

BANCO DE ESPAÑA  
Eurosistema

FALL 2015

# RESEARCH UPDATE

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## Welcome to the Banco de España RESEARCH UPDATE

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On behalf of the Banco de España, it is my pleasure to announce the second issue of the *Research Update* for 2015. This issue comes at the outset of a period of important changes in the Directorate General of Economics, Statistics and Research (known in Spanish as the “Servicio de Estudios”). After more than two decades leading the Directorate General, José Luis Malo de Molina resigned last September and was appointed adviser on European Monetary and Financial Affairs at the Permanent Representation of Spain to the European Union, in Brussels. In parallel I was appointed by the Executive Commission of the Banco de España as the new Director General.

The Banco de España strongly believes in the importance of grounding its policy work in high-quality empirical and theoretical research, and I hope to maintain our institution’s reputation for state-of-the-art economic thinking that Mr. Malo de Molina nurtured over the years. I will be supported in this endeavor by Óscar Arce, who is taking over as Director of the Department of Monetary and Financial Studies, and by a diverse and highly qualified research staff, including a number of recently hired economists who are profiled in this *Update*.

As in previous issues, this *Research Update* includes a number of feature articles on topics of current macroeconomic policy relevance.

An article by Miguel García-Posada and Marcos Marchetti studies the impact of recent nonconventional monetary policy actions of the Eurosystem, presenting evidence from Spanish data that the “Very Long-Term Refinancing Operations” of 2011-2012 stimulated bank lending to small and medium firms. A second article, by Galo Nuño and Carlos Thomas, argues that while monetary policy could be used to increase the sustainability of sovereign debt, it is better to eliminate this option entirely, because the gain from decreasing default risk is more than offset by the cost of greater inflation risk. Finally, an article by Juan Jimeno, and another by Yunus Aksoy, Henrique Basso, Tobias Grasl, and Ron Smith, both explore the longer-run challenges faced by countries with high debt and declining population.

*Pablo Hernández de Cos*  
Director General, Economics, Statistics, and Research  
Banco de España

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# FEATURES

## THE BANK LENDING CHANNEL OF UNCONVENTIONAL MONETARY POLICY: THE IMPACT OF THE VLTROS ON CREDIT SUPPLY IN SPAIN

MIGUEL GARCÍA-POSADA AND MARCOS MARCHETTI

WORKING PAPER N° 1512

*We assess the impact of the two very long term refinancing operations (VLTROs) conducted by the Eurosystem in December 2011 and February 2012 on credit supply to Spanish non-financial corporations, using data from a sample of more than one million bank-firm lending relationships during two years. Our methodology tackles the two main identification challenges: (i) how to disentangle credit supply from demand; (ii) the endogeneity of the VLTRO bids, as banks with more severe funding difficulties were more likely to ask for a large amount of funds and to restrain credit supply. First, we exploit the fact that many firms borrow from several banks simultaneously to control for firm-specific credit demand. Second, we control for banks' funding difficulties by constructing several measures of balance-sheet strength and by including bank fixed effects. Our findings suggest that the VLTROs had a positive, moderate-sized effect on banks' credit supply to firms, providing evidence of a bank lending channel in the context of unconventional monetary policy. The effect was greater for banks with less liquid assets, and for small and medium enterprises; there was no impact on loans to large firms.*

bids fully satisfied at a fixed interest rate, as long as they had enough eligible collateral to pledge) with a maturity of three years. The interest rates of these operations were set much lower than those borne by banks in wholesale markets at the time. The participation in these operations by banks was very large, implying a massive liquidity injection into the financial sector.

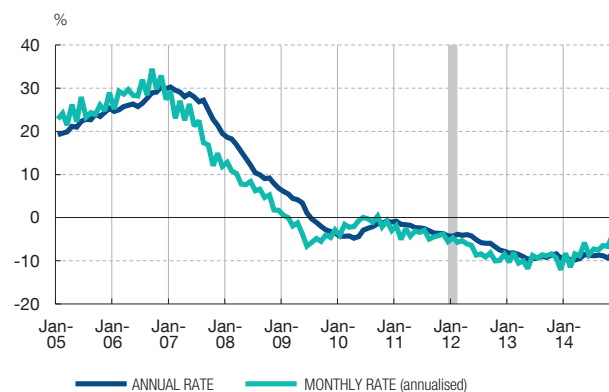
As credit to the non-financial private sector continued to decline after the VLTROs –as shown for the case of Spanish firms in Figure 1- serious doubts about their effectiveness were raised. Nevertheless, the extremely weak macroeconomic conditions prevailing in that period –which reduced credit demand and increased credit risk- and the liquidity and funding risks experienced by banks –which constrained credit supply- make it reasonable to ask whether credit would have declined even more in the absence of the VLTROs. This study aims to answer this question for the case of Spain.

### 1 Introduction

The intensification of the European sovereign debt crisis in the second half of 2011 hampered euro area banks' access to market-based funding, especially in Greece, Portugal, Ireland, Italy and Spain. The funding and deleveraging pressures borne by credit institutions risked curtailing lending to euro area households and non-financial firms. Against this background, the ECB decided to implement additional non-standard policy measures on 8 December 2011. These included two very long term refinancing operations (VLTROs), which were carried out at the end of December 2011 and in February 2012, respectively. The VLTROs were fixed-rate full allotment procedures (i.e., all banks had their

CREDIT GROWTH TO NON-FINANCIAL CORPORATIONS IN SPAIN

FIGURE 1



SOURCE: Banco de España.

NOTE: The grey area corresponds to the period between December 2011-February 2012 when the two VLTROs took place.

## 2 Identification strategy

We can express our identification strategy with the following equations:

$$\Delta \text{Credit}_{ijt} = \beta \text{VLTRO}_{it} + a_{jt} + b_i + \sum_{k=1}^K b^k \text{BANK\_VAR}_{it-1}^k + e_{ijt}, \quad (1)$$

$$\text{VLTRO}_{it} = \text{VLTRO}_i \cdot I(t \geq 2011M12), \quad (2)$$

where  $i$  refers to bank,  $j$  to firm and  $t$  to year and month. Here,  $\Delta \text{Credit}_{ijt}$  is the monthly credit growth rate (in annualised terms):  $\text{VLTRO}_{it}$  is the product of the gross amount of funds borrowed at the two VLTROs scaled by bank's total assets ( $\text{VLTRO}_i$ ) and an indicator variable  $I(t \geq 2011M12)$  that equals 1 since December 2011 (when the first VLTRO took place): The  $a_{jt}$  are time-varying firm fixed effects,  $b_i$  are bank fixed effects,  $\text{BANK\_VAR}$  are time-varying bank characteristics and  $e_{ijt}$  is a regression disturbance.

To assess the causal impact of the VLTROs on credit supply, two main identification challenges must be addressed. First, changes in credit supply must be disentangled from changes in credit demand. For instance, a credit contraction during a financial crisis can be due both to a reduction in credit supply (banks reduce credit supply to increase their capital and liquidity buffers) and to a drop in credit demand (firms reduce their demand for credit as they find less profitable investment opportunities). Second, banks' recourse to VLTROs and supply problems may be correlated. As banks that have a harder time obtaining funding are more likely both to borrow more funds in the VLTROs and to cut loan supply,  $\text{VLTRO}_{it}$  may be endogenous, biasing the estimated coefficient  $\beta$ .

We address the first problem by exploiting the fact that many firms simultaneously borrow from several banks, a strategy first implemented by Gan (2007) and Khwaja and Mian (2008). This allows us to include in the regression time-varying firm fixed effects  $a_{jt}$  (i.e., a dummy for every firm-time combination, at monthly frequency) that control for all (observed and unobserved) firm heterogeneity, including credit demand.

To address the second problem we control for banks' funding conditions by including a large set of time-varying bank characteristics such as liquidity, capital, loan quality, profitability, and size, as well as bank fixed effects. Even if this approach did not fully remove this bias, we would know its sign: we would expect a downward bias in the coefficient on  $\text{VLTRO}_{it}$ , as banks with more (less) deteriorated funding conditions are expected to borrow more (less) funds in the VLTROs and to exhibit a lower (higher) credit growth. Hence our

identification strategy estimates a lower bound on the true causal impact.

## 3 Data sources and sample

We collect data referring to the 11 months before and after the first VLTRO, i.e., from January 2011 to November 2012. Data on credit are drawn from the Banco de España's Credit Register (CIR), which contains monthly information on all bank-firm relationships over a reporting threshold of 6,000€ for credit institutions operating in Spain. We focus on loans granted to Spanish non-financial corporations. To include time-varying firm fixed effects in our regressions we only keep firms borrowing from at least two banks at the same time: those companies accounted for 38% of the total number of firms and 75% of the credit to non-financial companies registered in the CIR in December 2011. Unconsolidated bank balance sheet data are obtained from the supervisory reports that banks must file each month. The gross amount of funds borrowed at the two VLTROs by each Spanish bank comes from the Banco de España's Operations Department. We add the funds received by each bank in the VLTROs of December 2011 and February 2012 because both operations were announced at the same time, making the second VLTRO a fully anticipated shock. Our final sample has more than 12 million observations, with 42 banks, 315,000 firms, more than one million firm-bank relationships and 23 months.

## 4 Main results

Our main results are derived from the regressions of Table 1. In column (1), the coefficient on  $\text{VLTRO}_{it}$  is positive and statistically significant, implying that the marginal impact of the VLTRO uptake by an individual bank on its credit growth is around 0.076. To estimate the aggregate impact of the two VLTROs on credit growth we make a weighted average of the individual impacts (i.e., the products of the marginal impact and each bank's VLTRO uptake), where the weights are the ratio of each bank's outstanding loans to all loans in the sample. Algebraically:

$$\text{Agg\_Impact} = \sum_{i=1}^I \frac{\partial \Delta \text{Credit}_{ijt}}{\partial \text{VLTRO}_{it}} \cdot \text{VLTRO}_i \cdot \omega_i \quad (3)$$

$$\text{Where} \quad \frac{\partial \Delta \text{Credit}_{ijt}}{\partial \text{VLTRO}_{it}} = \beta \quad (4)$$

$$\text{and} \quad \omega_i = \frac{\text{Credit}_i}{\sum_{i=1}^I \text{Credit}_i} \quad (5)$$

	Dependent variable: credit growth			
	All Firms (1)	Large (2)	SMEs (3)	All firms (4)
VLTRO*I (t>2011M11)	0.076** (0.029)	0.001 (0.033)	0.077** (0.031)	0.083*** (0.030)
VLTRO*I (t>2011M11) X Liquidity Ratio (t-1)				-0.002** (0.001)
Liquidity Ratio (t-1)	0.027 (0.021)	0.094** (0.035)	0.026 (0.021)	0.040* (0.021)
Log [Loan to Deposits (t-1)]	3.228* (1.709)	7.896*** (2.657)	3.024* (1.747)	3.218* (1.798)
Capital Ratio (t-1)	-0.076 (0.088)	-0.257 (0.310)	-0.072 (0.084)	-0.079 (0.092)
NPL Ratio (t-1)	-0.001 (0.041)	-0.076 (0.094)	0.004 (0.041)	-0.022 (0.042)
Resident Deposits (t-1)	0.073 (0.044)	0.209** (0.103)	0.070 (0.044)	0.075* (0.043)
No Resident Deposits (t-1)	-0.057** (0.026)	-0.049 (0.050)	-0.056** (0.027)	-0.052* (0.026)
ROA (t-1)	0.001 (0.002)	-0.004 (0.004)	0.001 (0.002)	0.001 (0.002)
Log [Total Assets (t-1)]	0.940 (1.201)	-2.414 (3.322)	1.065 (1.123)	1.118 (1.240)
Relationship Length (t-1)	0.324*** (0.039)	0.768*** (0.123)	0.309*** (0.039)	0.325*** (0.040)
Log [HHI (t-1)]	-1.379** (0.567)	-3.232 (2.275)	-1.299** (0.595)	-1.597*** (0.544)
Firm-month fixed effects	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes
# Observations	12,181,556	232,175	11,818,378	12,181,556
R-squared	0.48	0.35	0.49	0.48

SOURCE: Banco de España.

NOTE: Estimator: OLS. Clustered standard errors in parenthesis. \*\*\* p<0.01, \*\* p<0.05, \* p<0.10. HHI is the Herfindahl-Hirschman Index of the bank's credit portfolio by industry. NPL ratio is the non-performing loan ratio. Columns (2) and (3) show the estimations of separate regressions run on sub-samples of large companies and SMEs, respectively.

Assuming that  $\beta = 0.076$  for all banks, the aggregate impact of the two VLTROs on annual credit growth was 0.8%. Of course, this does not mean that the VLTROs actually increased the available credit, but that they reduced the rate of contraction of lending: if they had not been implemented, credit to non-financial corporations would have decreased at a rate 0.8% higher than it did. As the average annual growth rate of the credit to non-financial corporations in the twelve months after the implementation of the first VLTRO was -5.1%, the VLTROs had a moderate-sized effect.

Another relevant question is whether the impact of VLTROs on credit to non-financial corporations depended

on the size of those firms, as small and medium enterprises (SMEs) are believed to be more vulnerable to a decline in credit than larger companies, as they often lack access to alternative sources of external finance. To answer this question, we split the sample into SMEs and large firms using the indicator variable constructed by Martínez Carrascal and Mulino (2014), and then rerun the specification from column (1). Columns (2) and (3) show that the VLTROs had no impact on the supply of credit to large firms, but had a sizeable effect on loans to SMEs. We also wish to know whether the transmission of the VLTROs depended on some banks' characteristics. Column (4) shows the estimates when we add an interaction between VLTRO\_it and a liquidity ratio.

The negative coefficient on that interaction means that the VLTROs had a larger positive impact on banks with less liquid assets, consistent with previous evidence on the transmission of monetary policy (e.g. Jiménez *et al.*, 2012). Finally, it is also worth mentioning the positive coefficient on relationship length across all specifications: a longer relationship between the firm and the bank led to a higher credit supply, consistent with previous findings on relationship lending (e.g., Petersen and Rajan, 1994).

## 5 Conclusions

This paper evaluates the impact on credit supply of the two very long term refinancing operations (VLTROs) implemented by the Eurosystem in response to the intensification of the European sovereign debt crisis in the second half of 2011. The estimates indicate that the VLTROs helped forestall a further contraction of credit in Spain. The Spanish experience is particularly informative because Spain was severely hit by the crisis, and is one of the largest economies in the euro area, and has a bank-based financial system.

Our findings suggest that the VLTROs had a positive, moderate-sized effect on the supply of bank credit to firms in the twelve months after the first VLTRO (December 2011 to November 2012), providing evidence of a “bank

lending channel” in the context of unconventional monetary policy. We also find that the VLTROs had a sizeable impact on credit to SMEs, while they had no effect on the loans to large firms. Finally, it seems that the VLTROs had a greater impact on the credit supply of banks with less liquid assets, which suggests that part of its effect worked through the mitigation of liquidity risks.

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## MONETARY POLICY AND SOVEREIGN DEBT VULNERABILITY

GALO NUÑO AND CARLOS THOMAS

WORKING PAPER Nº 1517

*We investigate the trade-offs between price stability and the sustainability of sovereign debt, using a small open economy model where the government issues nominal defaultable debt and chooses fiscal and monetary policy under discretion. Inflation reduces the real value of outstanding debt, thus making it more sustainable; but it also raises nominal yields and entails direct welfare costs. We compare this scenario with a situation in which the government gives up the ability to inflate debt away, e.g. by issuing foreign currency debt or joining a monetary union with an anti-inflationary stance. We find that the benefits of giving up this adjustment margin outweigh the costs, both for our preferred calibration and for a wide range of parameter values. This remains true even if a 'conservative' central banker is appointed.*

### Introduction

One of the main legacies of the 2007-9 financial crisis and the subsequent recession has been the emergence of large fiscal deficits across the industrialized world. The consequence has been a sharp increase in government debt, with debt-to-GDP ratios near or above record levels in countries such as the United States, United Kingdom, Japan or the Euro area periphery (Greece, Ireland, Italy, Portugal, Spain). Before the summer of 2012, Euro area periphery economies experienced dramatic spikes in their sovereign yields, whereas other highly indebted countries did not. Many observers emphasized that a key difference between the two groups of countries was that, whereas the US, UK and Japan had the option to inflate away the real burden of nominal debt, the Euro countries were forced to repay debt solely through fiscal surpluses. At the same time, the experience of a number of developing countries such as Mexico or Brazil, in which sovereign debt is often issued directly in foreign currency, illustrates situations in which governments sometimes renounce the possibility of inflating away their debts.

These developments raise the question as to what role monetary policy should have, if any, in guaranteeing the sustainability of sovereign debt, in view of the existing trade-offs between the latter and price stability. Broadly speaking, on the one hand it can be argued that central banks should provide a 'monetary

brake' that reassures investors in sovereign debt.<sup>1</sup> On the other hand, such a course of action may presumably give rise to inflation, with the resulting costs and distortions. Moreover, while using inflation temporarily for debt elimination purposes may not greatly affect inflation expectations in countries (such as the US or UK) where monetary authorities are perceived to have a clear and credible commitment towards price stability, the same may not be true in countries with a poorer inflation record and/or weaker monetary credibility, thus limiting the effectiveness of this strategy

In this paper, we try to shed light on the above issues by studying the trade-offs between price stability and sovereign debt sustainability when the government cannot make credible commitments about inflation.<sup>2</sup>

### Methodology

To analyze the above question, we build a model of a small open economy in which a government issues long-term sovereign nominal bonds to foreign investors.<sup>3</sup> At any time, the government may default on its debt if it finds it optimal to do so. Default produces some costs due to temporary exclusion from capital markets and a drop in output. In addition, the government chooses fiscal and monetary policy optimally under discretion. That is, the government cannot commit to a future path for primary deficit and inflation. When choosing inflation, the government trades off benefits and costs. On the one hand, inflation

<sup>1</sup> This view is shared e.g. by Krugman (2011) or De Grauwe (2011).

<sup>2</sup> Our paper relates to recent theoretical papers that analyze the link between sovereign debt vulnerability and monetary policy, such as Aguiar et al. (2013), Corsetti and Dedola (2014), Camous and Cooper (2014), and Bacchetta, Perazzi and van Wincoop (2015). These papers consider self-fulfilling debt crises along the lines of Calvo (1988) or Cole and Kehoe (2000). We complement this literature by considering a framework in which sovereign default is instead an optimal government decision based on fundamentals, in the tradition of Eaton and Gersovitz (1981).

<sup>3</sup> In technical terms, the model describes a continuous-time game between a benevolent government (i.e. one that maximizes social welfare) and a set of risk-neutral international investors pricing the risky sovereign bonds.

reduces the real value of debt; *ceteris paribus*, this improves sovereign debt sustainability by making default a less likely outcome. On the other hand, inflation entails a direct welfare cost. Moreover, expectations of future inflation worsen this trade-off by raising nominal yields for new bond issuances, thus making primary deficits more costly to finance.

We calibrate our model to capture some salient features of the EMU periphery economies, including their observed inflation record prior to joining the euro and their external sovereign debt-to-GDP ratio during the euro period.<sup>4</sup> In this case the government allows for relatively high inflation rates at debt ratios for which default is still perceived as rather distant by investors. We refer to this baseline scenario as the ‘inflationary regime’.

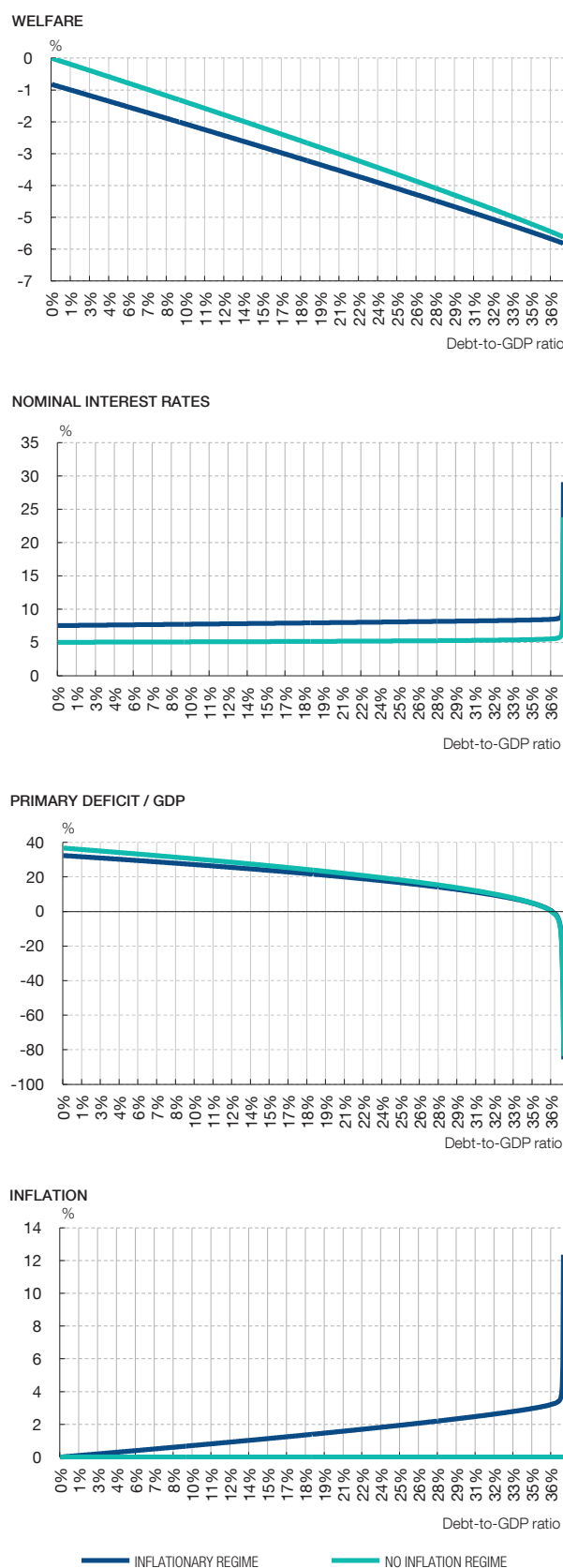
We then compare the baseline inflationary regime with a scenario in which inflation is zero at all times. In other words, the government effectively renounces the possibility of inflating debt away. Given our assumption that the government cannot make credible inflation commitments, this ‘no inflation’ regime is best interpreted as a situation in which the government directly issues foreign currency debt, or in which it joins a monetary union with a very strong and credible anti-inflationary stance.

## Results

The blue lines in Figure 1 display the equilibrium in the inflationary regime as a function of the model’s state variable, the external sovereign debt-to-GDP ratio. As shown in the last panel, inflation increases roughly linearly with the debt ratio, as higher indebtedness increases the government’s incentive to inflate the debt away. Close to the default threshold, inflation increases steeply as the government tries to avoid default. Nominal interest rates on bonds (second panel) increase gently with debt as investors expect higher inflation during the bond’s life. As the economy approaches default, investors start perceiving default as rather imminent, and bond prices fall steeply towards their value at default (which depends mostly on their recovery value following default). Also, the primary deficit decreases gradually with debt, as bond prices fall and deficits become more costly to finance; this process is intensified as debt approaches its

MODEL RESULTS

FIGURE 1



<sup>4</sup> Notice that the calibration targets *external*, rather than total, sovereign debt, consistently with the model’s assumption that sovereign debt is fully held by foreign investors.

SOURCE: Authors’ calculations. Welfare expressed in percent of permanent consumption.



default threshold and bond prices start collapsing, with deficits turning quickly into a (large) surplus.

As shown in the top panel, social welfare in the *no-inflation* regime (red lines) is higher than in the inflationary regime at *any* debt ratio. The reason is that the no-inflation regime avoids the welfare costs of inflation while not compromising too much the sustainability of sovereign debt. On the one hand, the inflationary regime creates relatively high levels of inflation even when debt is still relatively low and hence default is still perceived as rather distant by investors; this temptation to inflate disappears in the no-inflation regime. On the other hand, the debt elimination effect (the only benefit of inflation in the model) is mostly undone by the fall in nominal bond prices, or equivalently the increase in nominal bond yields, vis-à-vis the no-inflation regime. Higher yields in turn reflect the fact that the higher inflation premia under the inflationary regime clearly dominate the lower default premia. With the debt elimination channel weakened, the direct welfare costs of inflation become the dominant effect on welfare outcomes. As a consequence, the inflationary regime produces a significant loss in welfare relative to the no-inflation scenario.<sup>5</sup>

Moreover, even at relatively high debt ratios, the beneficial effects of inflation on debt sustainability are largely undone by the increase in nominal yields due to higher inflation expectations. As a result, the no-inflation regime performs better even when the economy is close to default.

Finally, as an alternative to giving up the inflation margin altogether, we investigate an intermediate arrangement in which the government delegates monetary policy to an independent central banker with a greater distaste for inflation than society as a whole.<sup>6</sup> We find that delegating monetary policy to such a 'conservative' central banker achieves superior welfare outcomes vis-à-vis the baseline inflationary regime, in which the benevolent government chooses inflation discretionarily. As it turns out, however, the no inflation regime is still preferable to delegating monetary policy to a conservative central banker, no matter how 'hawkish' the latter is.

<sup>5</sup> On average, the welfare losses in the inflationary regime relative to the no-inflation one are equivalent to a loss of almost 0.3% in permanent consumption, which is a first-order magnitude.

<sup>6</sup> Actual social preferences towards inflation (as well as all other parameters) remain as in the baseline calibration.

## Conclusions

Taken together, our results offer an important qualification of the conventional wisdom that individual countries may benefit from retaining the option to inflate away their sovereign debt. In particular, our analysis suggests that such countries may actually be better off by renouncing this tool if their governments are unable to make credible commitments about their future inflation policy. This qualification may be relevant for most EMU peripheral economies, in view of their inflation record (relative e.g. to that of Germany) in the decades prior to joining the euro. Our findings may also rationalize why a number of developing countries with limited inflation credibility typically resort to issuing debt in terms of a hard foreign currency.

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## LONG-LASTING CONSEQUENCES OF THE EUROPEAN CRISIS

JUAN F. JIMENO

WORKING PAPER N° 1522

There is a growing concern about the fragility of the recovery after the Great Recession, particularly in Europe. With little margin for fiscal and monetary policies to stimulate aggregate demand, due to the excessive levels of public debt and the very low nominal interest and inflation rates, some new papers have been analyzing how “stagnation traps”, or even “a secular stagnation trap”, may become plausible.<sup>1</sup>

A recent working paper (Jimeno, 2015) argues that this unfortunate state of events can be rationalized as the result of the interplay between the debt legacy of the crisis and the structural factors that have been slowing down economic growth since the late 1990s. The interactions go both ways: structural factors that slow down economic growth in the medium and long-run make deleveraging more difficult and costly, while, on the other hand, adapting to a low growth scenario is complicated by the debt overhang generated by the financial crisis. These structural factors are basically three. One is the declining working age population in many countries, in particular, in Europe. The second is population ageing, also expected to be exceptional in Europe. Finally, there is some uncertainty about the extent to which technological progress can provide productivity growth to compensate for the demographic trends.

These interactions are illustrated in a simple OLG model with three generations. There is a young generation that is credit constrained, does not produce, and receives no income, and hence consumes what it can borrow. There is a middle generation that provides labour, receives all income (labour earnings and capital income), pays off debt accumulated while young, and saves by purchasing capital, by lending to the young generation, and by holding public bonds. Finally, an old generation consumes all of its savings (plus interest receipts) and government transfers.

In a nutshell, the main mechanisms that determine the effects of deleveraging and supply shocks in this framework, some well-known, others less emphasized, are the following.

<sup>1</sup> Gianluca Benigno and Luca Fornaro (2015): “Stagnation Traps”, manuscript; Gauti B. Eggertsson and Neil R. Mehrotra (2014): “A Model of Secular Stagnation”, NBER Working Paper 20574.

- Population ageing implies that there are less young people demanding credit. Moreover, expected transfers to the old generation also fall, raising desired saving, especially if sustainability of public debt is dubious to begin with.
- For both of these reasons, as population growth falls, the natural interest rate also falls. Given the current productivity growth rates registered in advanced countries (around 1% TFP growth annually), the natural interest rate can be significantly negative even with constant population.
- Higher current productivity growth increases savings, because the middle generation can pay off the debt it accumulated when young using a lower fraction of its income.
- Higher expected productivity growth decreases savings, because both expected income and expected transfers to the old generation are higher.
- A decrease in the price of capital or a higher depreciation rate pushes the equilibrium real interest rate downwards
- The only effects of fiscal policy come through its impact on productivity growth or through changes in intergenerational transfers.

### Negative equilibrium real interest rates

Assuming that capital depreciates fully in one model period (one generation), the model delivers the following equation to determine the equilibrium real interest rate when the zero lower bound is not binding:

$$1+r_t = \frac{(1+n_t) [(1+\beta) d_t + (\tau_{t+1} + b_{t+1}^g) (1+a_{t+1})]}{\beta [\alpha (1-\tau_t) - b_t^g - (1+a_t)^{-1} d_{t-1}]}$$

Here,  $r$  stands for the real interest rate,  $\beta$  is the time preference factor, and  $a$  and  $n$  are the rates of growth of productivity and population, all stated with respect to one model period;  $d$  and  $b^g$  are the private and public debt-to-GDP ratios, respectively;  $\tau$  is the tax

rate on total production, and  $\alpha$  is the labour elasticity of production.

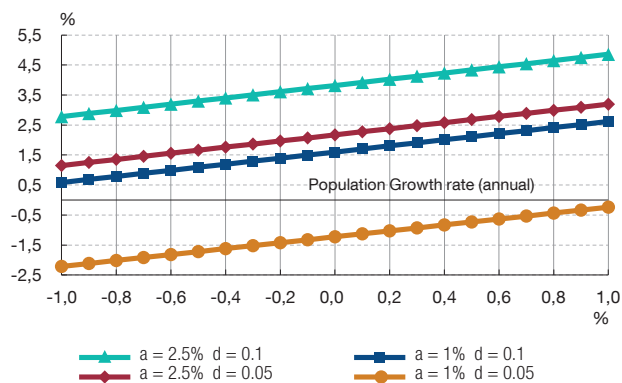
To interpret this equation quantitatively, it helps to restate all quantities in annual terms, rather than generational terms. Figure 1 gives the steady-state (annual) natural interest rate implied by the equation above for alternative population and productivity growth rates and debt-to-income ratios, under plausible values for the rest of the parameters (time discount rate 2% per annum, intergenerational transfers of 8% of GDP and a labour share of 2/3). The figure compares two levels of private-sector indebtedness:  $d=0.05$  versus  $d=0.1$ . In annual terms,  $d$  can be interpreted as the fraction of annual income dedicated to debt service by the middle-aged generation. Thus, we see in the figure that with low productivity growth (1% per annum) and low private-sector indebtedness, the natural rate can reach significant negative values even when the population growth rate is not especially low.<sup>2</sup>

growth, the change in the natural rate caused by a process of deleveraging ( $d_t < d_{t-1}$ ) is

$$r_{t+1} - r_t = \left( \frac{(1+n)(1+\alpha)(1+\beta)}{\beta} \right) \frac{(d_t - d_{t-1})/d_{t-1}}{[\alpha(1-\tau) - b^g](1+a)/d_{t-1} - 1}$$

The equation shows that a deleveraging shock causes a larger reduction in the real interest rate when the disposable income of the middle generation is lower (the denominator is proportional to this generation's disposable income after repaying debt and buying public bonds). The impact of the deleveraging shock on the natural rate is further increased if population or productivity growth is decreasing, or if the public debt ratio is higher, as all of these factors tend to increase savings. Assuming some plausible parameter values ( $\alpha=2/3$ , intergenerational transfers of 8% of GDP,  $a = 2\%$ , and  $d = 0.1$ ), a 10% reduction in the initial debt-to-income ratio of the middle generation would cause the natural rate to fall by 2 percentage points.

NATURAL INTEREST RATE UNDER SEVERAL PARAMETER VALUES FIGURE 1



SOURCE: Author's calculations.

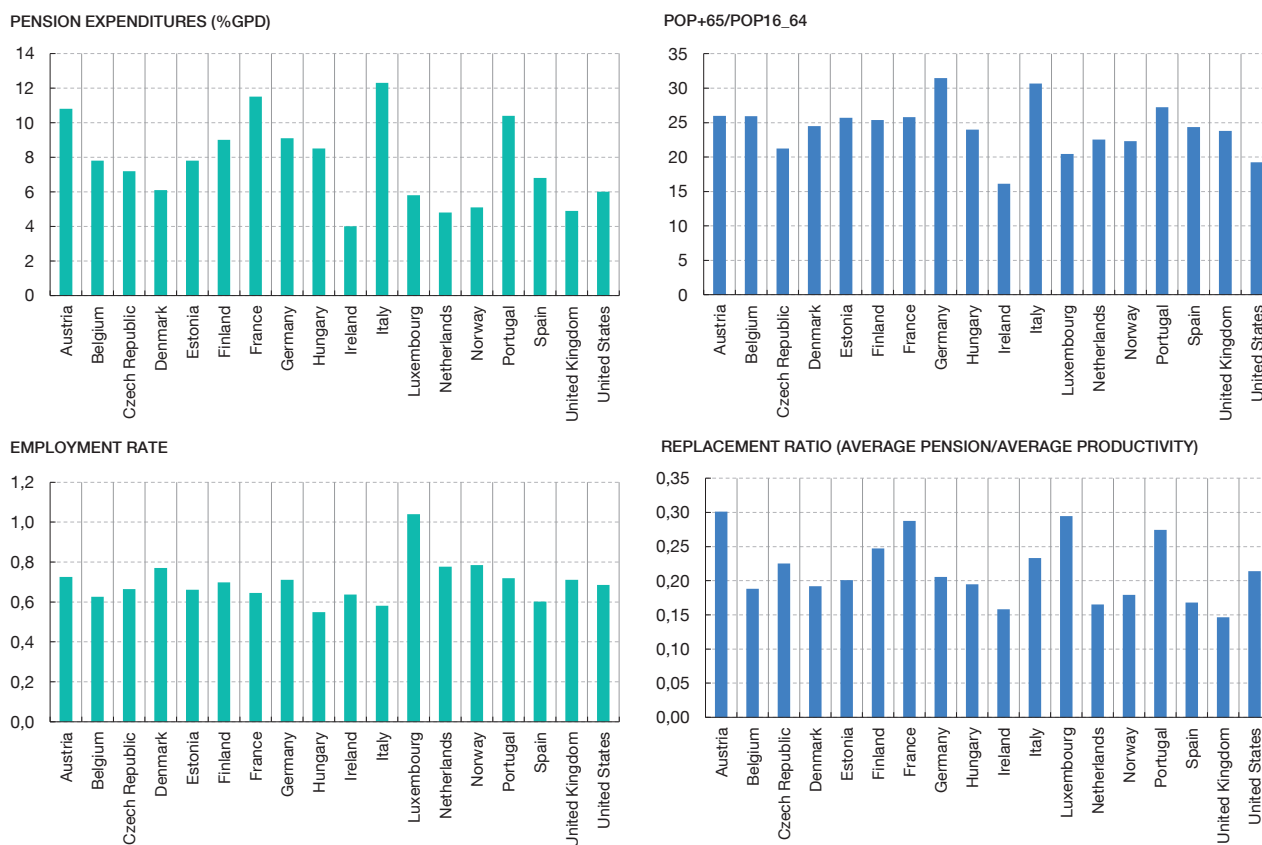
While Figure 1 shows the steady state implications for the real interest rate, a particular concern in the current context is deleveraging. Holding fixed other factors such as fiscal policy, population, and productivity

### The importance of nominal and real rigidities

If accommodated by monetary policy through a fall in the nominal rate, the fall of the natural interest rate has no unemployment consequences. As the real rate is lower, capital accumulation is higher, and output is at its full employment level, inflation is at its target, and nominal wages adjust for real wages to reach the level compatible with full employment.

However, suppose instead that monetary policy is unable to accommodate a fall in the real interest rate into negative territory, either because nominal rates cannot fall below zero, or because it is unwilling to pursue unconventional measures to raise inflation. In this scenario, there will be a persistent shortfall of demand and unemployment will be above its equilibrium level. The results in this case may vary, depending on whether the economy is characterized by nominal or real rigidities. In the case of nominal rigidities, an increase in inflationary expectations decreases real wages and the real interest rate, reducing the gap between the actual and the natural interest rate and bringing the economy closer to full employment. On the other hand, if real wages are rigid downwards, an increase in current inflation leaves real wages unchanged, and, therefore unemployment remains constant. If continued high unemployment holds down inflation expectations, then the economy tends to remain stuck in a low-inflation, high unemployment trap. In both cases, with nominal or real rigidities, since output is determined by expectations about future income and

<sup>2</sup> The calculations assume that the young accumulate debt, and the middle-aged decumulate debt, at an average rate of 5% or 10% of GDP each year, and that the model period represents 30 years. Ignoring interest rate effects, for simplicity, the peak debt level reached at the moment of entering the working-age population is either 150% or 300% of annual GDP. Averaging over the three generations, this translates into an aggregate debt ratio of 50% or 100% of annual GDP, respectively.



SOURCE: OECD (first three panels). Last panel computed as residual from the equation in the text.

expected inflation, if an increase in expected inflation can be achieved, output and employment will tend to recover.

$$\frac{P}{Y} = \frac{B \text{Pop}_{Ret}}{N(Y/N)} = \frac{\text{Pop}_{Ret}}{\text{Pop}_{Tot}} \frac{\text{Pop}_{Tot}}{N} \frac{B}{Y/N}$$

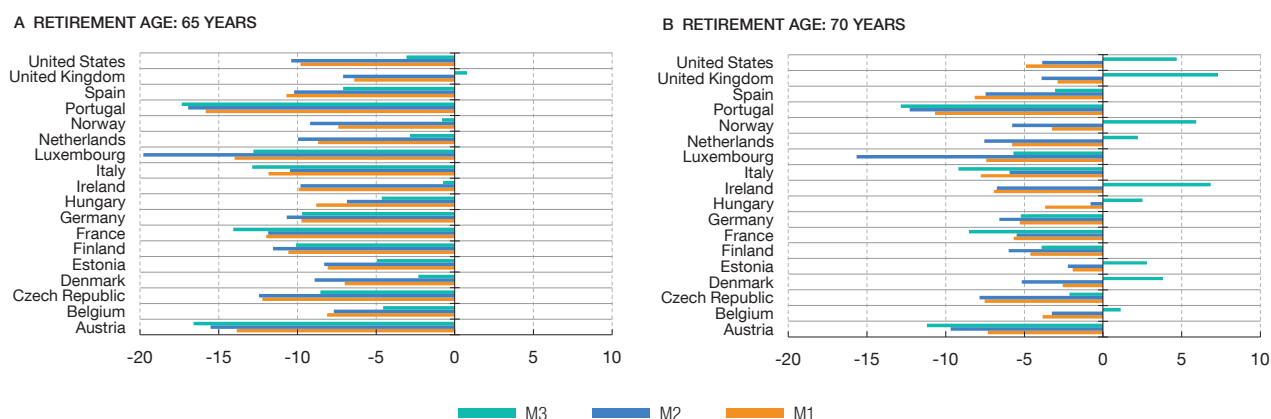
### Why fiscal policy is constrained

As noted above, in this simple OLG model the only effects of fiscal policy go through its impact on productivity growth or through changing intergenerational transfers. When the ratio of public debt to GDP is too high and is expected to decrease in the future, there is little scope for increasing transfers from the middle-aged to the old generation, especially if population growth is low. The middle generation then has a strong incentive to save, which keeps the equilibrium real interest rate low.

A section in the paper provides some quantitative evidence about the scope for intergenerational transfers from the middle to the old generation in European countries. The evidence relies on a simple decomposition of pension expenditures, documented in Figure 2:

where  $P$  represents pension expenditures,  $Y$  is output,  $N$  is employment,  $\text{Pop}_{Tot}$  is working-age population,  $\text{Pop}_{Ret}$  represents the number of pensioners, and  $B$  is the average pension benefit. Hence, pension expenditures as a fraction of output equal the ratio of pensioners to working-age population, times the ratio of the average pension benefit to average labour productivity, divided by the employment rate.

Starting from the three main determinants of pension expenditures, it is straightforward to compute, given population forecasts and assuming a given value for the employment rate, how much replacement ratios (the ratio  $B/(Y/N)$  of the average benefit relative to average labour productivity) would be for any given level of pension expenditures (as a fraction of GDP). Thus, for illustrative purposes, Figure 3 displays the change in replacement ratios between 2009 and 2050 for three different scenarios:



SOURCE: Author's calculations.

- Countries will have the same pension expenditures (as a fraction of GDP) and the same employment rates in 2050 as in 2009 (M1).
- Countries will converge to an employment rate of 65%, while keeping the same pension expenditures (as a fraction of GDP) as in 2009 (M2).
- Countries will converge both in employment rates (65%) and in pension expenditures (10% of GDP) (M3).

The calculations also consider two alternative definitions of the working-age population: from ages 16 to 64 years (left panel) and from 16 to 69 years (right panel).

The results suggest that budget balance will require a decrease in pensions in many countries, implying that savings incentives will remain high, keeping real interest rates low. Under the first two scenarios, the reductions in replacement ratios are sizeable: around 10 percentage points if the working population is considered to be between 16 and 64 years of age, and around 6 percentage points if the working population includes those between 16 and 69 years of age. For some countries, the picture is less grim: assuming pension expenditures converge to 10% of GDP, the replacement ratio could rise by as much as 5 percentage points in some Anglophone countries if they set the retirement age at 70 years. But even under these conditions, many continental European countries (Italy, France, Austria, and Portugal) would have to reduce replacement ratios by almost 10 percentage points.

Of course, what matters for individual savings decisions is how income during working age compares with income during old age. If labour productivity grows sufficiently fast, expected old-age income may be high in spite of sizeable reductions in replacement ratios like those calculated above. But insofar as productivity growth remains low, savings incentives will be high and the natural rate of interest will be low.

### Final remarks

The Great Recession and the subsequent European crisis have left the European economy in a dismal situation. The legacy of these events (high public and private debt, high unemployment and competitiveness misalignments) will have to be addressed in a context of population ageing, lower population growth, and uncertain productivity growth. The combination of this legacy with plausible future demographic and economic prospects suggests that the natural interest rate has probably fallen significantly, perhaps to a level that monetary policy is unable to accommodate, and may remain at that level for a long period. In this constrained regime, there can be a permanent shortfall of demand that pushes the economy into a high-unemployment trap.

Among the factors that could raise the natural interest rate, only a revival of productivity growth seems to lie within the scope of policy. This clearly explains why “structural reforms” are back at the top of the policy agenda in Europe. But even if structural reforms yield higher productivity growth, it seems that, as L. Summers has argued, the economy is entering a period in which concern with cyclical fluctuations will be minor relative to the importance of longer-run trends.

## DEMOGRAPHIC STRUCTURE AND MACROECONOMIC TRENDS

YUNUS AKSOY, HENRIQUE BASSO, TOBIAS GRASL AND RON SMITH  
WORKING PAPER N° 1528

*The disappointing recovery after the crisis has sparked renewed concern about the medium-run outlook of advanced economies. Lower population growth and its impact on labour supply gained widespread prominence. In this working paper, we take a more detailed look at this issue, identifying the impact of the evolution of demographic structure –the entire age profile– on the macroeconomy. Age profile changes have significant implications for savings, investment, real interest rates, and growth, and also affect innovation activities. The population ageing predicted for the next decades is found to be a significant factor in reducing output growth and real interest rates across OECD countries.*

### Introduction

The demographic age profiles in OECD economies are changing significantly. The average proportion of the population aged 60+ is projected to increase from 16% in 1970 to 29% in 2030, with most of the corresponding decline experienced in the 0-19 age group. Demographic changes, in particular their effect on labour supply, are often mentioned as one of the ‘headwinds’ of the observed slowdown in macroeconomic performance in advanced economies (Gordon 2012, 2014; Fernald and Jones 2014). Although important, this interpretation restricts the analysis of the impact of demographic changes on the macroeconomy. We take a more general and more detailed look at demographics, arguing that changes in the demographic structure, defined as the variations in proportions of the population in each age group from year to year, matter for macroeconomic activity and may also be related to innovation.

### How is the demographic structure relevant?

The demographic structure may affect short- and long-term macroeconomic conditions through several channels. Different age groups (i) have different savings behaviour, according to the lifecycle hypothesis; (ii) have different productivity levels, according to the age profile of wages; (iii) work different amounts – the very young and very old tend not to work, with implications for labour input; (iv) contribute differently to the innovation process, with young and middle-aged

workers contributing the most; and (v) provide different investment opportunities, as firms target their different needs. Thus, demographic changes can be expected to influence real interest rates, inflation and real output in the short- and long-term either directly or via their effects on expectations about the future course of key variables.

### Changes in the demographic structure affect the macroeconomy

In a forthcoming Bank of Spain Working Paper 1528 (Aksoy et al. 2015), using a panel of 20 OECD countries over the period 1970–2007, we analyse how much of the variation of key macroeconomic variables can be explained by the evolution of each country’s demographic structure, represented by share of age groups (0-9, 10-19,..., 70+) in the total population. Our methodology allows us to measure the short-run impact, exploring the heterogeneity across countries, and the long-run effects of demographic changes, calculated by assessing how the impact of age profile changes reverberates through the macroeconomy, exploring the interactions between our key variables.

We show that the changing age profile across OECD countries has economically and statistically significant impacts on all key macroeconomic variables and that these roughly follow a life-cycle pattern; that is, dependent cohorts (both young and old) tend to have a negative impact on all real macroeconomic variables, including real returns, and add positive inflationary pressures in the long run.

We use the United Nations (UN) population predictions and our long-run estimates to perform country-specific prediction exercises. Firstly we contrast the impact of demographic changes during the previous and the current decade on trend output growth (See Table 1). We find that for all countries in our sample the changes in age profile will lead to a statistically (with p-values no higher than 6.3%) and economically significant drop in trend growth. Average annual real output growth is expected to be reduced by 0.99 percentage points in Japan, 0.92 in the U.S., and 0.67 in Spain. More generally, the expected path of output growth and real interest rates from 2000 until 2030, shown in

Figure 1 for selected countries, highlights the downward pressure on real rates and output growth as a result of the decrease in working-age population and the increase in the proportion of retirees expected during this period.

Finally, we show that demographic structure also affects innovation. Greater proportions of young dependents and older generations affect the number of patent applications per capita negatively, whereas working-age groups (20-60) contribute positively. Moreover, within the working age population, young and middle aged workers (20-29 and 40-49) contribute the most, in line with the evidence in Jones (2010) and Feyrer (2008). Using these long-term estimates and UN population predictions we find that the expected aging in the next two decades may lead to a drop in patent applications per capita across OECD countries of around 20%.

**AVERAGE PREDICTED IMPACT ON GDP GROWTH BY CONTRY**

**TABLE 1**

	2000-2009	2010-2019	Change	Prob. (Change > 0)
Australia	1,64%	0,95%	-0,69%	0,050
Austria	2,05%	1,37%	-0,68%	0,038
Belgium	2,03%	1,28%	-0,75%	0,056
Canada	1,57%	0,45%	-1,12%	0,047
Denmark	1,20%	0,64%	-0,57%	0,041
Finland	1,23%	0,18%	-1,05%	0,051
France	1,57%	0,73%	-0,83%	0,054
Germany	1,66%	0,76%	-0,91%	0,048
Greece	1,50%	0,88%	-0,63%	0,059
Iceland	2,56%	1,77%	-0,80%	0,043
Ireland	3,59%	2,83%	-0,76%	0,061
Italy	1,83%	1,23%	-0,60%	0,053
Japan	0,92%	-0,07%	-0,99%	0,050
Luxembourg	1,98%	1,62%	-0,37%	0,044
Netherlands	0,51%	-0,55%	-1,06%	0,046
New Zealand	2,64%	1,87%	-0,78%	0,043
Norway	2,77%	2,16%	-0,61%	0,042
Portugal	2,19%	1,38%	-0,80%	0,043
Spain	1,42%	0,75%	-0,67%	0,063
Sweden	0,44%	0,05%	-0,39%	0,048
Switzerland	1,54%	0,77%	-0,77%	0,042
United Kingdom	1,83%	1,43%	-0,40%	0,044
United States	1,93%	1,00%	-0,92%	0,051

SOURCE: Author's calculations.

## Demographics, innovation and medium-run economic performance

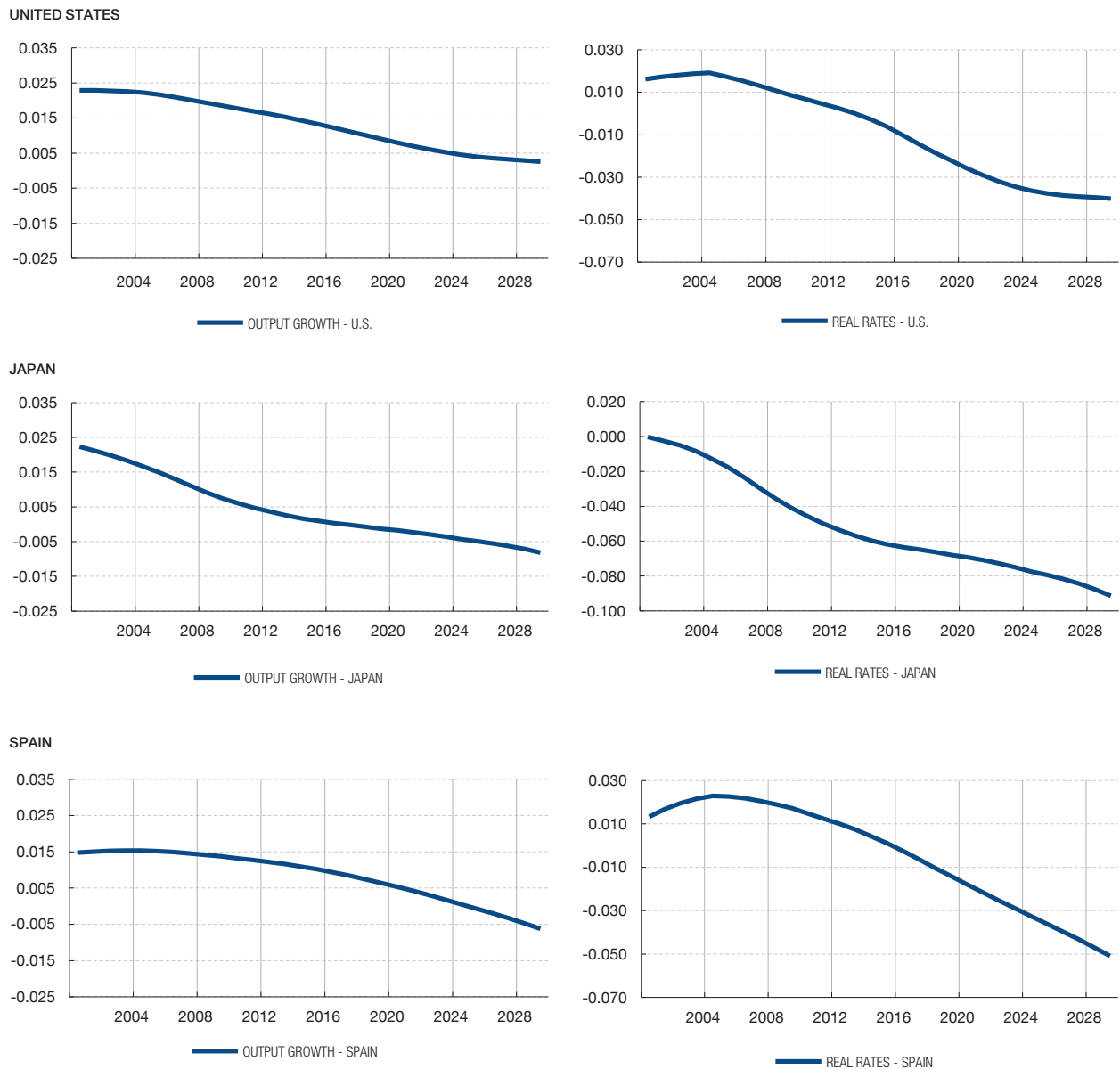
We also develop a theoretical model to match the life cycle characteristics observed empirically and to study the main mechanisms through which demographic changes affect the macroeconomy. The economic environment incorporates (i) life cycle properties, with three generations in the population (dependent young, workers and retirees); (ii) investment in human capital; and (iii) endogenous productivity and medium-term dynamics. It thus permits analysis of long-term interactions of demographic changes with savings, investment, and innovation decisions. Changing age profiles affect the macroeconomy through three distinct channels. First, changes in fertility and workers' available resources affect investment in human capital and labour supply. Second, ageing affects the saving decision of workers. Finally, the share of young workers impacts the innovation process positively and, as a result, a change in the demographic profile that skews the distribution of the population to the right leads to a decline in innovation activity. The link between demographics and innovation is crucial in matching our empirical findings.

Our simulation results show that:

- A relative increase in the share of young dependents and retirees decreases output growth and investment, while an increase in workers does the opposite.
- A permanent increase in longevity (an increase in life expectancy) leads to increased growth rates in the short term as the decrease in the marginal propensity for workers to consume leads to a lower real interest rate and an increase in innovative activity. However, as the share of young workers decreases, productivity in innovation decreases, leading to permanently lower output growth and investment.
- Feeding UN population predictions for different countries into our model, we match the predictions of the empirical model well.

## Conclusions

Our empirical and theoretical results indicate that the current trend of population ageing and reduced fertility, expected to continue in the next decades, may contribute



SOURCE: Aksoy, Basso, Grasl and Smith (2015).

to reduced output growth and real interest rates across OECD economies. Therefore, the next decades may witness a shift in the focus of economic policy from short-run stabilisation, which characterised the 1990s and most of 2000s, to medium-run economic performance.

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## PUBLICATIONS

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#### [EMPLOYMENT PROTECTION LEGISLATION AND LABOR COURT ACTIVITY IN SPAIN](#)

JUAN F. JIMENO, MARTA MARTÍNEZ-MATUTE

AND JUAN S. MORA-SANGUINETTI

WORKING PAPER N° 1507

Labor courts may introduce a significant wedge between “legal” firing costs and “effective” (post-trial) firing costs. Apart from procedural costs, there is uncertainty over judges’ rulings, in particular over the likelihood of a “fair” dismissal ultimately being ruled as “unfair”, which may increase firing costs significantly. In 2010 and 2012, reforms of Employment Protection Legislation widened the definition of fair economic dismissals in Spain. In this paper we look at Labor Court rulings on dismissals across Spanish provinces before and after the EPL reforms (2004-2014). We make this comparison taking into account a set of covariates (local labor market conditions, characteristics of the Labor Courts, pre-trial conciliations, congestion of Labor Courts) which may determine the selection of dismissal cases ruled by Labor Courts. Our results suggest that, despite the 2010 and 2012 EPL reforms, the proportion of economic redundancies being ruled as fair by Labor Courts has not substantially increased, although it is now less negatively associated with the local unemployment rate than in the pre-reform period.

#### [FISCAL TARGETS. A GUIDE TO FORECASTERS?](#)

JOAN PAREDES, JAVIER J. PÉREZ AND GABRIEL PEREZ-QUIRÓS

WORKING PAPER N° 1508

Should rational agents take into consideration government policy announcements? A skilled agent (an econometrician) could set up a model to combine the following two pieces of information in order to anticipate the future course of fiscal policy in real-time: (i) the ex-ante path of policy as published/announced by the government; (ii) incoming, observed data on the actual degree of implementation of ongoing plans. We formulate and estimate empirical models for a number of EU countries (Germany, France, Italy and Spain) to show that government (consumption) targets convey useful information about ex-post policy developments

when policy changes significantly (even if past credibility is low) and when there is limited information about the implementation of plans (e.g. at the beginning of a fiscal year). In addition, our models are instrumental in unveiling the current course of policy in real time. Our approach complements a well-established branch of the literature that finds politically motivated biases in policy targets.

#### [MONITORING THE WORLD BUSINESS CYCLE](#)

MAXIMO CAMACHO AND JAIME MARTINEZ-MARTIN

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We propose a Markov-switching dynamic factor model to construct an index of global business cycle conditions, for performing short-term forecasts of quarterly world GDP growth in real time and computing real-time business cycle probabilities. To overcome the real-time forecasting challenges, the model takes into account mixed frequencies, asynchronous data publication and leading indicators. Our pseudo real-time results show that this approach provides reliable and timely inferences of quarterly world growth and of the state of the world business cycle on a monthly basis.

#### [VOLATILITY-RELATED EXCHANGE TRADED ASSETS: AN ECONOMETRIC INVESTIGATION](#)

JAVIER MENCÍA AND ENRIQUE SENTANA

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We compare semi-nonparametric expansions of the Gamma distribution with alternative Laguerre expansions, showing that they substantially widen the range of feasible moments of positive random variables. Then we combine those expansions with a component version of the Multiplicative Error Model to capture the mean reversion typical in positive but stationary financial time series. Finally, we carry out an empirical application in which we compare various asset allocation strategies for Exchange Traded Notes tracking VIX futures indices, which are increasingly popular but risky financial instruments. We show the superior performance of the strategies based on our econometric model.

## FINANCIAL INNOVATION IN SOVEREIGN BORROWING AND PUBLIC PROVISION OF LIQUIDITY

PATRICIA GÓMEZ-GONZÁLEZ

WORKING PAPER N° 1511

This paper studies how financial innovation in sovereign debt markets can increase a country's level of private investment and welfare. I propose a model where public debt has a liquidity purpose for the domestic private sector and is demanded as a saving vehicle by more patient international investors. The public bond is risky, it has a low (high) return when the government's fiscal capacity is low (high), but the government cannot strategically default on it. The main result of the paper is that the government can increase private investment by increasing the number of assets supplied, tranching its fiscal capacity, and issuing a safe and a risky bond. The risky bond is held only by international investors and the domestic private sector demands the safe bonds. Safe bonds lower the cost of liquidity hoarding for the private sector which enables it to increase investment. I test the predictions of the model using a dataset on public debt and local currency sovereign debt ownership for a group of emerging economies. I find that domestic collateral constraints are key determinants of the shares held abroad of total public debt and especially of relatively riskier debt instruments (local currency debt).

## THE BANK LENDING CHANNEL OF UNCONVENTIONAL MONETARY POLICY: THE IMPACT OF THE VLTROS ON CREDIT SUPPLY IN SPAIN

MIGUEL GARCÍA-POSADA AND MARCOS MARCHETTI

WORKING PAPER N° 1512

See Features section.

## NETWORKS AND THE DYNAMICS OF FIRMS' EXPORT PORTFOLIO

JUAN DE LUCIO, RAÚL MÍNGUEZ, ASIER MINONDO

AND FRANCISCO REQUENA

WORKING PAPER N° 1513

We use network-analysis tools to identify communities in the web of exporters' destinations. Our network-based community measure is purely outcome-based; it captures multilateral rather than bilateral dependence across countries; and it can be calculated at the industry level. We next use our network-based community measure as a predictor of additional countries chosen by firms expanding their export destinations portfolios. Using data on new Mexican exporters, the probability of choosing a new export

destination doubles if it belongs to the same community of any of the firm's previous destinations. The introduction of the network-based community variable improves the accuracy of the model by up to 19% relative to a model that only includes gravity variables. Industry-specific communities and general communities play similar roles in determining the dynamics of Mexican exporters' country portfolios.

## DEFAULT NEAR-THE-DEFAULT-POINT: THE VALUE OF AND THE DISTANCE TO DEFAULT

ALFREDO IBÁÑEZ

WORKING PAPER N° 1514

We show that the default event defined by endogenous credit-risk models (i.e. low asset values) can likewise be described in terms of low equity prices and negative net cash-flows (high debt service and/or negative earnings). Specifically, distance-to-default (DD), a volatility-adjusted measure of leverage, is given by the ratio of equity prices to negative net cash flows. This implies that the probability of default is the probability of this ratio becoming small, which then depends on the path of these two variables. This helps to explain why just equity prices (price per share, past return, and volatility) and firm's debt and profitability are significant in reduced-form models that predict default while Merton's DD becomes redundant if we control for them [Campbell et al. (2008)]. In endogenous models, default is triggered by depressed equity prices and a negative flow to shareholders (rather than low asset value). And, inversely, default concerns are readily lessened by easing refinancing costs (e.g. sovereigns for which default is costly and which regularly roll over their debts), lowering the principal (underwater mortgages or subprime consumer loans, which increases equity value), or raising equity (troubled banks).

## FISCAL CONSOLIDATION AFTER THE GREAT RECESSION: THE ROLE OF COMPOSITION

IVÁN KATARYNIUK AND JAVIER VALLÉS

WORKING PAPER N° 1515

We have examined the fiscal consolidation episodes in a group of OECD countries from 2009 to 2014. The range of the estimated short-term fiscal multiplier runs from 1.2% to 2% of GDP, larger than those obtained in more "normal times", implying that the contractionary effect has been greater in depressed environments. Nevertheless, we have also found that revenue measures have a higher and more persistent real impact than expenditure measures, which is more consistent with the literature and suggests that expenditure cuts are less harmful for the economy than tax hikes.

## ON THE PREDICTABILITY OF NARRATIVE FISCAL ADJUSTMENTS

PABLO HERNÁNDEZ DE COS AND ENRIQUE MORAL-BENITO  
WORKING PAPER N° 1516

In an influential paper, Devries et al. (2011) construct narrative series of tax- and spending-based fiscal adjustments for a panel of OECD countries. In this paper, we find that the adjustments based on spending cuts can be predicted on the basis of past output growth and other macroeconomic variables. Moreover, we illustrate that this source of endogeneity may generate significant differences in the estimated multiplier.

## MONETARY POLICY AND SOVEREIGN DEBT VULNERABILITY

GALO NUÑO AND CARLOS THOMAS  
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See Features section.

## QUANTITATIVE EFFECTS OF THE SHALE OIL REVOLUTION

CRISTIANA BELU MANESCU AND GALO NUÑO  
WORKING PAPER N° 1518

The aim of this paper is to analyse the impact of the so-called “shale oil revolution” on oil prices and economic growth. We employ a general equilibrium model of the world oil market in which Saudi Arabia is the dominant firm, with the rest of the producers as a competitive fringe. Our results suggest that most of the expected increase in US oil supply due to the shale oil revolution has already been incorporated into prices and that it will produce an additional increase of 0.2 percent in the GDP of oil importers in the period 2010-2018. We also employ the model to analyse the collapse in oil prices in the second half of 2014 and conclude that it was mainly due to positive unanticipated supply shocks.

## PATENT COLLATERAL, INVESTOR COMMITMENT AND THE MARKET FOR VENTURE LENDING

Yael V. HOCHBERG, CARLOS J. SERRANO  
AND ROSEMARIE H. ZIEDONIS  
WORKING PAPER N° 1519

This paper investigates the market for lending to technology startups (i.e. venture lending) and examines two mechanisms that facilitate trade within it: the ‘saleability’ of patent collateral and financial intermediaries. We find that intensified trading in the secondary market for patent assets increases the annual rate of startup lending, particularly for startups

with more re-deployable patent assets. Moreover, we show that the credibility of venture capitalist commitments to refinance and grow fledgling companies is vital for startup debt provision. Following a severe and unexpected capital supply shock for VCs, we find a striking flight to safety among lenders, who continue to finance startups whose investors are better able to credibly commit to refinancing their portfolio companies, but withdraw from otherwise promising projects that may have most needed their funds. The findings are consistent with predictions of incomplete contracting and financial intermediation theory.

## HIGHER-ORDER RISK PREFERENCES, CONSTANT RELATIVE RISK AVERSION AND THE OPTIMAL PORTFOLIO ALLOCATION

TRINO-MANUEL ÑÍGUEZ, IVAN PAYA, DAVID PEEL AND JAVIER PEROTE  
WORKING PAPER N° 1520

We derive the conditions for the optimal portfolio choice within a constant relative risk aversion type of utility function considering alternative probability distributions that are able to capture the asymmetric and leptokurtic features of asset returns. We illustrate the role —beyond risk aversion— played by higher-order moments in the optimal decision to form a portfolio of risky assets. In particular, we show that higher-order risk attitudes such as prudence and temperance associated with the third and fourth moments of the distribution define different optimal portfolios than those constrained under risk aversion.

## CHANGES IN FUNDING PATTERNS BY LATIN AMERICAN BANKING SYSTEMS: HOW LARGE? HOW RISKY?

LILIANA ROJAS-SUÁREZ AND JOSÉ MARÍA SERENA  
WORKING PAPER N° 1521

This paper investigates the shifts in Latin American banks’ funding patterns in the postglobal financial crisis period. To this end we introduce a new measure of exposure of local banking systems to international debt markets that we term: *International Debt Issuances by Locally Supervised Institutions*. In contrast to well-known BIS measures, our new metric includes *all entities that fall under the supervisory purview of the local authority*. This is especially important in Latin America, where the participation of foreign banks that are established as independent, fully-capitalized entities is most substantial. Using this metric we found that all types of Latin American banking groups increased significantly and sharply their issuance of external debt securities. Owing to the low ratios of banks’ external debt to total liabilities in the pre-crisis period, solid solvency ratios and improved supervisory capacity, the

recent increase in banks' external indebtedness has not resulted in financial difficulties and banking systems remain strong. However, a preliminary analysis of risks based on this new trend reveals the emergence of several signs of increased vulnerability. First, in some banking groups (particularly in Brazilian banks, domestic and foreign alike) the increased issuance of external debt has been accompanied by a greater reliance on wholesale funding. In contrast, reliance on wholesale funding by Colombian banks has remained low and stable. Second, rollover risks have significantly increased for Latin American banking groups. Maturing debt, which increased significantly in 2013-14, will continue at high levels in 2015-16 in the context of major uncertainties in international capital markets. This risk is especially noticeable in Brazil and Chile, whose ratios of maturing debt to total debt are high. Third, in spite of a sizeable accumulation of international reserves, the large increase in banks' external debt might have contributed to reducing the resilience of central banks to deal with a severe adverse shock.

### LONG-LASTING CONSEQUENCES OF THE EUROPEAN CRISIS

JUAN F. JIMENO

WORKING PAPER N° 1522

See Features section.

### COUNTRY SHOCKS, MONETARY POLICY EXPECTATIONS AND ECB DECISIONS. A DYNAMIC NON-LINEAR APPROACH

MAXIMO CAMACHO, DANILO LEIVA-LEON

AND GABRIEL PEREZ-QUIROS

WORKING PAPER N° 1523

Previous studies have shown that the effectiveness of monetary policy largely depends on market expectations about future policy actions. This paper proposes an econometric framework to address the effect of the current state of the economy on monetary policy expectations. Specifically, we study the effect of contractionary (or expansionary) demand (or supply) shocks hitting the euro area countries on the expectations about the ECB's monetary policy in two stages. In the first stage, we construct indices of real activity and inflation dynamics for each country, based on soft and hard indicators. In the second stage, we use those indices to provide assessments of the type of aggregate shock hitting each country and assess its effect on monetary policy expectations at different horizons. Our results indicate that expectations are

responsive to aggregate contractionary shocks, but not to expansionary shocks. In particular, contractionary demand shocks have a negative effect on short-term monetary policy expectations, while contractionary supply shocks have a negative effect on medium and long-term expectations. Moreover, shocks to different economies do not have significantly different effects on expectations, although some cross-country differences arise.

### WHAT DRIVES BANK-INTERMEDIATED TRADE FINANCE? EVIDENCE FROM CROSS-COUNTRY ANALYSIS

JOSÉ MARÍA SERENA GARRALDA AND GARIMA VASISHTHA

WORKING PAPER N° 1524

Empirical work on the underlying causes of the recent dislocations in bank-intermediated trade finance has been limited by the scant availability of hard data. This paper aims to analyse the key determinants of bank-intermediated trade finance using a novel dataset covering ten banking jurisdictions. It focuses on the role of global factors as well as country-specific characteristics in driving trade finance. Results indicate that country-specific variables, such as growth in trade flows and funds available for domestic banks, as well as global financial conditions and global import growth, are important determinants of trade finance. These results are robust to different model specifications. Further, we do not find that trade finance is more sensitive to global financial conditions than other loans to non-bank entities.

### FAST ML ESTIMATION OF DYNAMIC BIFACTOR MODELS: AN APPLICATION TO EUROPEAN INFLATION

GABRIELE FIORENTINI, ALESSANDRO GALESÌ AND ENRIQUE SENTANA

WORKING PAPER N° 1525

We generalise the spectral EM algorithm for dynamic factor models in Fiorentini, Galesi and Sentana (2014) to bifactor models with pervasive global factors complemented by regional ones. We exploit the sparsity of the loading matrices so that researchers can estimate those models by maximum likelihood with numerous series from multiple regions. We also derive convenient expressions for the spectral scores and information matrix, which allows us to switch to the scoring algorithm near the optimum. We explore the ability of a model with one global factor and three regional factors to capture inflation dynamics across 25 European countries in the period 1999-2014.

## SECURITIZATION AND ASSET PRICES

YUNUS AKSOY AND HENRIQUE S. BASSO

WORKING PAPER N° 1526

We investigate the link between securitization and asset prices and show that increases in the growth rate of the volume of ABS issuance lead to a sizable decline in bond and equity premia. Furthermore, we show that in a model where banks select their portfolio of assets and create synthetic securities, the compensation for undertaking risk decreases as securitization increases. The pooling and tranching of credit assets relaxes both the funding and the risk constraints banks face allowing them to increase balance sheet holdings. Accordingly, the drop in risk premium may be unrelated to a decline in actual risk.

## THE GREAT MODERATION IN HISTORICAL PERSPECTIVE. IS IT THAT GREAT?

MARÍA DOLORES GADEA, ANA GÓMEZ-LOSCOS

AND GABRIEL PEREZ-QUIROS

WORKING PAPER N° 1527

The Great Moderation (GM) is widely documented in the literature as one of the most important changes in the US business cycle. All the papers that analyze it use post-WWII data. In this paper, we set the GM for the first time against a long-dated historical backdrop, stretching back a century and a half, which includes secular changes in the economic structure and a substantial reduction of output volatility. We find two robust structural breaks in volatility at the end of WWII and in the mid-eighties, showing that the GM still holds in the longer perspective. Furthermore, we show that GM volatility reduction is only linked to expansion features. We also date the US business cycle in the long run, finding that volatility plays a primary role in the definition of the business cycle, which has important consequences for econometricians and forecasters.

## DEMOGRAPHIC STRUCTURE AND MACROECONOMIC TRENDS

YUNUS AKSOY, HENRIQUE S. BASSO, RON P. SMITH

AND TOBIAS GRASL

WORKING PAPER N° 1528

See Features section.

## FINANCIAL STABILITY JOURNAL

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The Financial Stability Journal (Revista de Estabilidad Financiera) is published biannually by the Banco de España, with the aim of disseminating and participating in discussions on issues related to financial stability, with special emphasis on regulation and prudential supervision. Its board of editors comprises internal and external professionals. All articles appearing in the journal, which may be authored by Banco de España staff or researchers from other institutions, are refereed by at least one member of the board of editors.

## HISTORY OF BANKING REGULATION AS DEVELOPED BY THE BASEL COMMITTEE ON BANKING SUPERVISION 1974-2014 (BRIEF OVERVIEW)

HENRY PENIKAS

ESTABILIDAD FINANCIERA 28, MAYO 2015, 9-48.

This paper analyses in detail the regulatory activity of the Basel Committee on Banking Supervision (BCBS) –a key part of the recent history of banking regulation– on the occasion of its 40th anniversary. Based on documents published between 1974 and 2014, it classifies the regulatory activity into five major stages. It also provides data describing the Committee's activity (number of documents published, average consultation period, number of comments received, etc.) which show, for example, which countries and institutions have been most active in sending comments. It analyses developments in regulatory activity by area and concludes by making several recommendations, including the need to improve cooperation between the BCBS and the academic community so that the latest research is incorporated more rapidly.

## LA RECIENTE EVOLUCIÓN DEL GOBIERNO CORPORATIVO DE LAS ENTIDADES DE CRÉDITO

JAIME HERRERO

ESTABILIDAD FINANCIERA 28, MAYO 2015, 49-74.

This paper analyses the main components of corporate governance at Spanish banks. It examines its previous situation and its evolution, focusing on those less positive features that might have been involved in the emergence of the recent financial crisis. It goes on to describe the main regulatory changes introduced in the area of corporate governance in recent years and highlights certain improvements to governance which should be implemented by banks to ensure that banking activity is conducted properly. These improvements would also contribute to raising the

levels of transparency and of shareholder, investor and customer knowledge and confidence in credit institutions, a key factor in the appropriate conduct of banking business.

### **LA REFORMA DE LA POST-CONTRATACIÓN DE VALORES EN ESPAÑA**

JESÚS BENITO NAVEIRA AND IGNACIO SOLLOA MENDOZA  
ESTABILIDAD FINANCIERA 28, MAYO 2015, 75-102.

This paper describes the securities post-trading sector in Europe and Spain. This sector is an essential part of securities market operations and has been subject to an intensive reform process in recent years through initiatives such as TARGET2 Securities (T2S). In Spain, specific features of domestic practice have prompted a far-reaching reform. Noteworthy are the introduction of a central counterparty (CCP) – BME Clearing – in the equities clearing and settlement process and changes made to Iberclear to replace Referencias de Registro (RRs) in order to adapt to the European environment. The paper analyses both aspects in detail.

### **CREDIT AND LIQUIDITY RISK IN SOVEREIGN BONDS**

ÁLVARO MARTÍN HERRERO AND JAVIER MENCÍA  
ESTABILIDAD FINANCIERA 28, MAYO 2015, 103-124

This paper presents a quantitative study on the increase in the sovereign bond yields of France, the Netherlands, Germany and Spain and their breakdown into the credit and liquidity risk components. It uses data from January 2007 to February 2014, thus capturing two periods of stress: the financial crisis and the sovereign crisis. It concludes that, in general, the credit effect dominates, although in certain countries it is alleviated by the liquidity premia arising from the safe-haven flows characteristic of periods of hectic financial episodes. Additionally, it identifies a common European credit effect which makes it possible to distinguish idiosyncratic credit patterns.

## **RECENT PUBLICATIONS IN REFEREED JOURNALS**

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### **A TOOLKIT TO STRENGTHEN GOVERNMENT BUDGET SURVEILLANCE**

D. J. PEDREGAL, J. J. PÉREZ AND A. J. SÁNCHEZ-FUENTES  
HACIENDA PÚBLICA ESPAÑOLA - REVIEW OF PUBLIC ECONOMICS 211 (4),  
2014, 117-146

### **EL MITO DE LA ESPECIALIZACIÓN JUDICIAL**

G. DOMÉNECH AND J. S. MORA-SANGUINETTI  
INDRET 1,  
JANUARY 2015, 1-32

### **WAGE DYNAMICS IN THE PRESENCE OF UNOBSERVED INDIVIDUAL AND JOB HETEROGENEITY**

L. HOSPIDO  
LABOUR ECONOMICS 33,  
APRIL 2015, 81-93

### **A TWIN CRISIS WITH MULTIPLE BANKS OF ISSUE: SPAIN IN THE 1860s**

A. MORO, G. NUÑO AND P. TEDDE  
EUROPEAN REVIEW OF ECONOMIC HISTORY 19 (2),  
MAY 2015, 171-194

### **CAN WE USE SEASONALLY ADJUSTED INDICATORS IN DYNAMIC FACTOR MODELS?**

M. CAMACHO, Y. LOVCHA, AND G. PÉREZ-QUIRÓS  
STUDIES IN NONLINEAR DYNAMICS AND ECONOMETRICS 19 (3),  
JUNE 2015, 377-391

### **DISENTANGLING CONTAGION AMONG SOVEREIGN CDS SPREADS DURING THE EUROPEAN DEBT CRISIS**

C. BROTO AND G. PÉREZ QUIRÓS  
JOURNAL OF EMPIRICAL FINANCE 32,  
JUNE 2015, 165-179

### **PEER EFFECTS IN JUDICIAL DECISIONS: EVIDENCE FROM SPANISH LABOUR COURTS**

Á. MARTÍN-ROMÁN, A. MORAL, AND M. MARTÍNEZ-MATUTE  
INTERNATIONAL REVIEW OF LAW AND ECONOMICS 42,  
JUNE 2015, 20-37

### **SHORT-RUN FORECASTING OF ARGENTINE GROSS DOMESTIC PRODUCT GROWTH**

M. CAMACHO, M. DAL BIANCO AND J. MARTÍNEZ-MARTÍN  
EMERGING MARKETS FINANCE AND TRADE 51 (3),  
JUNE 2015, 473-485

### **THE FAILURE TO PREDICT THE GREAT RECESSION—A VIEW THROUGH THE ROLE OF CREDIT**

M. D. GADEA RIVAS AND G. PÉREZ-QUIRÓS  
JOURNAL OF THE EUROPEAN ECONOMIC ASSOCIATION 13 (3),  
JUNE 2015, 534-559

### **THE SAFETY AND SOUNDNESS EFFECTS OF BANK M&A IN THE EU: DOES PRUDENTIAL REGULATION HAVE ANY IMPACT?**

J. HAGENDORFF AND M. J. NIETO  
EUROPEAN FINANCIAL MANAGEMENT 21 (3),  
JUNE 2015, 462-490

### **TOWARD A MORE RELIABLE PICTURE OF THE ECONOMIC ACTIVITY: AN APPLICATION TO ARGENTINA**

M. CAMACHO, M. DAL BIANCO AND J. MARTÍNEZ-MARTÍN  
ECONOMICS LETTERS 132,  
JULY 2015, 129-132

### **ENTREPRENEURSHIP AND ENFORCEMENT INSTITUTIONS: DISAGGREGATED EVIDENCE FOR SPAIN**

M. GARCÍA-POSADA AND J. S. MORA-SANGUINETTI  
EUROPEAN JOURNAL OF LAW AND ECONOMICS 40 (1),  
AUGUST 2015, 49-74

### **RETURNS TO SKILLS AND THE DISTRIBUTION OF WAGES: SPAIN 1995–2010**

R. CARRASCO, J. F. JIMENO AND C. ORTEGA  
OXFORD BULLETIN OF ECONOMICS AND STATISTICS 77 (4),  
AUGUST 2015, 542-565

### **DISTORTIONS AND THE SIZE DISTRIBUTION OF PLANTS: EVIDENCE FROM CROSS-COUNTRY DATA**

M. GARCÍA-SANTANA AND R. RAMOS  
SERIES - JOURNAL OF THE SPANISH ECONOMIC ASSOCIATION 6 (3),  
AUGUST 2015, 279-312

### **PRECAUTIONARY PRICE STICKINESS**

J. COSTAIN AND A. NAKOV  
JOURNAL OF ECONOMIC DYNAMICS AND CONTROL 58,  
SEPTEMBER 2015, 218-234

### **DO LAWYERS INDUCE LITIGATION? EVIDENCE FROM SPAIN, 2001-2010**

J. S. MORA-SANGUINETTI AND N. GAROUPA  
INTERNATIONAL REVIEW OF LAW AND ECONOMICS 44,  
OCTOBER 2015, 29-41

### **ESTIMATION OF REGULATORY CREDIT RISK MODELS**

C. PÉREZ MONTES  
JOURNAL OF FINANCIAL SERVICES RESEARCH 48 (2),  
OCTOBER 2015, 161-191

### **RISK FACTORS AND THE MATURITY OF SUBNATIONAL DEBT: AN EMPIRICAL INVESTIGATION FOR THE CASE OF SPAIN**

J. J. PÉREZ AND R. PRIETO  
PUBLIC FINANCE REVIEW 43 (6),  
NOVEMBER 2015, 786-815

### **QUANTITATIVE EFFECTS OF THE SHALE OIL REVOLUTION**

C. B. MĂNESCU AND G. NUÑO  
ENERGY POLICY 86,  
NOVEMBER 2015, 855-866

### **MONITORING THE WORLD BUSINESS CYCLE**

M. CAMACHO AND J. MARTÍNEZ-MARTÍN  
ECONOMIC MODELLING 51,  
DECEMBER 2015, 617-625

## **FORTHCOMING ARTICLES IN REFEREED JOURNALS**

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### **EXTRACTING NON LINEAR SIGNALS FROM SEVERAL ECONOMIC INDICATORS**

M. CAMACHO, G. PÉREZ-QUIRÓS, AND P. PONCELA  
JOURNAL OF APPLIED ECONOMETRICS

### **GROWTH EMPIRICS IN PANEL DATA UNDER MODEL UNCERTAINTY AND WEAK EXOGENEITY**

E. MORAL-BENITO  
JOURNAL OF APPLIED ECONOMETRICS

### **MEASURING URBAN AGGLOMERATION. A REFOUNDATION OF THE MEAN CITY-POPULATION SIZE INDEX**

A. LEMELIN, F. RUBIERA-MOROLLÓN AND A. GÓMEZ-LOSCOS  
SOCIAL INDICATORS RESEARCH

**FAST ML ESTIMATION OF DYNAMIC BIFACTOR MODELS:  
AN APPLICATION TO EUROPEAN INFLATION**

G. FIORENTINI, A. GALESÌ, AND E. SENTANA  
ADVANCES IN ECONOMETRICS

**THE CYCLE OF EARNINGS INEQUALITY: EVIDENCE FROM  
SPANISH SOCIAL SECURITY DATA**

S. BONHOMME AND L. HOSPIDO  
ECONOMIC JOURNAL

**COMMONALITIES AND CROSS-COUNTRY SPILLOVERS  
IN MACROECONOMIC-FINANCIAL LINKAGES**

M. CICCARELLI, E. ORTEGA AND M. T. VALDERRAMA  
THE B.E. JOURNAL OF MACROECONOMICS

**SPANISH PUBLIC FINANCES THROUGH THE FINANCIAL CRISIS**

F. MARTÍ AND J. J. PÉREZ  
FISCAL STUDIES

**THE PUBLIC SECTOR PAY GAP IN A SELECTION OF EURO AREA  
COUNTRIES IN THE PRE-CRISIS PERIOD**

R. GIORDANO, D. DEPALO, M. C. PEREIRA, B. EUGÈNE,  
E. PAPAPETROU, J. J. PEREZ, L. REISS, AND M. ROTER  
HACIENDA PÚBLICA ESPAÑOLA - REVIEW OF PUBLIC ECONOMICS

**THE IMPACT OF FINANCIAL REGULATION ON CURRENT  
ACCOUNT BALANCES**

ENRIQUE MORAL-BENITO Y OLIVER ROEHN  
EUROPEAN ECONOMIC REVIEW

**FISCAL MULTIPLIERS IN TURBULENT TIMES:  
THE CASE OF SPAIN**

P. HERNÁNDEZ DE COS Y ENRIQUE MORAL-BENITO  
EMPIRICAL ECONOMICS



## NEWS AND EVENTS

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### NEWS

#### [JAIME FERNÁNDEZ DE ARAOZ PRIZE ON CORPORATE FINANCE](#)

10 SEPTEMBER 2015

On 10 September 2015, [the sixth edition of the Jaime Fernández de Aroz Prize](#) was awarded for the paper “[When credit dries up: Job losses in the Great Recession](#)”, by Samuel Bentolila (CEMFI), Marcel Jansen (Univ. Autónoma de Madrid), [Gabriel Jiménez](#) (Banco de España), and [Sonia Ruano](#) (Banco de España). The prize is granted every other year for research in the field of corporate finance.

The results of the paper, based on balance sheet data and bank-loan application data associated with 170,000 Spanish firms, suggest that firms that relied on loans from weaker banks were subsequently obliged to downsize (or exit) when the Great Recession arrived. The paper is available as CEMFI Working Paper #1310, and is currently being reviewed for publication in a refereed journal.

The Jaime Fernández de Aroz Prize is sponsored by [Deutsche Bank España](#), and was awarded to the researchers by [H.M. Felipe VI](#).

#### PRIZES FOR BANCO DE ESPAÑA RESEARCH

Two other studies by Banco de España economists were also recently singled out by awards for research excellence.

The paper “[A toolkit to strengthen government budget surveillance](#)”, by Diego J. Pedregal (Univ. Castilla-La Mancha), [Javier J. Pérez](#) (Banco de España), and Antonio Jesús Sánchez-Fuentes (Univ. Complutense de Madrid) was awarded the [Alexandre Pedrós Prize](#) for 2014, granted by the Societat Econòmica Barcelonèsca D'Amics del País. This prize recognizes the best article published in [Hacienda Pública Española / Review of Public Economics](#) each year, as selected by the editorial board of the journal.

The paper “[Heterogeneous responses to effective tax enforcement: Evidence from Spanish firms](#)”, by Miguel

Almunia (Univ. of Warwick) and [David López-Rodríguez](#) (Banco de España) was awarded the 2015 [IIPF Young Economists Award](#). This award, granted by the [International Institute of Public Finance](#), recognizes up to three papers presented at the IIPF annual congress. An early version of the paper is available as Banco de España Working Paper #1419; the current version is being reviewed for publication in a refereed journal.

### RECENT CONFERENCES

[LINK TO CONFERENCES PAGE](#)

#### [EUROPEAN SUMMER SYMPOSIUM IN INTERNATIONAL MACROECONOMICS \(ESSIM 2015\)](#)

RODA DE BARÀ (TARRAGONA), 26-29 MAY 2015

In late May, 2015, the Banco de España hosted the twenty-third edition of ESSIM (the European Summer Symposium in International Macroeconomics) in its facilities at Roda de Barà, in the province of Tarragona. The conference is an annual event of the CEPR (Centre for Economic Policy Research) which has been co-organized frequently with the Banco de España. The conference is intended as an opportunity for macroeconomists from European countries, especially younger researchers, to get to know each other and to meet key economists from the rest of the world, and to establish collaborative research projects.

The papers presented at the conferences addressed a variety of macroeconomic questions, from theoretical, empirical and policy-oriented perspectives. Issues receiving special attention in 2015 included the macroeconomic effects of fiscal adjustments, forward-looking models of government debt, policy approaches in asymmetric monetary unions, policy approaches at the zero lower bound, nonconventional instruments for central bank policy, and macroeconomic dynamics in the presence of financial frictions.

The ESSIM conference also provides an opportunity for interaction between Banco de España staff, economists from other central banks, and academic researchers. Presentations by Banco de España researchers included a talk by Henrique Basso (Dept. of Monetary and Financial Studies) on the macroeconomic effects of changes in an economy's demographic structure, a talk by Galo Nuño (DGA International Affairs) on monetary policy and sovereign debt, and a talk by James Costain (Dept. of Monetary and Financial Studies) on bargaining games between near-rational decision-makers.

#### **4TH WORLD BANK – BANCO DE ESPAÑA POLICY CONFERENCE: THE ECONOMIC CHALLENGES ASSOCIATED WITH RISING (AND FALLING) INEQUALITY**

MADRID, 8 JUNE 2015

On June 8, the Banco de España hosted its fourth joint conference with the World Bank, entitled: “The economic challenges associated with rising (and falling) inequality”. The goal of this policy conference was to bring together academics and policy makers to discuss the challenges that inequality represents for modern economies. The event included a keynote speech by Leandro Prados de la Escosura, where the developments in inequality were put in a historical perspective, as well as two round table discussions. In the first one, Leonardo Gasparini (CEDLAS-Universidad Nacional de La Plata), Augusto de la Torre (World Bank) and Santiago Levy (Inter-American Development Bank) discussed recent developments in inequality in Latin America. In the second, Marcelo Olarreaga (Université de Genève), Romain Ranciere (Paris School of Economics) and Andrea Brandolini (Banca d'Italia) elaborated on the macroeconomic implications of inequality.

#### **STRUCTURAL REFORMS IN THE WAKE OF RECOVERY: WHERE DO WE STAND?**

MADRID, 18-19 JUNE 2015

On 18 and 19 June 2015, the Banco de España hosted a research conference, jointly organized with Banque de France, entitled “Structural reforms in the wake of recovery: Where do we stand?”. The conference brought together academics and policy makers to discuss the aggregate implications of structural reforms, both from a theoretical and an empirical perspective.

Yann Algan (Sciences Po Paris), Jordi Galí (UPF), and

Francesco Giavazzi (Università Bocconi) participated as invited speakers. They discussed issues related to citizens' trust in economic and policy institutions in Europe (Algan), the role of exchange rates in understanding the gains from wage flexibility (Galí) and the optimal sequencing of labor and product market reforms (Giavazzi). The conference also included sessions on the macroeconomic impact of structural reforms, financial markets issues, and coordination issues related to structural reforms.

Finally, the policy panel included contributions by Alain de Serres (OECD), Marcel Fratzscher (DIW Berlin) and Vitor Gaspar (IMF).

## **RECENT ECONOMIC RESEARCH SEMINARS**

[LINK TO SEMINARS PAGE](#)

### **GENDER DIFFERENTIALS IN INS AND OUTS OF UNEMPLOYMENT IN THE GREAT RECESSION IN SPAIN**

SARA DE LA RICA

Univ. del País Vasco

6 MAY 2015

### **COMPARING FLAT AND RISK BASED CAPITAL REQUIREMENTS**

DAVID MARTÍNEZ MIERA

Univ. Carlos III de Madrid

13 MAY 2015

### **THE WORLD INCOME DISTRIBUTION: THE EFFECTS OF INTERNATIONAL UNBUNDLING OF PRODUCTION**

SERGI BASCO

Univ. Carlos III de Madrid

20 MAY 2015

### **CAPITAL GOODS, MEASURED TFP AND GROWTH: THE CASE OF SPAIN**

ANTONIA DÍAZ

Univ. Carlos III de Madrid

3 JUNE 2015

### **CAPITAL REQUIREMENTS IN A QUANTITATIVE MODEL OF BANKING INDUSTRY DYNAMICS**

DEAN CORBAE

Univ. of Wisconsin - Madison

16 JUNE 2015

### **BANK INTERVENTIONS AND DOWNSIDE CORRELATION RISK PREMIUM: EVIDENCE FROM THE GLOBAL AND EURO-AREA**

## **CRISIS**

JUAN-MIGUEL LONDONO

Federal Reserve Board

17 JUNE 2015

## **THE NEW FINANCIAL REGULATION IN BASEL III AND MONETARY POLICY: A MACROPRUDENTIAL APPROACH**

MARGARITA RUBIO

Univ. of Nottingham

24 JUNE 2015

## **INTERNATIONAL COMPETITIVENESS: PRODUCT DEREGULATION VERSUS INTERNAL DEVALUATION**

CÉLINE POILLY

Univ. de Lausanne

1 JULY 2015

## **THE COLLATERAL TRAP**

FRÉDÉRIC BOISSAY

European Central Bank

2 SEPTEMBER 2015

## **SPECIALIZATION IN BANK LENDING: EVIDENCE FROM EXPORTING FIRMS**

VERONICA RAPPOPORT

London School of Economics

16 SEPTEMBER 2015

## **FISCAL POLICY CHALLENGES FROM A EUROPEAN PERSPECTIVE**

LUDGER SCHUKNECHT

Federal Ministry of Finance, Germany

21 SEPTEMBER 2015

## **PRECAUTIONARY SAVING AND AGGREGATE DEMAND**

XAVIER RAGOT

Paris School of Economics

23 SEPTEMBER 2015

## **MONETARY-FISCAL POLICY MIX WITH FINANCIAL FRICTIONS**

PEDRO GOMES

Univ. Carlos III de Madrid

30 SEPTEMBER 2015

## **BANKS ARE NOT INTERMEDIARIES OF LOANABLE FUNDS – AND WHY THIS MATTERS**

MICHAEL KUMHOF

Bank of England

7 OCTOBER 2015

## **LENDING STANDARDS OVER THE CREDIT CYCLE**

EMANUELE TARANTINO

Univ. of Mannheim

14 OCTOBER 2015

## **CISS - A PORTFOLIO-THEORETIC FRAMEWORK FOR THE CONSTRUCTION OF FINANCIAL STRESS INDICES**

MANFRED KREMER

European Central Bank

20 OCTOBER 2015

# PEOPLE

## PROFILES

### GALO NUÑO

Staff economist (on leave)  
International Economics Division  
Currently visiting Research Division



*Galo Nuño first joined the International Economics Division of the Banco de España in 2009. After two years in the International Policy Analysis Division of the European Central Bank, where he analyzed the macroeconomic impact of oil markets, he returned to the Banco de España in 2014. Galo holds a PhD in electrical engineering from the Univ. Politécnica de Madrid, and an MSc in Management Science and Engineering from Stanford University, where he was awarded the Outstanding Graduate Prize in his program. He has a diverse range of publications in influential journals on topics of macroeconomics, banking, and finance.*

**RU: Your background is rather unusual since your main degree is in electrical engineering. Tell us about the path that led you to become a central banker.**

Actually an engineering background is not so uncommon; many academic economists started out in engineering or operations research.

By the time I moved to Stanford I already had some exposure to economics and finance from working briefly as a management consultant, and in those pre-crisis times (I arrived in 2005) lots of physicists and engineers were excited by finance and were switching fields. So I joined a rather unique program, called Management Science and Engineering, that originally grew out of operations research. On one hand, it taught finance and economics and optimization; also operations research topics related to designing manufacturing systems; and there were courses about entrepreneurship, finance, and day-to-day business skills. I got to take courses

in the economics department, in the business school, and in the engineering school. Then I worked for a time at BBVA Research before starting at the Banco de España.

**RU: You have done diverse work since you came to the Banco de España, including papers on research and development, oil markets, sovereign crises, banking and macroprudential policies, and modeling methods with heterogeneous agents.**

**But you also have a fascinating historical study of the Spanish banking system during the global financial crisis of the 1860s. That period recalls recent times, with a twin crisis affecting banks and sovereign debt, but it occurred when Spain still lacked a central bank. Tell us about how that crisis played out.**

I was fortunate to work with Pedro Tedde, the historian here at the Banco de España, who has recently retired. He was the last of a large cohort of economic historians working here since the late 1970s. The Banco de España has amazing archives, with information about its balance sheet and its board meetings ever since its foundation in the 18th century. So there is hard data, and soft data about the issues that worried people in those days. Nineteenth century balance sheets are fascinating because you already had all the main features of a modern economy, but the structure was much simpler. There were financial crises like we have today, but the balance sheets of the banks look like textbook examples: you see investment in equity and bonds, and financing by deposits, and bonds, and capital. Nothing else. So it's much easier to understand.

**RU: The Banco de España, at that time, was still called the Banco de San Carlos?**

No. The period we cover in the paper is 1856-1874. The Banco de España got its current name in 1856, when a new charter was issued, with new responsibilities and regulations for all Spanish banks. Similar regulations were issued around the same time in several countries— including France, some German states, and the United Kingdom, related to the emergence of limited liability in banking, and the emergence of universal banking. Before the mid-19th century, there were only private banks, owned by a few partners who put in their own money. But with the construction of the railroads, a new kind of bank was needed, which could issue shares, and take deposits, and bring in sufficient money to fund larger-scale investments.

**RU: You talk about two types of institutions in your paper, the local issuing banks, and the *sociedades de crédito* (credit societies).**

Right. There were two classes of limited-liability banks at that time. First, the issuing banks, which had the tremendous privilege of issuing bank notes in exchange for deposits of bullion. Their main business was providing commercial credit, discounting bills of trade and so forth. And while there were many issuing banks, it was not a “free banking” system as in Scotland or the U.S. Only one bank of issue was permitted in each city— a system of local monopolies. There was a Banco de Barcelona, a Banco de Santander, Banco de Cádiz, and so forth. And in spite of its name, the Banco de España was really just the largest local issuing bank, effectively a “Bank of Madrid”. But that gave it the advantage of being the main lender to the government.

The second class of banks were the *sociedades*, resembling contemporary investment banks, which were less regulated. They were not permitted to issue bank notes, and their main business was industrial investment, especially in railroads. So there was a dual system, with one sector more regulated than the other, one safer than the other. The *sociedades* were highly competitive— there were lots of them, with at least three in Madrid. They competed with each other in investment projects, and they also tried to muscle in on the business of the banks of issue, because they could see the profitability of issuing currency. They issued bearer

bonds that paid a small amount of interest, trying to create a sort of pseudo-money. That was controversial and arguably illegal.

Then came the crisis of 1864-1866, which has many parallels with recent times. Over six years there had been a huge economic boom in Spain, mostly driven by worldwide money growth due to the discovery of gold in California. And domestically the boom was concentrated in one sector: at that time it was not housing, but railroads. The *sociedades* were highly leveraged by then, and investing in railroads, partly because of government subsidies, but it was fairly predictable that many of these investments would fail.

Then all of a sudden a global panic raised interest rates worldwide, what we would call a “sudden stop” today. There were many causes, but the worst episode was the fall of a huge London institution called Overend & Gurney. The subsequent crisis is familiar to English academics, because that is when the Bank of England stepped in as a lender of last resort, as Walter Bagehot described in his book, *Lombard Street*.

**RU: What happened in Spain?**

The crisis led to a credit freeze, no one wanted to lend to Spain, and Spanish investors wanted their money back from the banks. The railway assets of the *sociedades* were highly illiquid, and they had lots of debt and little capital. So they had no money to pay back their creditors, and had to declare bankruptcy. There were also spillovers to the banks of issue, in spite of their sounder business model.

And perhaps due to institutional differences, or maybe just the ignorance of the authorities, the management of the crisis was very different here, awful really. On one hand, there was a lot of corruption, as overlapping shareholders in the issuing banks and *sociedades* maneuvered to place losses on the bondholders and depositors. But probably the most reckless behavior was by the central government itself. It was on a totally unsustainable fiscal path, and had no access to debt markets, due to its previous unresolved serial defaults. So the government decided to force the Banco de España to finance it. And the worry at that time was not about inflation, but sustainability— people worried that the unsustainable government debt would bankrupt the Banco de España.

**RU: So there was no one available to act as a lender of last resort.**

True, but not only that. The Banco de España was not really at the center of the system, unlike the English or French situations. It just saw itself as *primus inter pares*, the largest in the family of local banks. And unlike the Bank of England, which accepted deposits from other banks, the Banco de España had no close relationship with the others. It was a very large bank, amounting to half the banking system, but it had no wider role. So it was never tempted to help the other banks, which it basically viewed as competitors.

But even if it had wished to, the Banco de España could not have stabilized the financial system, because the government was deliberately draining its resources. It sounds crazy to say it, but there was a Machiavellian plan. The Spanish government, led by Alonso Martínez (who now has a metro station named for him) planned to borrow all the gold from the Banco de España, then force it into bankruptcy, and then grant a new monopoly of issue of banknotes to a new central bank, to be created by English capitalists. The government knew the outside rescuers would pay handsomely for the privilege of becoming Spain's central bankers. The local banks of issue would be eliminated, and the new central bank would have a monopoly of issue for the whole country, more like the Bank of England.

**RU: So, two questions! What happened to the banking system, and what happened to that Machiavellian plan?**

The plan failed, due to the financial crisis in London after the fall of Overend & Gurney. The British had their own crisis, so they could no longer consider creating a central bank for Spain. At the end of the day, there was no longer a Plan B, so the government could not let the Banco de España collapse.

But without a lender of last resort, Spain suffered a tremendous credit crunch, much worse than France, Italy, or the U.S. Some countries protected themselves through an explicit lender of last resort, others through suspension of convertibility and a more expansive monetary policy. Spain was the only country that stayed attached to gold throughout the whole period, without a lender of last resort. Half the financial system collapsed, causing a collapse in

credit, a huge economic crisis, and deflation. By 1868 this contributed to the so-called Glorious Revolution, which deposed Queen Isabel II and expelled her from the country. Eventually there was a liberal government, the First Republic of Spain, which implemented reforms to improve debt sustainability and create a healthier financial system, leading to some recovery from 1868 to 1874.

**RU: Goodhart and Perotti argued recently that old-fashioned bill discounting was much safer than the more modern business of long-term investment financing. The contrast between the issuing banks and the credit societies supports that view, no?**

Yes, the issuing banks did far better. Only three of the thirteen target credit societies survived, among them Crédito Mobiliario Español, the forerunner of Banesto today. But most of the issuing banks survived. Some were merged with the Banco de España, becoming what are now its regional branches. Other local banks chose not to merge with the Banco de España; they lost their note issuing privileges and became ordinary banks. Those included the Bank of Bilbao and the Bank of Santander.

**RU: You are also working on contemporary banking and finance issues. You and Carlos Thomas have a paper on bank leverage dynamics.**

Macroeconomists have long studied firms that face financial frictions, and there is a huge finance literature on the role of banks. Central banks often have a dual mandate for price stability and financial stability, where monetary policy guides inflation, while bank safety is addressed through regulation and inspection. The recent crisis reminded us that those issues are really inseparable, and we need to study how the financial system interacts with the real economy. In particular, we need to model the role of banks in general equilibrium, which is what we do.

**RU: What did you find, empirically, in the paper?**

Leverage dynamics are surprisingly controversial. Banks' leverage is the ratio of their total assets to their equity; greater leverage means they are more deeply indebted. In the data, leverage initially seems procyclical— banks take on more debt and pay more dividends in booms, and then deleverage and recapitalize in recessions. However, some researchers

have questioned that conclusion, claiming it is an artifact of measuring assets at book value rather than at market value. Imagine that you buy a house for a given amount of money. On your bank's balance sheet, that is the (book) value of the house. But if, in a crisis, the market price of the house falls faster than the bank can reduce its debt, then bank capital is destroyed. This might raise leverage during crises. By analyzing the data carefully, we found that while these price effects reduce the procyclicality of leverage, they are not strong enough to make it countercyclical.

But then we wanted to understand what determines banks' leverage, and how this affects the economy. A crucial issue, related to the 19th century questions we discussed earlier, is banks' limited liability. When banks issue debt, either in the form of deposits or bonds, the tail risks of investments ultimately lie with the lenders, not the bank. Therefore, lenders want banks to hold sufficient equity to act as a cushion against reckless behavior. So regardless of the regulatory regime, bondholders exert some degree of market discipline that discourages overleveraging.

**RU: What mechanisms do lenders have to force banks to increase equity?**

They can increase the haircut on new debt. They can restrict new bond issuance or rollovers. If the bank wants to maintain its investments, bondholders may no longer be willing to issue so much debt unless it is accompanied by increased equity. So this may either force an increase in equity or a reduction in investment.

But when economic uncertainty increases, this can set off a vicious circle of fire sales. Bondholders get nervous, and they require banks to raise equity and cut debt. But if all the banks try to sell assets at the same time, then asset prices collapse, making bondholders even more nervous. So even as banks try to reduce leverage, it may increase through this price effect. Then banks are forced to slash credit, and firms are forced to reduce investment and hiring, so wages will fall too. That creates a crisis that feeds through to the real economy, including households.

**RU: In your model, these cycles are driven by exogenous shocks to uncertainty, which are then amplified by this leverage effect, right? Because it seems that feedback loop could also generate endogenous cycles.**

Yes, it is an amplifying mechanism. A fully nonlinear version of our model might feature endogenous uncertainty and hence endogenous crises, as in Brunnermeier and Sannikov's work. But our paper focuses on a linearized model, feeding in exogenous shocks to uncertainty. And when we test the role of those shocks statistically, allowing for shocks to TFP and investment technology too, the uncertainty shock is crucial for explaining the dynamics of the banking system, and the depth and duration of the crisis. If the main problem had been productivity or investment shocks, the recession would have been shallow, with a quick recovery. The deep, L-shaped recession we have seen was mainly due to the problems in banks' balance sheets, and their deleveraging process.

**RU: So the severity of this crisis was due to the long period of stability that preceded it, which allowed banks and firms to grow exceptionally leveraged?**

Partially, yes. Banks leveraged up because they thought uncertainty was low, and when the crisis began they realized they were far too deeply indebted. And the deleveraging process, even if it was fairly fast, was very painful for the real economy. In future work, we may model some macroprudential policies to see whether reducing these financial fluctuations would improve welfare.

**RU: Finally, what are you working on now?**

Lately I am developing continuous-time methods for solving heterogeneous agent models. That might sound abstract, but heterogeneity is directly relevant for many policy questions. For example, if there are financial frictions, policy affects different people and different firms differently. And obviously a rise in interest rates squeezes debtors, making them pay more on their mortgages, while savers receive more interest income. Issues that are in the press every day, like "too big to fail", are rarely modeled formally— most papers have a representative bank, so no bank is bigger than the others. Thomas Piketty, for instance, has highlighted how wealth inequality matters for so many macroeconomic issues, from taxes, to central banking.

So modeling heterogeneity is very important, and it is often easier to do in continuous time instead of discrete time. Personally, I have been working with Benjamin Moll to develop tools for solving games in

heterogeneous agent models. The games we have in mind are situations where a policy maker chooses instruments that affect the behavior of a whole distribution of agents. So these games can be viewed as the strategic interaction of one player with a continuum of other players.

Carlos Thomas and I plan to apply these methods to monetary policy in a monetary union: a game between a single central bank and many heterogeneous countries. Also, similar questions arise for optimal monetary policy in a single economy with heterogeneous households.

#### Papers mentioned

Alessio Moro, Galo Nuño, and Pedro Tedde (2015), "A twin crisis with multiple banks of issue: Spain in the 1860s." *European Review of Economic History* 19 (2).

Galo Nuño and Carlos Thomas (2014), "Bank leverage cycles." Manuscript, Banco de España, December.

Benjamin Moll and Galo Nuño (2015), "Optimal control with heterogeneous agents in continuous time." Manuscript, Banco de España, September.

#### RESEARCH PAGE:

[http://www.bde.es/investigador/en/menu/research\\_staff\\_a/Nuno\\_Barrau\\_Galo.html](http://www.bde.es/investigador/en/menu/research_staff_a/Nuno_Barrau_Galo.html)

## NEW FACES



### MONICA CORREA-LÓPEZ

Staff economist  
Monetary Policy Division  
Monetary and Financial Studies Department

**MONICA CORREA-LÓPEZ** joined the Monetary Policy Division of the Banco de España in May 2015 after holding a senior economist post at BBVA Research. Mónica received her Ph.D. and M.Sc. in Economics from the University of Warwick (U.K.) and her B.Sc. in Economics from Universidad Carlos III (Spain). During her formative years, she was awarded the Ph.D. scholarship of the University of Warwick and the Marie Curie Doctoral Fellowship of the European Commission, which financed a period of research at Tilburg University (Netherlands). Mónica has taught economics at graduate and undergraduate levels in the subjects of macroeconomics, international economics, industrial organization and economic history, at the University of Warwick, Universidad Carlos III and the Universidad de Valencia.

Mónica's research centers primarily on the fields of macroeconomics, industrial organization and labor economics. Her current interests include the international transmission of medium-term cycles, productivity, inflation, and firms' performance in international markets, among others. One of her

ongoing projects investigates the international propagation mechanisms of U.S. shocks that persist into the medium frequency, paying special attention to the role of bilateral trade linkages between the U.S. and EMU economies. The project explores the consequences of a persistent slowdown in technical progress in the U.S. (assumed to be the technological leader) for the medium-term performance of technology-recipient countries. In addition, Mónica is studying the consequences of product market reforms in the service sector for the competitiveness of Spanish manufacturing firms. She finds that a more competitive environment in services positively influences firms' performance both in terms of their intermediate input prices and their sales abroad. The project also emphasizes the relevance of firm size for quantifying the economic impact of reforms. Finally, a third ongoing project addresses the long-run relationship between monetary policy regimes, credibility, and the properties of inflation to cast light on the institutional framework that has historically been best suited to the aim of stable inflation.





## ALESSANDRO GALESÌ

Staff economist  
Monetary Policy Division  
Monetary and Financial Studies Department

ALESSANDRO GALESÌ joined the Monetary Policy Division of the Banco de España in September 2015. Alessandro obtained his Ph.D. in Economics from CEMFI in June 2015. He also holds an M.Phil. in Economics and Finance from CEMFI, and an M.Sc. and B.Sc. in Economics from the University of Pisa. He worked at the External Developments Division of the European Central Bank, first as intern in 2009, then as consultant in 2010 for developing the *Global VAR Toolbox* and in 2015 for extending the *IVAR Toolbox*. Over the period 2012-2014 he also worked as research assistant to Prof. Claudio Michelacci for the European Research Council (ERC) project: *“Estimation of General Equilibrium Labor Market Search Models”*.

Alessandro does research in the fields of macroeconomics, housing, and macroeconometrics. The five chapters of his doctoral research contribute to business cycle analysis in two directions: first, by presenting new theories of housing, macroeconomics, and their interplay, and second, by providing novel

estimation techniques for dynamic factor models. In his latest paper Alessandro documents a downward trend in construction productivity relative to other industries, for the U.S. economy, which started around the end of the 1960s and still persists. He shows that the interaction of this productivity slowdown in construction and the low interest rates at which the United States has borrowed from the rest of the world over recent decades can help explain recent developments in the U.S. housing cycle and current account.

Alessandro is currently studying the role of *“Make it in America”* policies, introduced by the current U.S. administration to support the manufacturing sector. The research assesses how the Great Recession would have differed if the U.S. government had not subsidized the manufacturing sector.

### RESEARCH PAGE:

[http://www.bde.es/investigador/en/menu/research\\_staff\\_a/Galesi\\_Alessandro.html](http://www.bde.es/investigador/en/menu/research_staff_a/Galesi_Alessandro.html)



## OMAR RACHEDI

Staff Economist  
Research Division  
Monetary and Financial Studies Department

OMAR RACHEDI joined the Research Division of the Banco de España in September 2015. Omar obtained his Ph.D. in Economics from Universidad Carlos III de Madrid in July 2015. He also holds an undergraduate and M.Sc. degree in Economics from the Università di Pisa and an M.Sc. in Economics from Universidad Carlos III de Madrid. Before joining the Banco de España, he worked one year as risk analyst at Deloitte Consulting in Milan. Omar has also been a professional middle-distance runner for the Arma dei Carabinieri, appearing nine times for the Italian national team.

His research interests combine macroeconomic and financial theory with computational and empirical methods to address policy-relevant research questions, with a particular focus on asset pricing and the housing market. Omar has explored how changes in U.S. financial markets over the 1980s could have affected the capital structure of corporate firms, and eventually the dynamics of corporate default rates and corporate credit spreads. In another project, he has looked at the asset pricing implications of households' limited attention to the stock market. Finally, his job market

paper studies how fluctuations in aggregate volatility can cause financial crises. Omar shows that movements in uncertainty can alter the pledgeability of households' collateral, leading to booms and busts in the credit market and real economic activity.

Omar is currently studying the causes of the recent U.S housing market bust and the potential

implications in terms of macroprudential policy. This research points out how movements in the liquidity of the housing market can affect households' access to credit and lead future changes in the house price.

RESEARCH PAGE:

<https://sites.google.com/site/omirachedi/>

## VISITING FELLOWS

### ANTOINE LOEPER

Assistant Professor

Universidad Carlos III de Madrid

ANTOINE LOEPER is visiting the Research Division from September 2015 until July 2016. He received his undergraduate training in engineering at Ecole Polytechnique in Paris in 2001, and completed a PhD in Economics at the Toulouse School of Economics in 2006. Before joining Universidad Carlos III de Madrid as an Assistant Professor of Economics in 2011, he was an Assistant Professor at the Kellogg School of Management, Northwestern University.

Antoine specializes in political economy, public economics, and microeconomic theory. His early research was on the political economy of federal systems. In particular, he was interested in the conflict of interests among local jurisdictions generated by cross-jurisdictional externalities, and whether such externalities justify the centralization of policy-making responsibilities. He has also worked on models of social learning with applications to the dynamics of social movements. His current research focuses on dynamic models of bargaining among policy makers.

His research at the Bank of Spain investigates whether institutions composed of policy makers with heterogeneous preferences and beliefs can respond in a timely and effective manner to a changing environment. He uses dynamic bargaining models in which heterogeneous members of a policy-making institution (e.g., members of a legislature, or members of a monetary policy committee) must constantly revise the current policy to adapt to economic and political shocks. These models focus on the frictions generated by the conflicts of interest among policy makers, how the bargaining procedure affects such frictions, and whether they generate excessive policy inertia.

RESEARCH PAGE:

<http://www.eco.uc3m.es/personal/aloeper/>

### MARTÍN SOLA

Professor of Economics

UTDT (Buenos Aires) and Birkbeck (London)

MARTÍN SOLA is visiting the Research Division from September until November 2015. He is a Professor at the Universidad Torcuato di Tella (UTDT) in Buenos Aires, and a part-time Professor at Birkbeck,

University of London. He has held visiting positions at the IAE (Barcelona) and at the Federal Reserve Bank of St Louis. He received his Ph.D. in economics from the University of Southampton in 1991.

His research areas include nonlinear time series analysis, monetary economics and finance. He has studied how to incorporate regime changes into forward-looking models with rational expectations. Recently, he has investigated how bond, stock and options pricing models have to be modified to account for regime changes. He has published in journals such as the Journal of Econometrics, Journal of Monetary Economics, and European Economic Review. He is an associate editor for the journal Studies in Nonlinear Dynamics and Econometrics, and has been a recognized as a distinguished author of the Journal of Applied Econometrics.

Martín's research at the Banco de España investigates the use of a discrete-time affine model of commodity futures which is able to handle stochastic seasonality. His specification makes it possible to measure and price seasonal risks by attaching market prices of risks to the seasonal factors. By imposing some strong restrictions on the evolution of risk-neutral probabilities, his model is able to identify the market prices of risk and the risk premia associated with different trading strategies, which is otherwise a difficult identification problem in affine models.

**RESEARCH PAGE:**

<http://www.bbk.ac.uk/ems/faculty/sola>

# ANNOUNCEMENTS

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## JOB OPENINGS FOR PHD ECONOMISTS

25 NOVEMBER 2015

The Banco de España wishes to hire experienced or newly qualified PhD economists for positions at its headquarters in Madrid. Desired areas of expertise include monetary policy, international economics, macro-finance, banking and finance, industrial organization, and applied micro- and macroeconomics.

[See job details at EconJobMarket.org >](http://EconJobMarket.org)

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