



RESEARCH UPDATE

Fall 2022

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Welcome to the Banco de España Research Update

The Banco de España is pleased to announce the release of the Fall 2022 issue of its Research Update. The Update aims to inform both academic and policy-oriented economists and financial specialists about publications, conferences, and other research activities at the Banco de España.

Two years after the approval of the Banco de España's strategic framework for its medium-term analysis and research priorities, in 2020, this Update presents the latest revision. The framework has five main headings: central bank policies and their interactions; the main long-term trends in the Spanish economy; risks and opportunities arising from the international environment; the aggregate consequences of household and firm heterogeneity; the challenges of new technologies. In 2022, as part of the annual exercise to monitor and update the Banco de España's analysis and research priorities, these work streams have again been reviewed.

This Update includes the latest feature articles summarizing policy-relevant findings from recent Banco de España projects in diverse areas of research. First, J. García-Lozano, L. Hospido and A. Ruggieri study how labor market duality affects human capital accumulation and the wage trajectories of young workers in Spain. They find lower returns on experience accumulated under fixed-term contracts compared with open ended contracts; widespread use of the former holds back wage growth up to 16% after 15 years in the labor market. Second, Henrique Basso builds a macroeconomic model of credit frictions with risk shocks and shows that imperfect information aggregation in secondary credit markets has significant consequences for economic cycles. In a third feature, M. Izquierdo, E. Moral-Benito, E. Prades and J. Quintana provide a framework to analyze how a shock to a specific sector propagates along the global production network, and quantify the aggregate impact when the common shock affects the same industry across countries. E. Gautier, C. Conflitti, R. Faber, B. Fabo, L. Fadejeva, V. Jouvanceau, J. Menz, T. Messner, P. Petroulas, P. Roldán Blanco, F. Rumler, S. Santoro, E. Wieland and H. Zimmer build a novel dataset with 135 million pricing quotes from 11 euro area countries, representing about 60% of the euro area consumption basket, to document various facts regarding price rigidity in the low inflation period from 2010 to 2019. In a fifth feature, Salomón García develop a macro model of the U.S. housing finance system that delivers an equilibrium connection between the securitization and mortgage credit markets. In the model, the benefits of securitization are hindered by originators' private information about loan quality which leads to adverse selection in securitization. Finally, A. Bertheau, E. María Acabbi, C. Barceló, A. Gulyas, S. Lombardi, and R. Saggio document the consequences of losing a job across countries using a harmonized research design and administrative data from Social Security.

This Update also reports on other research news, such as recent publications in peer-reviewed journals, the publication of the Spring and Fall 2022 volumes of the Financial Stability Review, as well as current conferences. Moreover, it presents the profiles of six newly hired researchers who are joining the Banco de España during the fall of 2022.

We highlight these and other research developments at the Banco de España in hopes that they will interest the broader research community in Spain and internationally, and thereby contribute to an improved understanding of economic policy.

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Analysis and research priorities for the Banco de España: 2020-2024. 2022 update

*In 2020, the Banco de España defined the strategic framework for its **medium-term analysis and research priorities**, which were grouped under five main headings: central bank policies and their interactions; the main long-term trends in the Spanish economy; risks and opportunities arising from the international environment; the aggregate consequences of household and firm heterogeneity; and the challenges posed by new technologies.*

Various work streams were established in 2020 within each of these analysis and research priorities. In view of the changing economic environment, these work streams were **updated in 2021**, when many were preserved, others were reoriented and some new ones were included.

In 2022, as part of the annual exercise to monitor and update the Banco de España's analysis and research priorities, these work streams have again been reviewed. In particular, in the coming quarters, our analysis will concentrate mainly on five key work streams:

- The present inflationary episode and its implications for the main macroeconomic aggregates, the monetary policy stance and implementation, financial stability and macroprudential policies.
- The unequal impact that the rise in inflation, the change in the monetary policy stance and the energy crisis are having on certain groups of households and firms, and on the financial system.
- The risks of global financial and trade fragmentation and the European response to the current difficult environment, focusing in

particular on the measures envisaged in the area of energy policy and open strategic autonomy, and in the framework of the review of the European fiscal rules.

- The structural reforms recently approved – or currently under debate – in Spain and NGEU implementation, and their capacity to boost the potential medium and long-term growth of the Spanish economy.
- The risks and opportunities – for financial institutions, consumers and the stability of the financial system as a whole – posed by various technological innovations currently being developed, such as the digital euro, or gradually being introduced into financial operations.

As part of the internal transformation exercise that was launched in January 2020 with the approval of the **Strategic Plan 2024**, the Banco de España is seeking to strengthen its analytical work. The aim is to address the challenges posed by the various changes in the economic and social environment for the performance of its functions as a national central bank and member of the European System of Central Banks.

To this end, having identified the most relevant issues that may affect the economic welfare of Spanish society at different time horizons, in October 2020 the Banco de España published its **analysis and research priorities for the period 2020-2024**, organised under five main headings:

1. Central bank policies and their interactions.
2. Long-term trends in the Spanish economy.
3. Risks and opportunities arising from the international environment.
4. The aggregate consequences of household and firm heterogeneity.

5. New technologies and information sources: challenges for a central bank.

Since then, these five areas of analysis have crystallised into various work streams, whose focus and priority has been adjusted over time to adapt to a changing economic and geopolitical environment. In 2020, for instance, major efforts were made to study the impact of the economic measures adopted in response to the COVID-19 crisis, the challenges posed by negative interest rates, the factors behind low trend inflation, the development of sustainable finance, and the implications of the digital transformation of the banking business. By contrast, in 2021, analysis was concentrated, inter alia, on the medium and long-term implications of the pandemic crisis, the unequal impact it has had on households and firms and the role of economic policy, the possible impact of the NGEU programme in Spain, the economic and financial consequences of climate change, and the implications of the development and introduction of the digital euro.

In view of the most recent economic and geopolitical developments, and the new challenges and issues arising as a result, a new update of the priority work streams for the coming quarters is in order, in all cases in the framework of the five main areas of analysis defined in 2020.

First, as regards central bank policies and their interactions, the emphasis will be placed on:

- the current **inflationary episode** and its macroeconomic implications: the feedback loop between prices and wages, changes in consumer and saving patterns, pass-through of higher costs -especially gas and electricity costs- to prices and corporate earnings, relationship between financial stability and inflation, etc.;
- the impact of the **change in the monetary policy stance** – in light of the inflationary episode – on the key financial markets, in

terms of its transmission, its pass-through to bank rates, the financial position of Spanish households and firms and bank solvency; interaction between the different instruments (interest rate hikes and reduction in central banks' balance sheets) along the optimal monetary policy normalisation path in a high inflation setting;

- **interaction between fiscal and monetary policy:** effects of broad-based fiscal support measures compared with measures targeting inflation; fiscal conditionality and instrumentation of the ECB's new mechanism to protect monetary policy transmission (TPI); risks of financial fragmentation in the euro area;
- the costs and benefits of applying **macroprudential tools** to the banking sector and their effectiveness in mitigating systemic risk; the usability of capital buffers;
- analysis of a potential **simplification of the solvency and resolution arrangements** for credit institutions compared with the current prudential requirements.

Second, in relation to the long-term trends in the Spanish economy, greater priority will be given to the study of:

- changes in **energy dependence** patterns, in the configuration of the electricity market in Spain and, in the course of the **energy transition:** implications for the Spanish economy and its growth capacity, for the different sectors of activity –which interact through their input-output linkages– and for the inflation dynamics;
- the **implications of climate change for monetary policy and central bank activity:** conceptual development of the prudential

framework to enable banks to mitigate both the transition and the physical risks of climate change; assessment of the effects of climate change on the long-term growth of the Spanish economy and by economic sector; assessment of the investment made and measures taken; analysis of the barriers to implementation of some **sustainable finance** solutions provided by new technologies; study of the sustainability information content of corporate annual reports; inclusion of sustainability factors in government debt markets, portfolio management and monetary policy conduct;

- **debt sustainability:** the respective roles of fiscal consolidation and potential growth;
- factors that explain the **growth in inequality** (in terms of employment, gender, health, etc.) in recent crises;
- the impetus that automation and digitalisation are giving to **Spanish economic productivity** and changes in the labour market; the capacity of **NGEU and the structural reforms** to lift the potential medium and long-term growth of the Spanish economy;
- the consequences of **population ageing** on economic activity and employment, and the effectiveness of the public policies aimed at enhancing the work-life balance.

Third, in the area of risks and opportunities arising from the international environment, analysis of the following issues will be strengthened:

- the **risks of global financial and trade fragmentation** and their implications for global value chains, global financial stability and the role of multilateralism;

- the **European response to the current complex energy and geopolitical juncture**, with measures such as the “**Open Strategic Autonomy**” policies, the REPowerEU Plan, the implementation and financing of the **NGEU** recovery plan, and progress in the strengthening of the euro area, with institutional changes such as the review of the **fiscal rules**;
- **assessment of the structural reforms** recently approved – or under discussion – in Spain, and the NGEU-related reforms (labour market reform, tax system reform, pension system reform, etc.);
- the impact of the recent crises on the economies of **Latin America** and their interaction with the Spanish economy.

Fourth, as regards the aggregate consequences of household and firm heterogeneity, greater priority will be given to the study of:

- the **unequal impact that the rise in inflation, the change in the monetary policy stance and the energy crisis** are having on the different types of households and their saving, spending and house purchase decisions, on the different types of firms, and on financial markets;
- the development of methods to **identify the most vulnerable groups in a crisis situation**, with particular emphasis on: measuring households’ financial position, **the role of financial literacy and financial education**, assessment of measures to encourage inclusion, and the identification of best international practice in terms of labour market institutions and employment policies;

- the **risk of financial exclusion** and **access to cash**: geographical distribution of the demand for and access to cash, heterogeneity across households, the use of means of payment and assessment of measures;
- the **geographical dimension** of heterogeneity (regional, provincial or local) in several dimensions, for instance, the economic impact of regulation in Spain.

Lastly, in the area of the challenges that new technologies and information sources pose for a central bank, the study of the following aspects will be strengthened::

- the **digital euro** and the implications of the **introduction of a central bank digital currency** for the financial system and the economy as a whole: international alternatives and their limitations, possibilities and impact of solutions for the wholesale market, integrated digital identity management, privacy management, programmability, impact on the use of cash and aspects relating to the coexistence of digital and non-digital central bank currency;
- new technologies and **financial innovation**: international alternatives and ways to stimulate innovation that may supplement Sandbox developments; **FinTech** developments, existing **cryptocurrencies** and crypto-asset options, such as **decentralised finance** (DeFi), non-fungible tokens (NFTs) or various financial sector distributed ledger technology (DLT) applications; risks and opportunities of the use of artificial intelligence and machine learning techniques in **financial services**; identification of risks and good practice in the **digital transformation of the banking sector** and establishment of the main lines

of regulation for appropriate supervision and mitigation of the risks to financial stability linked to new technologies, including crypto-assets;

- the effects of **innovation in retail payments** for central banks' oversight functions and on analysis of the possibilities for reform of public cash management;
- the use of **advanced data analytics techniques** (artificial intelligence, machine learning, text mining, big data) to: develop **risk prediction models** for bank portfolios; create **analyst sentiment** indicators; identify and quantify the **key themes** of central bank decisions, banks' earnings releases or financial stability reports; construct indicators of the **Banco de España's presence and relevance** in economic debates in Spain and in other institutions; indicators of **geopolitical risk**, social unrest or economic policy uncertainty; construct a **sustainability indicator** database of Spanish firms drawing on their annual reports; widen the sample of valid Central Balance Sheet Data Office (CBSO) firms; analyse banknote data using serial number readings and image analysis for **quality control of banknotes** in circulation; develop a neurometric kit applied to the **most appropriate design of banknotes** and their security features.

By publishing this updated focus of its analysis and research priorities, the Banco de España underlines its commitment to transparency in its research activity, while at the same aspiring to foster collaboration in these areas with both the academic and economic research community.

Dual returns to experience

JOSE GARCIA-LOUZA, LAURA HOSPIDO, AND ALESSANDRO RUGGIERI

Summary of Banco de España Working Paper no. 2211

In recent years, the use of short-term work arrangements, such as temporary contracts, has become widespread in many European countries, where labor markets are relatively more rigid and regulated than those in the United States and the United Kingdom (ter Weel, 2018). In the case of Spain, before 2022, more than 90% of the contracts signed each month were fixed-term and around 25% of the workforce was under some form of temporary employment (Felgueroso et al., 2018).

Despite allowing employers to easily adapt to fluctuations in demand (Aguirregabiria and Alonso-Borrego, 2014), the impact of temporary contracts on worker's labor market careers is still debated. On the one hand, workers might benefit from their availability since they ease job finding (de Graaf-Zijl et al., 2011) and mitigate wage losses associated with skill depreciation during non-employment (Guvenen et al., 2017; Jarosch, 2021). On the other hand, they could be detrimental if they induce an unstable career (Blanchard and Landier, 2002; García-Pérez et al., 2019) or lower firm-sponsored on-the-job training (Cabrales et al., 2017; Bratti et al., 2021). Our paper studies how labor market duality affects human capital accumulation and the wage trajectories of young workers in Spain. Using rich administrative data up to 2018, we follow workers from their entry into the labor market to measure the exact time worked under open ended contracts (OECs) and under fixed term contracts (FTCs). We use these precise measures of accumulated experience to estimate reduced-form wage regressions derived from a stylized framework of human capital accumulation in a dual labor market.

Our estimation results document lower returns to accumulated experience under FTCs relative to OECs. We find that, after accounting for observed match components and unobserved worker heterogeneity, one additional year of experience in permanent employment is associated with wage gains of 5%, while returns are almost 1 percentage point (pp) lower for one extra year of experience in temporary

contracts. This gap corresponds to a 18.5% higher yearly return from accumulating one more year of experience in OECs relative to FTCs. Importantly, we show that the estimated gap in returns is neither due to differences in unobserved match quality nor firms' unobserved heterogeneity:

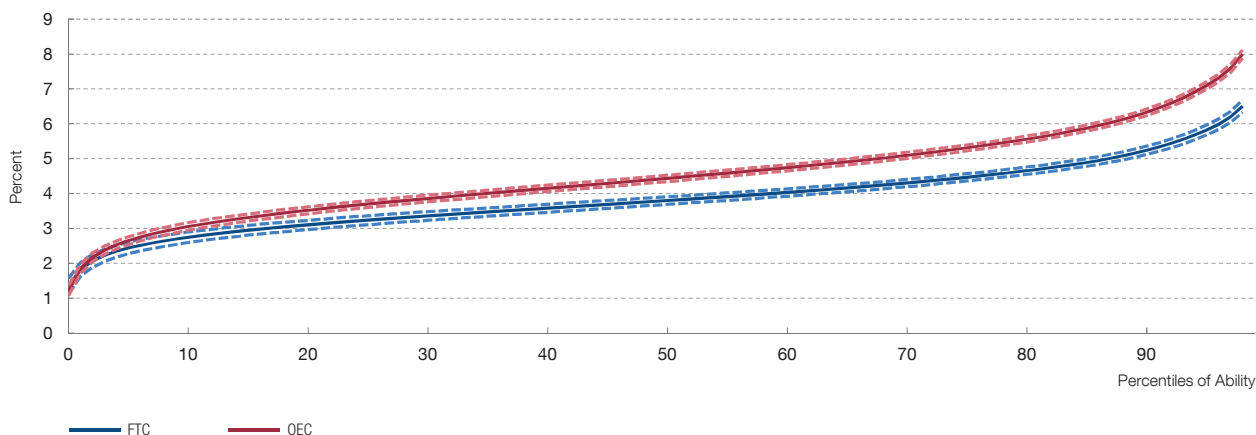
Our analysis suggests instead that the observed difference in returns is related to worse human capital accumulation under fixed-term contracts. First, we show that the gap in returns prevails among workers who switch jobs, suggesting a human capital channel since for these workers there is a clear dissociation between the job where experience is acquired and the job where it is valued. Second, we find that the gap in returns persists when workers move to jobs with similar skill requirements, while it vanishes when they move to jobs where prior accumulated skills are less portable. Thus, to the extent that the relationship between current wages and past experience reveals workers' past on-the-job learning opportunities, our results are indicative of lower skill accumulation under FTCs.

However, differences in returns to contract-specific experience vary according to worker's ability (both observed and unobserved), suggesting complementarity between workers' skills and learning opportunities. More specifically, we find that workers without a college degree face no differential returns to experience based on whether the latter was acquired under FTCs or OECs. In contrast, college graduates, while exhibiting similar returns to experience in FTCs relative to workers without a college degree, enjoy substantially higher returns to experience from permanent jobs, resulting in returns to experience accumulated in OECs that are 35% higher than in FTCs. The results are similar when we compare workers based on ability as measured by the time they have spent during their career in a high-skill occupation.

Heterogeneity in returns to experience by observed ability suggest that differences in skill acquisition across contracts might be related to individual (unobserved) ability to learn. To explore this complementarity, we incorporate the interaction between our estimate of each worker's unobserved ability and the learning benefits of FTC and

Chart 1

DUAL RETURNS TO EXPERIENCE: UNOBSERVED ABILITY



NOTES: Contract-specific returns to experience computed for each percentile of unobserved ability (individual FE) using our estimates ($\times 100$). 95% confidence bands are calculated using the clustered-wild bootstrap (100 repetitions) procedure by Cameron et al. (2008). OEC and FTC stand for experience acquired under open-ended and fixed-term contracts, respectively.

OEC into our framework.¹ Figure 1 shows that both returns are increasing with individual abilities, pointing to a strong complementarity in wages between unobserved skills and acquired experience. However, while past OEC experience has a higher reward on average, the gap in returns increases with individual ability. Comparing counterfactual wage trajectories in fixed-term and open-ended contracts reveals that workers at the top of the ability distribution (90th percentile) but employed under FTCs may face up to 16 percentage points lower wage growth 15 years after entering the labor market.

Taken together, our results indicate that labor market duality affects workers' careers over and above the instability of employment histories: experience accumulated in fixed-term contracts is less valuable, and poorer learning opportunities in temporary employment have implications for individual wage growth several years after labor market entry.

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¹ To estimate this model, we use the algorithm proposed by de la Roca and Puga (2017). The algorithm requires to guess a set of individual abilities and use them to estimate the equation. Then we obtain a new set of estimated individual abilities and use them as a new guess. We iterate this process until the absolute-value norm between two consecutive sets of abilities averaged across individuals is lower than a tolerance level that we set equal to 0.001.

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Asset holdings, information aggregation in secondary markets and credit cycles

HENRIQUE BASSO

Summary of Banco de España Working Paper no. 2214

Understanding fluctuations in credit that lead to persistent and sizable effects on economic activity has been at the forefront of the debate in policymaking and academia. Several features have been identified as important drivers behind these fluctuations. The most prominent involve problems of asymmetric information and adverse selection and the presence of non-linearities due to credit constraints. Here we focus on a novel mechanism generating amplified economic and credit cycles based on imperfect information aggregation in credit markets and mispricing. Asset holdings of financial intermediaries have grown considerably in the last decades. The share of assets allocated to the trading book, which is mark-to-market, has also increased substantially. Finally, bankers' compensation has been heavily skewed towards short-term payoff. In a framework that incorporates these features, in which banks have heterogeneous information and participate in an active secondary market of loan baskets, there are incentives for incomplete information aggregation in credit markets, ultimately leading to the mispricing of credit assets. These instances of market dysfunction and mispricing generate initially a boom, and subsequently a prolonged recession, increasing macroeconomic volatility and amplifying credit cycles. Mispricing may therefore contribute to shaping financial cycles.

FRAMEWORK

The framework used builds on the standard macroeconomic model of credit frictions with risk shocks (Christiano et al. (2014)). Entrepreneurs must borrow from banks to fund investment projects. Loan contracts are a function of the degree of riskiness of entrepreneurs' projects or the dispersion of the distribution of entrepreneurs returns, which is the only aggregate exogenous stochastic variable in the model. The key novelty of the framework is the introduction of a more realistic banking sector in which (1) bankers initiate every

period with a set of loans in the balance sheet and put a greater weight on current mark-to-market gains relative to future profits, (2) bankers differ regarding their information on the expected degree of riskiness of entrepreneur projects, as only a random subset of bankers get a signal on riskiness (bankers who receive a signal are informed and the ones who do not, are uninformed), and (3) bankers interact in a secondary market of credit through signalling games where by determining the new valuation of loans, an economy wide posterior view on the degree of riskiness emerges. Under this posterior view all existing and new loans are priced.

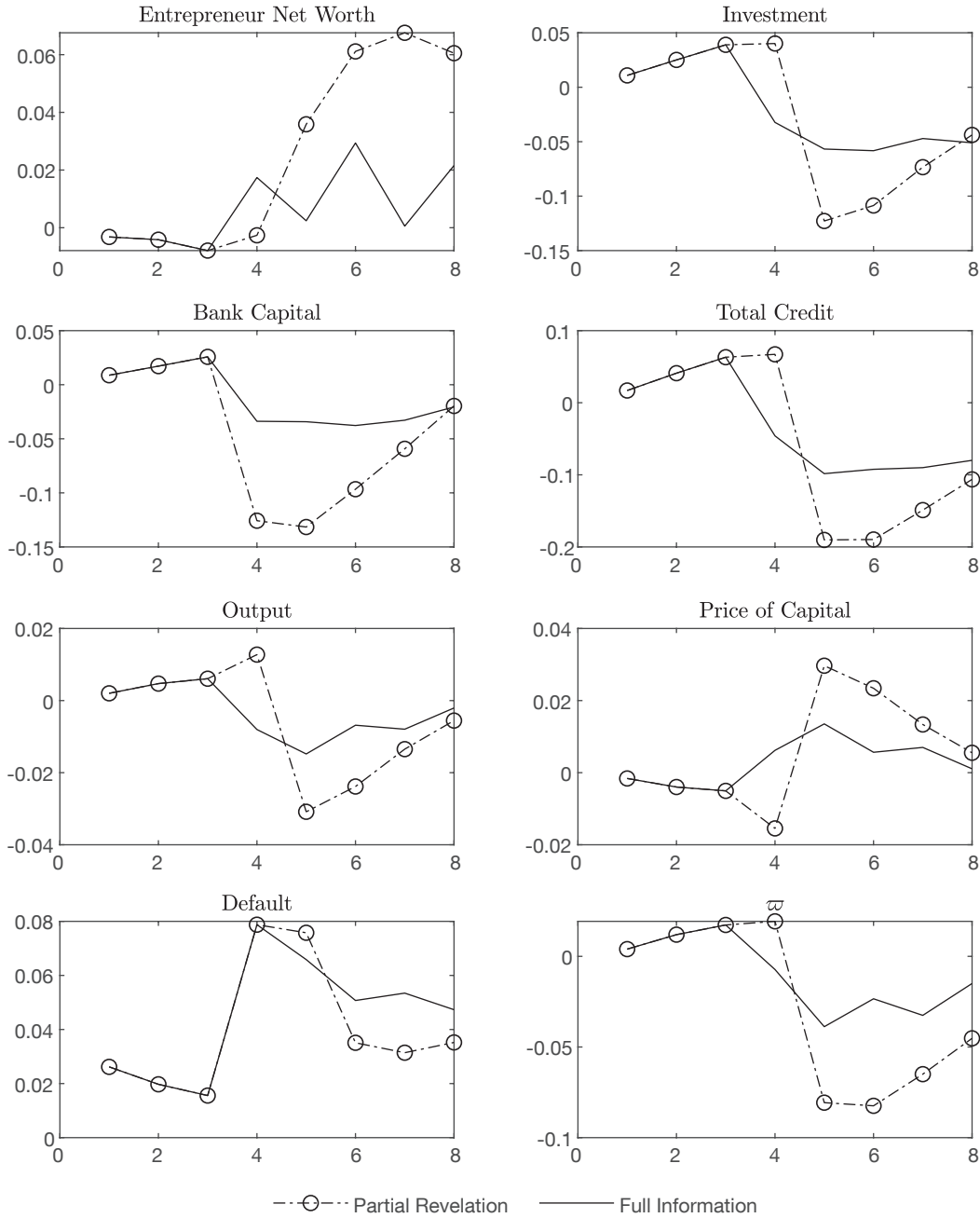
The key decision for an informed banker is whether to reveal its signal to uninformed bankers or avoid doing so. Informed bankers are all identical and set the same strategy in a series of signalling games between each informed banker and the collective of uninformed bankers, which then determines the equilibrium in secondary markets. On the one hand, if informed bankers fail to reveal adverse signals to uninformed ones by refraining from selling off credit assets, the equilibrium in credit markets is such that the mark-to-market value of assets in the balance sheet are preserved. However, by doing so informed bankers forgo gains from trading while exploiting informational advantages and as information does not become public, the valuation of new credit instruments does not appropriately reflect the risks undertaken - credit markets malfunction. As a result, the banking sector fails to set credit spreads that match the expected default rates, potentially increasing future losses. On the other hand, attempting to go short in the secondary market and revealing the signal leads to lower mark-to-market valuation of asset holdings. Nonetheless, informed bankers make trading profits and information is fully incorporated into loan rates. The banking sector sets credit spreads on new loans appropriately, avoiding future losses. Therefore, informed bankers effectively face a trade-off between the current mark-to-market valuation of asset holdings and their future profits from trading and newly issued loans.

MISPRICING AND BOOM-AND-BUST

The bigger the size of banks' balance sheets and the greater the short-term bias in the banker's payoff, the more likely it is that, after an adverse signal, informed bankers favour mark-

Chart 1

BOOM-AND-BUST IN THE PRESENCE OF IMPERFECT INFORMATION REVELATION



NOTE: Impulse Responses of a boom (three consecutive periods of positive shocks with default rates decreasing to 1.5%), followed by a strong adverse shock at period 4 (default rate increases to 8%). Two cases are compared, straight line - Full Information and dotted line with circles Partial Revelation (imperfect information case).

to-market gains on current asset holdings to the detriment of future profits. Thus, in a series of signalling games informed bankers avoid revealing the signal and the equilibrium in secondary markets only partially reflects new

information. As the adverse shock is effectively overlooked, markets remain bullish on entrepreneurs' projects, failing to adjust funding conditions. Credit spreads (which is related to $1/\sigma$, see Chart 1) are set relatively low, and total

loans/investment relatively high based on the underlying risk, benefiting entrepreneurs. As a result of this overinvestment, the price of capital falls, decreasing the funds needed for households to save in physical capital. In turn, this boosts consumption without depressing labour supply, and ultimately, production increases in the current period. Subsequently, banks face bigger losses resulting in a significant decrease in banking capital, compromising their ability to fund new investment going forward. Output thereafter decreases sharply due to credit supply shortages. This boom-and-bust characterisation matches closely to what it is observed during banking crises. Although defaults occur after an unanticipated adverse shock, without mispricing they are unable to generate volatile macroeconomic outcomes. Banks are more protected and credit market stability is guaranteed. Hence, the added mechanism creating credit market dysfunctions incorporated here, relative to standard models of credit frictions, is crucial in amplifying credit cycles.

The main element that drives economic fluctuations after imperfect or partial information revelation is the mispricing of risk. Contrary to Akerlof and Shiller (2009), who focus on “animal spirits” (or behaviour biases), mispricing in our setting results from instances where information is not fully reflected into prices as bankers react to their payoff incentives. Do we observe instances in which market prices do not fully reflect all available information? A cross market comparison of prices shows that agents may fail to require the correct compensation for the risk undertaken. Coval et al. (2009) show that the returns on credit default swaps on indexes and put options on these indexes, both of which reflect similar risk profiles, were significantly different. Comparatively, the differences of the lead bank’s internal valuation of syndicated loans and the price paid by investors reported by Ivashina and Sun (2011) suggest that not all information on the quality of borrowers reaches the auction for these loans. The results presented in these contributions indicate that prices of instruments used in the funding of investment (through securitization or syndication) may not internalize all available information.

The payoff structure that generates the incentive to avoid selling off in the secondary markets upon receiving signals

is directly related to the biases towards short-term market-to-market gains relative to realized payoffs in the banking industry. The CEO compensation numbers reported by Fahlenbrach and Stulz (2011) indicate a banking payoff structure heavily tilted towards short-term payments, as assumed in the framework here, seem to be the current norm in the industry. Analyzing the drivers that generate such payoff structure, potentially exploring both bankers’ tenure relative to the maturity of banks’ portfolios and the agency problems of writing contracts on imperfectly observed performance measures could further increase our understanding of how imperfect information revelation and mispricing of risk occurs.

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The propagation of worldwide sector-specific shocks

MARIO IZQUIERDO, ENRIQUE MORAL-BENITO, ELVIRA PRADES AND JAVIER QUINTANA

Summary of Banco de España Working Paper no. 2213

The implementation of policies that target specific sectors such as environmental regulations to fight climate change, the emergence of supply bottlenecks in the production of certain goods or the pandemic-induced digitalization of services are some of the topics gaining policymakers' attention recently. Even if each of these phenomena arises for distinct reasons, a common feature they share is their highly asymmetric impact across productive sectors. Still, although they originate in very specific parts of the economy, the impact of these shocks on aggregate output may be substantial. Another characteristic of these phenomena is their global character as firms operating in the same productive sector face very similar challenges independently of the country in which they are located. In our paper we analyze the effect on aggregate output of large sectoral shocks, affecting simultaneously the same sector in several countries.

A basic fact to understand the propagation of sector-specific shocks is that economies consist of linked networks of industries. These industries rely on each other for their production processes, purchasing inputs from their suppliers in other sectors and selling their output to final consumers or other industries as intermediate inputs. Moreover, in open economies, those customers and suppliers are located both inside and outside a country's borders. Thus the aggregate consequences and propagation of industry-specific shocks will reflect the input-output structure of the economy. The existing literature shows that, provided the shocks are small, sectoral size -measured as sales share, also known as Domar weights- is a good approximation of the effect on a country's GDP when there is a change in the productivity of a single sector.

THE ROLE OF CORRELATED SHOCKS

However, these shocks rarely occur in isolation; rather, it is typically observed that several sectors experience

simultaneous productivity shocks that arise for various reasons. Sometimes such simultaneous shocks affect sectors that are far apart in the global value chains and with little interaction between them. If that is the case, considering each shock separately and summing their effects is a good enough approximation of their joint impact. Yet, in practice, these shocks often affect sectors with important interactions between them. For example, sometimes all sectors of an economy are exposed to a country-wide shock. Another example is when, as in the case we discuss in our paper, the same sectors located in several countries experience a common shock. In our paper we show that in this case, and under usual assumptions about the complementarity of production factors, the aggregate effect of simultaneous productivity shocks can substantially exceed the sum of their effects considered separately.

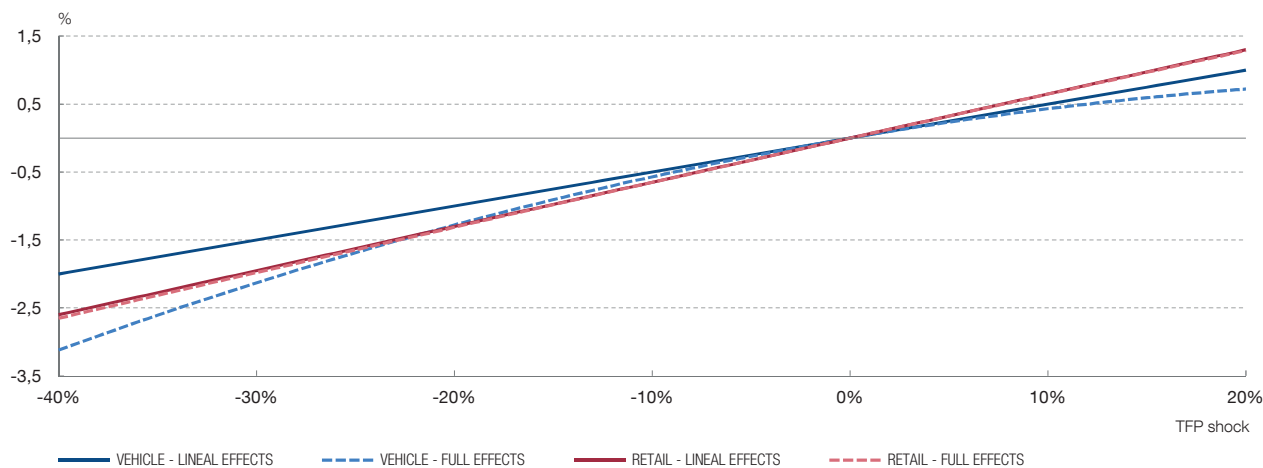
We address a particular case of correlated industry-specific shocks, more precisely, a common shock affecting simultaneously the same industry across different countries. In this case, the non-linear effects due to changes in the production networks can be particularly relevant. The reason stems from the large intra-industry trade flows existing in some industries. In many cases, producers of the same industry located in different countries have large trading flows among each other. Because of that, a shock affecting simultaneously to all of them will have implications for their own production but also the one of their main clients and suppliers. We provide an estimation of the aggregate impact of these shocks and discuss for which particular industries this effect is particularly relevant.

DEPARTING FROM PERFECT INPUT SUBSTITUTION

Methodologically, we base our analysis upon the existing literature of production networks. More precisely, we rely on Baqaee and Farhi's (2019) setting which allows studying a flexible production network with arbitrary elasticities of substitution and the existence of a variety of industry-specific shocks. We make use of their framework to introduce our contribution. Using the World Input-Output Table (WIOT), we estimate the effect for the largest

Chart 1

EFFECT ON GDP (SPAIN) OF SECTOR-SPECIFIC PRODUCTIVITY SHOCK



SOURCE: Own calculations based on WIOD.

NOTE: These graphs plot the aggregate impact on Spanish GDP following a sector specific TFP shock for sector C29-Manufacturing of motor vehicles (in red) and to sector G47-Retail trade (in blue), under two scenarios: [A] the linear impact based on Domar weights without input complementarities and [B] considers the case where there are both input complementarities. In both cases the shock affects each sector in every EU country.

European economies of correlated industry shocks across countries. Our estimates can accommodate cases with different shock sizes as well as different sets of countries exposed to them. The latter exercise provides novel insights that are not yet documented in the literature. Typically, analyses of the aggregate impact of sector-specific shocks consider either sector-specific shocks in a particular country or country-specific productivity shocks affecting every industry. This framework also allows to analyze the role of input complementarities. Under these complementarities, which imply that sectors have little flexibility to adapt their input mixes, a large shock to sector productivity can significantly alter the structure of the production network. Thus, when such changes occur, non-linear second-order effects of sector-specific shocks appear.

THE AGGREGATE IMPACT OF SECTOR-SPECIFIC POLICIES

Our work can be a useful tool for several policy-relevant scenarios. A practical example would be the implementation of new international environmental standards. This result is

particularly relevant for European economies because it allows predicting the effects of productivity shocks linked to sector-specific supranational regulations, as in EU directives. The effect of Covid-induced digitalization in services would be another policy question that our setting can contribute to shed light on.

Our findings indicate that the aggregate impact of a negative TFP shock to manufacturing industries increases significantly when this shock is common to several countries. The difference between considering independent or correlated multi-country sector shocks is larger in industries with highly integrated global value chains, as it is the case of European motor and airplane vehicle manufacturing or pharmaceutical industries. Conversely, this amplification effect is much more muted in the case of non-manufacturing industries.

As an example, Figure 1 shows the effects on Spanish GDP of a productivity shock affecting the vehicle manufacturing or retail trade simultaneously in all EU countries. For each of the two sectors we show both the linear effects of the shock

and the full effects when taking also into account the nonlinearities that we consider in the paper.

Between the two sectors, retail trade sales are around 30% higher in Spain than those of vehicle manufacturing. Therefore, the linear effects of a productivity shock of a given size are larger in the former. However, vehicle manufacturing is a highly integrated sector in the European economy. So much so that the vehicle manufacturing sectors in France and Germany are the two most important suppliers of intermediate inputs for this sector in Spain. Thus, when the productivity shock affects all of them simultaneously, non-linear effects appear. In addition to the drop in the sector's productivity in Spain, its main inputs have also become more expensive.

On the contrary, in the case of retail trade, intra-sector trade between the different European countries is very limited, so that the presence of simultaneous shocks has very limited non-linear effects. Thus, when the shocks are relatively large in magnitude, the nonlinear effects of vehicle manufacturing have a greater impact on GDP despite the fact that its relative size is smaller than that of retail trade.

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New Facts on Consumer Price Rigidity in the Euro Area

ERWAN GAUTIER, CRISTINA CONFLITTI, RIEMER P. FABER, BRIAN FABO, LUDMILA FADEJEVA, VALENTIN JOUVANCEAU, JAN-OLIVER MENZ, TERESA MESSNER, PAVLOS PETROULAS, PAU ROLDAN-BLANCO, FABIO RUMLER, SERGIO SANTORO, ELISABETH WIELAND, AND HÉLÈNE ZIMMER I

Summary of Banco de España Working Paper no. 2225

The aggregate rate of inflation is the sum of heterogeneous individual price setting decisions. Firms, from largest to smallest, adjust the price of their goods and services when these are misaligned from their target value. Both individual price increases and decreases can be large, asymmetric, and may exhibit different degrees of time- or state-dependency (that is, they may occur in specific periods during the year, and/or as a result of specific macroeconomic conditions). Further, price changes are typically infrequent, and occur in response to either idiosyncratic shocks, impacting the firm itself or the sector to which it belongs, or to the overall macroeconomic conditions under which

the firm operates. Infrequent price adjustment is critical for the design of monetary policy, as it affects the degree to and speed with which shocks impact inflation (so-called “monetary transmission”). But in addition to this nominal rigidity, the size by which the adjustment in individual prices takes place can also impact inflation dynamics, and a successful design of monetary policy requires understanding which prices adjust the most, and under which circumstances they do. Yet, understanding prices at such a level of disaggregation for the Euro area requires the use and analysis of extensive microdata, which is often scarce and typically only available for a few selected countries.

In this paper, we document new facts on consumer price rigidity for the euro area. To do so, we combine a unique and comprehensive micro pricing dataset including data for eleven euro area countries (Austria, Belgium, France, Germany, Greece, Italy, Latvia, Lithuania, Luxembourg, Slovakia and Spain), which we compile from data provided by each country’s national statistical institute. The time periods covered by the national datasets differ somewhat

Table 1

FREQUENCY OF PRICE CHANGES (in %)

	Including sales		Excluding sales (NSI flag if available)		Excluding sales (sales filter)		% of sales	
	Frequency of price change	% price increase	Frequency of price change	% price increase	Frequency of price change	% price increase	NSI flag	Sales filter
EURO AREA	12.3	64.0	8.5	68.8	8.0	66.4	4.4	4.9
<i>By Sector</i>								
Unprocessed Food	31.4	54.5	24.0	57.6	20.6	58.3	7.4	10.1
Processed Food	15.4	57.0	10.4	61.8	9.2	62.0	4.3	5.7
Non-Energy Industrial Goods	12.9	48.2	6.4	59.8	6.8	54.8	8.6	7.5
Services	6.0	82.5	5.7	82.4	5.5	80.4	0.5	1.2
BY COUNTRY								
France	12.7	60.8	9.8	66.9	8.1	64.8	5.5	5.1
Germany	12.7	61.9	9.2	67.2	8.4	66.8	4.1	4.7
Italy	10.3	69.9	4.8	75.6	6.1	67.0	4.3	5.4
Spain	13.5	64.0	9.0	65.3	9.0	65.3	NA	5.1

NOTES: Statistics are based on the country-specific period and on products that are common to at least 3 of the 4 largest countries. Price changes due to replacement are excluded beforehand (except Greece and Slovakia). Seasonal sales are excluded in the Belgian dataset but temporary promotions are included. Results excluding sales are based on (1) NSI sales flag (if available, and sales filter otherwise) or (2) common sales filter for all countries.

Table 2
SIZE OF PRICE CHANGES (in %)

	Including sales		Excluding sales (NSI flag if available)		Excluding sales (sales filter)	
	Median increase	Median decrease	Median increase	Median decrease	Median increase	Median decrease
EURO AREA	9.6	13.0	8.7	7.2	8.0	66.4
<i>By Sector</i>						
Unprocessed Food	12.6	15.0	11.0	10.8	20.6	58.3
Processed Food	9.2	12.0	6.5	6.0	9.2	62.0
Non-Energy Industrial Goods	13.9	19.2	10.7	9.0	6.8	54.8
Services	5.6	8.2	7.9	5.7	5.5	80.4
BY COUNTRY						
France	7.8	11.9	7.3	5.6	8.1	64.8
Germany	11.6	16.1	11.0	9.0	8.4	66.8
Italy	9.1	11.4	5.5	5.4	6.1	67.0
Spain	8.9	11.1	10.4	8.1	9.0	65.3

NOTES: Statistics are based on the country specific period and on products that are common to at least 3 of the 4 largest countries. Price changes due to replacement are excluded to at least 3 of the 4 largest countries. Price changes due to replacement are excluded but temporary promotions are included. Results excluding sales are based on (1) NSI sales flag (if available, and sales filter otherwise) or (2) common sales filter for all countries.

from one country to another, but most of them cover the period 2010 to 2019. Overall, our dataset includes about 135 million monthly price observations, and is representative of most non-energy sectors of the economy. Although the analysis is conducted in a decentralized way at the country level, we follow a harmonized methodology and use a common sample of products, namely those available for at least three of the four largest euro area countries (Germany, France, Italy and Spain). Our final sample includes 166 products at the COICOP-5 level, covering 59% of the total euro area Harmonized Index of Consumer Prices (HICP) and 65% of the HICP excluding energy products. We then compute the same statistics across countries at the COICOP-5 level (such as average frequency of price changes and several moments of the size distribution) both cross-sectionally and over time, and provide euro area aggregate empirical measures of price rigidity using euro area product-level and country weights.

Our main findings are the following. First, we find that euro area prices are sticky: on average, only 12.3% of prices change in a given month (see Table 1). When we restrict ourselves to regular price changes (i.e. excluding those

due to sales and promotions), the average monthly frequency of price changes drops to 8.5%, implying that the typical price quote does not change for about a year. Country differences in frequency numbers are relatively small, while heterogeneity across sectors is much more relevant. At the product level, there is a strong positive correlation across countries: products that change prices most frequently seem to do so across countries by similar amounts. Relative to earlier periods (comparing to a previous study by Dhyne et al. (2006)), the frequency of price changes has increased since the 1990s, but the extent of this increase has been heterogeneous across countries. Moreover, for comparable products, prices seem more rigid in the euro area than in the United States (comparing to previous data provided by Nakamura and Steinsson (2008)), though when we exclude sales the degree of price rigidity seems to be similar across both economic areas.

As for the size of price changes (see Table 2), we find the typical price change to be quite large: in absolute value terms, the median price increase (respectively, decrease) is 9.6% (respectively, 13%). Cross country heterogeneity is

more pronounced than in the case of frequency, though regional differences are small overall. Once again, differences are more noticeable across sectors, with service sectors exhibiting smaller median price changes than other sectors (namely, non-energy industrial products and both processed and unprocessed food products). When price changes due to sales are excluded, the size of price changes are lower for both price increases (7%) and decreases (9-11%, depending on the way that sales are defined). Compared to the United States, on average prices changes are somewhat smaller in the euro area.

Having explored the cross-sectional properties of the frequency and size of individual prices changes, we then proceed to study their time-series properties. Both frequency and size of price changes show large seasonal movements, mostly explained by seasonal sales (especially around January and July), but otherwise neither time series exhibits a significant upward or downward time trend over the time period 2005-2019. This would suggest that the frequency of price changes has not contributed to steepening or flattening the Philips curve over that period.

Taking these dynamics into consideration, we then study how patterns of price adjustment have contributed to overall inflation dynamics in the euro area. In a given month, inflation can go up because more outlets increase their prices, because for the same number of price changes the size of those changes increases, or a combination of both. Our main finding here is that the major contributor to inflation dynamics is the size of price changes, while the frequency of price changes contributed to a much lower degree: most of the short-term variation in inflation is due to variation in the overall size of price changes and not due to variation in the overall frequency. More specifically, inflation is mainly driven by movements in the proportion of price increases and decreases (translating to a change in overall size) and less by changes in the overall frequency or in the average size of price changes. These results are roughly consistent with the predictions of a Calvo (1983) model (in which the sole decision of firms is by how much to adjust prices, not how often), or with a menu cost model in a low-inflation environment (as in Alvarez et al., 2019, or Nakamura and

Steinsson, 2018), in which aggregate shocks are relatively small compared to firm-specific shocks and are less of a motive for firms to change their prices.

Finally, we look at the response of micro pricing decisions to various aggregate supply and demand shocks (such as oil shocks, VAT shocks, and monetary policy shocks). We find that firms respond to shocks (regardless of their type) by adjusting the overall size rather than the overall frequency. More specifically, aggregate shocks are transmitted via slow movements in the relative share of price decreases and increases. This would suggest that, in our data, idiosyncratic shocks are a more important driver of micro-pricing decisions than aggregate shocks.

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Mortgage Securitization and Information Frictions in General Equilibrium

SALOMÓN GARCÍA

Summary of Banco de España Working Paper no. 2221

Securitization is central in providing liquid funds for mortgage lending in the United States. However, this source of liquidity is volatile and can rapidly expand or collapse abruptly, as observed during the credit cycle of the 2000s. Such large fluctuations are a sign of markets in which information frictions play an important role. In García (2022), I develop a theory consistent with the U.S. mortgage market structure that replicates these dynamics. The model stresses the equilibrium connection between securitization and the credit market through the securitization liquidity channel (Loutskina, 2011; Calem et al., 2013; Vickery and Wright, 2013). I use the model to quantify the role of information frictions in accounting for aggregate credit dynamics. I also study the role of policy in stabilizing mortgage credit to households a key macroeconomic variable and a policymaker objective.

FRAMEWORK

The framework builds on a standard model of financial intermediation with housing. Impatient borrowing households, facing aggregate income and housing risk, take on long-term mortgages to finance their purchases of houses and non-durable goods. Mortgage credit is supplied by lenders operating with private equity. I extend this standard setup to capture relevant features of the U.S. mortgage market. First, borrower households can endogenously default on their mortgages, which defines the quality of loans that lenders hold. Second, lenders face heterogeneous loan origination costs, which capture the differences in origination technologies observed among mortgage originators. Third, as in practice, lenders face liquidity and information frictions. They are financially constrained by having limited access to debt markets, and they can privately identify the quality of the mortgages in their portfolios. Fourth, I introduce a securitization market where lenders can sell mortgages and buy securities. An endogenous securitization market has a dual role: reallocate illiquid assets and provide liquidity to

mortgage originators. Securitization increases the efficiency of credit funding and lowers interest rates for borrowers. However, its benefits are hindered by originators' private information about loan quality, thus leading to a classic adverse selection problem, as in Akerlof (1970).

THE ROLE OF INFORMATION FRICTIONS

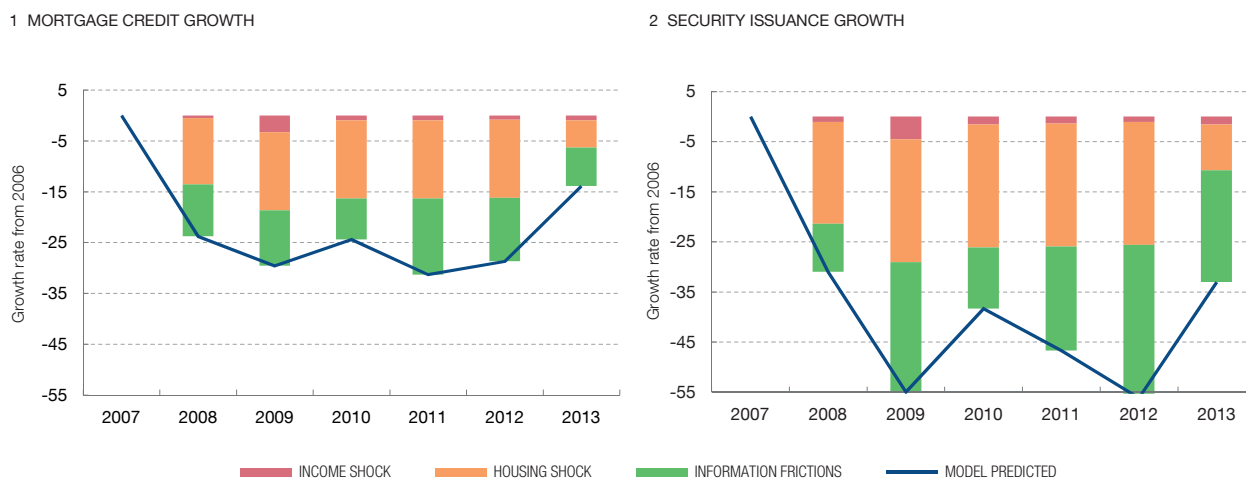
The model delivers boom-bust credit cycles driven by household credit risk with a novel feedback mechanism between the credit and the securitization markets. Episodes of high (housing valuation or income) risk can lead borrowers to default on their mortgages, affecting the composition of high- and low-quality loans in lenders' portfolios. For lenders, differences in origination costs and limited liquid funds generate motives for securitization trading. When trading, lenders split into groups: securitization sellers, buyers, and holders. Due to private information, sellers have incentives to sell low-quality loans and selectively retain high-quality ones when the market price is lower than their valuation. Security buyers understand these incentives; hence, securities trade at a discount. Holders are lenders that abstain from participating in securitization trading because the discount is too high for them. In times of low credit risk, the liquidity value and the cost-sharing benefits of securitization generally exceed the discount, and the market operates well.

In contrast, shocks that increase households' credit risk exacerbate information frictions. Buyers face a higher discount, demand for securities falls, and securities trade at a lower price. As a consequence, lenders stop trading and become holders. In the credit market, lenders face an endogenous liquidity shortage derived from the unwillingness to securitize their portfolios at current market prices. Given the limited access to debt markets, a contraction in the credit supplied to households ensues. This contraction further deteriorates households' balance sheets, leading to an amplification loop that amplifies credit cycles.

QUANTIFYING THE AMPLIFICATION EFFECTS DURING THE GFC

A quantitative test of the model shows that it can successfully replicate the dynamics observed in the data. When

Figure 1
SHOCK DECOMPOSITION DURING THE GREAT FINANCIAL CRISIS



NOTE: 1) Growth rate is in percentage points. 2) Shock decomposition: each bar shows the contribution of shocks to the model predicted growth rate. 3) Information frictions correspond to the difference between the benchmark economy and an economy with complete information.

households experience the same income and housing valuation shocks observed in the data during 2008-2013, the model successfully replicates two-thirds of the contraction in mortgage credit and the full contraction in MBS issuance.

Figure 1 shows the shock decomposition for new mortgage issuance in the credit and securitization markets. The yellow dashed bars quantifying the contribution of private information correspond to the difference between the benchmark economy and an economy with complete information. The decomposition of the underlying forces shows that information frictions could have amplified the credit contraction by up to 1.5 times (see figure). In other words, in the absence of information frictions, aggregate mortgage credit would have contracted by 27 percent instead of 40 percent. Pointing to a large adverse selection multiplier of household shocks (consistent with other models that study the amplification effects of information frictions in asset markets through liquidity channels Kurlat, 2013; Bigio, 2015, and Asriyan, 2020). The decomposition also shows that housing valuation shocks account for about half of the dynamics, and household income shocks played a less important role. This observation contributes to

understanding the factors at play during the GFC: showing how household mortgage risk dynamics together with agency problems can account for dynamics at the macro level. On policy grounds, the model provides insights into the rationale of credit guarantees as an instrument to stabilize liquidity in the MBS and mortgage credit markets affected by information frictions.

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The Unequal Consequences of Job Loss across Countries

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Summary of Banco de España Working Paper no. 2224

Losing a job entails lasting negative consequences on workers' careers (Jacobson et al, 1993). More efficient labor markets reallocate workers more quickly and generate lower earnings losses after job displacement. Comparing trajectories of displaced workers across countries may reveal which labor markets are functioning better than others and shed light on the potential mechanisms behind these negative and unequal consequences (supply factors, demand factors, institutions, frictions, etc.).

However, such comparisons remain challenging. Empirical analyses from existing literature usually focus on a single country, and their conclusions are clouded by differences in sample selection, the definition of the displacement event, and the econometric specifications. In Bertheau et al (2022), we illustrate how these discrepancies in the research design make very hard to interpret and reconcile the results across different studies.

The contribution of this paper to the empirical literature is to fill this gap by comparing negative consequences of job loss across countries using a harmonized dataset coming from administrative data from Social Security records and implementing an identical research design separately in each country to obtain comparable estimates across seven countries (Austria, Denmark, France, Italy, Portugal, Spain and Sweden) characterized by a wide range of labor market institutions.

EMPIRICAL STRATEGY AND RESULTS

Our research design follows very closely the study of Schmieder et al (2020) for Germany, in order to obtain comparable estimates. We focus on involuntary job separations coming from mass layoffs, that is, job displacements from collective dismissals or firm closures, in order to avoid capturing spurious effects of voluntary job quits or individual

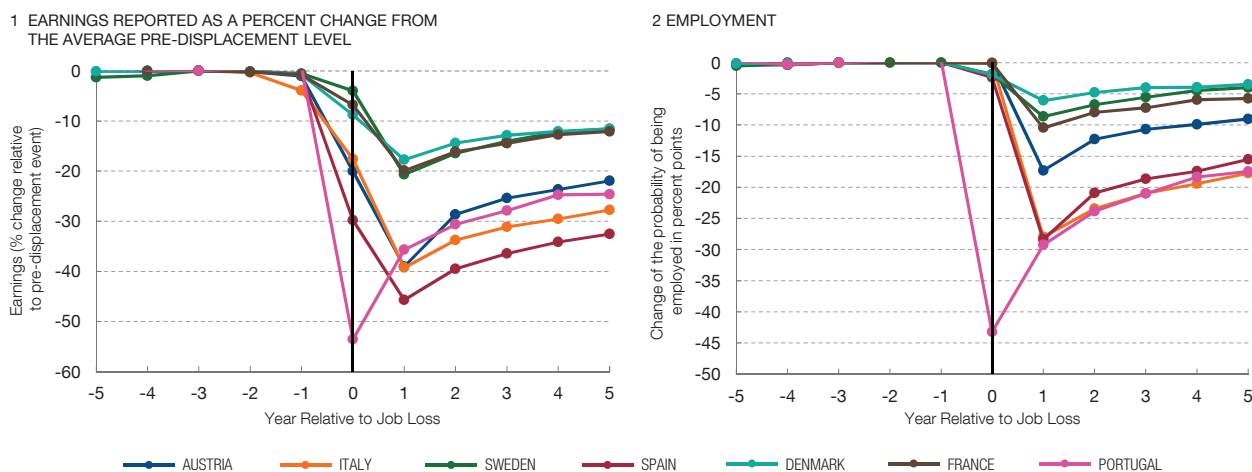
firings. Thus, we compare across countries how labor market outcomes evolve in a period of five years around the year of job displacement for displaced workers in comparison with the trajectories of workers who have never been displaced due to a mass layoff and who share very similar characteristics to those of the displaced workers.

Figure 1 shows the average difference between displaced and never-displaced workers in each year relative to the mass layoff for each country and for the following outcomes: total earnings (excluding government transfers) and the probability (in percentage) of being employed. To avoid biases due to permanent differences between displaced and non-displaced workers in the estimated impact of job loss, Figure 1 shows the mean difference of the outcomes between both groups of workers in each year relative to their mean difference in one year normalized, we use the third year prior to the mass layoff, year in which all workers that take part in our sample were employed by sampling design. Year 0 refers to the year in which job displacement takes place, positive years (1, 2...5) indicate each one of the five subsequent years after job displacement and negative relative years (-1, -2...-5) refer to five preceding years before the mass layoff (one year before, two years before, and so on).

Figure 1 shows that displaced workers experience large and persistent earnings losses in all countries. These losses are represented as a percentage of their average pre-displacement level of earnings. Panel 1 also reveals substantial heterogeneity across countries, earnings losses are around 10% in Northern European countries (Denmark and Sweden) vs 30% in Southern Europe (Italy, Portugal and Spain) five years after job displacement. Earnings losses in Austria and France are somewhere in between. Panel 2 highlights the fact that a large part of the differences in earnings losses is explained by the unequal probability of finding a job across countries. Five years after the mass layoff, the probability of being non-employed is 20 percentage points (pp) larger for displaced workers in Southern countries, whereas these non-employment probabilities are much lower in Denmark, Sweden and France (around 5pp) and in Austria (around 10pp). In the paper, we show that the differences of daily wage losses of displaced workers being employed five years after the mass

Figure 1

THE EFFECT OF JOB LOSS ON LABOR MARKET OUTCOMES ACROSS COUNTRIES



NOTE: Figure 1 shows average outcome differences between displaced workers and non-displaced workers in every year relative to the third year prior to the mass layoff (year -3). Year 0 refers to the year in which the job displacement takes place (indicated by a vertical line).

layoff are less disperse across countries and range approximately from 5% to 15%.

UNDERSTANDING THE IMPACT OF JOB LOSS ACROSS COUNTRIES

A large part of the earnings and wage losses suffered by displaced workers is explained by the transition to worse-paying jobs in all countries after job displacement (the loss of firm-specific human capital and rents accumulated by workers with their employers). This result is quite similar across countries. Moreover, we also find that the heterogeneity we observe in the negative consequences of job loss across countries is not explained by cross-country differences in worker and employer characteristics, such as gender, job tenure, age, unemployment rate, economic sector, and year of job loss, among others.

Finally, we investigate the sources of the differences in employment across countries after job displacement, and we find that the key explanation is the permanent withdrawal of displaced workers from the labor market at much higher rates in Southern Europe than those in the rest of countries. Even when we look at workers re-employed after the mass

layoff, these workers (mainly women) also experience significantly longer non-employment durations after losing the job in Southern Europe.

CONCLUSION

All in all, the vastly different earnings trajectories following a job loss documented in this paper should be informative for policy makers and academics alike. Our results reveal that labor markets appear to function better –in terms of faster reallocation of workers and lower earnings losses– in some countries than others. European policy makers should thus focus on policies that could reduce these differences.

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Related DT: 1730. Accepted: 15 Jan 2022

Published online: 21 Jan 2022

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Volume 56, Issue 8, August 2022, pp 1347-1358

Related DT: 1939

Accepted and published online: 15 Sept 2021

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Advances in Econometrics

Volume 44, Issue A, September 2022, pp. 177-210

Related DT: 2208. Accepted: 23 Feb 2022

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JACOPO TIMINI, NICOLA CORTINOVIS AND FERNANDO LOPEZ VICENTE

The World Economy

Volume 45, Issue 9, September 2022, pp 2820-2853

Related DT: 2017. Accepted: 17 Jan 2022

Published online: 02 Feb 2022

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International Review of Financial Analysis

Volume 83, October 2022, Art 102307

Related DT: 2035. Accepted: 14 Jul 2022

Published online: 22 July 2022

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Related DT: 2114. Accepted: 17 Feb 2022

Published online: 29 Mar 2022

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 Volume 84, November 2022, Art 102372
 Related DT: 2105. Accepted: 2 September 2022
 Published online: 13 September 2022

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 Volume 201, November 2022, Art 107554
 Accepted: 22 Jul 2022

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 Accepted: 24 May 2022
 Published online: 31 May 2022

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International Journal of Central Banking.
 Volume 18, issue 1, pp. 239-275, March 2022.

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 Related DT: 1517. Accepted: May 2022
 Published online: 23 Jun 2022

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Related DT: 1828

Accepted: 31 Aug 2022

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Accepted: 13 Sep 2022

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Related DT: 2120. Accepted: 26 Sept 2022

Published online: 14 Nov 2022

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Related DT: 2211. Accepted: 09 Nov 2022

Published online: 20 Nov 2022

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Financial Stability Review

The *Financial Stability Review* is a half-yearly journal published by the Banco de España that aims to act as a platform for communication and dialogue on issues related to financial stability, with a focus on macroprudential policy, regulation and supervision. Its editorial board comprises internal and external professionals. All articles appearing in the Review, which may be authored by Banco de España staff or researchers from other institutions, is subject to an anonymous refereeing process. The Spring and Fall 2022 Issues of the *Financial Stability Review* contain the following articles:

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**UNWRAPPING BLACK-BOX MODELS: A CASE
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JORGE TEJERO

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IACOPO VAROTTO

Sectoral Analysis, Economic Developments

IACOPO VAROTTO joined the Sectoral Analysis Division at the Banco de España in September 2022. He holds a PhD in Economics from Queen Mary University (London), a Master in Economics from Carlos III University (Madrid), and a B.A. from Ca' Foscari University of Venice. During his studies at Queen Mary University, Iacopo was a teaching assistant in Macroeconomics at undergraduate and at graduate levels. In his research he studies the aggregate implications of micro-level firm heterogeneity to address policy relevant research questions. In particular, his work explores the interaction between firm-level markups and aggregate innovation, firm-level and aggregate volatility, as well as government spending and production networks.

In one of his projects, Iacopo (jointly with Tatsuro Senga) investigated the contribution of firms' idiosyncratic shocks in

generating aggregate fluctuations. He found that the productivity shocks to the largest 80 firms can explain up to fourteen percent of the output volatility, 65 percent due to time-varying inefficiency of capital misallocation and 35 percent due to time-varying average productivity.

In another project (jointly with Alessandro Peri and Omar Rachedi) he studied the effects of public investment in a New Keynesian production network economy. He found that the network structure increases the public investment multiplier by 68 percent. In one ongoing project (jointly Tatsuro Senga), he developed a heterogeneous firm business cycle model with rational inattention to quantify the relative contribution of the micro and macro volatility in generating uncertainty around aggregate and idiosyncratic state and in driving aggregate fluctuations.



RUBÉN DOMÍNGUEZ DÍAZ

Conjunctural Analysis and Economic Forecasting, Economic Developments

RUBÉN DOMÍNGUEZ DÍAZ joined the Economic Developments Department at the Banco de España in September 2022. He holds a Ph.D. in Economics from the University of Bonn (Germany). Prior to his doctoral studies, Rubén obtained a M.Sc. in Economics from the University of Bonn, and a B.Sc. in Economics from the University of Vigo (Spain). During his Ph.D. studies, he also was a visiting student at Stanford University (US).

Rubén is a macroeconomist with research interests at the intersection of macroeconomic policies, business cycles, and inequality. One of his papers, "Precautionary Savings and Financial Frictions", offers a new perspective on the macroeconomic consequences of financial frictions in the banking system, through the role of banks as suppliers of liquid assets to households. The paper shows, both empirically and quantitatively, that tight financial conditions render the economy less resilient to shocks that lead households to shift their portfolios towards liquid bank deposits. Financial frictions in the banking sector are central for this result because, over and beyond their effects on lending, they restrict banks' supply of liquid assets to households.

In a second paper, "Hiring Stimulus and Precautionary Savings in a Liquidity Trap", Rubén explores the stabilization consequences of supply-side policies. In particular, the paper focuses on hiring subsidies provided to firms. Using a tractable model, the paper shows that demand-side effects that come with household heterogeneity render the hiring stimulus effective precisely when the central bank cannot further support aggregate demand. Finally, a more recent paper, "Unemployment Insurance, Precautionary Savings, and Fiscal Multipliers" (with Donghai Zhang), explores the stabilization consequences of countercyclical unemployment insurance (UI) extensions. Using regional-level data and exploiting the non-linear design of UI policy in the US, the paper shows that UI extensions render the economy less sensitive to government spending shocks. The paper then uses these empirical moments to inform competing models of UI extensions. It finds that a model with household heterogeneity and precautionary savings matches the empirical findings. In the model, a fall in UI extensions reduces insurance, raising precautionary savings and crowding-out private consumption, leading to a smaller fiscal multiplier.



JOSÉ ELÍAS GALLEGOS DAGO

Sectorial Analysis, Economic Developments

JOSÉ ELÍAS GALLEGOS DAGO joined the Sectorial Analysis Division at the Banco de España in September 2022. He holds a Ph.D. in Economics from the Institute for International Economic Studies (IIES, June 2022). Prior to his doctoral studies, José Elías obtained his MSc in Economic Analysis and BSc in Economics from Universidad Carlos III and Universidad Complutense, respectively. During his studies at the IIES he was also a teaching assistant for game theory, mathematics and macroeconomics courses, and spent a year at Harvard University as a Visiting Student.

José Elías' research interests focus on how individuals form expectations, and how these processes affect macroeconomic aggregates. In one of his papers, he studies the effect of monetary policy beyond the Full Information Rational Expectations hypothesis, obtaining insights on the role of forward guidance and animal spirits' shocks. In one of his papers (with Mattias Almgren, John Kramer and Ricardo Lima), recently published in the American Economic Journal: Macroeconomics, he finds that GDP responses to monetary policy shocks are heterogeneous by countries, and

such heterogeneity can be explained by differences in the share of financially-constrained households at the country level.

Finally, in his job market paper, he investigates how Federal Reserve changes in communication policy in recent decades can explain the fall in inflation persistence and the flattening of the Phillips curve. Using survey data on inflation expectations, he documents a positive co-movement between ex-ante average forecast errors and forecast revisions (suggesting forecast sluggishness) before the mid-1980s, no co-movement between the mid-1980s and 2019, and again a positive co-movement afterwards. He rationalizes these results by incorporating noisy and dispersed information features to an otherwise standard New Keynesian model, and shows that the change in firm forecasting behavior explains around 90% of the fall in inflation persistence since the mid-1980s, and can explain the recent increase in inflation persistence. He also finds that the flattening of the Phillips curve is entirely driven by the change in the frictions that firms face when acquiring information in order to form beliefs about the future.



JOSE E. GUTIERREZ

Financial Stability Analysis, Financial Stability and Macprudential Policy

JOSE E. GUTIERREZ joined the Financial Stability Analysis Division at the Banco de España in September 2022. He holds a Ph.D. in Economics from CEMFI (June 2022). He also has a Master's in Economics from Universidad del Pacífico (Lima, Perú) and an undergraduate degree in Economics from the same institution. Moreover, before starting his Ph.D., he worked for six years as a Research Analyst at the Economic Research Department of the Peruvian financial supervisory authority, providing him with firsthand knowledge of banking regulation and supervision and the challenges that banking systems face in developing countries. Additionally, Jose E. has experience as a lecturer and teaching assistant of undergraduate and graduate courses at Universidad del Pacífico and CEMFI.

Jose E. is an applied economist in the fields of Microeconomics and Finance, with a particular interest in banking-related topics. His work aims to better understand the functioning of credit markets

and provide recommendations for improving banking regulation. For instance, in his Job Market Paper, "Optimal Regulation of Credit Lines," he built a contract-theoretic model of credit lines. He finds that the optimal private arrangement does not fully insure firms against liquidity shocks in high liquidity need states. Hence, the contract is vulnerable to credit line runs as firms face the risk of being liquidated if funding is not obtained. Additionally, he shows that a fire-sale externality in the liquidation value of firms can justify a liquidity risk regulation of credit lines. While in a related paper, "Credit Line Runs and Bank Risk Management: Evidence from the Disclosure of Stress Test Results" (joint work with Luis Fernandez Lafuerza, Banco de España), using data from the credit registry of the Banco de España, he shows that credit line runs can occur as a result of disclosure of information about banks' financial health. Additionally, banks more sensitive to the disclosure of information are more prone to tightening their lending standards, even before the information becomes public.



GERGELY GANICS

Financial Stability Analysis, Financial Stability and Macprudential Policy

GERGELY GANICS joined the Financial Stability Division at the Banco de España in September 2022. He holds a Ph.D. in Economics from Universitat Pompeu Fabra (September 2017), as well as an MSc in Economics from the Barcelona Graduate School of Economics and a BA in International Business Economics from the Corvinus University of Budapest. Prior to returning to the Banco de España in 2022, Gergely was a researcher at the Central Bank of Hungary (2020-2022), and at the Banco de España (2017-2019).

Gergely's research focuses on time series econometrics, with a special emphasis on forecasting. In recent work (with Todd Clark and Elmar Mertens), he investigated how point forecasts from the US Survey of Professional Forecasters (SPF) can be used in conjunction with a state-space model to construct a complete term structure of

expectations and uncertainty of key macroeconomic variables (e.g., real GDP growth, inflation in the GDP price index), along with evaluating the potential incremental value of density forecasts from the SPF. They find that using a stochastic volatility specification in the state-space model provides competitive point and density predictions, with little value added from the panelists' density forecasts.

In another project (with Florens Odendahl), Gergely is investigating the consequences of the ordering of variables in Bayesian vector autoregressive models with stochastic volatility. They find that the ordering matters for both forecasts and structural objects of interests, e.g. for impulse-response functions. They evaluate the merits of an ordering-invariant specification, and demonstrate its advantages vis-à-vis the standard modelling approach.



MATIAS COVARRUBIAS

Monetary Policy and Capital Markets Division, Macro-financial Analysis and Monetary Policy

MATIAS COVARRUBIAS joined the Monetary Policy and Macroeconomic Analysis Division at the Banco de España in June 2021. He holds a Ph.D. in Economics from the New York University (May 2022). He also holds a Master's in Economics from Pontificia Universidad Católica de Chile, and an undergraduate degree in Economics from the same institution. During his studies at NYU, Matias specialized in Macroeconomics and his advisors were Ricardo Lagos, Thomas Philippon, and Stijn Van Nieuwerburgh.

Matias' primary research fields are Macroeconomics and Industrial Organization, with a focus on understanding the impact of market structure on aggregate phenomena such as inflation. He works in both empirical projects using disaggregated data and quantitative models. Methodologically, he uses novel tools from Artificial Intelligence and Machine Learning to solve for the optimal strategies of firms.

With Thomas Philippon and German Gutierrez, he published the paper "From Good to Bad Concentration? US industries over the past 30 years" in the NBER Macroannuals. The paper attempts to discern which of the possible causes of concentration explain better the recent evolution of U.S. Industry data. The paper concludes that until the 2000's, most industries were driven by good concentration sources such as increases in productivity of the

leaders. After 2000, the evolution of most industries is better explained by bad sources of concentration such as an increase in barriers of entry.

In his job market paper, titled "Dynamic Oligopoly and Monetary Policy – A Deep Reinforcement Learning Approach", he solves a model with heterogeneous firms and price rigidities a la menu cost, in which firms within industries compete oligopolistically, and are allowed to play complex strategies such as tacit collusive strategies that condition on memory. In order to achieve this, he solves for the optimal strategies of firms using forward looking artificial intelligence algorithms. He concludes that tacit collusive strategies increase the real effects of monetary policy, due to the incentives imposed by the punishment strategies performed in this dynamic game. Also, he finds that concentration also increase the transmission of monetary policy, mainly because in more concentrated markets there is a higher degree of tacit collusion.

Currently, he is working with disaggregated pricing data from Amazon and firm level data from Hungary to understand the pass-through of cost shocks to prices and other economic variables, and he is using both models and data to understand the transmission of cost shocks through the production network.

Recent conferences

[Link to conferences page](#)

HUMAN CAPITAL AND LABOR MARKET INSTITUTIONS - BANK OF PORTUGAL AND BANCO DE ESPAÑA

20-21 June, 2022

The Banco de Portugal and Banco de España Workshop on Labor Economics took place in Tavira, June 20-21, 2022. The workshop brought together economists to discuss research on Human Capital and Labour Market Institutions.

Conference program

FIRST BANCO DE ESPAÑA CONFERENCE ON THE SPANISH ECONOMY

7-8 July, 2022

On 7 and 8 July 2022, Banco de España launched the first of a series of academic conferences on the Spanish economy at its headquarters in Madrid.

This new conference series aims at bringing together top researchers to present their recent work on topics that are of critical importance for the Spanish economy, as well as distinguished policy-makers to discuss their views on these topics.

This first conference included academic sessions on the labour market, on the link between productivity and finance, on inflation, and on energy and climate change. It also featured an opening speech by Pablo Hernández de Cos, Governor of the Banco de España, and a closing panel discussion on “Public finances: fiscal reform and sustainability”.

Conference program

Speakers

CONFERENCE ON ECONOMETRIC METHODS AND EMPIRICAL ANALYSIS OF MICRO DATA IN HONOR OF MANUEL ARELLANO

11-12 July, 2022

Banco de España and CEMFI organized a Conference on econometric methods and empirical analysis of micro data in honor of Manuel Arellano that took place at Banco de España's premises, in Madrid, on 11-12 July 2022.

The various presentations of the conference reflect Manuel Arellano's far-ranging interests, covering topics in econometrics, labor economics and causal inference. In particular, it featured research studies that propose novel concepts to be measured and the techniques for doing so. Such concepts are often introduced following the availability of new economic data because the ability to innovate in the measurement of relevant characteristics of the economy depends on the access to the necessary observation mechanisms.

The conference featured presentations from distinguished researchers: Victor Aguirregabiria, Martín Almuzara, Orazio Attanasio, Richard Blundell, Stephen Bond, Stéphane Bonhomme, Jesús Carro, Jinyong Hahn, Bo Honoré, Laura Hospido, Joan Lull, Costas Meghir, Enrique Moral-Benito, Lucciano Villacorta, Martin Weidner, and Gema Zamarro. Pablo Hernández de Cos, Governor of the Banco de España, opened the conference.

Conference program

2022 ANNUAL MEETING OF THE CENTRAL BANK RESEARCH ASSOCIATION (CEBRA), CO-ORGANISED BY BANCO DE ESPAÑA

29-31 August, 2022

This year's meeting featured a keynote address by Deputy Governor Margarita Delgado of the Banco de España and a high-level panel chaired by Jordi Galí (CREI, UPF, BSE) featuring Deputy Governor Martin Flodén (Sveriges Riksbank), Philip Lane (European Central Bank), and Diogo Abry Guillen (Central Bank of Brazil).

VIII SEMINAR IN ECONOMIC HISTORY

20 October, 2022

The VIII Seminar in Economic History will take place on October 20th, 2022. The annual Seminar in Economic History of the Banco de España aims to bring together scholars from all over the world to discuss current academic work. The programme contributed to the progress of the discipline, providing new insights in several historical periods and areas of investigation.

Conference program**BUILDING RESILIENCE IN UNCERTAIN TIMES: SAFEGUARDING FINANCIAL STABILITY, ENCOURAGING INVESTMENTS**

31 October, 2022

On October 31, 2022, the VII Conference of Mediterranean Central Banks took place at the OECD headquarters in Istanbul under the title “Building resilience in uncertain times: Safeguarding financial stability, encouraging investments”, organized by the Banco de España, the Central Bank of the Republic of Türkiye, the European Institute of the Mediterranean (IEMed) and the Organization for Economic Cooperation and Development (OECD). The conference brings together the governors of the central banks of Croatia, Spain, Greece, Libya, Malta, Tunisia and Turkey, as well as the director of Economic Studies of Bank Al-Magrib, the deputy general director of Economics, Statistics and Research of the Banca d'Italia, other policymakers and experts from the OECD, academia and the financial sector. This edition consisted of two panels of central banks that address the impact of digital finance on economic and financial integration and the role of central banks in emerging from the COVID-19 crisis and two other panels of regional experts which discussed investment in sustainable infrastructure and connectivity and the economic and regulatory conditions necessary for the development of productive investment.

Conference program**Remarks by Pablo Hernández de Cos****FIFTH BANCO DE ESPAÑA ANNUAL RESEARCH CONFERENCE**

1-2 December, 2022

On December 1st and 2nd 2022, Banco de España hosted its Fifth Annual Research Conference in its Madrid headquarters. The pandemic caused by COVID-19 had a very deep and significant impact on economic relationships, especially on international trade, social and employment policies, technological developments, and the macroeconomic context. Against this background, economic researchers and policy-makers are now coming to terms with the duration of these changes and assessing how permanent they will be. To discuss the medium to long-run consequences of the pandemic and the policy measures to address them the conference brought together world leading scholars and policy-makers, such as Pol Antràs, Nytia Pandalai-Nayar, Richard Blundell, Antonella Trigari, Karel Mertens, Paul Mizen, Luca Fornaro, and Michael Weber.

Conference program**Recent economic research seminars**[Link to seminars page](#)**THE CROSS-BORDER EFFECTS OF BANK CAPITAL REGULATION****FREDERIC MALHERBE (UCL)**

11/05/2022

REVISITING THE DETERMINANTS OF UNEMPLOYMENT DURATION: VARIANCE DECOMPOSITION À LA ABS IN SPAIN**MAIA GÜELL (UNIVERSITY OF EDINBURGH, CEPR, FEDEA, AND IZA)**

25/05/2022

DOES WORKPLACE COMPETITION INCREASE LABOR SUPPLY? EVIDENCE FROM A FIELD**CARMIT SEGAL (UNIVERSITY OF ZURICH)**

01/06/2022

EFFECTIVE EXCHANGE RATE REGIMES AND INFLATION

PHILIPP HARMS (MAINZ)

08/06/2022

ASSORTATIVE MATING AND INCOME DYNAMICS OF COUPLES

ROCIO MADERA (SOUTHERN METHODIST UNIVERSITY) (WITH CHRISTOPHER BUSCH AND FANE GROES)

15/06/2022

WHAT DO THE PORTFOLIOS OF INDIVIDUAL INVESTORS REVEAL ABOUT THE CROSS-SECTION OF EQUITY RETURNS?

LAURENT CALVET (EDHEC)

22/06/2022

THE CROSS-SECTION OF HOUSING RETURNS

JONATHAN HALKET (TEXAS A&M)

21/07/2022

SCHOOL HEALTH PROGRAMS: EDUCATION, HEALTH, AND WELFARE DEPENDENCY OF YOUNG ADULTS

RITA GINJA (UNIVERSITY OF BERGEN)

07/09/2022

DEBT SUSTAINABILITY AND MONETARY POLICY: THE CASE OF ECB ASSET PURCHASES

ENRIQUE ALBEROLA (BIS)

12/09/2022

SOVEREIGN-BANK LINKS: THE PROCUREMENT CHANNEL

DIANA BONFIM (BANCO DE PORTUGAL AND CATOLICA LISBON)

21/09/2022

SCOPE 3 EMISSIONS: DATA QUALITY AND MACHINE LEARNING PREDICTION ACCURACY

QUYEN NGUYEN (UNIVERSITY OF OTAGO)

23/09/2022

DECOMPOSING SUPPLY AND DEMAND DRIVEN INFLATION

ADAM SHAPIRO (SAN FRANCISCO FED)

05/10/2022

FIRM EXPORT DYNAMICS IN INTERDEPENDENT MARKETS

EDUARDO MORALES (PRINCETON UNIVERSITY)

11/10/2022

MACROPRUDENTIAL POLICY, CREDIT BOOMS, AND BANKS' SYSTEMIC RISK

PETER KARLSTROM (CEMLA)

13/10/2022

FALLING INTEREST RATES AND CREDIT MISALLOCATION: LESSONS FROM GENERAL EQUILIBRIUM

VICTORIA VANASCO (UPF)

19/10/2022

Q-MONETARY TRANSMISSION

PRIIT JEENAS (UPF)

26/10/2022

SELECTION AND PARALLEL TRENDS

DALIA GHANEM (UC DAVIS)

31/10/2022

MEASURING AND NOWCASTING MACROECONOMIC VARIABLES WITH TEXTUAL DATA

JURI MARCUCCI (BANCA D'ITALIA)

31/10/2022

IMAGINING THE FUTURE: MEMORY, SIMULATION AND BELIEFS ABOUT COVID

PEDRO BORDALO (OXFORD)

10/11/2022

**YOU'RE THE ONE THAT I WANT!
UNDERSTANDING THE OVER-REPRESENTATION
OF WOMEN IN THE PUBLIC SECTOR**

ZOE KUEHN (UAM)

16/11/2022

**INCOME, EMPLOYMENT AND HEALTH RISKS
OF OLDER WORKERS**

SIQI WEI (IE UNIVERSITY)

23/11/2022

**MPC HETEROGENEITY AND THE DYNAMIC
RESPONSE OF CONSUMPTION TO MONETARY
POLICY**

RUSSELL COOPER (EUI)

30/11/2022

**MEMORY AND BELIEFS: EVIDENCE FROM
THE FIELD**

MICHAEL WEBER (CHICAGO BOOTH)

12/12/2022

Upcoming conferences

FOURTH CONFERENCE ON FINANCIAL STABILITY – BANCO DE ESPAÑA & CEMFI

29-30 June, 2023

Banco de España in cooperation with CEMFI organizes a series of biennial conferences to promote the research and discussion of topics related to financial stability and macroprudential policy among academics, practitioners, and policy-makers. The Fourth Financial Stability Conference will take place on 9-10 June 2023 at the Banco de España's headquarters in Madrid. To participate as presenter at the conference, the organizers invite the submission - until 15 February 2023 - of theoretical and empirical articles on any of the topics listed in the call for papers. Topics particularly welcome include the development of frameworks for systemic risk analysis and the implementation of macroprudential measures against current cyclical and structural challenges.

Call for papers

The Banco de España Research Update is edited by the Directorate General Economics, Statistics and Research of the Banco de España.

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ISSN 2697-2042

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