Introduction

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In 1999 the European Central Bank (ECB), together with the National Central Banks (NCBs) of the countries that had just adopted the euro, launched a major research initiative to study the transmission of monetary policy. The objective was to put together, in a reasonably short time, a comprehensive body of information on how the monetary policy of the newly created central bank would affect the economy of the 'euro area'.[1] In December 2001 this research was presented to academics and central bankers in an international conference at the ECB. This book brings together, in revised and shortened form, all the contributions presented at that conference.[2] It also includes a summary of the discussion and some further papers that, owing to time constraints, could not be presented then. For the reader, this book provides an overview of the project results and access to the most comprehensive set of analyses on the working of the single European monetary policy yet published.

Knowledge of the transmission mechanism is needed to determine how the monetary policy instruments should be set to achieve the desired goals. Interest rate decisions by central banks always rely on some explicit or implicit understanding of the transmission mechanism. Moreover, ideally this understanding suggests also how to *efficiently* achieve the monetary policy goal, i.e. limiting undesired side effects on other economic variables besides the ones the central bank is directly responsible for. Finally, understanding the transmission mechanism is critical for the external communication of policy. A central bank that uses this information well in explaining its actions can normally be more articulate, convincing and effective, other things being equal.

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[1] The euro area is composed of all the countries that have adopted the euro as their currency. Currently, the area includes twelve of the fifteen countries belonging to the European Union (the exceptions being Denmark, Sweden and the UK). The Eurosystem includes the ECB and the euro area NCBs.

[2] The papers presented at the conference have been published in the ECB Working Paper Series, nos. 91–114. The conference, entitled 'Monetary Policy Transmission in the Euro Area', was held at the ECB on 18 and 19 December 2001. Its program can be accessed at www.ecb.int.

When, in 1999, the ECB Governing Council started making monetary policy decisions for eleven sovereign countries[3] and a community of about 300 million Europeans, information on the euro area monetary policy transmission mechanism was extremely limited. The Bank for International Settlement (BIS) had in 1995 published a systematic set of simulations conducted on central bank econometric models, with harmonised criteria, showing the effects of monetary policy in a broad group of countries, including eight of the present euro area members. Additional research, by academic economists and central bankers, had provided other perspectives. Moreover, the research staff of the NCBs has considerable in-house knowledge of the national economies, much of which was of potentially great value for understanding the transmission mechanism. This expertise, largely unpublished, was available to the ECB decision-making bodies. But other crucial elements were missing. First, many of the existing analyses employed long data samples, going far back in time; this made the results potentially misleading since economic structures and institutions are changing over time. Secondly, most of these analyses, especially some of the studies of micro data, were country-specific, whereas the ECB needs evidence for the euro area as a whole. Lastly, the existing knowledge was fragmented and could not easily be pieced together to form an overall picture. In short, the regime shift entailed by the European Monetary Union (EMU) necessitated a fresh look at the transmission mechanism.

Some strategic choices on the direction of the project were taken at the outset and influenced the whole course of the work. These choices will be discussed in detail in the book, but we will also summarise them here because they help the reader understand the logic of the individual chapters and the links among them. This is the objective of the next section. The following section provides an overview of the results of the whole project and guide the reader through the structure of the book. A short section on the organisation of the research team concludes this introduction.

1   Fundamental issues in studying the transmission of monetary policy in the euro area, and the approach taken by the Eurosystem research team

1.1   *Area-wide versus country-level analysis*

The ECB aims at maintaining price stability for the euro area over a medium-term horizon. Unnecessary fluctuations in output and other

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[3] Greece, the twelfth country to adopt the single currency, joined the euro area in 2001.

relevant economic variables should be avoided.[4] This implies that an analysis of monetary policy transmission for the euro area aiming to have policy relevance should, as a matter of priority, yield information on how monetary policy influences euro-area-wide price dynamics over time. Moreover, it should indicate how other relevant economic variables might be affected during the adjustment process following a monetary policy change.

Though the analysis ultimately needs to produce aggregate results, there are several reasons why the problem cannot be approached *only* by a direct analysis of euro area-wide macroeconomic variables (such as money market interest rates, monetary and credit aggregates, output and prices). First, most existing euro area data are aggregations of national variables over a time when countries still conducted independent national monetary policies. Such *synthetic* variables, which include pre-1999 data, are likely to violate the criteria for valid aggregation. Before 1999, even the definition of an area-wide monetary policy stance is problematic. Hence, the analysis conducted with synthetic area-wide variables, while potentially useful, ought to be validated and cross-checked with other analyses.

Second, at present, the richest statistical data for monetary transmission analysis still refer to national economies, not to the euro area. The European statistical office (Eurostat) and the ECB produce only a limited number of harmonised EMU-wide macro series. Many of these series are built up by collecting information that is released at different points in time for individual countries. Thus, policy-makers out of necessity have to interpret national data as they become available in order to make an early assessment of area-wide conditions. This is further complicated because the national statistics themselves are in many cases heterogeneous, in quality and coverage. This calls for econometric analyses at the country level, tailored to the existing statistics. Thirdly, country-level analyses are also justified by the potential existence of national differences in the transmission mechanism, owing to differences in economic and financial structures.

To balance these concerns, euro area-wide data were analysed to obtain estimates of the aggregate impact of monetary policy. These estimates were compared with estimates using national sources to verify the area-wide figures, and to obtain additional details on the distribution of the effects and on the importance of different transmission channels. Moreover, extensive use of national sources permitted the researchers to exploit their country-specific institutional knowledge.

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[4] See Issing *et al*. (2001) and the January 1999 issue of the *ECB Monthly Bulletin*.

4   *I. Angeloni, A. K. Kashyap and B. Mojon*

1.2   *Use of pre-EMU data for post-EMU inference*

All the chapters of this book contain empirical analyses using data *prior*
to the introduction of the euro in 1999. The aim is to obtain evidence for
which one can claim validity *after* 1999. The changeover to a new cur-
rency is a policy regime change of major proportion, to which the 'Lucas
critique' which states that changes in policy regimes may alter private eco-
nomic behaviour forcefully applies; this raises serious potential objections
to the validity of the results. One obvious response is that there were, and
still are, no alternatives to the use of pre-1999 data for a comprehensive
investigation of the euro area monetary transmission process while anal-
ysis (let alone monetary policy) cannot wait for long data samples to be-
come available. But this cannot be, and in our view is not, the only answer.

A number of elements support the validity of a selective use of pre-1999
data. First, EMU was a gradual process. It included a prior convergence
in policies and economic performance during which economic agents
had time to prepare and adjust. Much of this adjustment is likely to have
occurred before 1999, but some took place even after the new currency
was introduced. Data prior to 1999 are likely to contain early informa-
tion about the new regime. The use of panel data, extensive in parts 3
and 4 of this book, is intended *inter alia* to reduce the need for a long
time-series dimension. Moreover, panel data might help in identifying
structural parameters that can be viewed as approximately constant dur-
ing the transition. Furthermore, the approach taken in the project, to
cross-check different sources of evidence using alternative methodolo-
gies and data, should be of help. In cases where instability is significant,
it is likely to induce different effects on different tests; put differently, in
cases where many indicators point in a similar direction this is unlikely to
be due to chance, while a finding that different indicators yield different
conclusions suggests that more cautious conclusions should be drawn.
All this said, it is clear that, as more data from the new regime become
available, our results and conclusions will require closer and more intense
scrutiny. The findings here should be taken as a tentative benchmark for
these future investigations.

1.3   *Choice of data and economic sectors under investigation*

In addition to area-wide and national aggregate data the research team
also worked extensively with panel data on banks and non-financial firms.
These sectors and this type of data were chosen for several reasons. First,
the Eurosystem experts had some comparative advantage in using some
of the panel data. One source of advantage arises because some of the

data, in the case of the supervisory information on banks, are collected by central banks and not typically available to other scholars. In other cases, such as with the firm panels, the NCB economists had extensive experience working with these data. Bank- and firm-level data happen to be potentially very relevant for the transmission of monetary policy. Commercial banks, as described in chapter 14, play a dominant role in the financing of investment expenditures in the euro area, and a small but increasing one in financing consumption. Moreover, the structure of the euro area banking system (characterised on average by small-sized banks and strong bilateral ties with borrowers) creates potentially the conditions for a bank lending channel to be present. The literature in recent years has repeatedly explored this hypothesis, and has provided partly different answers. In any case, a strong focus on banks in this project was a natural choice. Regarding firms, their role in the transmission of monetary policy – determined essentially by the way pricing and expenditure decisions are influenced by monetary policy via interest rate and financial channels – is clearly also a central one.

A third factor was that some other options that might be equally important simply could not be explored because of data problems. In particular this project provides little information on household responses to monetary policy changes. Neither broadly homogeneous households' data panels (as in the case of banks and firms), nor good aggregate national and area-wide series (for example, separating durable from non-durable consumption) are available in the euro area yet. As these data differ significantly across countries in terms of coverage and definitions, the analysis would have lost much of its comparative content and area-wide relevance.

While the joint use of micro and macro data proved very fruitful in this project, such use was not free of difficulties. Micro data do not respect macroeconomic accounting identities, owing to the differences in data sources and coverage, in collection methods, etc. Making the link between the results coming from different data requires judgement. Explicit discussion of the difficulties involved in making these judgements is contained in the summary chapters bringing together different sources of evidence (see especially chapters 7, 14 and 24).

1.4   *Choice of the modelling strategy*

The choice of data is sometimes linked to that of model specification: for example, for panel data the set of econometric techniques and model specifications is rather standard. When analysing aggregate macroeconomic series, the choice-set is broader. In particular, structural models,

VARs, and various combinations of semi-structural models have all extensively been used for analysing the transmission mechanism.

We do not wish to enter here into the debate on the relative merits of these models. The empirical VAR literature on monetary transmission published in recent years is so vast, and its role in academic and policy discussions so prominent, that VARs had in any case to be part of a comprehensive research on the transmission mechanism. Accordingly, chapters 2 and 3 examine the VAR properties of the area-wide data (with the US results used as a benchmark) and of the national data.

At the same time, given the data limitations and the pitfalls deriving from structural change, VARs, in which the use of theoretical priors is willingly limited, would not alone constitute a sufficient approach. Structural analysis offers a way to incorporate prior knowledge in a systematic manner. Hence, extensive use was also made of a variety of structural econometric models, for the whole area and for the countries separately (chapters 4, 5 and 24), and their results were compared and cross-checked with the VAR results (mainly in chapter 24).

2   Summary of findings

Three chapters in the book (7, 14 and 24) provide partial summaries of the findings. This section puts in a nutshell the main findings of the whole project, reviewing the macroeconomic evidence first, followed by the micro-firm and the micro-bank evidence. We highlight only the findings which were corroborated by different sources of evidence.

Starting from the macro evidence, the analysis suggests that the basic business cycle properties of the aggregate euro area economy appear remarkably similar to those of the USA (chapter 1). Chapter 2 shows that a number of familiar patterns emerge when a standard VAR is fitted to synthetic euro area data, i.e. a tightening of monetary policy leads to a decline in output with the maximum response between one and two years after the policy change. Output returns towards baseline in the long run, as consistent with monetary neutrality, and prices are estimated to decline gradually, responding much more slowly than output. Several structural models yield similar patterns (chapters 4 and 5). The VAR results confirm the fact that the lags with which monetary policy affects prices are long and uncertain, which suggest that monetary policy should take a medium-term orientation and not engage in fine-tuning.

Besides these similarities, there are also two important differences between the ways in which monetary policy appears to operate in the USA and the euro area. First, the estimated impact of the exchange rate on prices and output seems, in the short run, larger for the euro area than for

the USA. However, the role of the exchange rate in the transmission of monetary policy should in our view be discounted because there is much uncertainty about the link between monetary policy and the exchange rate (see the discussion in chapters 5 and 24).

Second, the adjustment of euro area output in the wake of a monetary policy change appears to be primarily driven by investment changes. The evidence for the USA is that monetary policy seems to have (relatively) stronger effects on consumption than investment. This difference is being explored in follow-up work.

The country-level macro analysis follows two complementary approaches. First, chapter 3 analyses the impact of monetary policy in euro area countries prior to 1999, using VAR models that explicitly take into account the different nature of the exchange rate constraint faced by each country within the European Monetary System (EMS). The analysis shows how this constraint can be modelled using three different VAR specifications. Second, chapter 5 reports the results of a coordinated simulation of NCBs of their own country for an EMU-like interest rate shock. Both approaches suggest that the results found for the euro area as a whole by and large correspond with those for the individual countries.

Cross-country comparisons of the magnitude of GDP and prices' responses to interest rate shocks are difficult. Previous studies do not agree on these magnitudes for different euro area countries. The rankings based on the VARs and on structural models also differ somewhat. These differing findings could reflect a lack of statistical power, given the myriad special factors during the recent, short sample periods that are typically studied, or may accurately signal that there are no true differences in the effects of monetary policy across euro area countries. As experience with the single monetary policy accumulates, we expect to be able to much more confidently judge the size of these magnitudes and better determine whether or not policy has asymmetric cross-country effects.

The micro evidence on non-financial firms' investment (chapter 7, drawing on chapters 8–13) provides further insight into the response of investment to monetary policy shifts. In particular, firm-level estimates show that the elasticity of the capital stock with respect to the user cost of capital is significant in Austria, Belgium, France, Germany, Italy, Luxembourg and Spain. The point estimates of the elasticity cluster between -0.1 and -0.5, and essentially all of them are significantly lower (in absolute terms) than -1. These findings are important because the macro evidence had suggested that investment responses accounted for a substantial portion of the adjustment after a monetary policy change.

However, the interest rate effects on investment through the user cost of capital are not the only transmission channel. In most countries, cash

8   *I. Angeloni, A. K. Kashyap and B. Mojon*

flow is also a driver of investment. Cash flow effects tend to be stronger
for sub-samples of firms with low collateral values. But there is no single
sample split of firms that consistently identifies firms with different cash
flow sensitivity of investment in all countries. Moreover, chapters 7 and
24 show that the impact of changes in interest rates on the cash flow of
firms is not economically significant in all countries.

There are also a number of recurring patterns regarding the response
of the lending behaviour of banks to monetary policy shocks (chapter 14
and the country case studies of chapters 15–23). Aggregate national and
bank-level estimates show that the long-run effect of an increase in in-
terest rates is to reduce loan growth in most countries (Finland, France,
Germany, Greece, Italy, the Netherlands, Portugal and Spain). While this
could reflect either loan demand or loan supply, subsequent tests suggest
that, in most countries, loan-supply shifts are contributing to this decline.

However, loan-supply effects differ from those that have been shown
for the USA. The key factor in Europe seems to be whether banks are
holding high or low levels of liquid assets. The banks with more liquid
asset holdings show weaker loan adjustments in the wake of changes to
the short-term interest rate. But, in contrast to the USA, monetary policy
does not have stronger effects on the lending of small banks, or banks with
low ratios of capital to assets in most of the European countries studied.
These findings could be attributable to a number of the structural char-
acteristics of European banking markets. In particular, the importance
of banks' networks, state guarantees and public ownership is likely to
weaken the importance of bank size and capitalisation (these aspects are
discussed in chapter 14) as determinants of loan-supply shifts in the busi-
ness cycle.

The overall judgement that emerges concerning the role of financial
factors generally, and of the bank lending channel in particular, in the
transmission of monetary policy is mixed. On the one hand, the joint read-
ing of the micro and macro evidence (chapter 24) suggests that, both in
the euro area and in the majority of the component countries, the classic
'interest rate channel' is sufficient to explain the broad patterns of the
responses of the economy to monetary policy. From this viewpoint, the
observed pro-cyclical patterns of several monetary and credit aggregates
could be interpreted as largely demand-driven. On the other hand, the
micro estimates, as we have seen, support the idea that there are sys-
tematic cash flow effects on firms' expenditures and that bank lending
supply amplifies, at least to some extent and for some types of banks,
the effects of monetary policy changes. This suggests that, at least when
certain categories of banks meet certain categories of borrowers, financial
factors and lending constraints are likely play a role. This evidence could

be seen as supportive of an active role of bank balance sheet aggregates in the transmission of monetary policy.

Finally, chapter 6, written by a Bank of England team led by Charlie Bean, was commissioned specifically for the December 2001 conference. This chapter is the only one that does not focus on the euro area, but provides additional perspectives and elements of comparison for the other results presented in the book. Chapter 25 contains an edited transcript of the concluding discussion of the December 2001 conference, with interventions, among others, by Ben Bernanke, Xavier Freixas, Ben Friedman, Vítor Gaspar, Jürgen von Hagen and Christopher Sims. Finally, chapter 26 brings together various pieces of statistical information on the economic and financial structures in the euro area, used as background during the course of the work.

Each chapter in this book is signed by the author, or group of authors, mainly responsible for the analysis and the draft contribution. However, much more than is usually the case in edited volumes, each chapter was subject to intense scrutiny and peer review by the overall team that participated in the project. The summary chapters, in particular, were discussed and reviewed many times. The version in which they appear now is, to a large extent, the result of collective ideas and contribution.

3 Directions for future research

Most findings in this book call for further investigation and confirmation, particularly when longer data samples and richer statistics for the euro area become available. Moreover, there are many aspects that the project, owing to a lack of time or data, left open for the future.

A major area that clearly calls for further work relates to the response of private consumption to monetary policy. The tentative evidence and inference presented in chapter 24 suggests that the response of European consumers to monetary policy changes may be different – and on the whole more muted – than that of the consumers in the USA. Why do the USA and Europe seem to differ with respect to consumption behaviour? Is it a structural difference – linked, for example, to intertemporal preferences, and hence possibly long-lasting – or is it due to other less fundamental and more transient factors? Is convergence to be expected?

A second critical question is why inflation seems to respond so sluggishly to policy shifts. From where do these patterns of persistence originate? Are they more relevant in some countries than in others, and if so, why? Will the present patterns of inflation persistence continue now that a single currency is used across the whole euro area?

Finally, the analysis of euro area monetary transmission will use more and more post-1999 data. Initially, such investigation will concentrate on banking and financial markets, for which high-frequency data exist. Later on, the empirical analysis can gradually be extended to other sectors. It should be of particular interest to look for any changes that may have occurred as a result of the policy regime shift, which may provide a test for the empirical relevance of arguments based on the Lucas critique.

4   Organisation of the research team

The team of researchers who carried out this work, called the 'Monetary Transmission Network', included Ignazio Angeloni, Michael Ehrmann, Reint Gropp, Benoît Mojon, Frank Smets and Philip Vermeulen (ECB); Anil Kashyap (University of Chicago Graduate School of Business and NBER); Paul Butzen and Catherine Fuss (Banque Nationale de Belgique); Heinz Herrmann, Ulf von Kalckreuth and Andreas Worms (Deutsche Bundesbank); Ignacio Hernando and Jorge Martinez-Pagés (Banco de España); Jean-Bernard Chatelain (then at the Banque de France and now at LEO, Université d'Orléans and CEPREMAP), Claire Loupias and André Tiomo (Banque de France); Patrick Sevestre (Banque de France and Université Paris XII Val-de-Marne); Sophocles Brissimis (Bank of Greece and University of Piraeus), Nicos Kamberoglou and George Simigiannis (Bank of Greece); Don Bredin and Gerard O'Reilly (Central Bank of Ireland); Eugenio Gaiotti, Leonardo Gambacorta, Andrea Generale and Daniele Terlizzese (Banca d'Italia); Patrick Lünnemann and Thomas Mathä (Banque centrale du Luxembourg); Leo de Haan (De Nederlandsche Bank); Sylvia Kaufmann and Maria Valderrama (Oesterreichische Nationalbank); Luísa Farinha and Carlos Robalo Marques (Banco de Portugal); Jukka Topi and Jouko Vilmunen (Suomen Pankki). The views expressed in the book should not be attributed to the institution to which the authors are affiliated.

In addition, the following persons participated in one or more meetings: Luigi Guiso (University of Sassari and Ente Einaudi); Jeremy Stein (Harvard University); Raf Wouters and Annick Bruggeman (Banque Nationale de Belgique); Fred Ramb (Deutsche Bundesbank); Gert Peersman (then an intern at the ECB and now at the Bank of England); Juan Ayuso (Banco de España); Anna-Maria Agresti, Gabe de Bondt, Jaak Claessens and Julian Morgan (ECB); Rolf Strauch (then at the Deutsche Bundesbank and now at the ECB); Dario Focarelli, Francesco Lippi and Fabio Panetta (Banca d'Italia); Sandrine Scheller (Banque centrale du Luxembourg); Ad Stokman and Marga Peeters (De Nerdelandsche Bank); and Bernardino Adao (Banco de Portugal).