an immediate and clear jump in the overall price index. In addition, the comparison of mean inflation rates before and after 2002 suggests a moderate increase in average inflation dynamics.

Average inflation rises from 2.05% in the pre-changeover to 2.50% in the post-changeover period. This corresponds to a 0.45 percentage-point increase. The aggregate evidence, however, shows a substantial heterogeneity across the different COICOP categories.

Figure 5.1 - Italy: HICP All-items (CP00), 1996–2008



Notes: The figure reports the annual average HICP all-items index (CP00) for Italy. The dashed vertical line marks the year 2002, corresponding to the euro cash changeover.

Source: Author's elaboration on Eurostat HICP annual average data.

Once the analysis is extended to the sectoral level, significant differences emerge across categories. Specific sectors record a more pronounced post-2002 increase in average inflation.

The clearest cases are alcoholic beverages, tobacco and narcotics, where the average inflation rises from 2.71% to 5.03%; food and non-alcoholic beverages, where it increases from 1.43% to 2.65%; and transport, where it moves from 2.07% to 3.18%.

By contrast, other categories display weaker dynamics or even a decline in inflation. This is the case for communications, where the average inflation falls from -1.26% to -4.39%, as well as for health (from 3.84% to 2.32%) and clothing and footwear (from 1.99% to 1.59%).

The complete descriptive evidence by COICOP category is presented in Appendix B, while the main text focuses on the aggregate index and on the categories showing the most relevant post-2002 changes.

Table 5.1 - Italy: selected pre- and post-2002 inflation averages.

COICOP category	Pre-2002 inflation	Post-2002 inflation	Change (pp)
All-items HICP	2.05	2.50	+0.45
Alcoholic beverages, tobacco and narcotics	2.71	5.03	+2.32
Food and non-alcoholic beverages	1.43	2.65	+1.22
Transport	2.07	3.18	+1.11
Communications	-1.26	-4.39	-3.13
Health	3.84	2.32	-1.52
Clothing and footwear	1.99	1.59	-0.40

*Notes: The table reports average annual inflation rates (infl_log) for Italy before and after the euro cash changeover. Change is computed as post-2002 minus pre-2002, in percentage points.
Source: Author's elaboration on Eurostat HICP annual average data.*

5.1.2 Economic interpretation of the results and relation to RQ1

In relation to RQ1, the descriptive results suggest that the Italian post-2002 pattern cannot be interpreted as a uniform price increase across the entire consumption basket. Rather, the first step of the empirical analysis points to a limited aggregate acceleration combined with strong sectoral heterogeneity.

The sectoral composition is economically relevant because the categories with the strongest post-2002 increases include goods and services that are particularly visible in everyday

consumption. Food and transport, for instance, are highly salient to households and are frequently purchased.

As discussed in Chapter 2, price movements in frequently purchased items may disproportionately affect consumers' perceptions of inflation. These findings should be interpreted with caution.

The descriptive evidence is consistent with the possibility of a structural change in Italian price dynamics, but not with the idea of a sharp and generalised inflation surge. The pre/post comparison is purely descriptive and does not isolate changeover-related dynamics from other macroeconomic or sector-specific developments.

For this reason, the evidence just presented is a descriptive mapping of the Italian case, which motivates the more formal structural break tests and panel regressions developed in the following sections.

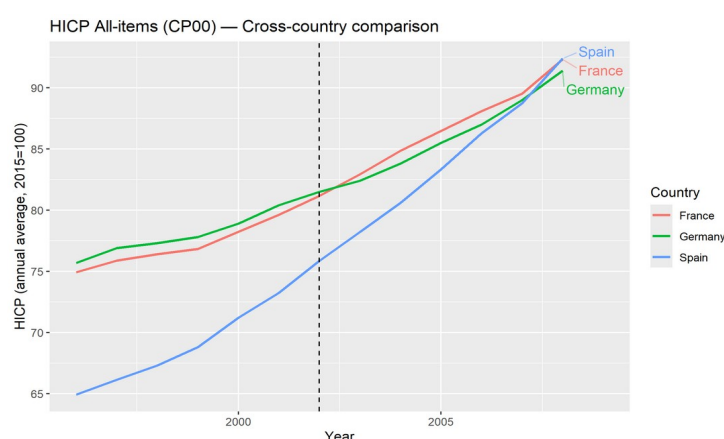
5.2 Cross-country Descriptive Evidence: Italy and Benchmark Countries

5.2.1 Presentation of the results

This section extends the descriptive analysis from Italy to the three benchmark countries. The same annual-average HICP series, time window, and pre/post-split are retained, so that cross-country comparison is consistent with the results obtained in section 5.1.

At the aggregate level, all the benchmark countries display higher inflation after 2002. In France, the mean inflation rate rose from 1.21% to 2.12%; in Germany, from 1.20% to 1.83%; and in Spain, from 2.41% to 3.32%.

Figure 5.2 - HICP All-items (CP00): benchmark-country comparison, 1996–2008.



Notes: The figure reports the annual average HICP all-items index (CP00) for France, Germany, and Spain. The dashed vertical line marks the year 2002, corresponding to the euro cash changeover.
Source: Author's elaboration on Eurostat HICP annual average data.

The aggregate comparison is complemented by a sectoral analysis across COICOP categories in all countries. Sectoral heterogeneity is found in all benchmark Eurozone members.

In France, the largest post-minus-pre changes are observed in housing, water, electricity, gas and other fuels (+2.42 percentage points), transport (+1.71), and communications (+2.05). In the case of communications, however, the category remains deflationary in both subperiods, and the positive change reflects a move from stronger deflation to milder deflation (- 3.13% to -1.08%), rather than a shift to high positive inflation.

In Germany, the largest positive change is also recorded in communications (+5.52), but again this reflects a marked reduction in deflation, with mean inflation moving from -6.24% to -0.72%. Alcoholic beverages, tobacco and narcotics (+2.96) and education (+2.43) represent other sizable increases.

In Spain, the largest increases are found in food and non-alcoholic beverages (+2.27), housing (+1.50), and transport (+1.44).

At the same time, some categories weakened after 2002, especially recreation and culture in France and Spain, and clothing and footwear in Germany.

Table 5.3 records the most pronounced inflation changes in COICOP categories for each observed country.

Table 5.2 - Aggregate pre- and post-2002 descriptive statistics: Italy and benchmark countries

Country	Mean HICP pre	Mean HICP post	Mean inflation pre (%)	Mean inflation post (%)	Δ inflation (pp)
Italy	71.98	83.84	2.05	2.50	+0.45
France	76.98	86.48	1.21	2.12	+0.90
Germany	77.83	85.80	1.20	1.83	+0.63
Spain	68.61	83.64	2.41	3.32	+0.92

Notes: The table reports mean HICP levels and mean inflation rates before and after the 2002 cash changeover. Inflation is measured as the annual log change in the HICP index. Italy is included to facilitate comparison with the benchmark countries discussed in this section.

Source: Author's elaboration on Eurostat HICP annual average data.

Table 5.3 - Selected sectoral inflation patterns by country.

Country	All-items Δ inflation (pp)	Largest positive change category	Δ increase (pp)	Largest negative change category	Δ decrease (pp)
Italy	+0.45	Alcoholic beverages, tobacco and narcotics	+2.32	Communications	-3.13
France	+0.90	Housing, water, electricity, gas and other fuels	+2.42	Recreation and culture	-0.81
Germany	+0.63	Communications	+5.52	Clothing and footwear	-0.73
Spain	+0.92	Food and non-alcoholic beverages	+2.27	Recreation and culture	-2.12

Notes: The table reports, for each country, the aggregate post-minus-pre change in mean inflation together with the category recording the strongest increase and the category recording the strongest decline in mean inflation.

Source: Author's elaboration on Eurostat HICP annual average data.

5.2.2 Economic interpretation of the results and relation to RQ1 and RQ2

Overall, the cross-country descriptive comparison shows that a post-2002 rise in average inflation was not confined to Italy. Thus, the benchmark-country comparison weakens the interpretation of Italy as a clear descriptive outlier in the period after the changeover. If anything, Italy records a smaller increase in average inflation than that of the three other Eurozone members.

In relation to RQ1, the results from step two support the idea that a possible change in inflation dynamics around 2002 should be assessed with caution: the date is economically meaningful, but the descriptive evidence remains strongly dependent on the level of aggregation.

In relation to RQ2, the results provide a first comparative answer: there is no clear descriptive indication that Italy experienced a more pronounced post-2002 inflation pattern than the selected benchmark countries.

Taking these results into account, the following steps rely on formal structural break tests and panel regressions, thus moving beyond simple descriptive evidence.

A full description of the results obtained from the cross-country descriptive analysis is reported in Appendix C.

5.3 Structural break evidence around the 2002 cash changeover

5.3.1 Presentation of the results

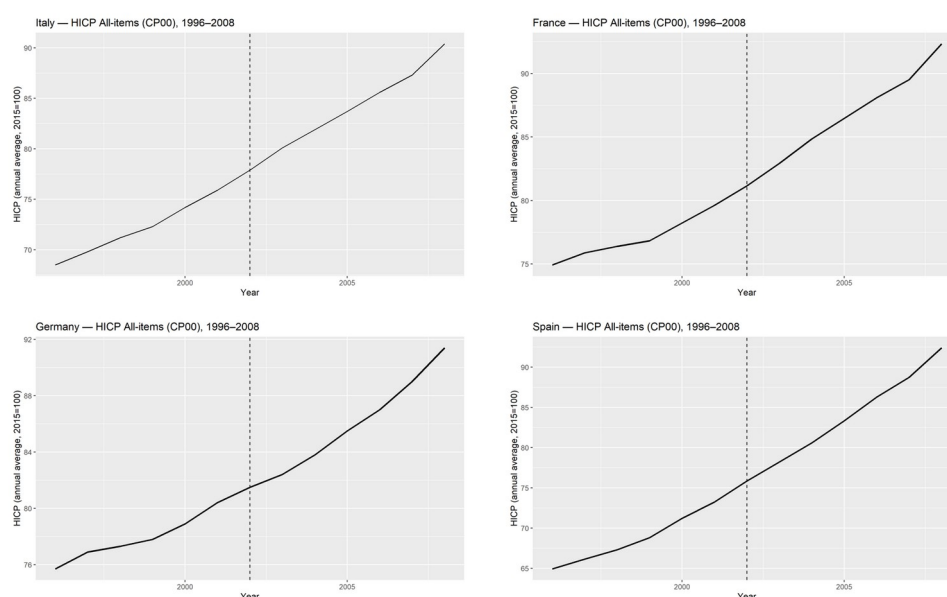
As previously introduced in Chapter 4, the Chow test is based on a linear trend model fitted to the logarithm of the HICP level; rejection of the null indicates parameter instability around the changeover.

At the aggregate level, the results reject parameter stability for all countries. The F-static is 25.42 in France, 15.25 in Germany, 5.96 in Italy, and 16.17 in Spain. The corresponding p-values remain below 0.05 in all cases. The Italian result is still statistically significant but less pronounced with respect to the other benchmark countries.

This evidence suggests that HICP levels changed around 2002 in all Eurozone member states included in the analysis.

Tables including the extended Chow results are presented in Appendix D.

Figure 5.3 - All-items HICP (CP00) by country, 1996–2008.



Notes: The figure reports the annual average HICP all-items index (CP00) for Italy, France, Germany, and Spain. The dashed vertical line marks the year 2002, corresponding to the euro cash changeover.
Source: Author's elaboration on Eurostat HICP annual average data.

Table 5.4 - Chow test results for All-items HICP (CP00), breakpoint at 2002

Country	F-statistic	p-value	Sig.
France	25.42	0.000198	***
Germany	15.25	0.001287	***
Italy	5.96	0.022488	**
Spain	16.17	0.001047	***

Notes: The table reports country-level Chow tests for the aggregate HICP series. The null hypothesis is parameter stability before and after 2002. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.
Source: Author's elaboration on Eurostat HICP annual average data.

The sectoral extension of the Chow test reveals substantial heterogeneity. Out of 13 series per country, the number of statistically significant breaks at the 5% level is 10 for France, 5 for Germany, 10 for Italy, and 10 for Spain.

The break around 2002 is therefore not confined to Italy and is not limited to the aggregate index.

Table 5.5 - Number of significant structural breaks by country.

Country	Number of significant series ($p < 0.05$)
France	10
Germany	5
Italy	10
Spain	10

Notes: The table reports the number of country-level series for which the Chow test rejects parameter stability at the 5 % level. The count includes the aggregate All-items HICP series and the 12 COICOP categories.

Source: Author's elaboration on Eurostat HICP annual average data.

An analysis of the results indicates that the strongest Italian break is found in Communications, followed by Alcoholic beverages, tobacco and narcotics, Restaurants and Hotels, Recreation and culture, and Transport.

However, highly significant breaks are also observed across all benchmark countries, most notably Recreation and culture in Spain. Housing, water, electricity, gas and other fuels in France.

Table 5.6 - Selected sectoral Chow test results.

Country	COICOP category	F-statistic	p-value	Sig.
France	Housing, water, electricity, gas and other fuels	104.27	5.96e-07	***
France	Restaurants and hotels	75.18	2.42e-06	***
Germany	Communications	20.74	0.000427	***
Italy	Communications	27.90	0.000139	***
Italy	Restaurants and hotels	16.39	0.000999	***
Spain	Recreation and culture	237.14	1.64e-08	***
Spain	Health	32.09	8.02e-05	***

Notes: The table reports selected sectoral results highlighting the strongest statistically significant breaks in the sample. The full country-by-category results are reported in Appendix D. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

Source: Author's elaboration on Eurostat HICP annual average data.

5.3.2 Economic interpretation of the results and relation to RQ1 and RQ2

Regarding RQ1, the Italian price process does not appear fully stable across the pre- and post-changeover periods. In addition, the Italian break is not strong in comparative terms, and the sectoral patterns remain heterogeneous.

The comparison with Germany, France, and Spain is crucial for assessing RQ2. Given the statistical significance of the aggregate break and the sectoral instability in all countries, the year 2002 cannot be interpreted as an Italian anomaly on the basis of the Chow tests.

Motivating the next step of the analysis based on fixed-effects panel models to verify whether Italy experienced any post-2002 divergence in inflation dynamics.

It is important to clarify that these findings should be interpreted with caution. The significance of the p-values can be inflated because the annual sample is short, and the tests use log prices.

A better understanding of the limitations is given in Chapter 6.

5.4 Comparative panel results and robustness checks

5.4.1 Baseline fixed-effect results

Step four provides the central econometric assessment of whether Italy experienced a stronger post-2002 inflation differential with respect to the benchmark countries.

The baseline specification estimates a fixed-effect panel model with country, COICOP, and year effects, using *infl_log* as the dependent variable and *it_post* as the coefficient of interest.

The preferred inference clusters standard errors at the country $\times$ COICOP level (*panel_id*), while country-level clustering is reported only as a sensitivity check.

Table 5.7 - Baseline fixed-effects estimates for the Italy $\times$ Post coefficient

Variable	Cluster country (sensitivity)	Cluster panel_id (main inference)
it_post	-0.614 (0.252)	-0.614 (0.427)
Observations	624	624
R ²	0.466	0.466
Within R ²	0.006	0.006
Country FE	Yes	Yes
COICOP FE	Yes	Yes
Year FE	Yes	Yes

Notes: The table reports the baseline fixed-effects model using annual sectoral inflation (*infl_log*) as the dependent variable. The coefficient *it_post* captures the average post-2002 inflation differential of Italy relative to the benchmark countries. The *panel_id* clustering at the country $\times$ COICOP level is preferred for inference because it matches the data's panel structure. Source: Author's elaboration based on Step 4 fixed-effects estimates from Eurostat HICP annual average data.

The baseline estimate is negative in both columns ($\beta \approx -0.61$), indicating that, conditional on the fixed effects, Italy does not display a stronger post-2002 inflation differential than the benchmark countries.

It is important to state that, under the preferred panel-level clustering, the standard error increases, and the coefficient is not statistically distinguishable from zero at conventional levels ($p \approx 0.16$). The result is directionally informative, but not precise enough to indicate a strong causal claim.

5.4.2 Robustness to alternative outcomes and samples

The negative sign of the Italy $\times$ Post coefficient remains stable across alternative outcomes and samples. When inflation is measured through *infl_yoy*, the estimate remains close to the baseline value.

The sector-only specification also preserves a negative coefficient. The only specification that reaches conventional significance is the CP00-only model, but this result relies on just 38 observations and country-level clustering with four clusters.

Table 5.8 - Robustness to alternative outcomes and samples.

Variable	Main: infl_log	Robust: infl_yoy	CP00 only	Sectors only
it_post	−0.614 (0.427)	−0.618 (0.431)	−0.370* (0.103)	−0.634 (0.463)
Observations	624	624	48	576
R ²	0.466	0.450	0.890	0.464
Within R ²	0.006	0.005	0.079	0.005
Clustering	panel_id	panel_id	country	panel_id

Notes: The table reports alternative fixed-effects specifications used to assess the stability of the baseline result. The CP00-only regression includes only the aggregate All-items HICP series and clusters at the country level; for this reason, its significance should be interpreted with caution. * $p < 0.05$.

Source: Author's elaboration based on Step 4 robustness estimates.

5.4.3 Results with macroeconomic controls

The next step adds country-year macroeconomic controls to identify whether the baseline differential is driven by broader cyclical conditions.

As previously introduced in Chapter 4, the three controls considered are: real GDP growth, nominal unit labour cost growth, and the unemployment rate.

To account for possible timing differences between the macroeconomic conditions and price adjustment, a lagged version of the specification is estimated.

Table 5.9 - Fixed-effects models with macroeconomic controls (cluster panel_id).

Variable	(1) Baseline	(2) + Controls	(3) + Lagged controls
it_post	-0.614 (0.427)	-0.481 (0.448)	-0.715 (0.438)
GDP real growth	—	0.249 (0.219)	—
ULC growth	—	0.009 (0.070)	—
Unemployment rate	—	0.056 (0.066)	—
GDP real growth (t-1)	—	—	0.064 (0.177)
ULC growth (t-1)	—	—	0.081 (0.076)
Unemployment rate (t-1)	—	—	0.036 (0.058)
Observations	624	624	620
R ²	0.466	0.470	0.466
Within R ²	0.006	0.013	0.009

Notes: Standard errors are reported in parentheses and are clustered at the country $\times$ COICOP level.

Source: Author's elaboration based on fixed-effects estimates with macroeconomic controls using Eurostat HICP data, OECD real GDP growth, Eurostat unit labour cost growth, and ILOSTAT unemployment data.

With contemporaneous controls, the Italy $\times$ Post estimate falls from -0.614 to -0.481. This result suggests that part of the baseline differential may be associated with macroeconomic conditions. In contrast, when lagged controls are considered, the coefficient becomes more negative again (-0.715).

In all cases, the sign remains negative, but the preferred panel-level inference does not yield conventional statistical significance.

5.4.4 Economic interpretation of the results and relation to RQ2

Step four provides the main econometric answer to RQ2. Overall, the baseline estimates, sample robustness checks, and models with macroeconomic controls do not support the view that Italy experienced a stronger post-2002 inflation differential than Germany, France, and Spain. If anything, the results suggest a weaker relative inflation pattern for Italy.

This result should be interpreted carefully; a negative coefficient does not imply that Italian inflation was low in absolute terms but rather suggests that it was not larger than the corresponding change in the benchmark countries once common shocks and structural differences are absorbed by the fixed effects.

The full set of panel estimates and a graphical summary of the control coefficients are developed in Appendix E.

To conclude, this step provides the central comparative results of the thesis, but, given the short time dimension and the use of cluster-robust inference, the statistical power is limited.

A better understanding of these limitations is discussed in Chapter 6.

5.5 Dynamic evidence and placebo tests

5.5.1 Presentation of the results

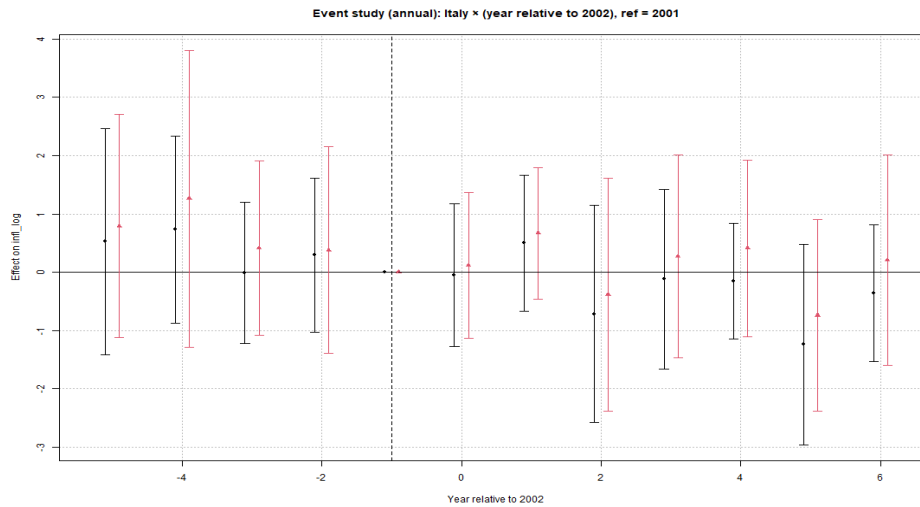
Step five estimates an event-study model centred on 2002 and implements two placebo tests.

The main objective is to assess whether Italy displays a statistically meaningful inflation differential relative to the benchmark countries and whether the empirical analysis produces spurious effects when the treatment year or the treated country is altered.

Figure 5.4 reports the coefficients for Italy relative to Germany, France, and Spain, with 2001 as the reference year. The confidence intervals are wide, and all of them include zero, both before and after 2002.

Those results suggest that, at annual frequency, the data do not reveal a statistically robust pre-trend or a clear significant post-2002 inflation differential for Italy.

Figure 5.4 - Event-study estimates for Italy relative to benchmark countries (ref. year = 2001).



Notes: The figure reports event-study coefficients for the $Italy \times relative\text{-}year$ interactions, with 2001 omitted as the reference year. Black points denote the baseline model and red points denote the specification with macroeconomic controls. Vertical bars represent 95 % confidence intervals.

Source: Author's elaboration based on Step 5 event-study estimates from Eurostat HICP annual average data.

In addition, Table 5.10 shows the fit of the two event-study specifications. The overall fit is similar across models, while the selected year-specific coefficients remain statistically indistinguishable from zero.

Table 5.10 - Event-study fit statistics and selected post-2002 coefficients

Statistic /coefficient	Baseline	+ Controls
Observations	624	624
R ²	0.472	0.476
Within R ²	0.017	0.024
2002 (k = 0)	-0.053 (0.625)	0.118 (0.637)
2003 (k = 1)	0.499 (0.595)	0.669 (0.575)
2004 (k = 2)	-0.718 (0.950)	-0.383 (1.018)
2007 (k = 5)	-1.243 (0.878)	-0.740 (0.838)

Notes: The table reports model fit statistics for the baseline and controlled event-study specifications, together with selected post-2002 coefficients discussed in the text. Standard errors are reported in parentheses. The coefficients measure the Italy-versus-benchmark inflation differential in year k , relative to the Italy-versus-benchmark differential in 2001.

Source: Author's elaboration based on Step 5 event-study estimates.

Table 5.11 illustrates that the macroeconomic controls are not significant in the controlled event-study specification.

Table 5.11 - Macroeconomic controls in the event-study specification.

Control	Coefficient	SE	95% CI
GDP real growth	0.294	0.332	[-0.356, 0.944]
ULC growth	0.031	0.170	[-0.303, 0.365]
Unemployment rate	0.062	0.066	[-0.067, 0.192]

Notes: The table reports the coefficients on the country-year macroeconomic controls included in the controlled event-study model. None of the controls is statistically significant at conventional levels under panel-level clustering.

Source: Author's elaboration based on Step 5 controlled event-study estimates.

When the treatment is artificially assigned to Italy from 2000 onwards, or when it is reassigned to Germany in 2002, the placebo coefficients remain far from statistical significance. This implies that the empirical design does not mechanically generate a differential effect under arbitrary timing or treatment assignment.

Table 5.12 - Placebo-test summary.

Test	Coefficient	SE	p-value
Placebo year (Italy post = 2000)	-0.704	0.590	0.238
Placebo country (Germany treated post = 2002)	0.330	0.637	0.606

Notes: The placebo year test assigns treatment to Italy from 2000 onward, while the placebo country test assigns treatment to Germany in 2002. In both cases the coefficient is not statistically significant, which supports the credibility of the empirical design.

Source: Author's elaboration based on Step 5 placebo regressions.

5.5.2 Economic interpretation of the results and relation to RQ2

Step five does not support the existence of a persistent, statistically robust post-2002 inflation divergence in Italy relative to the benchmark countries.

The dynamic coefficients do not display a clear post-changeover pattern; the design is not driven by obvious pre-existing divergence.

The results for the placebo tests show that the model does not produce a significant differential effect when the timing or the treated country is changed arbitrarily.

Overall, the results support a cautious interpretation of RQ2: once country, sector, and year fixed effects are included, the data do not reveal a robust dynamic pattern of a stronger and more pronounced Italian inflation after 2002.

Because the annual data provides limited time variation and the confidence intervals are wide, those results should be understood as a credibility check on the comparative panel framework rather than as a definitive test in isolation.

Additional tables and figures related to placebo tests and event-studies are reported in Appendix F.

6. Limitations of the empirical strategy

6.1 Data, identification, and inference limitations

The results obtained should be interpreted with caution.

First, the analysis is based on annual average HICP data for the period 1996-2008. This implies that short-lived price adjustments concentrated around the cash changeover cannot be fully captured. If some adjustments were brief and clustered around the immediate transition period, annual data are likely to attenuate them (European Central Bank, 2003, 2007).

Second, the dataset's time dimension is short. This implies a limited statistical power, especially when fixed effects and clustered standard errors are considered. Wide confidence intervals and weak statistical significance are not unexpected.

In general, cluster-robust inference is methodologically appropriate in panel settings, but it is also more conservative (Cameron & Miller, 2015).

Third, the analysis does not estimate a causal effect of the euro adoption relative to a non-euro counterfactual. Instead, it examines whether Italian inflation evolved differently from that of the benchmark countries after 2002.

As a result, even when a break is detected around 2002, it cannot be interpreted as a causal effect specific to the changeover. This limitation is particularly relevant for the Chow test.

Rejection of the null indicates parameter instability but, by itself, does not provide a clear distinction between a break in level and a break in slope, nor does it isolate the euro cash changeover from broader common shocks. Structural break tests are therefore informative, but their interpretation remains limited (Casini & Perron, 2018).

Fourth, the baseline panel specification is deliberately demanding. The inclusion of country, sector, and year fixed effects is useful for absorbing persistent cross-country differences, structural sectoral heterogeneity, and common time shocks.

At the same time, this means that Italy $\times$ Post coefficient is determined by a narrow source of within-panel variation. The low within- R^2 values in the main specifications are consistent with this feature: they do not indicate misspecification but rather show that the residual variation available to identify a relative Italian post-2002 differential is limited.

For the same reason, the preferred clustering strategy at the country $\times$ COICOP level is methodologically more appropriate than country-level clustering, but it is also more conservative in practice. This helps explain why some estimates remain stable in sign while losing significance (Cameron & Miller, 2015).

In relation to the dynamic analysis structured around the event-study, it is appropriate to state that 13 annual observations limit the strength of the conclusions. The results, given the available annual data and fixed-effect structure, do not indicate a precise dynamic path for an Italian post-2002 divergence. Pre-trend and event-study coefficients may have limited power in finite samples (Freyaldenhoven et al., 2019; Roth, 2022).

Finally, the macroeconomic controls included in the robustness checks should be interpreted as useful checks rather than as a solution to all identification concerns.

Overall, these limitations do not invalidate the empirical analysis, but they weaken the conclusion.

The thesis, therefore, offers a disciplined comparative assessment of the Italian case within the broader Eurozone inflation debate.

7. Conclusions

7.1 Research questions: concise answers

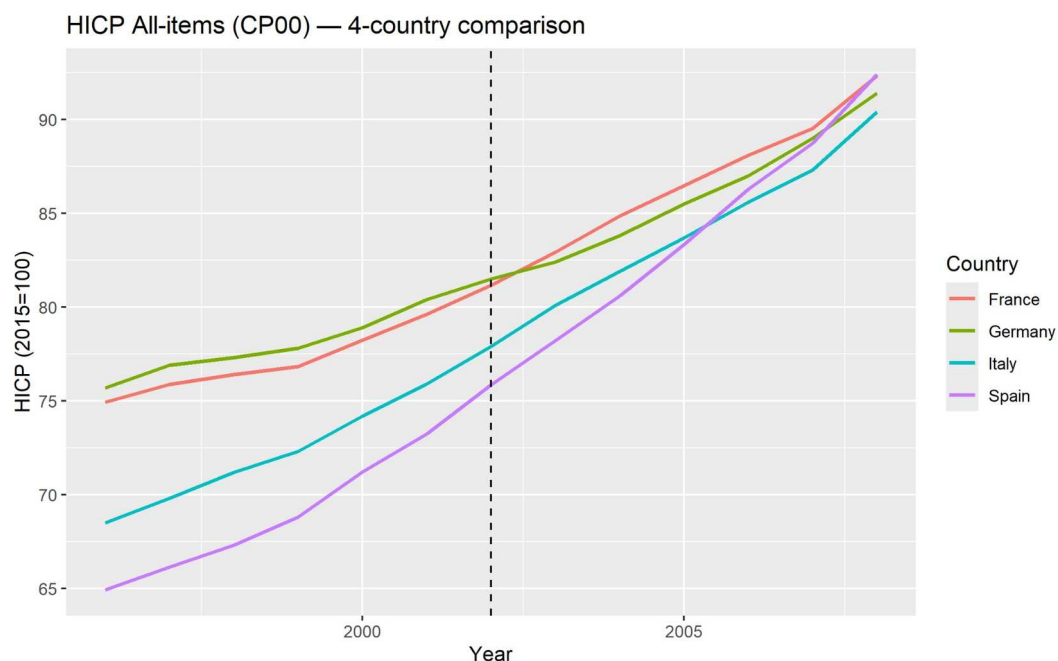
The thesis studied whether Italy experienced a distinctive shift in inflation dynamics around the euro changeover (2002) and whether it displayed a more pronounced post-2002 inflation pattern with respect to comparable Eurozone economies (Germany, France, and Spain).

The empirical analysis conducted provides cautious overall conclusions:

A detectable change around 2002 occurred for the Italian price dynamic, especially for selected consumption categories. However, the results do not support the idea of a uniform and general inflation shock.

The comparative analysis does not suggest that Italy experienced a stronger post-2002 inflation differential than Germany, France, or Spain. Across the different specifications, Italy does not appear as a clear positive outlier. These findings are conditioned on the limitations presented in Chapter 6.

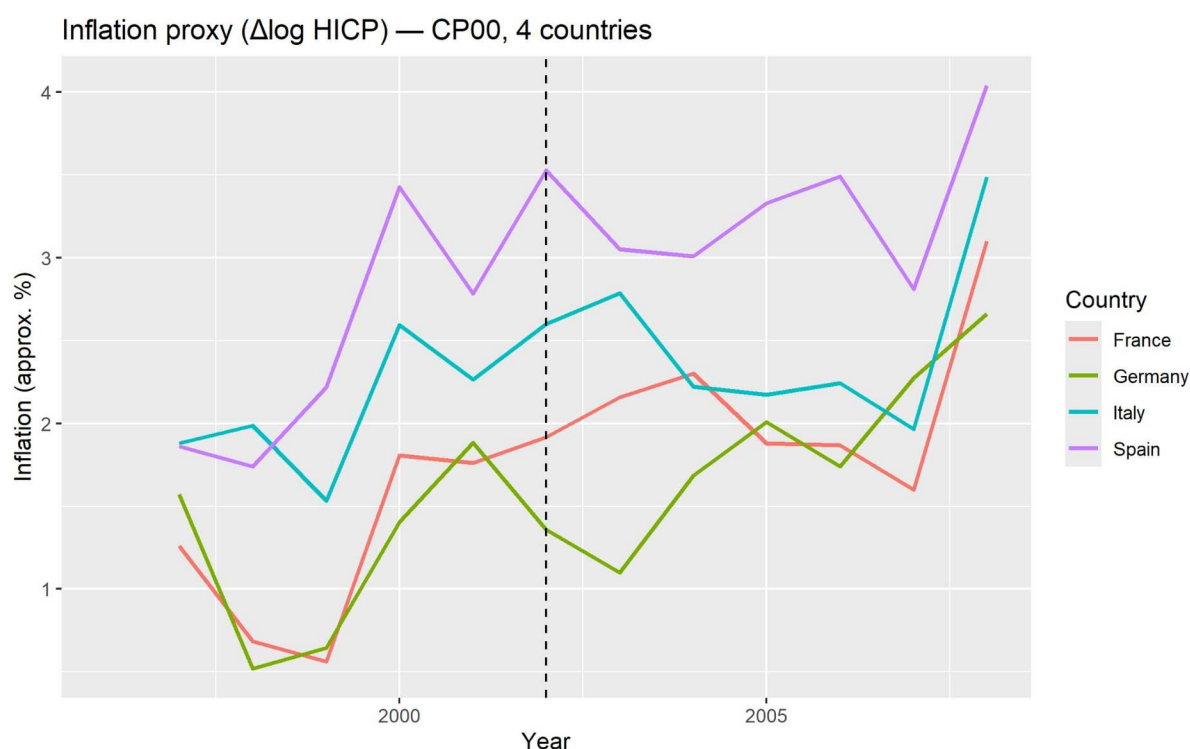
Figure 7.1 - CP00 inflation level (annual), Italy vs France vs Germany vs Spain.



Notes: it provides a synthetic visual benchmark by comparing the annual inflation level (CP00) across the four countries. The cross-country pattern shows that post-2002 inflation increases are not unique to Italy, consistent with the comparative findings discussed in the empirical chapters.

Source: Author's elaboration

Figure 7.2 - CP00 HICP level (annual), Italy vs France vs Germany vs Spain



Notes: it reports the evolution of the CP00 HICP index levels. The four series show broadly rising price levels over the period, with no immediate, sharp discontinuity at 2002 in the aggregate index.

Source: Author's elaboration

7.2 Interpreting the findings through the perceived inflation literature

As reported in the first and second chapters, a central motivation for studying the 2002 cash changeover is the well documented divergence in measured and perceived inflation.

According to the literature, the main factors that can influence consumer perception of inflation are: the overvaluation in the price changes in frequently purchased goods, the conversion mechanism of the old currency to the new currency, and the information environment shaped by media narratives (Brachinger, 2008; Döhring & Mordonu, 2007; Ehrmann, 2006; Lamla & Lein, 2015; Stix, 2009).

The empirical results reported in Chapter 5 are generally consistent with this literature.

First, the descriptive evidence shows only a moderate change in Italy's aggregate CP00 inflation after 2002, while simultaneously finding strong sectoral heterogeneity across COICOP categories most visible to consumers. Notably, food and non-alcoholic beverages and Transport

(and, in the Italian case, Alcoholic beverages and tobacco). This is precisely the setting in which perceived inflation may diverge from measured inflation. Brachinger (2008) formalises this intuition by weighting frequently purchased items more heavily and by allowing psychologically salient price increases to dominate perceptions.

Second, the comparative evidence does not identify Italy as a robust positive outlier relative to the selected benchmark countries. This aligns with the perceived-inflation literature's emphasis on limited attention and heuristic processing, in which consumers' perceptions do not track aggregate inflation or cross-country differentials (Ehrmann, 2006; Stix, 2009).

Third, the dynamic validation results strengthen this reading. The event-study, alongside the placebo tests, does not reveal a statistically strong post-2002 acceleration in Italy's inflation.

Sectoral heterogeneity combined with the conversion mechanism and media dynamics can explain why perceived inflation remains strong in the Italian case (Lamla & Lein, 2015; Döhring & Mordonu, 2007).

Future work can improve the assessment in three complementary ways. First, replicating the baseline analysis with monthly data would increase the statistical power and thus capture the short-run changeover adjustments that annual data attenuate. Second, focusing exclusively on salient purchased goods can improve the correlation with the perceived inflation literature. Third, when available, the use of micro price data can be helpful to detect rounding patterns that aggregate indices are not able to identify.

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APPENDIX A

COICOP categories used in the analysis

Table A.1. COICOP aggregates included in the empirical sample

COICOP code	Consumption aggregate
CP00	All-items HICP
CP01	Food and non-alcoholic beverages
CP02	Alcoholic beverages, tobacco and narcotics
CP03	Clothing and footwear
CP04	Housing, water, electricity, gas and other fuels
CP05	Furnishings, household equipment and routine household maintenance
CP06	Health
CP07	Transport
CP08	Communications
CP09	Recreation and culture
CP10	Education
CP11	Restaurants and hotels
CP12	Miscellaneous goods and services

Source: Author's elaboration based on Eurostat HICP ECOICOP/COICOP classification.

APPENDIX B

Additional descriptive results for Italy

B.1 Full pre-/post-2002 descriptive statistics by COICOP category

This appendix reports the complete descriptive evidence for Italy underlying Section 5.1. Table B.1 presents, for each COICOP category consistent with Appendix A, the mean HICP level and the mean inflation rate before and after the 2002 cash changeover

Table B.1. Italy: full pre- and post-2002 descriptive statistics by COICOP category.

COICOP category	Mean HICP pre	Mean HICP post	Mean inflation pre	Mean inflation post	Change (pp)
All-items HICP	71.98	83.84	2.05	2.50	+0.45
Food and non-alcoholic beverages	71.53	83.16	1.43	2.65	+1.22
Alcoholic beverages, tobacco and narcotics	54.33	71.23	2.71	5.03	+2.32
Clothing and footwear	82.78	93.21	1.99	1.59	-0.40
Housing, water, electricity, gas and other fuels	61.93	75.86	3.32	3.58	+0.26
Furnishings, household equipment and routine household maintenance	75.83	85.76	1.82	2.08	+0.26
Health	67.77	80.19	3.84	2.32	-1.52
Transport	66.30	78.84	2.07	3.18	+1.11
Communications	170.55	140.89	-1.26	-4.39	-3.13
Recreation and culture	84.33	93.06	1.09	1.52	+0.43
Education	67.55	80.07	2.21	2.70	+0.49
Restaurants and hotels	67.85	84.01	3.02	3.01	-0.01
Miscellaneous goods and services	67.38	81.64	2.45	2.95	+0.50

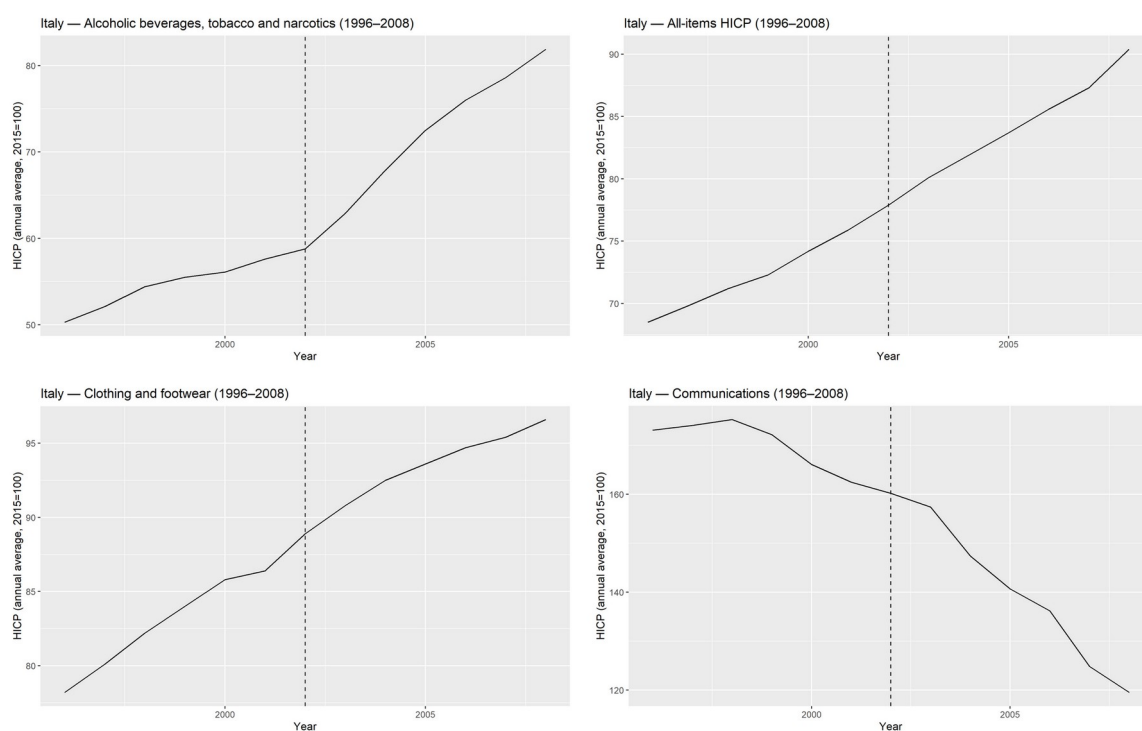
Notes: The table reports mean HICP levels and mean annual inflation rates for Italy by COICOP category. Inflation is measured as the annual log change in the HICP index. Because inflation requires a one-year lag, pre-changeover inflation averages are based on 1997–2001, while HICP level averages for the pre-period refer to 1996–2001. Post-changeover averages refer to 2002–2008. Change is computed as post-2002 minus pre-2002, in percentage points.

Source: Author's elaboration on Eurostat HICP annual average data.

B.2 Sectoral HICP series for Italy

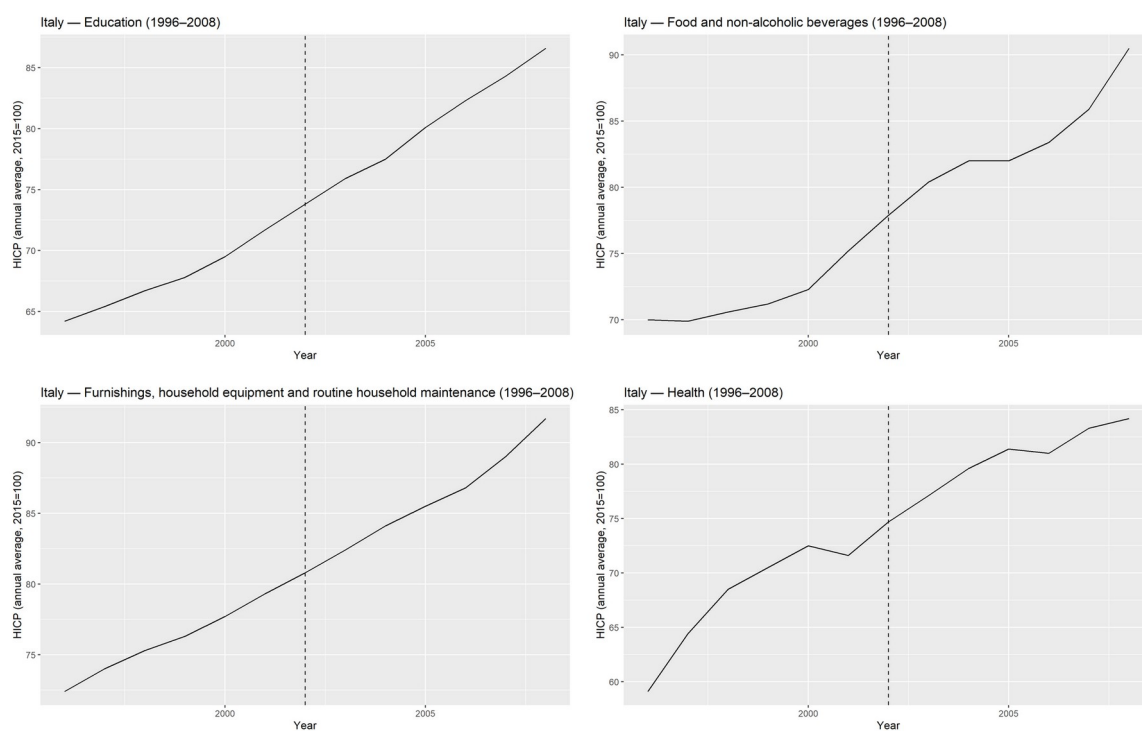
This section reports the full set of Italian HICP time-series plots by COICOP category over the period 1996–2008. The panels complement the aggregate evidence discussed in Section 5.1 and allow the reader to assess visually the extent of sectoral heterogeneity around the euro cash changeover.

Figure B.1. Italy: HICP series by COICOP category, panels 1–4.



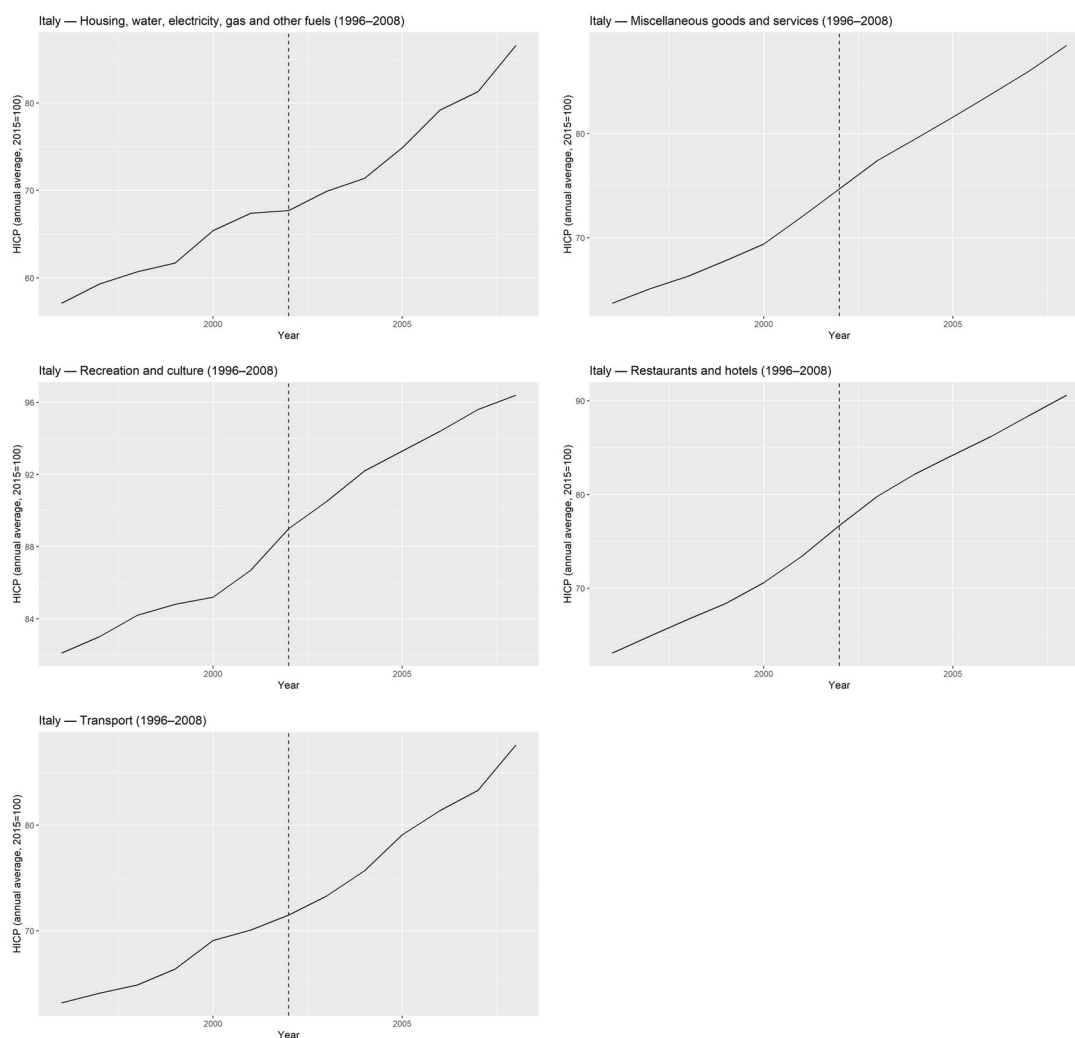
Notes: The panels report the annual average HICP index for alcoholic beverages, tobacco and narcotics; all-items HICP; clothing and footwear; and communications. The dashed vertical line marks the year 2002. Source: Author's elaboration on Eurostat HICP annual average data.

Figure B.2. Italy: HICP series by COICOP category, panels 5–8.



Notes: The panels report the annual average HICP index for education; food and non-alcoholic beverages; furnishings, household equipment and routine household maintenance; and health. The dashed vertical line marks the year 2002.
Source: Author's elaboration on Eurostat HICP annual average data.

Figure B.3. Italy: HICP series by COICOP category, panels 9–13.



Notes: The panels report the annual average HICP index for housing, water, electricity, gas and other fuels; miscellaneous goods and services; recreation and culture; restaurants and hotels; and transport. The dashed vertical line marks the year 2002.

Source: Author's elaboration on Eurostat HICP annual average data.

APPENDIX C

Additional descriptive results for benchmark countries

This appendix reports the complete pre-/post-2002 descriptive tables for the three benchmark countries used in Section 5.2 and a set of selected country-sector figures.

The appendix is intended to preserve the readability of the main chapter while ensuring transparency of the descriptive comparison.

Table C.1. France: pre- and post-2002 descriptive statistics by COICOP category.

Category (COICOP)	HICP pre	HICP post	Δ HICP	Infl. (%) pre	Infl. (%) post	Δ infl. (pp)
All-items HICP	76.98	86.48	+9.50	1.21	2.12	+0.90
Housing, water, electricity, gas and other fuels	65.89	76.41	+10.52	0.98	3.40	+2.42
Communications	149.28	131.88	-17.40	-3.13	-1.08	+2.05
Transport	71.95	83.23	+11.28	1.34	3.06	+1.71
Education	64.63	75.69	+11.05	1.55	2.96	+1.42
Alcoholic beverages, tobacco and narcotics	52.84	71.99	+19.15	3.26	4.65	+1.39
Health	79.10	89.61	+10.51	1.50	2.59	+1.09
Miscellaneous goods and services	71.98	81.78	+9.81	1.13	2.21	+1.08
Restaurants and hotels	68.15	80.79	+12.64	1.93	2.86	+0.92
Furnishings, household equipment and routine household maintenance	84.50	91.10	+6.59	0.88	1.24	+0.36
Clothing and footwear	93.17	94.96	+1.79	0.22	0.35	+0.14
Food and non-alcoholic beverages	76.52	87.75	+11.23	2.21	1.95	-0.27
Recreation and culture	109.95	107.70	-2.25	-0.01	-0.82	-0.81

Notes: The table reports mean HICP levels and mean inflation rates before and after the 2002 cash changeover. Inflation is measured as the annual log change in the HICP index. Positive differences indicate higher average inflation in the post-2002 period.

Source: Author's elaboration on Eurostat HICP annual average data.

Table C.2. Germany: pre- and post-2002 descriptive statistics by COICOP category.

Category (COICOP)	HICP pre	HICP post	Δ HICP	Infl. (%) pre	Infl. (%) post	Δ infl. (pp)
All-items HICP	77.83	85.80	+7.97	1.20	1.83	+0.63
Communications	143.57	117.86	-25.71	-6.24	-0.72	+5.52
Alcoholic beverages, tobacco and narcotics	59.32	76.06	+16.74	1.65	4.61	+2.96
Education	69.30	87.61	+18.31	3.18	5.61	+2.43
Health	72.70	88.19	+15.49	1.44	3.49	+2.06
Transport	72.52	85.33	+12.81	2.11	2.74	+0.64
Food and non-alcoholic beverages	77.42	82.59	+5.17	1.03	1.54	+0.51
Housing, water, electricity, gas and other fuels	70.60	82.21	+11.61	2.31	2.68	+0.37
Restaurants and hotels	71.90	80.04	+8.14	1.41	1.68	+0.26
Furnishings, household equipment and routine household maintenance	90.62	93.07	+2.45	0.44	0.47	+0.03
Miscellaneous goods and services	78.75	88.21	+9.46	1.69	1.53	-0.15
Recreation and culture	87.68	87.47	-0.21	0.46	0.10	-0.36
Clothing and footwear	92.93	92.40	-0.53	0.39	-0.34	-0.73

Notes: The table reports mean HICP levels and mean inflation rates before and after the 2002 cash changeover. Inflation is measured as the annual log change in the HICP index. Positive differences indicate higher average inflation in the post-2002 period.

Source: Author's elaboration on Eurostat HICP annual average data.

Table C.3. Spain: pre- and post-2002 descriptive statistics by COICOP category.

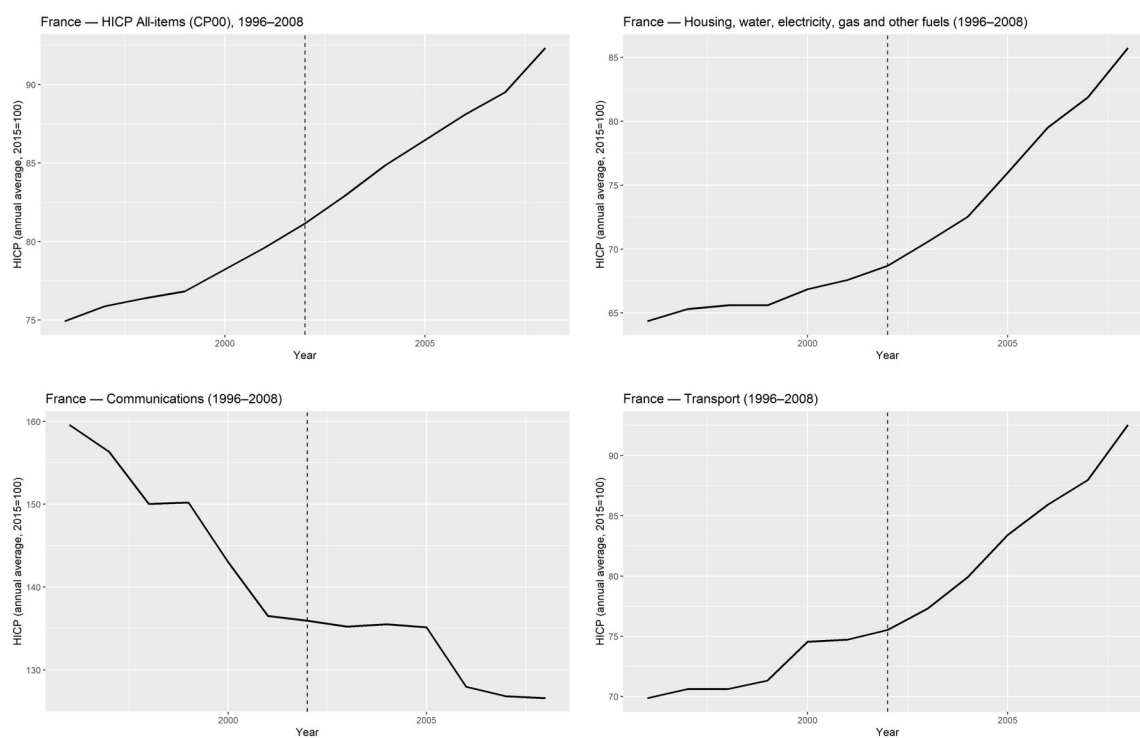
Category (COICOP)	HICP pre	HICP post	Δ HICP	Infl. pre (%)	Infl. post (%)	Δ infl. (pp)
All-items HICP	68.61	83.64	+15.03	2.41	3.32	+0.92
Food and non-alcoholic beverages	66.10	83.30	+17.20	1.85	4.12	+2.27
Housing, water, electricity, gas and other fuels	58.30	72.92	+14.62	2.80	4.29	+1.50
Transport	65.27	80.38	+15.11	2.44	3.88	+1.44
Restaurants and hotels	61.73	81.65	+19.93	3.64	4.49	+0.85
Miscellaneous goods and services	66.06	80.24	+14.18	2.51	3.22	+0.71
Education	54.01	70.12	+16.11	3.59	4.12	+0.53
Clothing and footwear	81.49	94.00	+12.51	1.59	2.12	+0.53
Furnishings, household equipment and routine household maintenance	78.14	89.45	+11.31	2.05	2.18	+0.13
Communications	135.14	122.39	-12.75	-0.36	-1.35	-1.00
Alcoholic beverages, tobacco and narcotics	43.23	57.32	+14.08	5.41	4.36	-1.05
Health	82.39	92.33	+9.94	2.35	0.83	-1.51
Recreation and culture	93.86	102.56	+8.70	2.45	0.33	-2.12

Notes: The table reports mean HICP levels and mean inflation rates before and after the 2002 cash changeover. Inflation is measured as the annual log change in the HICP index. Positive differences indicate higher average inflation in the post-2002 period.

Source: Author's elaboration on Eurostat HICP annual average data.

Figure C.1. France: selected HICP series, 1996–2008.

France — selected HICP series

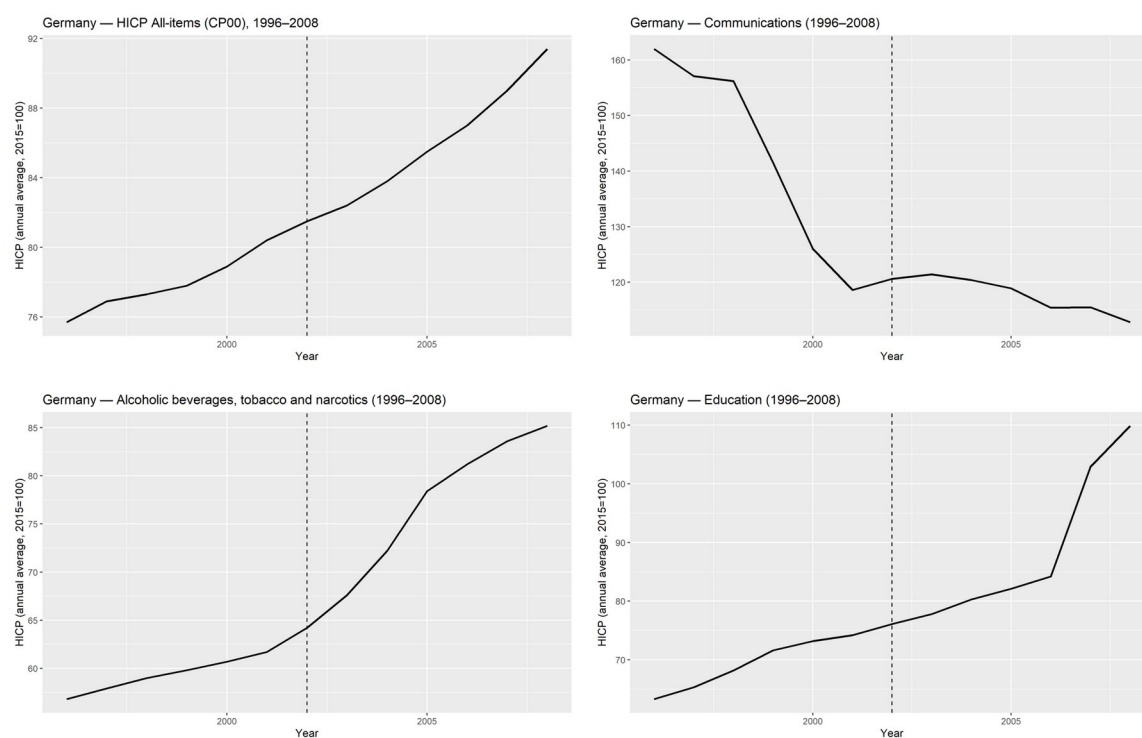


Notes: The figure reports the annual average HICP all-items index and three selected categories for France. The dashed vertical line marks the year 2002, corresponding to the euro cash changeover.

Source: Author's elaboration on Eurostat HICP annual average data.

Figure C.2. Germany: selected HICP series, 1996–2008.

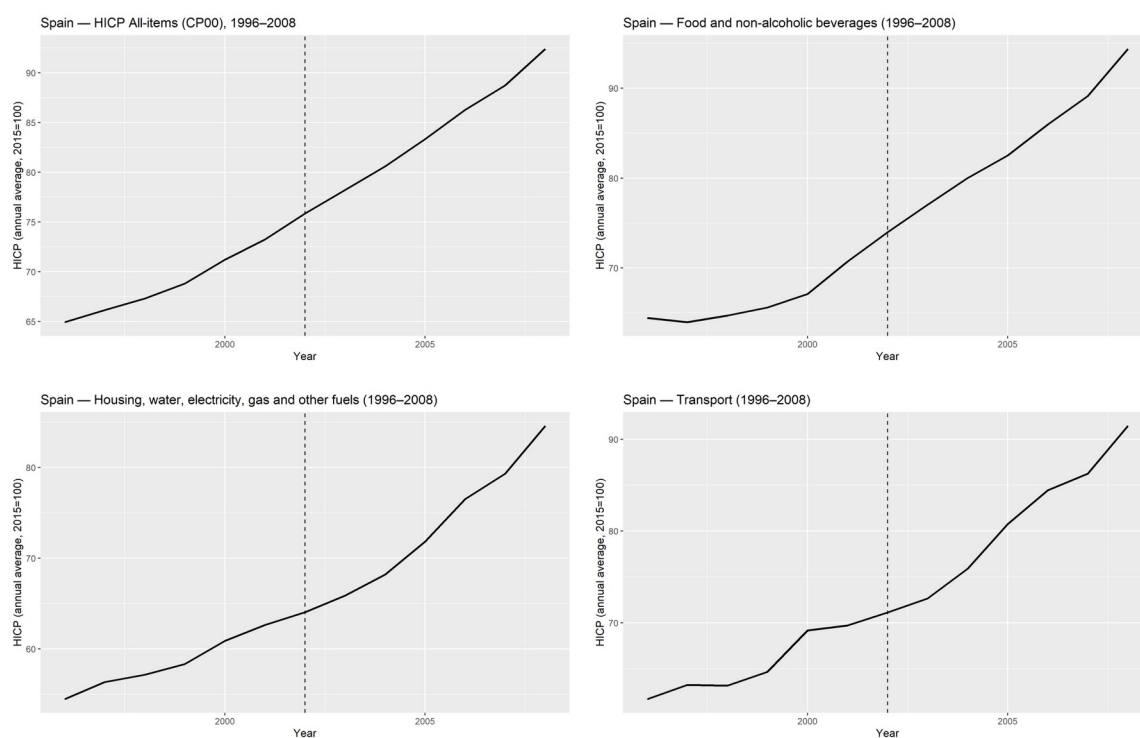
Germany — selected HICP series



Notes: The figure reports the annual average HICP all-items index and three selected categories for Germany. The selected categories correspond to the most relevant post-2002 sectoral changes discussed in the main text.
Source: Author's elaboration on Eurostat HICP annual average data.

Figure C.3. Spain: selected HICP series, 1996–2008.

Spain — selected HICP series



Notes: The figure reports the annual average HICP all-items index and three selected categories for Spain. The selected categories correspond to the most relevant post-2002 sectoral changes discussed in the main text.

Source: Author's elaboration on Eurostat HICP annual average data.

APPENDIX D

Full Chow test results by country and COICOP category

This appendix reports the complete country-by-category Chow test results underlying the discussion in Section 5.3. The breakpoint is fixed between 2001 and 2002. The test is estimated on the logarithm of the HICP level with a linear trend. * $p < 0.10$; ** $p < 0.05$; *** $p < 0.01$.

Table D.1. France: full Chow test results

COICOP category	F-statistic	p-value	Sig.
Housing, water, electricity, gas and other fuels	104.27	5.96e-07	***
Restaurants and hotels	75.18	2.42e-06	***
Education	64.98	4.48e-06	***
Recreation and culture	41.06	2.99e-05	***
Miscellaneous goods and services	26.85	0.000161	***
All-items HICP	25.42	0.000198	***
Transport	23.07	0.000287	***
Health	19.04	0.000583	***
Furnishings, household equipment and routine household maintenance	10.79	0.00407	***
Communications	7.41	0.0131	**
Alcoholic beverages, tobacco and narcotics	6.84	0.0166	**
Clothing and footwear	2.28	0.154	
Food and non-alcoholic beverages	1.75	0.208	

Notes: The table reports the full set of Chow test results for the selected country. The null hypothesis is parameter stability before and after 2002.

Source: Author's elaboration on Eurostat HICP annual average data.

Table D.2. Germany: full Chow test results

COICOP category	F-statistic	p-value	Sig.
Communications	20.74	0.000427	***
Alcoholic beverages, tobacco and narcotics	17.75	0.000753	***
All-items HICP	15.25	0.00129	***
Clothing and footwear	11.10	0.00371	***
Housing, water, electricity, gas and other fuels	7.86	0.0106	**
Restaurants and hotels	3.63	0.07	*
Education	3.62	0.0702	*
Health	2.64	0.125	
Transport	2.45	0.141	
Miscellaneous goods and services	2.14	0.165	
Food and non-alcoholic beverages	1.95	0.184	
Furnishings, household equipment and routine household maintenance	1.82	0.198	
Recreation and culture	0.55	0.467	

Notes: The table reports the full set of Chow test results for the selected country. The null hypothesis is parameter stability before and after 2002.

Source: Author's elaboration on Eurostat HICP annual average data.

Table D.3. Italy: full Chow test results

COICOP category	F-statistic	p-value	Sig.
Communications	27.90	0.000139	***
Alcoholic beverages, tobacco and narcotics	17.92	0.000726	***
Restaurants and hotels	16.39	0.000999	***
Recreation and culture	16.13	0.00106	***
Transport	13.64	0.00188	***
Miscellaneous goods and services	13.47	0.00197	***
Education	11.84	0.00302	***
Clothing and footwear	11.43	0.00338	***
Housing, water, electricity, gas and other fuels	8.13	0.00961	***
All-items HICP	5.96	0.0225	**
Food and non-alcoholic beverages	3.64	0.0684	*
Furnishings, household equipment and routine household maintenance	2.11	0.168	
Health	1.62	0.224	

Notes: The table reports the full set of Chow test results for the selected country. The null hypothesis is parameter stability before and after 2002.

Source: Author's elaboration on Eurostat HICP annual average data.

Table D.4. Spain: full Chow test results

COICOP category	F-statistic	p-value	Sig.
Recreation and culture	237.14	1.64e-08	***
Health	32.09	8.02e-05	***
Housing, water, electricity, gas and other fuels	22.44	0.000318	***
All-items HICP	16.17	0.00105	***
Miscellaneous goods and services	16.00	0.00109	***
Restaurants and hotels	15.68	0.00117	***
Food and non-alcoholic beverages	14.48	0.00154	***
Education	10.06	0.00508	***
Transport	8.66	0.00801	***
Furnishings, household equipment and routine household maintenance	7.69	0.0112	**
Alcoholic beverages, tobacco and narcotics	2.15	0.164	
Communications	0.95	0.344	
Clothing and footwear	0.56	0.464	

Notes: The table reports the full set of Chow test results for the selected country. The null hypothesis is parameter stability before and after 2002.

Source: Author's elaboration on Eurostat HICP annual average data.

APPENDIX E

Additional panel results for Step 4

This appendix reports the full set of panel estimates underlying Section 5.4. It includes the baseline model, the main robustness checks, the specifications with macroeconomic controls, and a short graphical summary of the control coefficients. The appendix is intended to preserve the readability of the main chapter while ensuring transparency of the econometric evidence.

Table E.1. Full baseline fixed-effects output.

Statistic	Cluster country	Cluster panel_id
it_post	−0.6135 (0.2517)	−0.6135 (0.4274)
Observations	624	624
R ²	0.4661	0.4661
Adjusted R ²	0.4420	0.4420
Within R ²	0.0056	0.0056
Within Adj. R ²	0.0036	0.0036
AIC	2527.4	2527.4
BIC	2651.7	2651.7
RMSE	1.75	1.75
Country FE	Yes	Yes
COICOP FE	Yes	Yes
Year FE	Yes	Yes

Notes: The two columns differ only in the structure used for the standard errors. The panel_id clustering at the country × COICOP level is the preferred inference reported in the main text.

Source: Author's elaboration based on Step 4 baseline estimates.

Table E.2. Full robustness results across outcomes and samples.

Statistic	Main: infl_log	Robust: infl_yoy	CP00 only	Sectors only
it_post	−0.613 (0.427)	−0.618 (0.431)	−0.370* (0.103)	−0.634 (0.463)
Observations	624	624	48	576
R ²	0.466	0.450	0.890	0.464
Adjusted R ²	0.442	0.425	0.838	0.438
Within R ²	0.006	0.005	0.079	0.005
Within Adj. R ²	0.004	0.003	0.051	0.004
AIC	2527.4	2581.3	42.2	2378.5
BIC	2651.7	2705.5	72.1	2496.1
RMSE	1.75	1.83	0.27	1.82
Clustering	panel_id	panel_id	country	panel_id

*Notes: The CP00-only specification includes only the aggregate All-items HICP and uses country-level clustering. All other columns cluster standard errors at the country × COICOP level. * $p < 0.05$.*

Source: Author's elaboration based on Step 4 robustness estimates.

Table E.3. Full fixed-effects models with macroeconomic controls (cluster panel_id).

Variable	(1) Baseline	(2) + Controls	(3) + Lagged controls
it_post	-0.6135 (0.4274)	-0.4809 (0.4484)	-0.7153 (0.4377)
gdp_real_growth	—	0.2485 (0.2186)	—
ulc_growth	—	0.0088 (0.0701)	—
unemp_rate	—	0.0558 (0.0664)	—
gdp_real_growth_l1	—	—	0.0644 (0.1774)
ulc_growth_l1	—	—	0.0809 (0.0757)
unemp_rate_l1	—	—	0.0357 (0.0581)
Observations	624	624	620
R ²	0.46610	0.47010	0.46602
Within R ²	0.00555	0.01299	0.00857

Notes: Standard errors are clustered at the country × COICOP level. The baseline model is reported again to facilitate comparison with the models that add contemporaneous and lagged macroeconomic controls.

Source: Author's elaboration based on Step 4 macro-controls estimates.

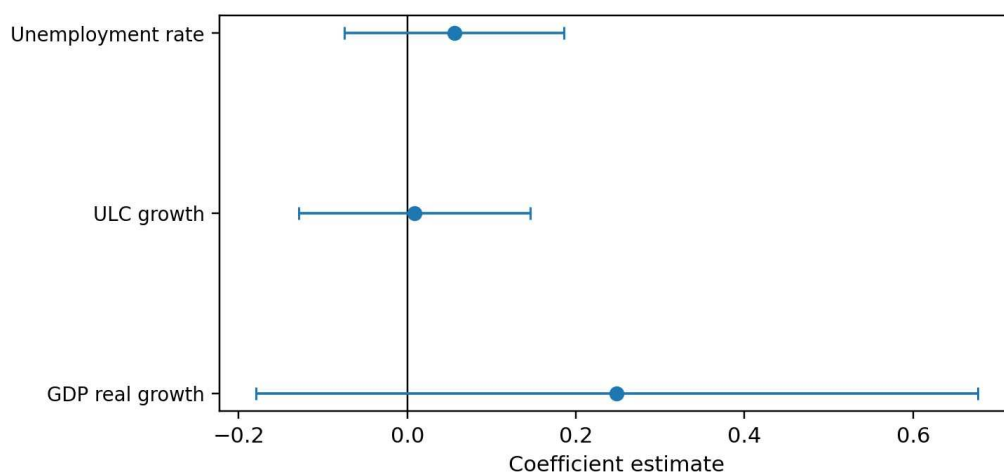
Table E.4. Alternative inference for the macro-controls specification.

Variable	Cluster panel_id	Hetero-robust
it_post	-0.4809 (0.4484)	-0.4809 (0.3160)
gdp_real_growth	0.2485 (0.2186)	0.2485 (0.1814)
ulc_growth	0.0088 (0.0701)	0.0088 (0.0759)
unemp_rate	0.0558 (0.0664)	0.0558 (0.0537)

Notes: The hetero-robust column is reported only as an additional stability check and does not replace the main clustered inference. The point estimates are identical; only the estimated uncertainty changes.

Source: Author's elaboration based on Step 4 macro-controls sensitivity checks.

Figure E.1. Coefficients of macroeconomic controls in the contemporaneous-controls model.



Notes: Points report coefficient estimates from column (2) of Table 5.9 and horizontal bars report approximate 95 % confidence intervals computed as coefficient $\pm 1.96 \times$ standard error. None of the controls is estimated precisely enough to be statistically different from zero under panel-level clustering.

Source: Author's elaboration based on the macro-controls specification reported in Table 5.9.

APPENDIX F

Additional dynamic and placebo results

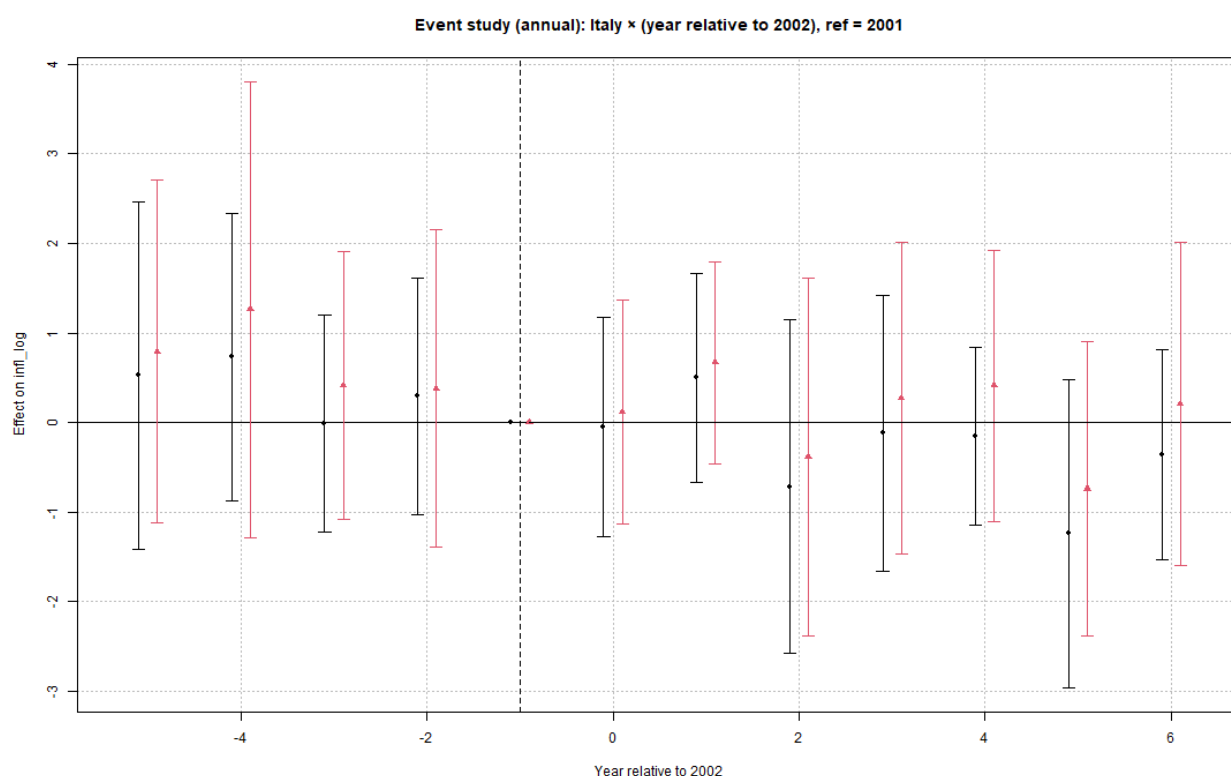
Table F.1. Event-study fit statistics and selected dynamic coefficients.

Year (k)	Baseline coef.	Baseline 95% CI	+ Controls coef.	+ Controls 95% CI
2002 (0)	-0.053	[-1.284, 1.165]	0.118	[-1.137, 1.361]
2003 (1)	0.499	[-0.678, 1.654]	0.669	[-0.467, 1.786]
2004 (2)	-0.718	[-2.586, 1.139]	-0.383	[-2.386, 1.606]
2007 (5)	-1.243	[-2.972, 0.469]	-0.740	[-2.386, 0.898]

Notes: The table reports selected event-time coefficients highlighted in the main text. The reference year is 2001. Coefficients represent the Italy-versus-benchmark inflation differential in year k relative to 2001.

Source: Author's elaboration based on Step 5 event-study estimates.

Figure F.1. Event-study plot (enlarged).



Notes: The enlarged figure reproduces the dynamic coefficient plot shown in the main text. Confidence intervals are reported at the 95 % level.

Source: Author's elaboration based on Step 5 event-study estimates.

Table F.2. Macroeconomic controls in the controlled event-study model.

Control	Coefficient	SE	95% CI
GDP real growth	0.294	0.332	[-0.356, 0.944]
ULC growth	0.031	0.170	[-0.303, 0.365]
Unemployment rate	0.062	0.066	[-0.067, 0.192]

Notes: The controlled event-study specification includes GDP real growth, ULC growth, and the unemployment rate at the country-year level. Standard errors are clustered at the country $\times$ COICOP level.

Source: Author's elaboration based on Step 5 controlled event-study estimates.

Table F.3. Placebo-test summary.

Test	Coefficient	SE	p-value
Placebo year (Italy post = 2000)	-0.704	0.590	0.238
Placebo country (Germany treated post = 2002)	0.330	0.637	0.606

Notes: Neither placebo coefficient is statistically significant at conventional levels. This supports the interpretation that the main dynamic framework does not mechanically generate false positives.

Source: Author's elaboration based on Step 5 placebo estimates.

Table F.4. Placebo regressions with controls.

Variable	Model (1) coef. (SE)	Model (1) 95% CI	Model (2) coef. (SE)	Model (2) 95% CI
Placebo year: Italy $\times$ Post ($\geq$ 2000)	-0.704 (0.590)	[-1.861, 0.453]	—	—
Placebo country: Germany $\times$ Post ($\geq$ 2002)	—	—	0.330 (0.637)	[-0.918, 1.579]
GDP real growth (%)	0.301 (0.225)	[-0.140, 0.743]	0.241 (0.225)	[-0.200, 0.682]
ULC growth (%)	0.014 (0.074)	[-0.131, 0.160]	-0.010 (0.066)	[-0.138, 0.119]
Unemployment rate (%)	0.066 (0.066)	[-0.063, 0.194]	0.033 (0.073)	[-0.110, 0.177]

Notes: Model (1) reports the placebo year specification; Model (2) reports the placebo country specification. Both models include country, COICOP, and year fixed effects, as well as macroeconomic controls.

Source: Author's elaboration based on Step 5 placebo regressions.