

HETEROGENEITY, COMMONALITY AND
INTERDEPENDENCE IN THE EURO AREA:

Size and Dynamics of Fiscal Spillover Effects in
macroeconomic-financial linkages

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Abstract

The paper develops empirical measures to estimate the strength and dynamic of fiscal spillover effects in the Euro Area. It moves for estimating a Bayesian VAR model of real and financial variables in order to examine in depth economic policy coordination and policy making, with a strong attention on the current financial crisis. Spillovers are estimated recursively with weakly-exogenous common factors. The aim of the project accounts for interdependencies across countries within the Euro Area and derives impulse response functions and conditional forecasts with the output of an Monte Carlo Markov Chain (MCMC) routine. However, the paper attempts to estimate the systemic contribution and cross-country transmission of unexpected shocks on the productivity in the EA between June 1995 and March 2014. Overall, the positive impact on outputs in the financial dimension indicates the importance of coordinated fiscal actions in the EA. Shocks overflow in a heterogeneous way across countries. Moreover, financial variables show higher amplification of spillover effects which can be seen as a result of increased interdependence between variables. Finally, the analysis is consistent and robust with the more recent literature on business cycles, which recognizes the importance of both group-specific and global factors in evaluating cross-country spillovers and responses to an unexpected shocks.

Keywords: Fiscal Policy, Cross-country Spillovers, Impulse Responses, Conditional Forecasts, Bayesian VAR, Financial Crisis, Common Features, Causality, Catching-up, Competitiveness.

Contents

Non-Technical Summary	2
Conclusion	5

Non-Technical Summary

In the debate on global imbalances, the euro area countries did not receive much attention so far. While the current account has been close to balance over the past decades at the aggregate level, divergences between individual member states have increased since the introduction of the common currency. Disparities across the member states are striking, for example persistent current account deficits of Portugal, Ireland, Greece, and Spain (PIGS) are accompanied by huge surpluses in Germany, Austria, and Netherlands.

Since the Euro started¹, the most research findings focused on debt dynamics, current account balances, contagion effects, and fiscal rules. However, there are many channels and factors through which macroeconomic and financial linkages can be analyzed. For instance, they can arise by a deterioration of financial conditions affecting the economy through a negative wealth effect on consumption and investment decisions. Additionally, business cycles, demographic developments, and fiscal policy are important determinants of empirical realisations of inward growth spillover effects. Furthermore, the European integration process certainly made stronger interdependencies across countries to a fiscal shock. On the other hand, in the meantime tight institutional and economic interdependencies may have made euro area countries more alike, the recent recession has shown that there may still be a substantial degree of heterogeneity, with some common behavior, in real and financial linkages across countries. In addition, those linkages may have changed over time because of economic/institutional implications. Up to now, research on these issues have still not been analysed in the necessary depth. The aim of the project is to try to fill this gap, accounting for break-time effects, time-varying variables, and macroeconomic-financial linkages.

This paper addresses the topic of commonality and heterogeneity across countries and over time within the euro area. It analyzes sign, dimension, and transmission of fiscal spillover effects across countries, with a particular emphasis on the recent recession and fiscal consolidations. Finally, it quantifies the prominent role of transmission channels and economic/institutional implications in driving height difference and spreading of shocks and *cause-effect* relationships. The project accounts for a BVAR model where real, financial, and

¹The euro area consists of those European Union (EU) Member States which have adopted the euro as their single currency. The euro area were introduced on 1 January 1999, as stage III of economic and monetary union began, in 11 countries and expanded through a series of enlargements to 18 countries, so far.

selected *latent* factors² are jointly modelled for a total of 12 countries of the eurozone for the period from 1999 to 2014. The project runs out evaluating a Seemingly Unrelated Model (SUR) in order to analyze the evolution (and, hence, strength and dynamic), commonality, and heterogeneity of fiscal spillover effects in macroeconomic-financial linkages. The selected eurozone countries are: Italy (IT), Spain (ES), France (FR), Belgium (BE), Netherlands (NL), Austria (AT), Germany (DE), Finland (FI), Luxembourg (LU), Ireland (IE), Portugal (PT), and Greece (GR). The first 11 countries are the founding euro-area Member States. On 1 January 2001, Greece joined the euro area.

The analysis confirms the need to allow for cross-country and cross-variable interdependence and the importance of economic/institutional implications when studying real-financial linkages. The empirical model including real and financial variables for the countries of the EA12 identifies significant spillovers. A shock to a variable in a given country affects all other countries and the transmission is more intense among financial variables, mainly during the recent fiscal consolidations. This result seems to prove higher interdependencies among financial variables and consolidations occurred simultaneously behind more coordinated fiscal actions across members states. During the financial crisis, the imbalances have been reduced and the evidence found seems to believe that the global imbalances will decline in the period ahead.

However, growth shocks spill over in a heterogeneous way across countries, with some common behavior. This latter increased during financial crisis in its financial dimension and even more in its real dimension. The common component is larger during recent fiscal consolidations.

In addition, country-specific factors remain very important in explaining the presence of a heterogeneous pattern in real-financial linkages. Moreover, they are potentially strongly sensitive to trade and capital flows (selected to measure transmission channels) and to common and idiosyncratic factors (selected to measure economic and institutional implications) across countries of the eurozone. The analysis accounts for national policy factors (final consumption, unemployment rate), competitiveness factors (unit labour costs, international investment positions), and private factors (household's private consumptions). The result is consistent with the more recent literature on business cycles and effects of fiscal policy, which recognizes the importance of existing transmission channels of spillovers and the determinants generating inward and outward growth spillovers.

These findings cast a new perspective for theoretical models of idiosyncratic business cycles and policy making.

From a modelling perspective, the analysis appears to favour models that assign an important role to *catching-up* and competitiveness factors in explaining current account imbalances and debt dynamics. Moreover, transmission channels suggest that trade channels matter relatively less than financial channels. Growth shocks appear to be predominantly transmitted via financial linkages. The interdependence is stronger in financial dimension, while real component shows higher degree of heterogeneity and it is mainly affected by latent

²Latent or hidden factors are variables that are not directly observed but are rather inferred from other variables that are observed and, hence, directly measured.

confounding effects. The results are consistent with the recent literature which recognizes the importance of accounting for both country-specific and global factors when studying real and financial interactions. Moreover, the analysis is consistent with the premise that for countries to be an important source of growth spillovers, growth should rely on a greater extent of autonomous domestic sources.

From a policy perspective, several considerations can be displayed. First, despite high degree of heterogeneity, countries of the eurozone share common financial shocks and, hence, the analysis is in line with rapidly increasing cross-border trade and financial linkages. Second, despite a common monetary policy, national policies of fiscal policy, investments, and structural reforms in labour and complementary markets remain heterogenous across the euro area. Thus, national authorities may be tempted to design domestic policies so as to counteract world conditions, but those policies may be ineffective and counter-productive for the domestic economy. Third, structural differences among national policy may also be driven by idiosyncratic business cycles and, hence, the importance of accounting for transmission channels and latent confounding effects. Fourth and probably most importantly, divergence across countries were driven by different degrees of productivity growth.

Conclusion

The paper develops an approach to conduct inference in time-varying coefficients using a Bayesian multicountry VAR models with lagged cross-unit interdependencies and unit-specific dynamics. Bayesian computations are used to estimate and restrict the coefficients to have a low-dimensional time-varying factor structure. The specification model uses a hierarchical prior for the vector of factors in order to permit exchangeability, time variations, and heteroskedasticity in the innovations in the factors. An overparametrized VAR is transformed into a parsimonious SUR model where the regressors are observable linear combinations of the right-hand side variables of the VAR, and the loadings are the time-varying coefficient factors. Generalized impulse response functions and conditional forecasts are obtained with the output of an MCMC routine.

The evidence would confirm the need to allow for cross-country and cross-factors interdependencies when analyzing macroeconomic-financial linkages. Net spillover matrices including real and financial variables for the EA12 are constructed to define total bilateral net spillover effects. They incorporate feedback effects from the impulse variables and temporary or persistent long-run effects of potential shocks that may lead to contagion. Analyzing the entire time-series period, shocks spill over in a heterogeneous way across countries, more intensive among financial variables. This finding accounts for higher amplification of spillover effects which can be seen as a result of increased interdependences between variables.

In this paper, spillovers are defined as the transmission of an unexpected but identified shock from one variable to receiving variables in the system. Accounting for cross-country and cross-variable interdependencies, conditional forecasts for bilateral trade and capital are computed. In this way, the model is able to investigate interactions between real and financial variables and to capture changes of interdependencies over time. Following the definition by Allen and Gale (2000), the contagion index proposed in this paper is defined as a consequence of excess spillover. Thus, extreme amplification of spillover effects can be seen as alarming levels which could lead to contagion. Optimal policy coordination in the Euro Area would have required a differentiation of consolidation efforts depending on the fiscal space to minimise the negative spillovers. Spillovers of fiscal consolidations are larger in financial dimension. Larger output effects prove that consolidations occurred simultaneously. The positive impact on outputs of most members in the financial dimension indicates the importance of coordinated fiscal actions in the Euro Area.

After estimating different specification of this model, the highest marginal likelihood was found for the model including four country-specific component for each economy, four variable-type components, and two common components for all series. These common, country-specific and variable-type components quantify the relative contribution of common and heterogenous factors in macroeconomic-financial linkages and help to address the following questions: Is there a significant common component in the real and financial interactions across eurozone members or do country-specific heterogeneities matter more? How did *weights* and *outliers* factors affect real economy and financial variables over time? What is the importance of transmission channels and latent confounding effects when studying growth shocks across countries within a common currency area?

Here, some considerations are in order. Country-specific factors remain very important explaining the presence of a heterogeneous pattern across members. However, interactions between real and financial dimension are important to understand co-movements in economic activity. Thus, bilateral trade and capital conduct a prominent role when analyzing foreign and domestic policies. Highly indebted countries were forced into taking wide-ranging austerity measures, having lost access to the financial markets. This has led to call for stronger cross-country differentiation and for temporary stimulus measures in countries not facing financial market pressure. Therefore, cross-border spillovers have exacerbated the negative effects of consolidations. This finding accounts for a substantial degree of heterogeneity in real dimension and a deeper interdependence in financial dynamic.

These findings cast a new perspective for theoretical models of idiosyncratic business cycles and policy making.

From a modelling perspective, the analysis appears to favour models that assign an important role to *catching-up* and competitiveness factors in explaining current account imbalances and debt dynamics. Moreover, transmission channels suggest that trade channels matter relatively less than financial channels. Growth shocks appear to be predominantly transmitted via financial linkages. The interdependence is stronger in financial dimension, while real component shows higher degree of heterogeneity and it is mainly affected by latent confounding effects. The results are consistent with the recent literature which recognizes the importance of accounting for both country-specific and global factors when studying real and financial interactions. Moreover, the analysis is consistent with the premise that for countries to be an important source of growth spillovers, growth should rely to a greater extent on autonomous domestic sources. Nevertheless, testing for commonality and heterogeneity, the idiosyncratic components in driving fiscal shock transmissions is high, suggesting the necessity of accounting also for growth shocks outside the EMU that are to a relatively larger extent transmitted via trade. Finally the analysis is consistent with the possibility that larger co-movements or macroeconomic-financial linkages observed, mainly in the last recession, could be more related to the size and height difference of the shocks than to the intensification of their transmission.

From a policy perspective, several considerations can be displayed. First, despite high

degree of heterogeneity, countries of the eurozone share common financial shocks and, hence, the analysis is in line with rapidly increasing cross-border trade and financial linkages. Although early indications suggest that the imbalances have been reduced and the eurozone countries are weathering the current *storm* during current recession, without the appropriate adjustment of the private and public sector, euro area imbalances could pick up again if the macroeconomic conditions normalize. Second, despite a common monetary policy, national policies of fiscal policy, investments, and structural reforms in labour and complementary markets remain heterogeneous across the euro area. This might have contributed to the emergence of different country-specific developments of competitiveness, consumption, investment, and production structures affecting national economy. Thus, national authorities may be tempted to design domestic policies so as to counteract world conditions, but those policies may be ineffective and counter-productive for the domestic economy. Third, structural differences among national policy may also be driven by idiosyncratic business cycles and, hence, the importance of accounting for transmission channels and latent confounding effects. Fourth and probably most importantly, divergence across countries were driven by different degrees of productivity growth. Thus, in the euro area, structural reforms without coordinated national fiscal actions affect the adjustment capacity of the currency union as a whole because of high degree of divergence.

These considerations raise interesting questions that could be addressed in future research. (i) The importance of fiscal and monetary policy interactions in a currency Union when analyzing macroeconomic-financial linkages. (ii) International business cycles play a prominent role with countries endogenously reacting to foreign impulses.

Bibliography

- [1] Allen F. and Gale D. (2000), 'Financial Contagion', *Journal of Political Economy*, vol. 108, no. 1, pp. 1-33.
- [2] Alvarez J. and Arellano M. (2003), 'The Time Series and Cross-Section Asymptotics of Dynamic Panel Data Estimators', *Econometrica*, vol. 71, no. 4, July 2003, pp. 1121-1159.
- [3] Bénassy-Quéré, Agnès (2006), 'Short-Term Fiscal Spillovers in a Monetary Union', *Working Paper*, no. 13, July 2006.
- [4] Barassi M. R. and Hall S. G. (2002), 'Interest Rate Linkages: A Kalman Filter Approach to detecting Structural Change', *Working Paper*, Department of Economics, University of Birmingham, August 2002.
- [5] Beetsma, Roel, Giuliodori M. , and Klaassen F. (2005), 'Trade Spillovers of Fiscal Policy in the European Union: A Panel Analysis', *Working Paper*, De Nederlandsche Bank, no. 52, August 2005.
- [6] Blanchard O. J. and Perotti R. (2002), 'An Empirical Characterization of the Dynamic Effects of changes in Government Spending and Taxes on Output', *Quarterly Journal of Economics*, vol. 117, no. 4, pp. 329-1368.
- [7] Canova F. and Pappa E. (2002), 'Price Dispersions in Monetary Unions: the Role of Fiscal Shocks', *CEPR Discussion Paper*, no. 3746.
- [8] Canova F. and Ciccarelli M. (2009), 'Estimating multicountry VAR models', *International Economic Review*, vol. 50, no. 3, August 2009.
- [9] Canova F. , Ciccarelli M. , and Ortega E. (2012), 'Do institutional changes affect business cycles? Evidence form Europe', *Journal of Economics Dynamics and Control*.
- [10] Catrina L. (2012), 'Fiscal Compact between growth and debt crisis resolution', *European Journal of Science and Theology*, vol. 8, June 2012, pp. 5-14.
- [11] Cerra V. and Saxena Sweta C. (2008), 'Growth Dynamics: The Myth of Economic Recovery', *American Economic Review*, vol. 98, no. 1, March 2008, pp. 439-457.

- [12] Ciccarelli M. and Rebucci A. (2007), 'Measuring Contagion Using a Bayesian Time-Varying Coefficient Model', *Journal of Financial Econometrics*, no. 5, pp. 285-320.
- [13] Chib S. (1995), 'Marginal Likelihood from the Gibbs Output', *Journal of the American Statistical Association*, vol. 90, no. 432, December 1995, pp. 1313-1321.
- [14] Chib S. (1996), 'Calculating posterior distributions and modal estimates in Markov mixture models', *Journal of Econometrics*, no. 75, 1996, pp. 79-97.
- [15] Chib S. and Jeliazkov I. (2001), 'Marginal Likelihood from the Metropolis-Hastings Output', *Journal of the American Statistical Association*, vol. 96, no. 453, March 2001, pp. 270.
- [16] Constancio V. (2012), 'Contagion and the Europe debt crisis', *Financial Stability Review*, no. 16, pp. 633-672.
- [17] Corsetti J., Kuester K., Meier A. and Muller Genot J. (2012), 'Debt Consolidation and Fiscal Stabilization of Deep Recessions', *American Economic Association*, vol. 100, no. 2, pp. 41-45.
- [18] Creel J., Hubert P., and Saraceno F. (2012), 'The European Fiscal Compact: A Counterfactual Assessment', *Journal of Economic Integration*, vol. 27, no. 4, December 2012, pp. 537-563.
- [19] Dungey M. and Fry R. (2009), 'The Identification of fiscal and monetary policy in a structural VAR', *Economic Modelling*, vol. 26, pp. 1147-1160.
- [20] Engle R. B. and Granger C. W. J. (1987), 'Co-Integration and Error Correction: Representation, Estimation, and Testing', *Econometrica*, vol. 55, no. 2, March 1987, pp. 251-276.
- [21] Forni M. and Reichlin L. (1998), 'Let's get real: A factor analytic approach to disaggregated business cycle dynamics', *Review of Economic Studies*, no. 65, pp. 453-473.
- [22] Feige E. and Pearce D. (2013), 'Economically Rational Expectations: Are Innovations in the Rate of Inflation Independent of Innovations in Measures of Monetary and Fiscal Policy?', *Journal of Political Economy*, vol. 84, no. 3, June 1976, pp. 499-522.
- [23] Geweke J. (2001), 'Bayesian econometrics and forecasting', *Journal of Econometrics*, vol. 100, January 2001, pp. 11-15.
- [24] Giannone M. and Reichlin L. (2010), 'Large bayesian VARs', *Journal of International Economics*, vol. 48, pp. 233-253.
- [25] Greenberg E. and Chib S. (1995), 'Hierarchical Analysis of SUR Models with Extensions to Correlated Serial Errors and Time-Varying Parameter Models', *Journal of Econometrics*, vol. 68, pp. 409-431.

- [26] Gruner Hans P. (2009), 'Why EMU is not a failure?', *European Journal of Political Economy*, vol. 26, pp. 1-11.
- [27] Hughes Hallett A. and Lewis J. (2006), 'Debt, deficits, and the accession of the new member States to the Euro', *European Journal of Political Economy*, vol. 23, pp. 316-337.
- [28] Kareem R. O., Afolabi A. J., Raheem K. A. and Bashir N. O. (2012) 'Analysis of Fiscal and Monetary Policies on Economic Growth: Evidence from Nigerian Democracy', *Journal of Economic Theory*, no. 5, pp. 11-19.
- [29] Koop G. (1996), 'Parameter uncertainty and impulse response analysis', *Journal of Econometrics*, no. 72, pp. 135-149.
- [30] Koop G. and Korobilis D. (2010), 'Bayesian multivariate time series method for empirical macroeconomics', *Working Paper*, Department of Economics, University of Strathclyde.
- [31] Merkl C. and Schmitz T. (2011), 'Macroeconomic volatilities and the labour market: First results from the euro experiment', *European Journal of Political Economy*, vol. 27, pp. 44-60.
- [32] Mikosch H. and Sturm J. E. (2012), 'Has the EMU reduced wage growth and unemployment? Testing a model of trade union behavior', *European Journal of Political Economy*, vol. 28, pp. 27-37.
- [33] Pesaran M. and Shin Y. (1998), 'Generalized Impulse Response Analysis in Linear Multivariate Models', *Economics Letters*, no. 58, pp. 17-29.
- [34] Pesaran H. (2003), 'Estimation and Inference in Large Heterogeneous Panels with Cross Section Dependence', *Working Paper*, no. 0305, University of Cambridge.
- [35] Perotti R. (2005), 'Estimating the Effects of Fiscal Policy in OECD Countries', *CEPR Discussion Paper*, no. 4842.
- [36] Quah D. (1993), 'Empirical cross-section dynamics in economic growth', *European Economic Review*, vol. 37, pp. 426-434.
- [37] Raftery A. , Di Ciccio T. J. , Kass R. E. , Wasserman L. (1997), 'Computing Bayes Factors by Combining Simulation and Asymptotic Approximations', *Journal of the American Statistical Association*, vol. 92, no. 439, September 1997, pp. 903-915.
- [38] Raftery A. and Lewis S. M. (1997), 'Estimating Bayes Factors via Posterior Simulation With the Laplace-Metropolis Estimator', *Journal of the American Statistical Association*, vol. 92, no. 438, June 1997, pp. 648-655.
- [39] Sala-i-Martin X. (1995), 'Regional cohesion: evidence and theories of regional growth and convergence', *European Economic Review*, vol. 40, no. 6, June 1996, pp. 1325-1352.

- [40] Sargent T. J. and Cogley T. (2005), 'Drifts and volatilities: monetary policies and outcomes in the post WWII US', *Review of Economics Dynamics*, vol. 8, no. 2, April 2005, pp. 262-302.
- [41] Terazi E. (2012), 'The Effects of the Global Financial Crisis on the Central and Eastern European Union Countries', *International Journal of Business and Social Science*, vol. 2, no. 17.