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# Optimal monetary policy and Phillips curves. The ECB targets in a complex scenario

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## **INTRODUCTION**

The target of this paper is to present the relationship between ECB policies and Complexity. The method will be based on setting some political and institutional tools necessary to thrive in complex contexts and studying how they have been implemented in the course of history, with particular attention on what is still missing in the European System of Central Banks.

### **Literature review.**

The concept of “adaptation to complexity” is largely inspired by the contributions of Tinbergen and Lucas, that in their “On the Theory of Economic Policy” (Tinbergen, 1952) and “Some International Evidence on Output-Inflation Tradeoffs” (Lucas R. E., 1973) set some universal criteria that can foster the capacity of central banks to pursue successful monetary policies. Within this framework, the focus on the effective interactions among institutions, private investors and other actors is developed based on Mundell’s (1961), McKinnon’s (1963), and Kenen’s (1981) studies over the Optimal Currency Areas as well as on the works of Hamada (1976) regarding the international coordination.

The literature that underlies the comparison between the pre-EMU and the EMU phases in Europe gathers numerous studies. The pre-EMU phase is interpreted through CEPR’s “The Making of the European Monetary Union: 30 years since the ERM crisis” (2022), Blancheton’s “L'autonomie de la Banque de France de la Grande Guerre à la loi du 4 aout 1993” (2014), Del Boca’s “The Phillips curve and the Italian lira, 1861–1998” (2010), and Baffigi’s “The changing relationship between inflation and the economic cycle in Italy: 1861–2012” (2015), whereas the adaptation of the current institutional asset is analysed via the lens of the Neofunctionalism as presented by Ernst Bernard Haas in his “The uniting of Europe: political, social, and economic forces” (1958).

The presence of a proficuous “adaptation to complexity” is tested within the paradigm set by Bharadwaj and Dvorkin in their work “The Case of the Disappearing Phillips Curve” (2018), where he argued that optimum monetary policy should replace the positive correlation between the output gap and inflation with a non-positive one. His ideas were developed furtherly by Eser, Karadi, Lane, Moretti, and Osabat in their “The Phillips Curve at the ECB” (2020) which is part of the ECB Working Paper Series, and just for this reason their contribution is included in the present paper as well.

In this context, the final econometric analysis is based just on the Phillips Curve as presented by its author in “The Relationship between Unemployment and the Rate of Change of Money Wages in the

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United Kingdom, 1861-1968” (Phillips, 1958), with particular stress on the time-varying estimation of the value of the slope of the curve.

### **Optimal monetary policy and right accompanying institutional tools to avoid economic doom loops.**

The analysis must start acknowledging the evident fact that the role of monetary policy improves only the short-run condition of economies since money itself is not a form of wealth but just a means to exchange it, with the consequence that this policy cannot affect directly long-run development.

Though, a good monetary policy can ameliorate the framework in which decisions with effects, in the long run, are undertaken, preventing the economic and political doom loops.

In this work, I would like to highlight how the way of thinking about the role of Central Banks can promote their success, and in particular, how should they deal with complexity. Both inflation and financial instability (which are the natural main targets of the vast majority of Central Banks) are indeed processes that feed themselves through behavioural mechanisms typical of complex systems.

Above all, the Eurosystem can be regarded as the main example of the interaction between the economy (often defined as a complex adaptive system) and the institutions, due to the cultural and historical extension of Europe.

### **The measures of adaptation to the complexity**

Complexity has to be internalised rather than left untamed, following four main principles in the ways a monetary system is designed by laws and treaties and is managed by its institutions.

#### **Coordination**

The first principle is “coordination” in terms of the unification of the decision centres ruling over the same subject, which has the purpose to bring the dialectical relationship between economic powers below the control of a central institution, with resulting increase in coordination and avoidance of “zero-sum” effects. Unifying the decision centres ruling over the same subject is nothing more than committing to reducing the competition among powers leading to what Hamada has defined in terms of potential gains of coordination (A Strategic Analysis of Monetary Interdependence, 1976), particularly relevant to the group of countries that show great interconnection for historical, cultural, geographical, political, and trade reasons.

#### **Cooperation with the other economic actors**

The second is what can be defined as “vertical contraction” of power. A Central Bank has to acknowledge the limits in translating institutional willingness into practice, due to the imperfect

capacity of understanding what goes on in the economy as well as of acting with the right timing<sup>1</sup>. The paradigm must be focused on considering the Central Bank as a simple coordinator in the monetary system, with the consequence that it must rely on the cooperation of national Institutions, private investors (often wearing the speculator shoes), and society in general. To do so successfully, the ECB must adopt some practical tools:

1. Carry out a policy of clear and easy communication. It is often taking place in the 21<sup>st</sup> century in terms of forward guidance (Monacelli, 2022), through a series of specific and credible<sup>2</sup> commitments that lead the actors to cooperate with the ECB in meeting its targets<sup>3</sup>.
2. Demonstrate a clear long-term view. It is more a geopolitical than an economic prescription, that has anyway a great relevance in the economy. The political push of populations and governors towards a particular long-term project can give essential clues to economic agents about the robustness of the ECB decisions. A concrete example of this is the difference between the economic disaster of the euro crisis of the early 2010s and the management of the socio-political turmoil of the early 2020s. The awareness of a long-term plan for the EU and Eurozone significantly improved the resilience of these entities and markets are much less likely to bet on the contrary.
3. Have clear, measurable, and limited goals. Just in the way Tinbergen (On the Theory of Economic Policy, 1952) exposed the necessity to make the number of targets correspond to that of disposable tools, the institutional actors that intervene in the Monetary System must avoid overcharging themselves with objectives they cannot achieve. Moreover, the macroeconomic goals have to be easily understood to give worldwide investors a clear framework to assess the credibility mentioned before<sup>4</sup>.
4. Success in respecting the operators' expectations. Realising the pre-determined commitments is itself a guarantee of creditworthiness that "buys" the credibility and the cooperation of the economic actors<sup>5</sup>.

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<sup>1</sup> Milton Friedman identified the presence of long and variable lags in the effects of monetary policy actions (Friedman, 1961)

<sup>2</sup> The idea itself of having respected previous commitments is the most useful signal of credibility.

<sup>3</sup> A practical example is given by the Mario Draghi's speech -in the Role of ECB President- during the Press Conference of 8<sup>th</sup> May 2014. In that case, the announcement to intervene on the exchange rate a month later was itself sufficient to spurn markets to conduct the rate to the desired level. Source: European Central Bank. (2014, May 8). ECB Press Conference - 8 May 2014. Retrieved from YouTube: <https://www.youtube.com/watch?v=3DlfgQRdbc8>

<sup>4</sup> This trend in monetary policy is confirmed by the increasing number of Central Banks that use the clear and easily measurable inflation targeting (Rose, 2022)

<sup>5</sup> Even in this case the Mario Draghi's speech cited above is a valid confirm.

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### **Creation of backstop mechanisms**

Complexity requires entities to be able to reschedule their political actions swiftly, and that can be possible only if there is a good luggage of “emergency” resources always available.

The creation of the European Stability Mechanism (ESM) in 2012<sup>6</sup> is the most iconic form of implementation of this principle: the certainty about the amount of money the ESM is itself enough to stabilise the markets as well as the expectations over the soundness of financial and banking system<sup>7</sup>. Another clear example of a backstop mechanism is given by the non-conventional ECB’s policy actions of the 2010s: the “whatever it takes” pledge has granted investors the existence of whatever quantity of coin needed to repay their credits, halting the process of speculation that was hurting the most highly indebted Eurozone members.

### **Coherence**

The success of a common monetary union is obtainable if and only if the surrounding conditions accompany it. The birth of the European Economic and Monetary Area has been often criticised for the lack of coherence between the supranational level at which monetary power is exercised and the national one where fiscal decisions and banking surveillance take place. It is not by chance indeed, that the trials of promoting greater banking and fiscal cooperation (as in the case of the Next Generation EU) are making the EMU capable of better tackling the challenges posed by the complexity.

### **How to measure the success of the Eurosystem in adapting to the complexity**

The success of the Eurosystem is measurable by its capacity to pursue its objectives on a long-term basis, in concrete, of guaranteeing price stability and soundness of the banking system.

“Here at the European Central Bank<sup>8</sup>, we work to keep prices stable in the euro area. We do this so that you will be able to buy as much with your money tomorrow as you can today.

We also contribute to the safety and soundness of the European banking system. This helps to ensure that your money stays safe in the bank.” (European Central Bank)

### **How the analysis is carried out in the present work**

In the first chapter, it is possible to see how the European monetary situation of the second half of the 20<sup>th</sup> century was wanting of the right institutional and economic aspects required to survive in a so

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<sup>6</sup> To have further details consider the second chapter

<sup>7</sup> European Stability Mechanism. (2022). Facts. Retrieved from [esm.europa.eu](https://www.esm.europa.eu/): <https://www.esm.europa.eu/>

<sup>8</sup> European Central Bank. (2023). About. Retrieved from [www.ecb.eu](http://www.ecb.eu): <https://www.ecb.europa.eu/ecb/html/index.en.html>

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complex system. In the second chapter, the European Economic and Monetary Union is analysed in terms of what it already has to adapt to complex scenarios, pointing out that between price stability and soundness of the banking system, the first is the most likely to be abandoned in the case of a prolonged period of crisis.

The meter to detect the effectiveness of the Eurozone adaptation to the complexity will therefore converge on ECB's inflation management. The key to the whole reasoning is understanding how able the ECB is to stabilise inflation through expectations, slowing down the passing-through rate between loosening of monetary policy and price growth.

The data analysis will therefore go in the direction of quantifying the parameters of the Phillips Curve, which links price growth to the other macroeconomic fundamentals, both in some of the national European monetary systems preceding the Eurosystem and in the Eurozone. The flatter this curve is and the stabler the inflation expectations are, the greater the Central Banks' possibility to intervene to assure the soundness of the banking system without contrasting with price stability.



# 1. THE PITFALLS IN THE 20<sup>TH</sup>-CENTURY EUROPEAN MONETARY SYSTEMS

## 1.1. Verticalization, lack of coordination, and the existence of a large span of goals.

In the whole history of credit institutions, the adaptation to complexity has been the main driver of the most remarkable evolutions. Starting from a disorganised set of creditors banks have converged into banking systems under the guidance of national central issuers and eventually arrived to be part of vast international organizations (ECB above all).

What has been expressed in terms of “coordination” in the introduction to this paper, is just the principal mechanism that brought to the creation of large Central Banks that follow highly coordinated patterns of action. The main example in this sense is the coordinated increase of inflation-targeting banks, whose impact was limited to slightly more than 20% of global GDP in 2000 and nowadays accounts for more than 70% (Rose, 2022)

It seems evident that Europe has played a fundamental role in this sense since just in the twenty-year period described above one leading Credit Institute has taken stably the place of its multiple predecessors. What such predecessors missed was a common view and reason of existence, giving each of the current member states of the European System of Central Banks the possibility to interfere negatively with the politics of the others, following Nash equilibria behaviours deleterious to the welfare of the whole system, recognisable in the rigid contraposition between Germany and other ERM States in the early 1990s.

## 1.2. The reasons National Credit Institutes were born are much different from their current mission.

The cause of the different attitudes of the Central Banks preceding the ECB is essential to be found in their different missions and the timings of their foundations. In Britain, for instance, an inchoate form of Banking System started to take place in the 1750s as a natural evolution of the role of the Bank of England, whereas the origin of the Banque de France in 1800 is to be attributed to Napoleon and the Institute was therefore stuck to a strong form of Government control from its birth (De Simone, 2014). However, in both cases, the primary task was providing the central government with monetary resources, in contrast with the characteristic of other monetary systems: for post-war Germany, the Deutsche Mark soundness was the main driver of the Bundesbank’s action in the process of reconstruction of the whole Institutions set (L. Hetzel, 2012).

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The current economic theories and the empirical evidence have suggested a limitation in the nowadays span of action of Central Banks, and that is highly recognisable looking at the ECB's official mission which, in deference with EU establishing treaties, is limited to price and financial stability.

Such preliminary considerations are needed to give an insight into the extent of historical and geographical fragmentation characterising European Banks. In the following paragraph, the focus will move to the cause for coordination and to the parameters needed to reach it.

### **1.3. The zero-sum effects in interrelated systems: need for symmetry and coordination.**

Highly interrelated economical systems need a shared set of principles and entities in order to promote and catalyse the benefits of such interrelation. Thinking of the same function in different ways throughout neighbouring economies acts similarly to trade and financial barriers, multiplying the occurrence of risk and uncertainty in social exchanges that are assumed to be free and secure from risk.

Several attempts have been carried out in the second part of the 20<sup>th</sup> century in order to tackle the problem of monetary coordination (Bretton Woods system and ERM above all), but in most of the occasions, they were not accompanied by correct instruments of enforcement as well as did not guarantee the right balance of interests among the different actors.

#### **1.3.1. Bretton Woods denied the existence of complexity.**

Considering the failure of the Bretton Woods system, it is worth noting how lacking it was in conforming to the growing complexity of the global economy. A mechanism that pegged currencies to an almost constant amount of gold and that forced the whole world to depend on the whims of one single Country is everything but what suits a development phase as the one following two world wars. The "ploy" was to create something static trying to extirpate complexity artificially by only gainsaying it.

Recalling the four principles elaborated in the introduction, consisting of "Coordination", "Vertical contraction", "Backstops-creation", and "Coherence", it is possible to say that none of them was pursued but on the contrary, the political decisions completely opposed them. The permanence of a mosaic of decision centres that operated following often diverging macroeconomic prescriptions was a form of "non-contraction", while the decision to subordinate the value of money all over the world permanently to what an Agreement of 1944 had fixed is an act of deep control configurable as "Vertical extension". Moreover, all the emergency exits such as IMF interventions and the

readjustments of the exchange rates were not effective instruments due both to the strong symbolic political shame that brought on National Governments and to the unwillingness to modify acquired competitive advantage, for these reasons the necessity of having “backstops” was not satisfied. Finally, the lack of “Coherence” is retrieved both from the detachment between the leading principles of each CB compared to the others and from the missing adherence of the model to reality.

In concrete, the absurdities are substantiated by the economist Robert Triffin, who pointed out the impossibility of keeping the level of dollars sufficient to accompany global growth if its value was pegged to an almost constant amount of gold. Either “quality” or “quantity” of dollars should be preserved at the expense of the other. Furthermore, the whole functioning was based on continuous overconsumption of the “coin-exporting” country (naturally required by the asset outflow used by the rest of the world as a payment system) that gradually alimented commercial tensions between USA-Europe (Triffin, 1960). The crash of the system arrived when the chosen instrument of international payment started lacking credibility in the eyes of European and Japanese Authorities, showing the incapability to pull the strings of complexity (Pilbeam, 2013, p. 264). That given, public and private investors started to give up dollar assets, creating a doom loop of fall in the value of the coin halted only with the official sanctioning of the end of its convertibility into gold by US President Nixon in July 1971<sup>9</sup>.

### **1.3.2. The weakness of ERM towards complexity**

While in the Bretton Woods case, the underlying plan ought to be considered flawed to coexist with the natural complexity of world phenomena, what happened in the early 1990s in Europe is rather due to a misapplication of the principle that led investors and society to cooperate with monetary institutions.

The ancestor of the current Eurosystem missed all that is required for a successful “Vertical contraction” of CBs role, expressed in the introduction to this paper.

There was no “Clear and easy communication”, due to the cacophony of equal-rank voices that confused public opinion. The perfect example is given by the straw that broke the camel's back in the history of UK participation in the Exchange Rate Mechanism: on that occasion, provided that the pound's value was itself excessive considering the underlying macroeconomic fundamentals (Minford, 1992), the wanton remark of the President of the Bundesbank of the time - Helmut Schlesinger – on Sterling's soundness addressed to reporters from Handelsblatt and the Wall Street

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<sup>9</sup> Presidential Library, R. N. (1971, August 15). President Nixon Address to the Nation Outlining a New Economic Policy: "The Challenge of Peace". Retrieved from YouTube: <https://www.youtube.com/watch?v=0BVj2gT6CgI>

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Journal amplified consistently the market reaction to this unevenness (Eichengreen, Thirty years after the ERM crisis, 2022) with an Exchange Market Pressure of 49.7% borne by the Bank of England (Eichengreen & Naef, Imported or home grown? The 1992–3 EMS crisis, 2020).

In addition, no “long-term view” portrayed a viable common destiny for the Countries that were going to join the common monetary area. The uncertain outcomes of national referenda cast doubts on the participation of the European Monetary Union of States like Ireland and France just after Denmark rejected to ratify the Maastricht Treaty -the EMU’s cornerstone- (ibidem).

Furthermore, the purposes and the responsibilities that each Central Issuer had to face were specious and even now -30 years later- it is not clear which of them had the greatest responsibility in the failure of the ERM. Either an attractive Deutsche mark or a poor dollar (with consequences on the reserves of some Nations) or even poor fundamentals of economies like the Italian one (Committee of Governors of the Central Banks of the Member States, 1992) could be drivers of the speculation attacks, but none of them was clearly figured out and removed. Basically, there was no “Clear goal” and consequently no “expectations fulfilment” to demonstrate success and buy credibility in the markets.

What’s more, without an effective enforcement system, there was not enough incentive to restore equilibrium in case of deviation from it. For example, when Germany exceeded the limits fixed for its currency, Bundesbank did not take any action and no higher-rank Institution had the task to do so (Pilbeam, 2013, p. 407). Neither official data nor public critics were effectively used as a stimulus to ameliorate the situation.

### **1.3.3. Complexity is intrinsic in the main monetary policy targets. Inflation and financial stability preserving as complex global phenomena.**

The principal test beds of the soundness of any monetary system are inflation management and financial stability preservation, considering that they imply the viability and the value-conservation of the system itself.

Intuitively, in a so interrelated world economy, inflation represents something to be considered from a global perspective. However, the quantification of the extent of such interrelation points out how any attempt to pursue National solutions is in vain. The totality of the OECD countries has indeed borne long-term fluctuations of price growth, with a rise in the Sixties and Seventies of the past Century and a decline in the 1980s and 1990s, followed by a new upward trend from 2007.

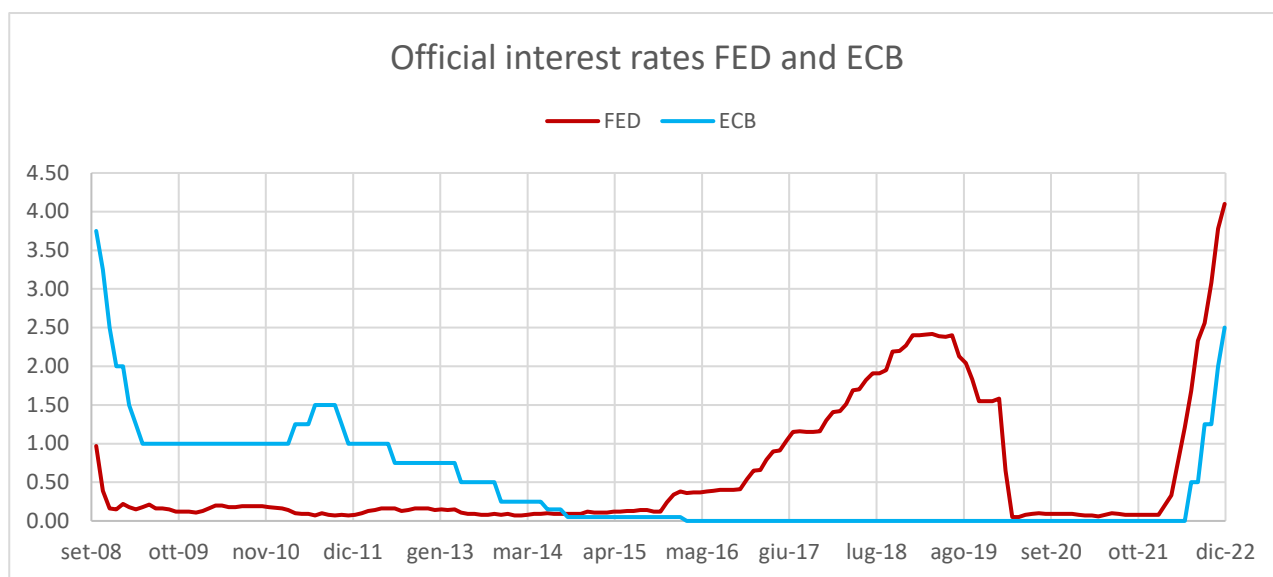
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Moreover, on average almost 70% of the variance of inflation of 22 OECD countries during the Sixties and Seventies is explained by global one. Although such a trend is partially due to the persistence of high inflation, which required economies to make efforts to go back to a low-inflation state (the so-called “run-to-the-mean” phenomenon), the correlation among global and national inflations kept high even for a broader interval of time going from 1960 to 2008. That is particularly true for what is now the Euro Area, where between 76% and 95% of the total inflation variation in the same period can be explained by the global price rise. (Ciccarelli, 2008).

Financial stability does not need any particular data to be perceived as a global phenomenon, given the great examples of the Great depressions following the 1873 and 1929 financial crises, and that of the 2008-2009 Great Recession after Leman Brothers crack of 2008 (De Simone, 2014, p. 90, 193, 265).

The hint is that not only do very close-knit systems need to cooperate within themselves, but they also need to consider other actors in the most difficult moments. Taking the example of the Euro Area and the United States, permanent monetary coordination is not needed, since the wealth benefits it can carry are almost negligible due to the so limited exchange of goods and services (Evi, 2004). That given, in normal periods the risk associated with a lack of coordination is limited and does not require any specific form of intervention by the two Central Issuers. However, when approaching troublesome phases, the necessity of coordination soars, due to an increased risk of contagion between the economies.

The previous statements are confirmed by the data on the policy rates set by the two Central Banks, which show a general near-to-zero correlation of -7.27% in the 171 months included between October 2008 and December 2022 (figure 1.1) but much higher values in shorter periods corresponding to global economic uncertainty phases, such as during Global Financial Crisis and Eurocrisis (2008-2014) and during the inflation phase after the outbreak of Corona-Pandemic and of Ukrainian War. In specific, the correlation between the two sets of data for the 74 months between October 2008 and November 2014 levels up at 69.5%, whereas that for the 17 months going from August 2021 to December 2022 rises even at 94.5% -the shorter term considered plays a role in this second case- (St. Louis Fed, 2023) (European Central Bank, 2023).



**Fig. 1.1** Refinancing rates of Federal Reserve<sup>10</sup> and European Central Bank<sup>11</sup>, October 2008 – December 2022.

Very frequently, macroeconomic fundamentals of the Countries stroke by such disturbances are different, like in the case of 2022 inflation, in which the main driver of European prices run represented by energy costs was not present in North America, but despite that, prices went up as well. The main outline is therefore that money disturbances cross countries following a complex pattern and require as much coordination as possible to be tackled.

### 1.3.4. The cause for “coordination” against fragmentation

Apart from the mindful downsides like competitive devaluations and currency wars, which can ultimately harm global economic growth, lack of coordination results also in a greater fragility in facing complexity. Fragmentation in monetary policy can erode the credibility of central banks, as investors and market participants may become sceptical about the effectiveness and consistency of their policies. A lack of credibility in monetary policy can lead to higher borrowing costs for governments and businesses, which can reduce investment and economic growth. Another bad consequence is the loss of confidence in the global financial system, which can cause investors to withdraw their investments, further harming economic growth. Lastly, a lack of credibility in monetary policy can also make it more difficult for central banks to achieve their policy goals, such as controlling inflation (Lucas R. , 1976) or stabilizing financial markets.

<sup>10</sup> St. Louis Fed. (2023, February). Monthly Federal funds effective rate in the United States from July 1954 to January 2023. Retrieved from fred.stlouisfed.org.

<sup>11</sup> European Central Bank. (2023, February). Fluctuation of the European Central Bank fixed interest rate from 2008 to 2023. Retrieved from ecb.europa.eu.

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To maintain credibility, central banks must ensure that their policies are consistent and transparent and that they communicate effectively with other central banks and market participants. This can help to build trust and confidence in their policies and ensure a stable and prosperous global economy.

#### **1.4. The incapacity of countries such as Italy and France to tackle inflation before the birth of EMU: too many goals with few instruments.**

Another factor that opposes the process of complexity-taming is the inability to use properly disposable tools. What is decided on site of policy-making, is usually not implemented in the same way due to the complex diaphragm between policy and reality -often identified by macroeconomists as internal and external delay, difficulty to formulate economic predictions as well as ignorance of expectations (Mankiw & Taylor, 2015). The capability of overcoming such entangling goes with the correct quantification of instruments.

In his “On the Theory of Economic Policy” (1952), Tinbergen suggested that the number of macroeconomic instruments must be adequate with the number of goals, at least equalising their number and possibly exceeding it. A such hint can be definitely applied also to the job of Central Banks.

##### **1.4.1. The contribution of Tinbergen**

Targets, indeed, present most of the time some kind of *prima facie* incompatibility with each other. Using a limited number of instruments brings therefore to a “zero-sum” effect, in which the pushes coming from the opposing parties annul each trial of acting on the modifiable economic variables.

As Tinbergen affirms, widening the set of tools permits to overcome such incongruences, allowing the policy maker both to act more efficiently and to distribute fairly the weight of every decision to the interested parties (Tinbergen, 1952, p. 41-42).

Applying this theory to monetary policy, it is possible to come up with one of the principles fixed in the introduction as a means to tame complexity: “Clear, measurable, and limited goals”. The direct implications affect the Central Banks themselves as well as, more generally, the whole economic system.

The policy instruments that Central Banks have are basically two, as an outcome of the combination of tools they use. Not only do they control the money supply directly (through a monetary base) or - more often- indirectly (through refinancing rates and minimum reserve requirements), but they also monitor and assure the soundness of the banking and financial system fixing parameters and requirements (such as the previously mentioned minimum reserve). Therefore, what current Central Banks such as ECB have as the purpose is formally coherent with their structure and their tools, two

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main instruments for two main targets: “Here at the European Central Bank<sup>12</sup>, we work to keep prices stable in the euro area. We do this so that you will be able to buy as much with your money tomorrow as you can today. | We also contribute to the safety and soundness of the European banking system. This helps to ensure that your money stays safe in the bank.” (European Central Bank).

Central Banks are not the only actor in the context of monetary policy. The way the economic systems are imagined, planned, and governed accounts for most of the success of the actions of the Central Issuers. The main, trivial, reason is that the legal and institutional choices are what empower CBs to a greater or smaller degree. However, other aspects indirectly influence such power, among these Government budgets as well as the degree of internal competition have an important role in determining the effectiveness of adaptation to complexity.

#### **1.4.2. The overload of Central Banks**

If the considerations above are distended when it comes to policy making, the probability for one State to be overwhelmed by monetary complexity increases dramatically. France and Italy displayed great evidence of such non-observance during the end of the past Century. The two nations had some characteristics in common, that affected their CBs and their National bureaucracy, limiting their capacity to get over the stagflation of the 1970s and 1980s.

In both cases, the complexity was denied through the extreme centralisation of the economy below the control of the central Governments. Banque de France was subject to some political influence by the executive power since Council of Ministers appointed the Governors of the Bank and required the Institution to lend money to supply national overspending (Blancheton, *L'impossible réforme de la Banque de France dans les années 1980, L'autonomie repoussée*, 2018, p. 87-88). It was not until 1993 that the *Banque de France* became fully independent, through a law that granted the central bank complete independence in setting monetary policy and prohibited it from lending money to the government (Blancheton, 2014).

Italy followed a similar pattern, with a highly indebted public sector rescued “voluntarily” by the Central Bank -at least until the so-called “Divorce” of 1981 (Salvemini, 2008) - so that the creditworthiness of the Institute was deeply undermined, even though Governors enjoyed greater independence compared to their French colleagues. *Banca di Italia*'s chiefs as Guido Carli and Carlo Azeglio Ciampi acquired indeed great influence both through official legal prescriptions -such as the lack of the provision of a fixed term until 2005 fixed with the Law of the 28<sup>th</sup> of December 2005, n.

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<sup>12</sup> European Central Bank. (2023). About. Retrieved from [www.ecb.europa.eu/ecb/html/index.en.html](https://www.ecb.europa.eu/ecb/html/index.en.html)

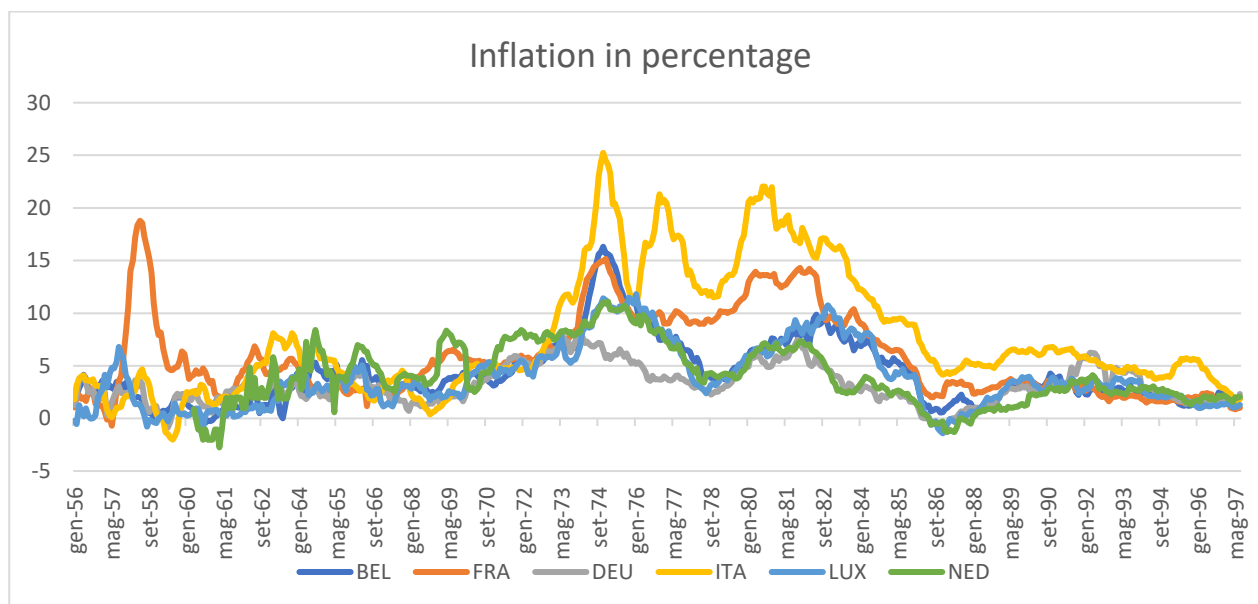


262 (Legge 28 dicembre 2005, n. 262<sup>9</sup> - and through personal influence over the public opinion and economists community (Addis, 1987) but this was not enough to recover swiftly from a history of monetization of public debt.

### 1.4.3. The overload of Central Governments

What the two bordering countries had also in common was the rife presence of public authority in the markets. The so large number of public companies, the trial to control prices artificially, and the abuse of indexation of wages -often overrating either the growing cost of living or the productivity increases- made it impossible to go out deftly from the spiral of inflation of the 1970s and 1980s. The lack of competition in some sectors allowed firms to charge higher prices while price controls<sup>13</sup> contributed to abating competition and created goods and services shortages (Lewis, 1986).

The effect of the political choices presented above is clearly recognisable in the diverging trend of monthly inflation between France and Italy and the other four founding countries of European Communities between 1976 and 1982 (Figure 1.2). After the rise in prices due to oil shocks in the early 70s common to all six counties, Germany and Benelux experienced a deep decline, whereas Italy and France started to experience a decade of untameable inflation, with peaks of 22% in 1980 for Italy and almost 15% in 1982 for France<sup>14</sup>.



**Fig. 1.2** Monthly inflation rate in the six founding countries of European Communities<sup>15</sup>, January 1956- July 1997

<sup>13</sup> The New York Times. (1973, November 3). French Price Controls. The New York Times, p. 35. Retrieved from <https://www.nytimes.com/1973/11/03/archives/french-price-controls.html?searchResultPosition=6>

<sup>14</sup> OECD. (2023, March 27). Inflation (CPI). Retrieved from OECD Data: <https://data.oecd.org/price/inflation-cpi.htm>

<sup>15</sup> ibidem

Italy and France, keeping high the level of national participation within the economic sectors, did not leave to find the right way to boost productivity. Without any increase in productivity, the only possibility to reduce pressure on prices goes with a slowdown of demand and therefore with a lower level of production and labour:  $P - P_{-1} = P^e - P_{-1} + \frac{1}{\alpha}(Y - \bar{Y})$ <sup>16</sup>.

Productivity fosters equilibrium production ( $\bar{Y}$ ), whereas what affects total wealth year-by-year is the short-term production ( $Y$ ), also determining the employment rates. Hence, it is clear that the trade-off between GDP ( $Y$ ) growth and price stability, exists only when no changes in productivity occur.

#### 1.4.4. Limiting complexity forces us to think on just two dimensions.

Taking the example of Italy, it is not by chance that it did not suffer any relevant and prolonged inflationary pressure before WWI and after the European monetary unification. In between, the long period of high statal influence in the economy is remarked by the appearance of the “Phillips-curve”, exactly that one that points out a negative correlation between unemployment -and therefore lower growth- and inflation:  $\pi = \pi^e - \beta(u - u^n) + v$ <sup>17</sup> (Phillips, 1958).

In the period before, Italy had experienced great benefits from market opening, industry take-off, and fixed exchange rate regime (Gold standard) on its prices, while in the period after, the benefits came from the further opening of the economy and the higher credibility of Euro (Baffigi, 2015).

In between, not only did the disinflation need unemployment to rise, but in some cases, such sacrifice was not enough. In Del Boca's study (The Phillips curve and the Italian lira, 1861–1998, 2010), the key finding was that the “sacrifice rate” in moments of high inflation went to infinite, breaking the relationship between the two variables of the Philips curve.

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<sup>16</sup>The equation comes from the derivation of the supply curve operated through the sticky-price model (Rotemberg, 1982), the sticky-wages model (Gray, 1976) (Fischer, 1977), and the imperfect information model (Lucas R. E., 1973).

- Supply curve:  $Y = \bar{Y} + \alpha(P - P^e)$
- Inverse function:  $P - P_{-1} = P^e - P_{-1} + \frac{1}{\alpha}(Y - \bar{Y})$
- Add on both sides  $P_{-1}$ :  $P - P_{-1} = P^e - P_{-1} + \frac{1}{\alpha}(Y - \bar{Y})$

<sup>17</sup> In this equation  $\pi$  stands for the actual inflation,  $\pi^e$  is the expected one,  $u$  is the rate of unemployment, while  $u^n$  corresponds to the level of long-run production  $\bar{Y}$ , and  $v$  is an exogenous variable corresponding to supply shocks. The derivation of such curve is strictly linked to the supply curve analysed previously.

- Starting equation:  $P - P_{-1} = P^e - P_{-1} + \frac{1}{\alpha}(Y - \bar{Y})$
- Add the “supply-shock” component:  $P - P_{-1} = P^e - P_{-1} + \frac{1}{\alpha}(Y - \bar{Y}) + v$
- Substitute the difference in price with the “inflation indicator” ( $\pi$ ):  $\pi = \pi^e + \frac{1}{\alpha}(Y - \bar{Y}) + v$
- Use the Okun’s Law (The Political Economy of Prosperity, 1970) to substitute the change in GDP with the change in unemployment  $\pi = \pi^e - \beta(u - u^n) + v$ . For given capital and given productivity of labour (good approximation of the short-run), any decrease in total production directly affects employment.

## Optimal monetary policy and Phillips curves. The ECB targets in a complex scenario

Going back to evidence that emerged on page 12 -in relation to Tinbergen's contribution- the negation of the existence of complexity -like in the case of a simplistic hierarchy of an economy completely subject to central executive power- the availability of instruments to overcome the limits posed by macroeconomic trade-offs decreases. On the contrary, whenever new variables and a broader approach to complexity are considered, what first seems to be an insolvable trade-off dissolves, leaving space for a solution.

Limiting complexity is like forcing oneself to think in two dimensions in a three-dimensional reality, what length and largeness cannot explain needs width to be understood.

## **2. HOW ECB'S ROLE HAS BEEN CARRIED OUT THROUGHOUT THE LAST 20 YEARS.**

Many of the issues affecting European countries that emerged in the previous chapter have been overcome with the creation of the European Monetary Union (EMU), at least formally.

Some of the best practices followed by the most disciplined and successful countries either inside or outside Europe have been included in the leading principles of the current European Monetary and Executive institution. History itself has provided important lessons that step by step have induced the current Eurozone to follow a specific path since the ratification of the Maastricht Treaty in 1992.

However, even in this case complexity has demonstrated to be a beast difficult to domesticate and often politicians and economists have had to go back to the drawing board, reimagining the instruments, the targets and even the underlying principles of such a Monetary Union. Moreover, even the most accurate methods to face properly a complex adaptive system as the economy of a whole Continent are not always the ones that fit with all the cultures and lifestyles present in Europe.

Hence, the dream of the EMU is everything but something already realised. The outcomes of this experiment in the field of complexity management are far to be understood now.

Going back to the principles fixed at the very beginning, what emerges is that the existence itself of a common monetary union is a result of a process of “Coordination”. The risk of a “war among brothers” attitude, typical of the whole European history, has been formally diminished with the privation of one of the strongest identifying instruments of each state, coinage. As regards “Vertical contraction”, the multiple lessons of the past made it possible to create a central monetary institution based on collaboration rather than on contraposition with private investors: credible, transparent, (Mersch, 2019), and goal-reaching. Moreover, a clear set of principles and values have emerged in the last decade, from Mario Draghi’s “Whatever it Takes”<sup>18</sup> on, passing through pandemic crisis management (Hutchinson & Mee, 2020) response as well as the common answer to the Russian invasion of Ukraine by the Eurozone members. After all these stages, governors and populations of Member States are much more likely to believe in a common destiny, halting the possible outbreak of tensions similar to those that alimanted the early 1990s and early 2010s crises. In a nutshell, the commonality of principles is itself a guidance factor whenever other instruments fail, just contributing to an increase in the “backstop mechanisms” that policymakers have on their side.

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<sup>18</sup> Kennedy, S., & Speciale, A. (2015, July 27). Draghi’s ‘Whatever It Takes’ Marks Three Years Proving Enough. Retrieved from Bloomberg news: <https://www.bloomberg.com/news/articles/2015-07-27/draghi-s-whatever-it-takes-marks-three-years-proving-enough#xj4y7vzkg>

For the “coherency” aspects, there are many challenges to overcome yet. The birth of EMU has indeed occurred in a very premature stage of European unification, which was far from being what Mundell in 1961 defined as an Optimum Currency Area (A Theory of Optimum Currency Areas, 1961), meaning a group of countries for which the increase in benefits outnumbers the increase in social, economic and political costs at the moment they decide to give up monetary autonomy and fix the nominal exchange rates of their currencies.

## **2.1. The lack of coherency in the macroeconomics of the Eurozone, born as a weak currency area**

The exact criteria to define an Optimum Currency Area (OCA) were set firstly by Mundell and his job was later completed by McKinnon (Optimum Currency Areas, 1963) and Kenen (The Theory of Optimum Currency Areas: An Eclectic View, 1981). Such criteria were financial integration, production factor mobility, trade integration, level of product diversification, and degree of similarity in inflation rates. Among them, financial integration was the only requirement completely fulfilled even before the Maastricht Treaty, because the European Single Act had already established the criteria for a unique financial market without any form of capital control in 1986.

### **2.1.1. Trade Integration**

For what concerns trade integration, European Union confirms partially the necessity of developing a single currency<sup>19</sup>, since the portion of trade exchanges that its members have among them is significant if compared to that they carry out with the rest of the world. Anyway, the impact of trade is not so clear to come up with either a negative or a positive judgement over the choice to converge to a unique coinage.

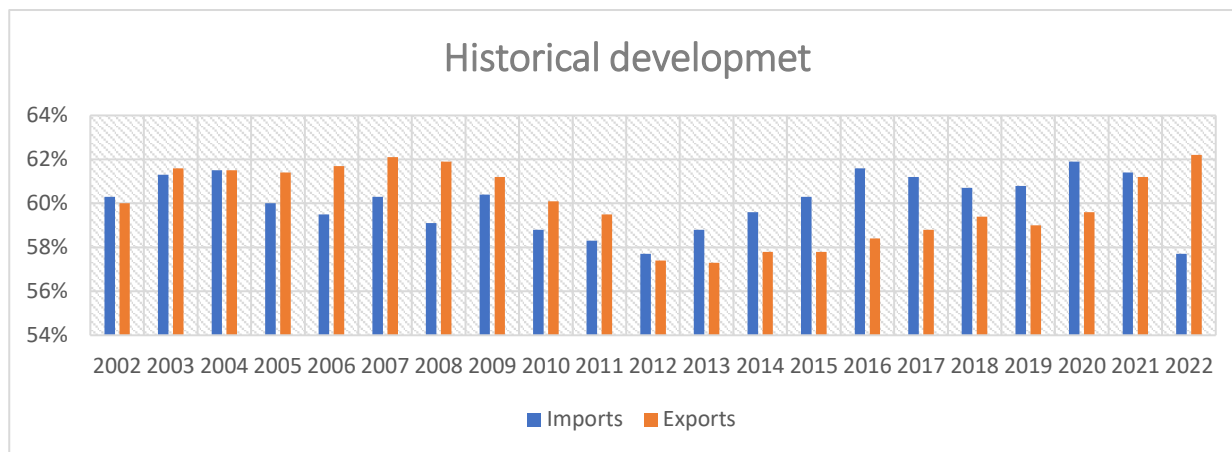
Combining data from Eurostat<sup>20</sup> and World Bank<sup>21</sup> displayed in **figures 2.1** and **2.2**, it is possible to affirm that inter-EU trade is not much more than the one occurring within other trade areas whose countries do not share the same currency, like the one made of the North America Free Trade. Furthermore, there is a great diversity in the degree of trade integration of the different EU countries (**figure 2.2**).

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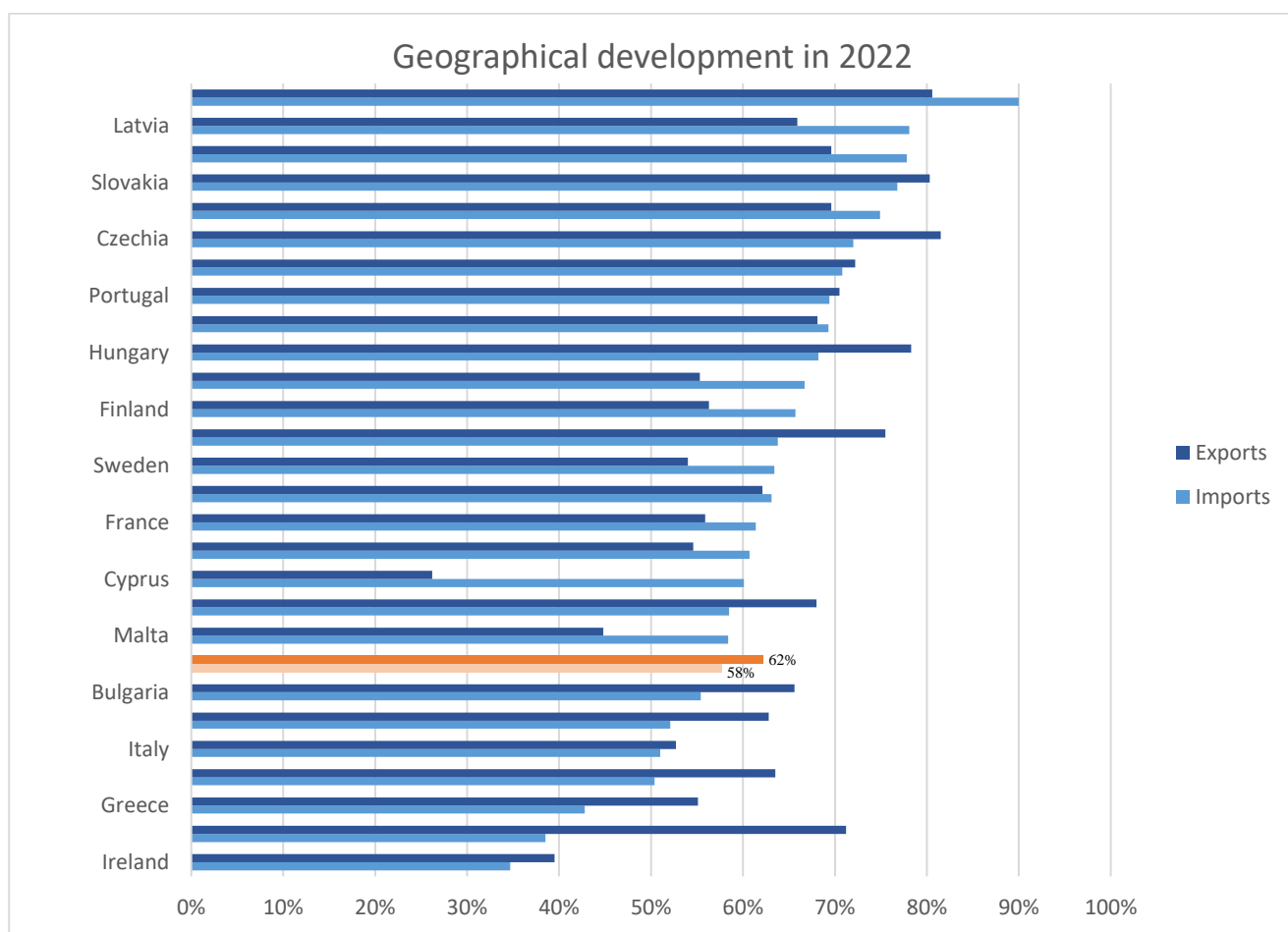
<sup>19</sup> On some occasion European Union and Eurozone are used as synonyms. That is not by chance, but is due to the fact that EU founding treaties suggest the creation of a common currency area requiring the compulsory participation of all the Union’s Members (ex-Article 3 TEU), with the only exception of Sweden and Denmark, that are anyway subjected to a strong influence from ECB decisions and in turn can influence these. All the considerations regarding the long-term view on the Monetary Union are therefore bound to EU characteristics.

<sup>20</sup> Eurostat. (2023, 03 20). Intra and Extra-EU trade by Member State and by product group. Retrieved from Eurostat Data Browser: [https://ec.europa.eu/eurostat/databrowser/view/EXT\\_LT\\_INTRATRD\\_\\_custom\\_5628548/default/table](https://ec.europa.eu/eurostat/databrowser/view/EXT_LT_INTRATRD__custom_5628548/default/table)

<sup>21</sup> World Bank. (2023, March 01). Imports of goods and services (% of GDP); Exports of goods and services (% of GDP). Retrieved from The World Bank Data: <https://data.worldbank.org/indicator/NE.IMP.GNFS.ZS?locations=EU>; <https://data.worldbank.org/indicator/NE.EXP.GNFS.ZS?locations=EU>



**Fig. 2.1** Percentage of trade happening within the EU compared to the total exchanges that EU countries have with the world<sup>22</sup>.

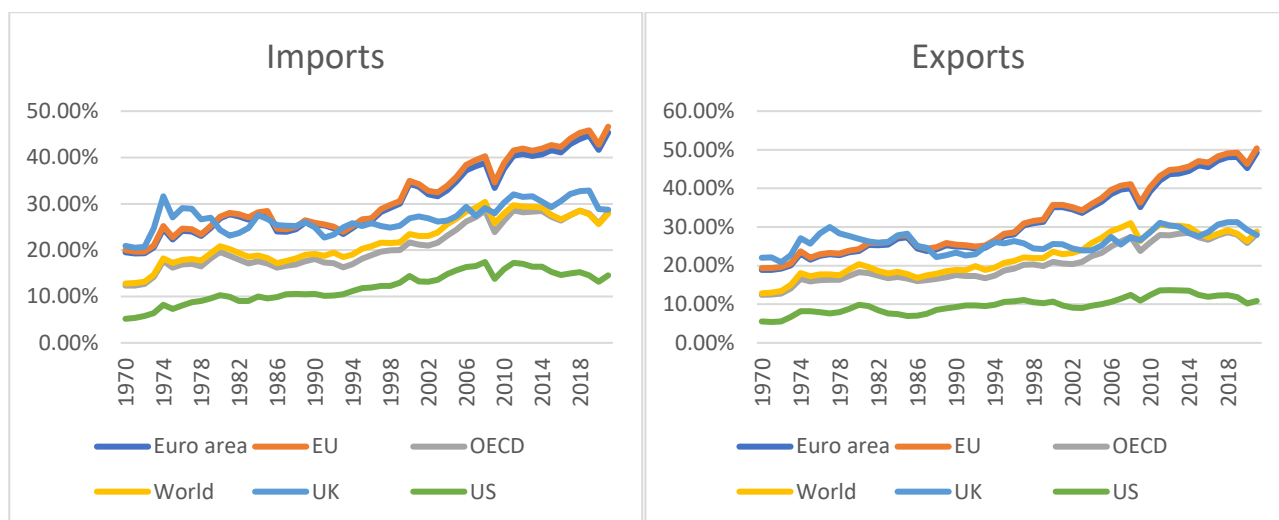


**Fig. 2.2** Percentage of trade happening within the EU compared to the total exchanges that EU countries have with the world in 2022<sup>23</sup>.

<sup>22</sup> Eurostat. (2023, 03 20). Intra and Extra-EU trade by Member State and by product group. Retrieved from Eurostat Data Browser: [https://ec.europa.eu/eurostat/databrowser/view/EXT\\_LT\\_INTRATRD\\_\\_custom\\_5628548/default/table](https://ec.europa.eu/eurostat/databrowser/view/EXT_LT_INTRATRD__custom_5628548/default/table)

<sup>23</sup> ibidem

So, even though European nations show a great -and increasing- level of trade openness compared to the rest of the world (**figure 2.3**), as well as a noticeable and stable degree of trade integration (**figures 2.1 and 2.2**), such evidence is not enough to affirm the necessity of a Monetary Union for trade reasons.



**Fig. 2.3** Degree of trade openness for several countries, showing Import and Exports percentage of GDP<sup>24</sup>.

### 2.1.2. Inflation Rates

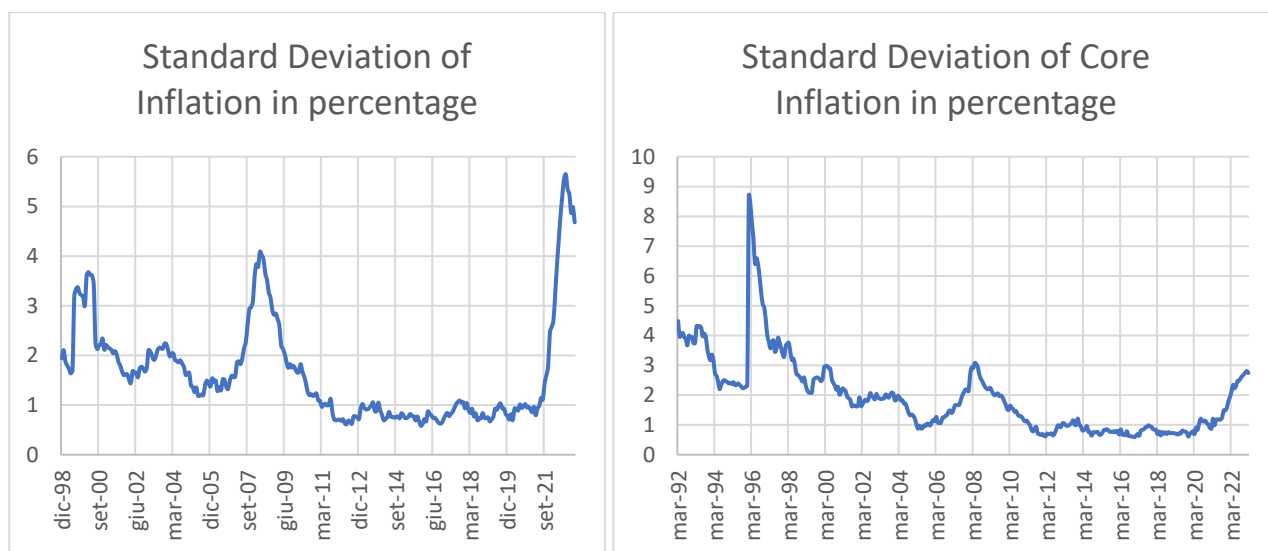
For what concerns inflation rates, the degree of similarity among countries is a necessary condition to avoid significant fluctuations in the real exchange rate and therefore in their respective competitiveness, since no other instrument but deflationary policies can be used to recover such deviation. Ontologically, the nominal exchange rate instrument is not actionable in a common currency area (Mundell, 1961)<sup>25</sup>.

Even in this case, data are partially ambiguous. What can be derived by looking at the variability of headline inflation among the countries is contradicted by core inflation (**figure 2.4**). Core inflation's standard deviation, which is the one more easily responding to Central Banks' action, shows a downward trend over the 30 years displayed, with a peak just before the birth of the single currency, and that is almost trivial considering that the common European Central Bank have subsumed the whole monetary powers of its predecessors. On the contrary, for headline inflation, things have gone

<sup>24</sup> World Bank. (2023, March 01). Imports of goods and services (% of GDP); Exports of goods and services (% of GDP). Retrieved from The World Bank Data: <https://data.worldbank.org/indicator/NE.IMP.GNFS.ZS?locations=EU>; <https://data.worldbank.org/indicator/NE.EXP.GNFS.ZS?locations=EU>

<sup>25</sup> Given the short-term application of this concept, the focus is not on the whole EU, but on the Eurozone. Countries that do not have the same currency can indeed adjust the competitiveness between them leaving the exchange rates to either rise or decrease.

differently and after 20 years the greatest divergences are due just to food and energy, the two components out of ECB control, with peaks in moments of great uncertainty like the global financial crisis of 2008 and post-pandemic inflation of 2022<sup>26</sup>. Paradoxically, under these conditions, European Central Bank is impeded from acting properly just when its action is needed more.



**Fig. 2.4.** For the current members of the Eurozone<sup>27</sup>: on the left is the Standard Deviation of Inflation during the whole life of the Euro, and on the right is the Standard Deviation of Core Inflation (without food and energy) since the year Maastricht Treaty was signed<sup>28</sup>.

The lack of coherence<sup>29</sup> is noticeable just in the paradox mentioned before, the common monetary policy has kept stable the core inflation differentials among countries, whereas the lack of a common energy and food-market integration has prevented such stability to be present in the real life of common European citizens.

### 2.1.3. Product diversification

For product diversification, being among the most developed countries, European economies show a very high propensity to distribute their exports over more categories of products and services. The so low level of export concentration -0.06 according to the United Nations Conference on Trade and

<sup>26</sup> OECD data show that the correlation between total inflation in Eurozone and its variability has been 0.65 for the two decades of life of Euro. Source: OECD. (2023, April 06). Inflation (CPI). Retrieved from OECD Data:

<https://data.oecd.org/price/inflation>

<sup>27</sup> Ibidem

<sup>28</sup> The perspective on the left-hand side highlights the actual inflation, and therefore what the fixed exchange rate have impeded to solve (therefore the interval of time starts just one month before the official introduction of Euro), whereas the point of view on the right regards the more structural components of inflation and therefore needs to take into account also the period between the Maastricht Treaty and the birth of the common coinage.

<sup>29</sup> In this case coherence can be interpreted as a mismatch between monetary decisional centre and food-market and energetic ones.



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Development<sup>30</sup> - assures that in case of worsening in the condition of one industry, such nations can preserve their current account balance even without modifying their nominal exchange rates.

#### **2.1.4. Internal factors mobility: the stationary labour force**

The greatest limit to the process of cohesion for the Eurozone lies in the practical and ethical burdens to production factors' mobility. As Mundell suggested (1961), nominal exchange rate modification is the only way to keep stable the current account of counties when they start to lose competitiveness<sup>31</sup> without using deflationary policies. In the absence of the exchange rate instrument, the reallocation of the production factors is a necessary outcome.

Within a common monetary area, states are left with no choice: if the market considers goods less attractive either for their intrinsic characteristics or for their price, the production factors -considering for simplicity just labour force and capital equipment- have to move towards regions where demand soars. Following this logic, in the long run, the current account of nations keeps stable and all the cyclical mismatches readjust. Intuitively, the theoretical ease of expressing such concepts is far from being applied to the real world.

The issue does not regard capital equipment, since although plants are not so easy to move to different countries once built, the economy adapts to this exigence in the long run. The demonstration is obtained by looking at the gradual offshoring of production occurring worldwide, from places where prices and standard of life are higher to those in which plants' building and running costs are kept significantly lower<sup>32</sup>.

What really concerns policymakers all over the world is the effect on people: the loss of jobs and the worsening of living conditions of citizens of countries that suffer more from the dislocation of production are the greatest pitfalls that every monetary union risks to face. The most direct

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<sup>30</sup> UNCTAD. (2022, October 1). Trade indicators. Retrieved from unctad.org: <https://hbs.unctad.org/trade-indicators/>

<sup>31</sup> Competitiveness is expressed in term of real exchange rate defined as  $Ex^r = Ex^n * \frac{P^*}{P}$ , where:

- $Ex^n$  is the nominal exchange rate of one country, defined as units of inner currency to buy one unit of foreign
- $P^*$  is the foreign level of prices
- $P$  is the domestic level of prices

An increase of real exchange rate determines higher propensity of foreign people to buy inner goods (since they result cheaper) and lower propensity of inner people to buy foreign one (since they result more expensive).

<sup>32</sup> Offshoring has been so intense in some European regions to determine a great amount of job losses. For 2005 the ratio between jobs lost because of offshoring and the total job losses was: 54.7% for Portugal, 29.6% for Austria, 28.8% for Denmark, 25.2% for Slovakia, 24% for Slovenia, 23.6% for Ireland, 15.9% for Finland, 15.7% for Italy, 10.9% for Belgium, 7.2% for Germany, 4.6% for France, 2.3% for Spain and 0,7% for Netherlands (Hatzichronoglou, 2007). Data show significant but not homogeneous impact on employment, meaning that some countries in Eurozone are less vulnerable to offshoring, suggesting that, in some cases, some of them can even benefit from this change in allocation of capital equipment.

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consequence in Europe has been the rising of a bottom-up wave of resentment that undermined the positive spirit of cooperation among populations and made populism blossom.

The remarkable dissimilarities in culture, language, lifestyles and education make Eurozone states unable to fulfil in concrete the people's freedom of movement established by the Single European Act in 1986. Using the USA as a benchmark, it is not a surprise that European Union<sup>33</sup> shows a very poor level of labour mobility. In 2015, in the EU less than 3% of the citizens resided in another EU country, while in the US the percentage was 10 times greater. Analogously, annual mobility flows between states were 0.3% for the EU and 3% for the US (Barslund, Busse, & Schwarzwälder, 2015).

To overcome this impasse, a source of hope can be found in the disruption of the labour market that occurred together with the outbreak of the Covid-19 Pandemic in 2020. The heritage that Eurozone has to preserve from that tragic event is the capacity to dematerialise workspaces in the form of smart working. According to a Eurofound analysis of 2021<sup>34</sup>, in some cases like the Italian one, the number of smart workers increased by 12 times in just one year between 2019 and 2020, and this shows a potential previously undisclosed.

The reason virtualisation is so important is ascribable to its great relevance to the production of tradable goods and services, which suffers more from the dislocation from one nation to another. The growing mechanisation and possibility of remote control could let people create wealth for one firm based in a region of Europe different from the one they live in, with even a positive spillover on Purchasing Power Parity among different areas of the Monetary Union<sup>35</sup>.

## **2.2. The lack of coherence as an institutional problem**

The most significant issues that emerged in the paragraph before are mainly attributable to a wanting institutional approach to complexity. The multiplicity of legislative, executive, and fiscal centres of decision mismatches the unique System of Central Banks.

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<sup>33</sup> The data are referred to the whole EU. As for the case of trade integration, studying EU and Eurozone interchangeably is not a great problem, since the focus is on a long-term aspect of the Monetary Union, which necessarily concerns its eventual bond with the whole European Union.

<sup>34</sup> Krovovay, N. (2021, April 22). Remote working becomes the 'new normal'. Retrieved from eurofound.europa.eu: <https://www.eurofound.europa.eu/publications/article/2021/policy-responses-from-governments-and-social-partners-to-the-covid-19-pandemic>

<sup>35</sup> The Purchasing Power Parity (PPP) is the equivalence between real exchange rates among countries (or regions) so that each citizen has the same economic convenience in buying in one of them. In reality, this condition does not manifest because of differences in productivity among areas for the tradable sectors. Salaries tend to be higher where tradable-sector productivity is too, even though no great changes in non-tradable-sector productivity are recognisable. Such incongruence is the cause of the difficulty to reach PPP according to the Balassa-Samuelson model (Balassa, 1964) (Samuelson, 1964). However, what that model did not include in 1964 was the posthumous possibility to dematerialise job activities and to break the bond between productivity and salaries of one country. Such consideration was out of the main focus of the paragraph but reinforces the importance of virtualisation as form of cohesion among European regions.

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As a consequence, the most useful progresses made in the adaptation to complexity concerned the creation of instruments to overcome this mismatch. Among them, the European Stability Mechanism and the Next Generation EU are the forerunners of the eventual fiscal union that sooner or later will take place.

### **2.2.1. Fiscal cooperation is the cornerstone of institutional coherence**

The ESM, founded in 2012 just after the Euro crisis addresses the necessity to provide the Eurozone members with liquidity whenever markets seem unlikely to do so, and just as its provisional predecessor, the European Financial Stability Mechanism (EFSM) – founded in 2010, has had the merit to lower the perceived country-risk<sup>36</sup> associated with sovereign securities of some countries, diminishing the spread between the yields of the treasury bonds of the most credit-worthy members of Euro area and those of the most likely to default<sup>37</sup>. Until 2022 it has lent 296 billion €, preserving 417.4 billion € capacity (European Stability Mechanism, 2022).

The Next Generation EU (NGEU), with its 806.9 billion € value<sup>38</sup>, is considered an embryonic form of fiscal cooperation in Europe necessary after the shock of the Covid-19 pandemic. While the ESM has had just a backstop function, the NGEU has growth and investment as its main targets, and just for this reason has a more complex funding system which relies for its 30% on NGEU Green Bonds making the European Commission the larger green bond issuer of the world. Moreover, while ESM has taken exclusively the form of a loan -that eventually, beneficiary countries have to give back, even though it happens at a lower interest rate than they would have if borrowing on their own- almost half of the NGEU funds that arrive directly to governments is given as a grant.

What is mentioned above shows that, in the framework of Next Generation EU, not only has the EU directly become a bond issuer, but also a huge wealth redistribution has taken place within it. These are the reasons that allow thinking that fiscal cooperation is about to start after this stage (De Grauwe, 2023).

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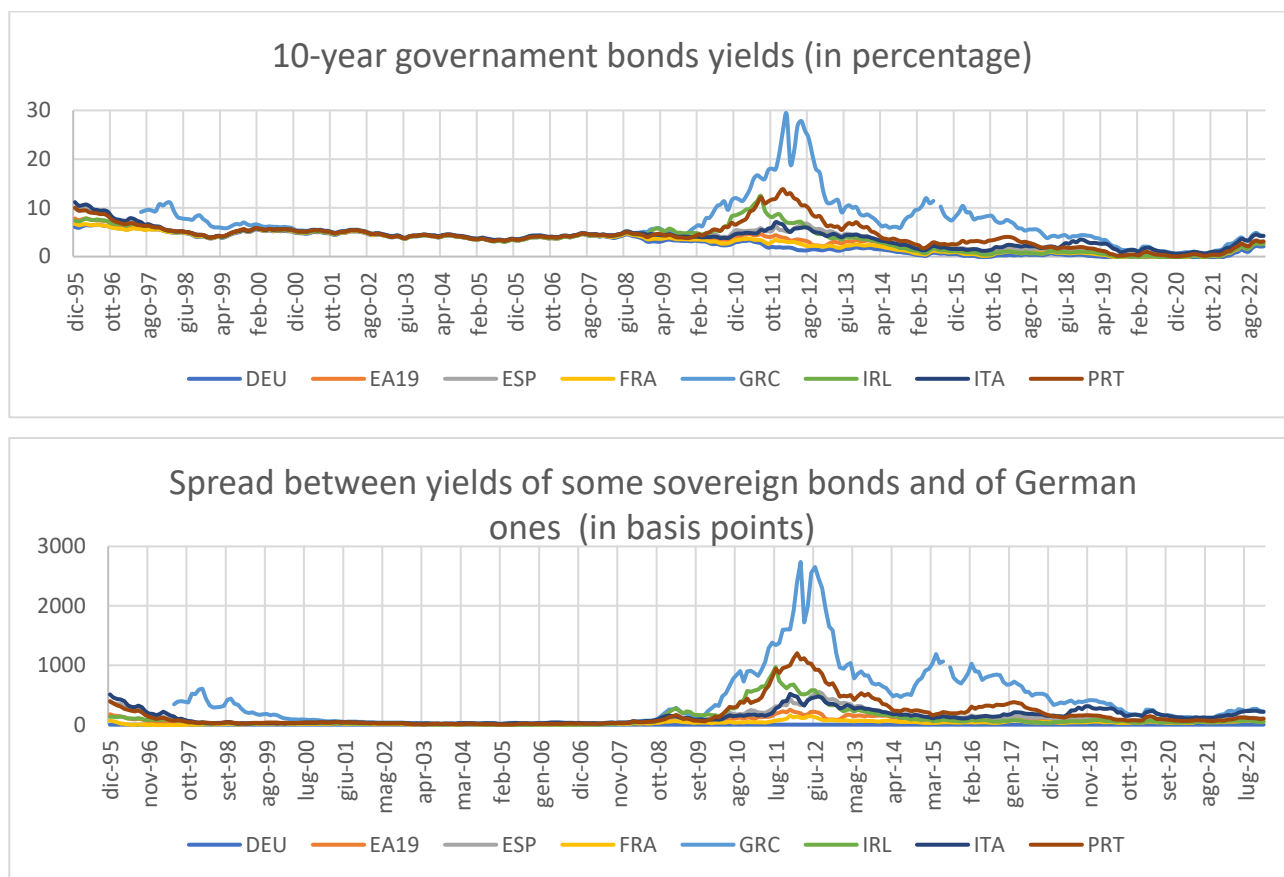
<sup>36</sup> The two types of risk investors face when lending money to a sovereign institution are the currency-risk and the country-risk. The first is linked to the loss of value of the investment caused by the currency, and in a common currency area, its differential is null by definition. The second refers to the impossibility of governments to repay their debt and during the Eurocrisis determined a boom in the interest rates that weaker economies had to pay (Pilbeam, 2013, p. 179-181).

<sup>37</sup> European Stability Mechanism. (2022). History. Retrieved from [esm.europa.eu: https://www.esm.europa.eu/about-us/history](https://www.esm.europa.eu/about-us/history)

<sup>38</sup> European Commission. (2023). NextGenerationEU. Retrieved from [commission.europa.eu: https://commission.europa.eu/strategy-and-policy/eu-budget/eu-borrower-investor-relations/nextgenerationeu\\_en](https://commission.europa.eu/strategy-and-policy/eu-budget/eu-borrower-investor-relations/nextgenerationeu_en)

### 2.2.2. The evolution of the “whatever it takes” approach from a monetary to a fiscal perspective

Although the founding of ESM was meant as a “backstop” instrument in the hands of European institutions, the reluctance of governments to accede to it for both symbolic and factual<sup>39</sup> motivations did not configure it as a completely useful tool.



**Fig. 2.5.** In the upper graph, it is possible to see the 10-year yields of the bonds of the main five countries hit by sovereign debts crisis in the early 2010s (Spain, Greece, Ireland, Italy, and Portugal) compared to those of Germany, France, and Euro area observed as a whole<sup>40</sup>. In the second graph, the same reasoning is repeated for the spread in basis points<sup>41</sup> between German yields and those of other countries<sup>42</sup>. In both cases, data are monthly<sup>43</sup>.

<sup>39</sup> The usage of pre-default funds is the last resource in the hands of governors and can highlight their failures (symbolic deterrence to the usage) and the austerithy conditions that ESM imposes are a factual limit to the eagerness of countries to accede to it.

<sup>40</sup> Croatia is not considered since joined Eurozone on January 2023

<sup>41</sup> 100 basis points are equal to 1% difference in interest rates

<sup>42</sup> the function of studing yields trough the spread is to control for the effect of ECB policies and focus just on the additional country-risk premium required by the markets

<sup>43</sup> OECD. (2023, April 15). Long-term interest rates. Retrieved from OECD Data: <https://data.oecd.org/interest/long-term-interest-rates.htm>

## Optimal monetary policy and Phillips curves. The ECB targets in a complex scenario

The burden of preserving financial viability in the Eurosystem has been therefore borne by the ECB, from 26<sup>th</sup> July 2012 when its President Mario Draghi gave the so-called “whatever it takes” speech, today widely considered as the turnaround point in the European sovereign debt crisis (Benigno, Canofari, Di Bartolomeo, Messori, & Whelan, 2022).

No sooner did Mario Draghi give that speech, than the spread between sovereign titles and the German Bunds dropped, as is possible to see in the second graph of **Figure 2.5**.

The ESM instrument was useful but not enough to free completely the European Central Bank from the burden mentioned above since it could be actionable only by either defaulting or quasi-defaulting economies and in the immediate, that was not sufficient to calm markets and stop the doom-loops that had been triggered since late 2009.

With its unconventional policies<sup>44</sup>, the ECB has changed once and for all the idea that the entire world had of the Eurosystem, partially contradicting the non-bailout principle established with the Maastricht Treaty in 1992. Essentially breaking any form of control over the money aggregates’ growth, the so huge injection of liquidity used to temporarily monetise the debt of some member States has conflicted dramatically with the long-term price stability objective, with the risk of driving Euro countries back to the ages of untamable inflation between the 1970s and the 1980s.

In the absence of the more germane instrument represented by fiscal integration, the Central Bank, such as its predecessors had almost reached a deadlock in 2020. After several years of extremely loose monetary policy, without any remarkable effects on growth (Terzi, 2019), the pandemic required it once again to adopt expansive actions. The contradiction exploded in the Press Conference after the meeting of the ECB Governing Council on 12<sup>th</sup> March 2020<sup>45</sup> – concerning the pandemic side-effects on some Eurozone economies like Italy –, when President Christine Lagarde affirmed that although using full flexibility, the ECB was not there “to close spreads”. The statement caused an immediate soaring of the spread between Italian BTPs and German Bunds until the level of 275.760 basis points<sup>46</sup> was reached on 17<sup>th</sup> March<sup>47</sup>. The debt monetisation backstop was thought to be provisional and short-living, and markets perceived its end clearly from that day on.

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<sup>44</sup> The unconventional monetary policy operations represent a group of actions undertaken by ECB from the Eurocrisis on. The unprecedented shocks that hit Eurozone (financial crisis, sovereign debts crisis and pandemic) forced the Central Bank to introduce instrument not established by European treaties. Their main function has been to increase enormously the liquidity availability for all the actors of the Eurosystem and were mainly addressed to credit institutes and national governments (European Central Bank, 2023).

<sup>45</sup> European Central Bank. (2020). PRESS CONFERENCE, 12 March 2020. Frankfurt am Main: ECB.

<sup>46</sup> Borsa Italiana. (2023, 04 16). Bond Spread Italy BTP-BUND 10 years. Retrieved from [Borsaitaliana.it: https://www.borsaitaliana.it/obbligazioni/spread/italia/btp-bund.en.htm](https://www.borsaitaliana.it/obbligazioni/spread/italia/btp-bund.en.htm)

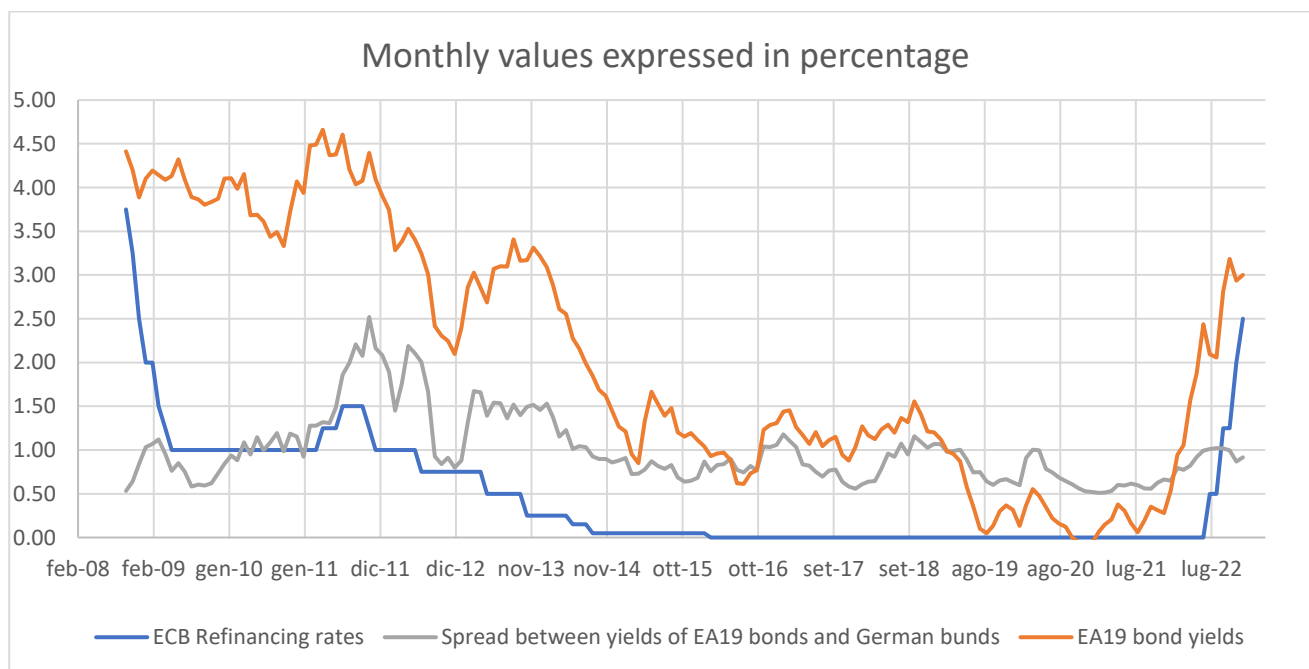
<sup>47</sup> **Figure 2.5** gives also a ballpark figure of what happened in those months.

## Optimal monetary policy and Phillips curves. The ECB targets in a complex scenario

It is not casual that the financial soundness and cohesion of the Continent started to be assured back only when a new, different-in-nature tool was proposed. The German and French proposal of a 500 billion € recovery fund<sup>48</sup> finally broke the so close relationship between European Central Bank decisions and public debts' sustainability with clearly perceivable effects on the spreads from 18<sup>th</sup> May 2020 on (ibidem).

The presence of a complete, growth-oriented fiscal tool, as the Next Generation EU fund had demonstrated to be, freed the Central Bank from the burden of choosing between the financial soundness of highly-indebted States and the targets it had, being the Central Bank of 19<sup>49</sup> nations.

The demonstration of the medium-term success of the embryonic fiscal integration process is the mild way yields of sovereign bonds have grown during the tightening phase of the ECB's monetary policy after the prices rise of 2022. As it is possible to see in **Figure 2.6**, from late 2019 on, bond yields in the Eurozone started to depend essentially on ECB's refinancing rates, meaning a thinning of the risk-premium component that markets required Governments to lend them money. Moreover, not even with the rise of interest rates occurring in 2022, such risk premia have risen considerably. Maybe it is too early to affirm it with extreme certainty, but it seems that the solvability of the Eurozone members to the international financial markets is not supposed to be assured only by the ECB.



<sup>48</sup> BBC News. (2020, May 18). Coronavirus: France and Germany propose €500bn recovery fund. BBC News.

<sup>49</sup> Until December 2022

**Fig. 2.6.** Monthly values of bond yields in the Eurozone<sup>50</sup> and spread between them and yields of German Bunds (OECD, 2023) compared to ECB official Refinancing Interest Rate (European Central Bank, 2023), from the aftermath of the global financial crisis to the end of 2022.

The 2022 tightening of the monetary policy has also been a test of the cohesion of the area. The spread between German Bunds and other bonds has not reflected the rise in official Refinancing Interest Rates, with a positive contribution to the homogeneity of the countries, that allows the Central Bank to use effectively its tools without generating contradictory effects on economies.

The *prima facie* evidence is that some of the requirements needed for the Eurozone to be OCA missing in 1992 and 1999<sup>51</sup> are gradually emerging together with the complexity-oriented evolution this paper is about.

### **2.3. Not all stages are a smooth consequence of the previous, the adaptation to complexity is tough and has a spiral way.**

In complex systems, the whole is not just the sum of its components, but it is something different (Anderson, 1972), subject to randomness, emergence and particular laws that cannot be pre-determined by looking at the components themselves. The economy is often defined as a complex adaptive system (CAS), including heterogeneous economic agents interacting with each other and with the environment, (Eijffinger & Hoogduin, 2018). It is therefore implicit in this definition that in the economic field as well as for any other complex system it is impossible to plan exactly its functioning ex-ante and to predict the totality of the interactions occurring within it. For the Eurozone, these assumptions are the basis of the functionalist theses over the destiny of its institutions.

The functionalist idea was born in the 1950s (Howarth & Loedel, 2005) and reformulated in the 1970s by neo-functionalists (Sweet & Sandholtz, 2012). The core of such a political view was that although an initial degree of substantial imperfection, once established, the European institutional mechanisms would bring themselves to reach the right reciprocal interactions. Just like children dipped abruptly in the water to learn how to float and swim, European Communities' engines were started before being completely ready to work to let them learn how to do so.

Anyway, the previous conclusions must be not considered in their extremes. There is a natural limit for everything to survive, and this paper has as its main task to detect it, understanding whether the Eurosystem lies within the threshold of survival to complexity or not.

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<sup>50</sup> Croatia is not considered since data refer to an interval of time preceding January 2023

<sup>51</sup> Respectively when Maastricht treaty was signed and when Euro was born.

## Optimal monetary policy and Phillips curves. The ECB targets in a complex scenario

Neo-functionalists portrayed spillover effects, from the Single European Act in 1986 (no capital controls) to the creation of EMU through the Maastricht Treaty and to the final complete economic and fiscal integration. They were not so wrong, except for the fact that they could not forecast the so noxious effects on people's lives of the burden of the common institutions during financial and debt crises.

In the course of the whole life of European institutions and, in particular, of Eurozone it is possible to see a spiral pattern of adaptation to complexity, typical of numerous anthropic entities, in line with Hegel's philosophic triadic interpretation of the world.

Taking the example of two principal sets of conditions for the Economic and Monetary European Union established by the Maastricht Treaty<sup>52</sup> and Stability and Growth Pact<sup>53</sup>, it is possible to regard them as a Hegelian thesis, thought to prevent the ECB from monetising national debts, inducing States to keep sound macroeconomic fundamentals. However, the "antithesis moment" would have come sooner or later, and in the history of the Euro, it has materialised in the financial, debt, and pandemic crises. The rigid and frail mechanism imposed at the beginning has been tempered by reality and has adapted to the complexity<sup>54</sup>.

The current situation can be regarded as the synthesis of the triad. The initial principle of keeping the Central Bank free from any responsibility over public debts has been reaffirmed, but the possibilities to do it without risking a series of defaults have grown consistently between 2008 and 2022. In concrete, the Stability and Growth Pact -suspended since the outbreak of the Covid-19 pandemic- is supposed to be reintroduced with modified conditions<sup>55</sup> and a new scenario for common fiscal policy is open.

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<sup>52</sup> Maastricht Treaty conditions regards States willing to join the Economic and Monetary Union (EMU) and requires them to have (ex. TEEC):

- Public debt lower than 60% of the GDP.
- Budget deficit of the last financial year lower than 3% of the GDP.
- Inflation not more than 1.5% higher than the one of the three States with the greatest level of price stability.
- Being part for at least 2 years of ERM (Exchange Rate mechanism), to avoid any kind of sudden devaluation.
- Long-term interest rates not more than 2% higher than those of the three States with the greatest level of price stability.

<sup>53</sup> This pact between member states, ratified in 1997, has the main task to provide stability in the EMU, requiring members to keep medium-term budgetary stance "close to balance or surplus" and introducing penalties with budget deficit beyond 3%. A reference to the need to keep public debt below 60% of the GDP was introduced in 2011. Source: European Commission. (2023). Stability and Growth Pact. Retrieved from Economy and Finance: [https://economy-finance.ec.europa.eu/economic-and-fiscal-governance/stability-and-growth-pact\\_en](https://economy-finance.ec.europa.eu/economic-and-fiscal-governance/stability-and-growth-pact_en)

<sup>54</sup> The non-conventional ECB policies as well as the suspension of the Stability and Growth Pact – going on since 2020 – demonstrate the need to go back to the drawing board of what is required to Member States.

<sup>55</sup> European Commission. Commission proposes new economic governance rules fit for the future. Retrieved from News: [https://malta.representation.ec.europa.eu/news/commission-proposes-new-economic-governance-rules-fit-future-2023-04-26\\_en](https://malta.representation.ec.europa.eu/news/commission-proposes-new-economic-governance-rules-fit-future-2023-04-26_en)



#### 2.4. How to prove the symbiotic adaptation to the complexity

The lack of some characteristics can put Eurosystem in danger while the dialectical confrontation between institutional decisions and the real world takes place. On the other side, such aggregation of nations is not expected to have all the possible instruments always ready, since it is immersed in a complex context that predilects continuous adaptation rather than the ex-ante availability of everything.

At this point, it is necessary to fix some observable data through which determine whether Eurosystem is strong enough to feed on complexity and evolve from it.

Provided that the ECB can act to pursue monetary and financial stability, the experiences of the first two decades of the 21<sup>st</sup> century confirm that it would do “whatever it takes” to preserve the latter, because not only can the danger of the default of some members be catastrophic for the whole Eurozone but also the Central Bank formally has plenty of space to do so by simply buying sovereign (and non-sovereign) securities. For this, the target more likely to be sacrificed is -paradoxically - price stability.

Hence, the real success of such a common currency project is measurable in terms of inflation management, which is also the macroeconomic variable most linked to the credibility of the system and its institutions, as the concept of forward guidance<sup>56</sup> of markets demonstrates (Fellner, Phelps, & Gordon, 1979).

The following chapter will therefore be centred on the capacity of the European Central Bank to escape deadlocks while dealing with inflation, by creating a credible image in the mind of the other economic actors. The estimated slope is also not independent of the conduct of monetary policy. By adjusting its commitment to inflation stabilisation  $\Phi_\pi$ <sup>57</sup>, the central bank can modify the relative volatility of the inflation and the output gap (Eser, Karadi, Lane, Moretti, & Osbat, 2020).

If inflation stabilisation increases without limit ( $\Phi_\pi \rightarrow \infty$ ), the reduced-form Phillips Curve becomes flat (Bharadwaj & Dvorkin, 2018), since the anchored expectation that the market has on inflation breaks the short-term relationship between the output gap (and all the measures that can influence it, such as massive injection of liquidity) and the prices. “The policymaker should therefore promise to react aggressively to deviations of inflation from the target in conducting monetary policy”, with the ultimate consequence of flattening completely the Philips Curve.

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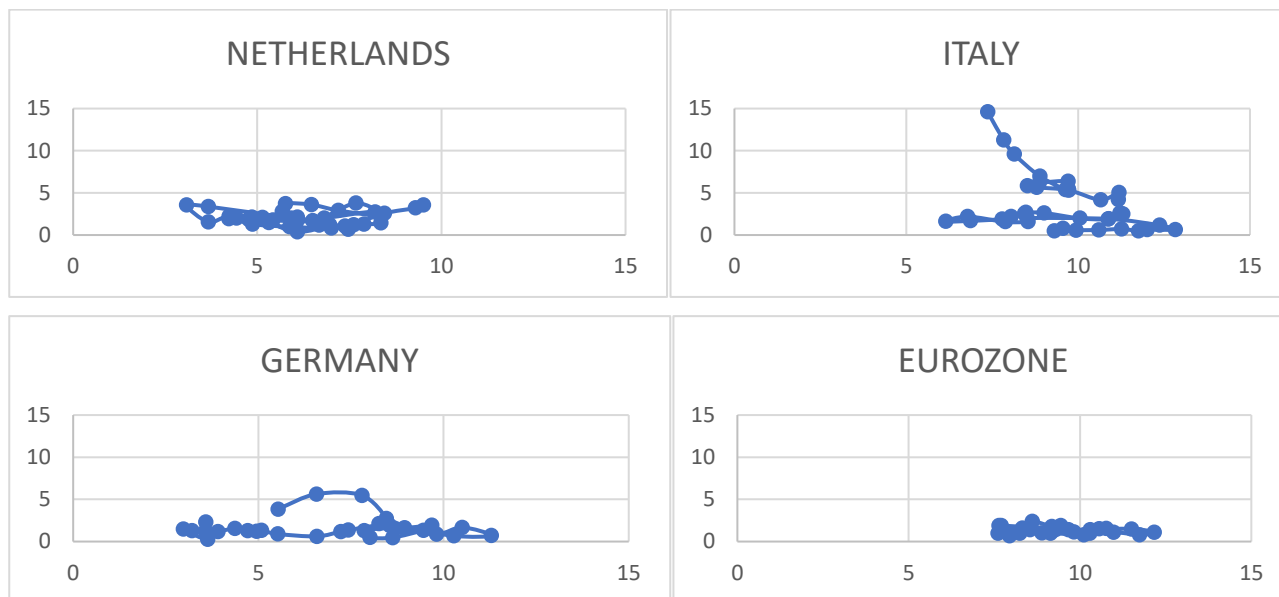
<sup>56</sup> The forward guidance is the capacity of an institution to lead economic actors to the realisation of its own scopes, through a positive and credible collaboration. It is a point that the present paper stresses consistently.

<sup>57</sup>  $\Phi_\pi$  is the interest rate response to inflation (Bharadwaj & Dvorkin, 2018)



### 3. DATA OBSERVATION

The analysis is based on data retrieved from OECD (Oecd data, 2023) on annual unemployment<sup>58</sup> and core inflation<sup>59</sup> and has the purpose to determine the year-by-year evolution of the Phillips curve's slope ( $\beta$ ) for three different Eurozone Members countries and for the whole Eurozone<sup>60</sup>.



**Fig. 3.1.** Plot of the Phillips curve for Netherlands, Italy<sup>61</sup>, Germany<sup>62</sup>, and Eurozone<sup>63</sup>. Unemployment and core inflation are presented respectively on the horizontal and vertical axes<sup>64</sup>. It is possible to see the flattening of the Italian and German curves, while the slope keeps stable for the Dutch and Eurozone ones.

The three states considered are Netherlands, Germany, and Italy, The first two are examples of virtuous inflation management, while the last has often been the contrary. The purpose is to support two theses. The first one is that Phillips Curve has generally flatten for the whole Eurozone, and the

<sup>58</sup> The unemployed are people of working age who are without work, are available for work, and have taken specific steps to find work. This indicator is measured in numbers of unemployed people as a percentage of the labour force, and it is seasonally adjusted. The labour force is defined as the total number of unemployed people plus those in employment. Data are based on labour force surveys (LFS). For European Union countries where monthly LFS information is not available, the monthly unemployed figures are estimated by Eurostat, source: OECD. (2023). Unemployment. Retrieved from OECD data: <https://data.oecd.org/unemp/unemployment-rate.htm>

<sup>59</sup> Inflation measured by consumer price index (CPI) is defined as the change in the prices of a basket of goods and services that are typically purchased by specific groups of households. Each summary measure is constructed as a weighted average of a large number of elementary aggregate indices. Each of the elementary aggregate indices is estimated using a sample of prices for a defined set of goods and services obtained in, or by residents of, a specific region from a given set of outlets or other sources of consumption goods and services.

<sup>60</sup> The Eurozone data refers to the 19 countries that were part of the common monetary union in December 2022 (before the entrance of Croatia), not only during their permanence in the EMU but also previously.

<sup>61</sup> For Italy and the Netherlands, data are available from 1983 to 2021

<sup>62</sup> For Germany, data are available from 1991 to 2021

<sup>63</sup> For Eurozone (excluding Croatia), data are available from 1997 to 2021

<sup>64</sup> OECD. (2023). Oecd data. Retrieved from Oecd: <https://data.oecd.org/>

second is that the benefits that Italy (taken as example) has got in terms of inflation management did not impose a significant cost over the other two countries (taken as examples as well). In line with the literature mentioned in the introduction, and in particular, with Bharadwaj's and Dvorkin's considerations over the slope of the Phillips Curve expressed in "The Case of the Disappearing Phillips Curve" (2018), the gradual decrease in the slope of such a curve is to be considered the sign of a grown capacity of most of the western country to tame inflation through the control of the expectations.

The methodology carried out in this chapter is based on looking at  $\beta$ , showing its general decrease over time. The strong underlying assumption is that the curve is linear. Although there is plenty of factors that can give rise to non-linear effects<sup>65</sup> there is, indeed, no evidence that non-linearity helps in forecasting euro area inflation (Moretti, Onorante, & Zakipour Saber, 2019), especially if other exogenous variables are not considered.

The linear relationship that is measured is therefore:  $\pi_i = \alpha + \beta u_i + \varepsilon_i$ . Where " $\pi_i$ " accounts for inflation, " $u_i$ " is the unemployment, " $\varepsilon_i$ " is the error term, " $\alpha$ " represents the constant term and " $\beta$ " is the slope of the curve.

Basing the  $\beta$  estimations on 19-year intervals, each of them is reported in correspondence to the last year of the interval<sup>66</sup>.

All four sets of data have 2021 as their last year, but they do not begin at the same time. For Italy and the Netherlands, information on inflation and unemployment is available from 1983, while for Germany and Eurozone the starting years are postponed to 1991 and 1997 respectively.

It means that both for Italy and the Netherlands, 21 values of  $\hat{\beta}$  have been determined, whereas they are 13 for Germany and just 7 for the Eurozone.

	NETHERLANDS		ITALY		GERMANY		EUROZONE	
YEAR	I	U	I	U	I	U	I	U
1983	3.539821	9.508333	14.60758	7.366667				
1984	3.200578	9.291667	11.26185	7.833333				
1985	2.565394	8.45	9.578799	8.141666				
1986	1.187779	7.608333	6.973087	8.883333				
1987	0.6846573	7.466667	5.384191	9.633333				
1988	1.046561	7.375	5.53558	9.7				
1989	1.178069	6.675	6.383557	9.7				

<sup>65</sup> Among such factors an ECB document (Eser, Karadi, Lane, Moretti, & Osbat, 2020) presents the downward rigidity of nominal wages and the influence of inflation expectations on price adjustment frequency.

<sup>66</sup> To give an example, the value that  $\hat{\beta}$  is attributed for 2001 is obtained by the regression of inflation and unemployment in the interval between 1983 and 2001 itself.

1990	2.104579	6.083333	6.181182	8.866667				
1991	2.793696	5.675	5.835902	8.516666	3.855886	5.525		
1992	3.716632	5.758333	5.649635	8.791667	5.63017	6.566667		
1993	3.608108	6.466667	5.316476	9.725	5.488068	7.791667		
1994	2.927201	7.191667	4.170759	10.65	2.743748	8.45		
1995	2.293737	8.358334	5.049182	11.18333	2.119275	8.25		
1996	3.773056	7.675	4.194029	11.16667	1.642241	8.941667		
1997	1.689404	6.5	2.603644	11.21667	1.933198	9.675	1.567233	10.75833
1998	2.0604	5.133333	2.482182	11.3	1.354026	9.45	1.517116	10.55
1999	2.235505	4.233333	1.89063	10.86667	0.4798443	8.625	1.149572	9.816667
2000	1.558887	3.666667	1.983422	10.05	0.4989842	8.008333	1.035484	8.883333
2001	3.549433	3.075	2.61927	9.008333	1.28174	7.858333	1.612298	8.308333
2002	3.375993	3.666667	2.667614	8.475	1.569443	8.683333	2.4	8.6
2003	2.014584	5.908333	2.536171	8.433333	0.8899286	9.808333	1.8	9.175
2004	1.534633	6.775	2.207934	8.05	1.683157	10.5	1.9	9.433333
2005	1.188854	6.958333	1.889365	7.783333	0.7235062	11.28333	1.4	9.275
2006	0.3577217	6.083333	1.681551	6.866667	0.6788928	10.275	1.4	8.533334
2007	1.483435	5.308333	1.616669	6.15	1.897852	8.541667	1.9	7.633333
2008	1.841722	4.758333	2.188951	6.775	1.360562	7.425	1.9	7.691667
2009	1.76143	5.425	1.572092	7.875	1.190384	7.225	1.4	9.658334
2010	1.589399	6.066667	1.573095	8.541667	0.6194832	6.575	1	10.28333
2011	1.76072	6.05	1.996946	8.508333	0.9038321	5.516667	1.4	10.29167
2012	2.002047	6.816667	1.910476	10.88333	1.317692	5.083333	1.5	11.5
2013	2.737481	8.191667	1.157523	12.36667	1.225309	4.95	1.1	12.15833
2014	1.421008	8.35	0.6514667	12.825	1.30847	4.708333	0.8	11.73333
2015	1.26856	7.891667	0.6367812	12	1.557151	4.366667	1.1	10.975
2016	0.8100381	7	0.4979809	11.75	1.202826	3.908333	0.8	10.10833
2017	0.9867315	5.875	0.7119514	11.25833	1.214309	3.566667	1	9.133333
2018	1.292799	4.866667	0.5977152	10.6	1.294732	3.208333	1	8.233334
2019	2.005146	4.433333	0.5725608	9.933333	1.477561	2.975	1	7.6
2020	2.125606	4.85	0.4921978	9.3	0.287277	3.625	0.7	7.941667
2021	1.917532	4.225	0.7966448	9.558333	2.334659	3.575	1.5	7.733333

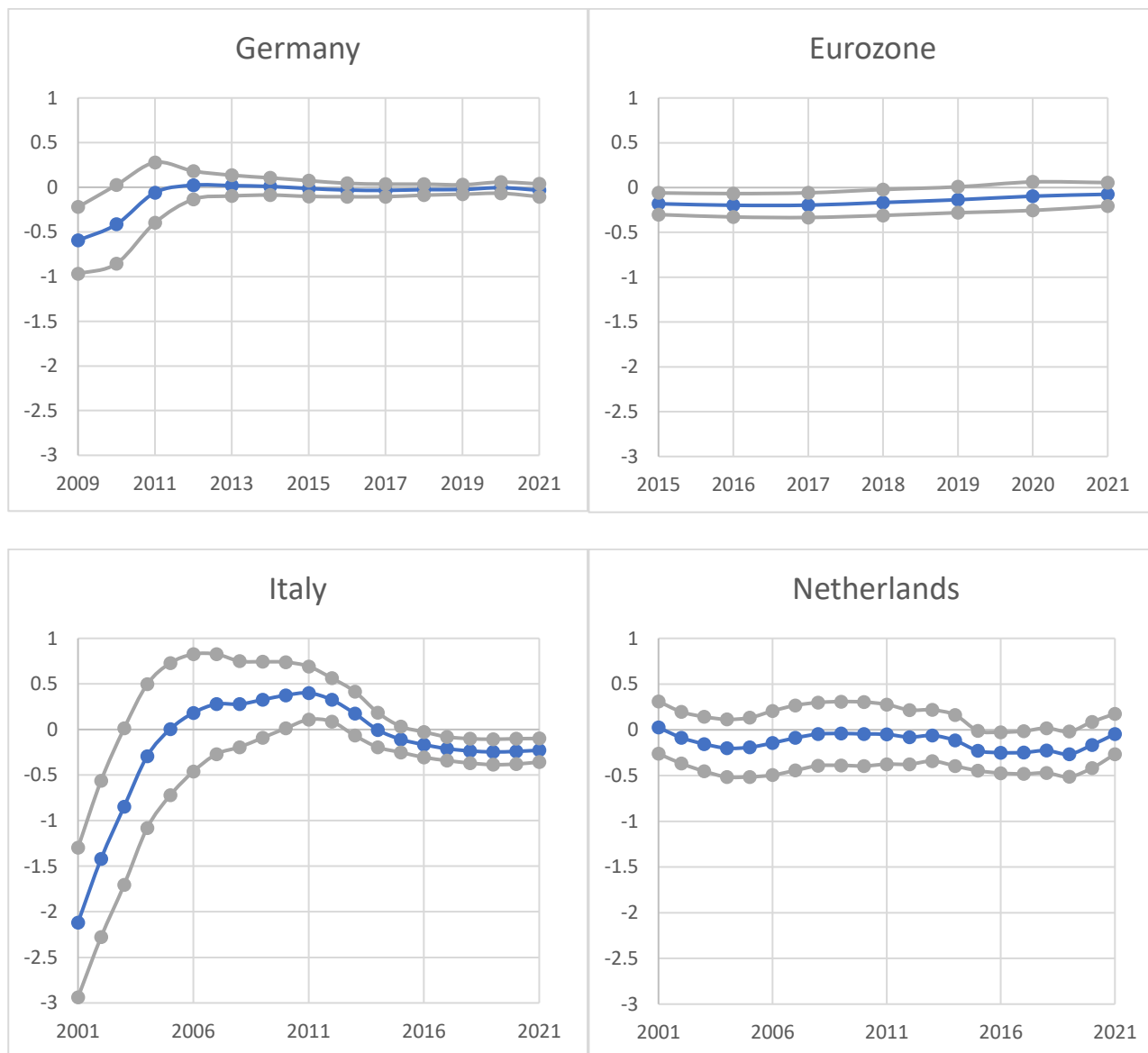
**Table 3.1.** Inflation (I) and Unemployment (U) in the Netherlands, Italy, Germany, and Eurozone between 1983 and 2021<sup>67</sup>.

### 3.1. Estimation of the Phillips curve slope

Among the assumptions typical of linear regression, the independence of regressor ( $u$ ) and dependent variable ( $\pi$ ) values goes far beyond the exemplifications that can be applied to reality to make it fit the model, because annual unemployment and inflation are persistent and self-feeding phenomena. However, the purpose of this work is just to show the weakening of the linear dependence between the two, while pointing out that other variables and autocorrelation can affect inflation much more

<sup>67</sup> OECD. (2023). Oecd data. Retrieved from Oecd: <https://data.oecd.org/>

than the degree of unemployment. For these reasons, the determination of a 95% confidence interval for  $\beta$ , using t-student distribution, can be considered sufficient for the scope of the work.



**Fig. 3.2.** Estimations of  $\beta$  (blue line) and borders of the relative 95% confidence intervals (grey lines). The values of  $\hat{\beta}$  are presented on the vertical axis.

### 3.2. Data interpretation

As it is possible to see in **Figure 3.1**, the four Phillips curves present an overall flat aspect for the last years considered, while some differences among them can be seen for the period preceding the birth of the European Monetary Union, for which Italy and Germany show negative slopes.

The flattening trend is confirmed by the estimations of  $\beta$  for all four curves (as shown in **Figure 3.2**), which gradually stabilise at levels (on average) not significantly different from zero.

## Optimal monetary policy and Phillips curves. The ECB targets in a complex scenario

For what concerns Italy, a huge decrease in the absolute value of the coefficient is evident between 2001 (the year to which information on the 1983-2001 interval is referred) and 2011, moreover, it is even possible to consider a significantly positive value of  $\hat{\beta}$  estimation in 2011. After that,  $\hat{\beta}$  stabilises at a slightly negative level.

The Eurozone shows a slow process of decrease in the absolute value of  $\hat{\beta}$ , similarly, Germany shows a decrease in the slope of the curve, which starting from significantly negative values of the parameter in 2009<sup>68</sup>, keeps null from 2011 on.

The Netherlands, on their side, keep their  $\hat{\beta}$  fluctuating around zero, with a downward pressure between 2014 and 2019, reabsorbed in the following two years.

YEAR	NLD		ITA		GER		EA19	
	$\hat{\alpha}$	$\hat{\beta}$	$\hat{\alpha}$	$\hat{\beta}$	$\hat{\alpha}$	$\hat{\beta}$	$\hat{\alpha}$	$\hat{\beta}$
2001	0.025	0.136	26.015	-2.117				
2002	-0.086	0.135	18.763	-1.419				
2003	-0.155	0.142	12.790	-0.846				
2004	-0.201	0.151	7.022	-0.292				
2005	-0.191	0.155	3.887	0.004				
2006	-0.144	0.168	1.999	0.182				
2007	-0.088	0.170	0.934	0.278				
2008	-0.047	0.165	0.758	0.278				
2009	-0.040	0.166	0.093	0.326	-0.595	7.048		
2010	-0.046	0.167	-0.585	0.376	-0.414	5.354		
2011	-0.050	0.156	-0.994	0.400	-0.060	2.046		
2012	-0.080	0.142	-0.513	0.326	0.023	1.114		
2013	-0.062	0.134	0.689	0.175	0.018	1.078		
2014	-0.117	0.133	2.119	-0.005	0.009	1.113		
2015	-0.229	0.104	2.904	-0.108	-0.014	1.292	3.226	-0.180
2016	-0.250	0.107	3.337	-0.166	-0.031	1.376	3.347	-0.198
2017	-0.248	0.112	3.663	-0.211	-0.035	1.389	3.291	-0.196
2018	-0.227	0.117	3.817	-0.235	-0.026	1.363	2.983	-0.166
2019	-0.266	0.118	3.851	-0.246	-0.025	1.399	2.681	-0.136
2020	-0.165	0.121	3.683	-0.240	-0.005	1.209	2.252	-0.096
2021	-0.046	0.105	3.479	-0.227	-0.034	1.428	2.000	-0.075

**Table 3.2** The table shows development over the time of the estimated<sup>69</sup> values of the Phillips Curve coefficients.  $\hat{\alpha}$  is the estimation of the constant term, while  $\hat{\beta}$  stands for the estimated slope.

<sup>68</sup> A possible explanation for the initial non-zero value of  $\hat{\beta}$  is the presence of the effects of German Reunification in the first data considered, which gave rise to an inflationary environment in the early 1990s.

<sup>69</sup> As described before, basing the estimations on 19-year intervals, each estimation is reported in correspondence to the last year of the interval.

## Optimal monetary policy and Phillips curves. The ECB targets in a complex scenario

The general increase of the  $\hat{\beta}$  coefficient goes together with the decrease of the constant term “ $\hat{\alpha}$ ” (**Table 3.2**), confirming that the reason for the weakening of the relationship between unemployment and core inflation is to be found in the change of other exogenous variables, such as inflation expectations. An important quantitative hint in this sense is given by the values of the coefficient of correlation ( $r_{\alpha\beta}$ <sup>70</sup>) between  $\hat{\alpha}$  and  $\hat{\beta}$ , which is “-0.844” for the Netherlands, “-0.986” for Italy, and “-0.998” for Germany and Eurozone.

The main outcomes of this analysis are two. The first one is that, although giving the possibility to more frail states to gain credibility and soundness, the Monetary Union has not imposed any relevant cost (in credibility terms). The second is that -provided its capacity to influence expectations- the European Central Bank has enough room to intervene successfully both in the banking (and productive<sup>71</sup>) system and keep its credibility in inflation management.

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<sup>70</sup>  $r_{\alpha\beta}$  is the sample correlation coefficient, calculated on the estimated value of  $\alpha$  and  $\beta$ :  $r_{\alpha\beta} = \frac{s_{\alpha\beta}}{s_{\alpha}s_{\beta}}$

<sup>71</sup>The impact of the unconventional ECB policies carried out during the 2010s is accounted as the cause of almost 50% of the GDP growth in the Eurozone in 2018. Source: Lane, P. R. (2019, September 4). The Phillips Curve at the ECB. 50th Anniversary Conference of the Money, Macro & Finance Research Group. ECB. Retrieved from European Central Bank: <https://www.ecb.europa.eu/press/key/date/2019/html/ecb.sp190904~4deab30349.en.pdf>



## CONCLUSIONS

The birth of the European System of Central Banks has been an important stage in the process of European unification and it is a matter of common interest trying to understand if such a stage happened at the right moment and with the right conditions.

The correctness at issue is to be found in the capacity of the European Central Bank to answer to the complexity of the economy more organically and successfully than the Central Issuer of the States that are now part of the Eurozone. After having fixed some criteria and having considered them as necessary to obtain a successful response to the complexity, the work has examined the correspondence of the mentioned criteria to what has been carried out by the Central Bank during its whole life.

The successful response cited above has been tested in terms of the ability to address the targets that the ECB has imposed itself, which consist of price stability and soundness of the banking (and financial) system in the Eurozone.

The multiple happenings of the economic history can force the ECB to sacrifice one of the two goals in order to pursue the other, and the one that is more likely to be abandoned is just inflation management, as demonstrated by the policies carried out in the 2010s. The massive injection of liquidity of the 2010s, indeed, on one side has saved the stability of highly indebted states, but on the other has put in serious danger the price stability. That given, the quantitative proof of the ECB's effectiveness in taming complex situations can be found in the low level of inflation it has been able to maintain on average as well as in the capacity to escape the deadlocks of a steep Phillips curve. As shown in the third chapter, under European Central Bank the relationship between core inflation and unemployment has remained stably null for the “virtuous” members of the Eurozone (such as the Netherlands) while decreasing substantially for historically less creditworthy countries (such as Italy), with an aggregate increase in the capacity to use inflation expectation as a further monetary tool.

The thesis presented in the work is far from being confirmed once forever since some of the positive outcomes of this work can not only be attributed to the good adaptation to complexity but also to the contingent macroeconomic happenings, such as the heavy deflationary environment that for the interval between 2008 and 2021 has hit the Eurozone. A complete judgement over the destiny of the Eurozone and its ability to adapt to complexity is too early to be expressed, and a lot of studies have to be conducted on the medium-term consequences of the post-pandemic inflation that has hit Europe since 2022 and on the way the Eurosystem will address them.

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