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Building on their innovative credit risk indices, Simon Gilchrist and Benoît Mojon show that credit spreads revealed that the financial crisis of 2008 dramatically increased the cost of market funding for both financial and non-financial firms in the euro area.

To explore how regulatory changes abroad as well as in France affect cross-border lending, Matthieu Buissière, Julia Schmidt and Frédéric Vinas looked at various regulatory measures and reserve requirements imposed on banks. They especially show that banks' balance sheet characteristics are important when it comes to the cross-border transmission of domestic capital regulation.

In French data over 1978-2011, Leo Kaas, Patrick Pintus and Simon Ray find positive and significant correlation between the market value of firms' real estate holdings and their levels of investment and hiring at an aggregate level. They also show why it matters to understand the macroeconomic dynamics of investment, hiring and unemployment.

Using a spatial competition model, Clémence Berson examines worker preference with regard to geographical location when firms are located around a circle city. She shows, inter alia, that the wage gap does not disappear with more competition and public policies are needed to reduce it.

Cristina Jude and Grégory Levieuge note that countries with the same level of foreign direct investment (FDI) experience different growth outcomes depending on their institutional quality. Thus they examine the modulating role of institutions in the FDI-growth relationship in numerous emerging and developing countries.

Antoine Berthou and Lionel Fontagné use an innovative empirical strategy to reply to the following question: How does globalisation through the trade openness of economies affect the wealth of France? They show that an increase in foreign tariffs of 1% lead to a decline in individual firms' exports of about 2.5%.

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Maintaining financial stability requires the highest standard of research to back systemic risk prevention and policy making

Laurent Clerc

Laurent Clerc has been Director for Financial Stability at the Banque de France since May 2010. Previously, he held various positions at the Banque de France, notably as Director for Monetary and Financial Studies and Secretary of the Banque de France Foundation for Research in Economics, Banking and Finance. His main fields of research are in the areas of monetary policy and financial stability. Most of his papers have been published in refereed journals, such as the *Journal of International Economics*, the *Journal of Banking and Finance* and the *International Journal of Central Banking*.

The Banque de France's new Financial Stability Directorate was established in July 2007, just a few weeks before the financial crisis unfolded, in order to incorporate a financial stability perspective into prudential discussions. Since then, the Directorate has been involved in the development of the G20 regulatory reform agenda, dealing with a wide range of issues, from the Basel III framework to making the derivatives markets safer or addressing the risks stemming from the shadow banking sector. The Directorate has also been involved in setting macroprudential policy in France. Alongside the French Treasury, it co-chairs the Secretariat of the Haut Conseil de stabilité financière (HCSF), the French macroprudential authority. Over the years, the Directorate has focused its research agenda on areas dealing with the prevention of systemic risk, the analysis of interconnectedness and contagion, or macroprudential policies. It is also currently working on issues related to European integration in the context of the Capital Market Union (CMU) and on financial stability risks stemming from climate change. In what follows, I present several recent contributions to this research agenda.

Building early warning systems for the prevention of systemic risk

The Banque de France has developed a number of early warning systems with a view to preventing systemic risk and triggering macroprudential instruments. For instance, Borgy et al. (2014) investigated the extent to which it was possible to detect asset-price booms and banking crises according to alternative identification strategies and assess their robustness. They found some evidence that house price-booms were more likely than stock-price booms to turn into costly recessions or to trigger banking crises. Using both a non-parametric approach and a discrete-choice model, Borgy et al. analysed the ability of a wide set of indicators to robustly explain costly asset-price booms. Similarly, more recently, Coudert and Idier (2016) constructed an early warning system to detect banking crises that could be used to set the countercyclical capital buffer (CCyB) rate. They started off by selecting certain macro-financial risk indicators among a large number of candidates, based on their signalling ability. They then ran all the possible logit models including four of these indicators, one being necessarily a measure of credit gap to suit the Basel recommendations for the setting of the CCyB. They then applied a weighted average of the pre-crisis probabilities estimated by the models. They found that better results could be obtained by aggregating more models than by relying on one single model or only a few, since model uncertainty is reduced. Performance is also enhanced by aggregating the results of models with country-specific weights as opposed to common panel weightings. These Early Warning Systems are used for our regular risk assessment exercises and may also be used in triggering or releasing macroprudential instruments such as the countercyclical buffer.

Building a macro-financial model to assess the effects of macroprudential policy

Relying on a set of macroeconomic models, including dynamic stochastic general equilibrium (DSGE) models with financial frictions, Angelini et al. (2015) assessed the long-term impact of Basel III on economic performance and fluctuations. Their analysis also showed, for the first time, that the adoption of countercyclical capital buffers could have a sizeable dampening effect on output volatility. Building on this analysis, Clerc et al. (2015) put together a more ambitious model allowing for a welfare analysis of macroprudential policy. For that purpose, they developed a DSGE model in which default played both a central and a material role. In effect, default and its costs impinge on the balance sheet of lenders, influencing their optimal behaviour and therefore macroeconomic outcomes. The rationale for macroprudential policies in this model arises from two key distortions associated with banks' external debt financing: banks' limited liability and the existence of deposit insurance;

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the presence of transaction costs in the event of a bank failure. Clerc et al.'s analysis showed that: i) there is generally an optimal level of capital requirements; ii) when bank leverage is high (because capital requirements are low), the economy is more responsive to shocks; and iii) countercyclical adjustment of capital ratios may significantly improve the benefits of high capital requirements, but only up to a certain level. This model is now currently used by the ECB as well as a number of national central banks in Europe and has also been calibrated on French data for macroprudential policy purposes.

Assessing interconnectedness and contagion risks

A significant part of the Directorate's resources have been devoted to the analysis of interconnectedness, notably in the context of European Systemic Risk Board (ESRB) groups. For instance, Clerc et al. (2014) studied the structure and topology of the European CDS (credit default swap) market and its evolution from 2008 to 2012, through network analysis. The structural features that were revealed showed bilateral CDS exposures describing growing scale-free networks whose highly-interconnected hubs constituted both a strength and a weakness for the stability of the system. The potential "super spreaders" of financial contagion, identified as the most interconnected participants, consisted mostly of banks. Net notional exposures for some of them may be particularly large relative to their total common equity. These findings also revealed the importance of some non-dealer/non-bank participants belonging to the shadow banking system. Besides direct contagion, Clerc et al. (2016) identified the fundamental channels of indirect contagion, which can be manifested even in the absence of direct contractual links. They highlighted policy tools which could be efficient in ensuring systemic resilience to indirect contagion such as macroprudential liquidity regulation, restrictions on margins and haircuts and information disclosure. This research has been incorporated into the current policy efforts to develop macroprudential instruments beyond banking.

Relying on the findings of Fourel et al. (2013), Gabrieli et al. (2015) investigated the scope for cross-border contagion in Europe and used, for the first time, a unique dataset of interbank money market transactions, with various maturities, estimated from Target2 payment data. Their results showed the considerable impact of heterogeneity and concentration in the structure of interbank exposures on domestic and cross-border propagation. The number of defaults resulting from a set of stress scenarios can be up to six times higher than the average, depending on the underlying structure of interbank linkages. In another attempt to assess cross-border contagion risk, Idier and Piquard (2016) proposed a simulation framework of pandemic crises in a financial system composed of banks, asset markets and interbank markets. They built on the network model of Gouriéroux, Héam and Monfort (2012), adding some asset market channels as did Greenwood, Landier and Thesmar (2015) and interbank markets characterised by collateralised debt and margin calls. They showed that rather small shocks can be amplified and destabilise the entire financial system. In their framework, the fact that the system enters an adverse situation comes from first round loss amplification triggered by asset depreciation, interbank contraction and bank failures in a chain reaction. These two models are frequently used to assess contagion risks stemming from the European banking sector.

Strengthening European integration

Finally, Bignon et al. (2015) also provided some grounds for fostering credit market integration in Europe. Building on a symmetrical two-country model of fiat money and bank credit, they showed that a regime of monetary union is always optimal when credit markets are sufficiently integrated. Their analysis provided a normative argument for the integration of bank credit markets of a currency zone in order to reap the benefits expected from the unification of the currency.

To conclude, the research agenda of the Banque de France's Financial Stability Directorate is quite broad and continuously evolving. As an illustration, the teams are getting involved in new avenues of work such as the development of new analytical tools to assess the cumulative impact of financial regulatory reforms, the risk for the financial system related to climate change or the challenges for the banking sector raised by Digitalization.

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What place has research occupied in your career?

My career at the Banque de France has combined – with varying intensity depending on the posts concerned – research work and work to support decision-making: studies and macroeconomic forecasts. Engaging in research enables you to focus on understanding this or that phenomenon in depth; at the same time, it allows you to develop technical knowledge that is useful elsewhere (regarding econometric methods for example) and the ability to set out and argue your theses rigorously, and to question received ideas. The inevitable tension that any economist-researcher has to manage, particularly at a central bank, is that research takes place within a long timeframe whereas the timeframe for economic policy issues and decisions is relatively short.

Do analyses of individual price data play an important part in your work?

Understanding price setting and inflation dynamics has been one of my focuses of interest for a long time. About ten years ago, I had the opportunity of contributing to research on this topic by participating in a series of studies based on microeconomic price data, notably individual consumer price recordings, which previously had been little studied by researchers in Europe. These studies, which were carried out within the framework of a Eurosystem research network, made it possible to bring out the detailed and original characteristics of price adjustments. For example, we can observe that prices are generally stickier in Europe than in the United States, but that falls in prices are not uncommon there as in the US (Dhyne et al. 2006). Moreover, the recent crisis has changed the characteristics of price adjustments relatively little (Berardi et al. 2015).

What is the contribution made by analysis using individual data and how do you then move to analysis at a more aggregate level?

In my view, the analysis of microeconomic data allows stylised facts to be highlighted and theories to be tested in a way that is often more robust than with aggregate data. "Identification" difficulties are certainly not absent in microeconomic studies. But with microeconomic data we have more information than with macroeconomic data in order to choose between two competing theories to explain a phenomenon. For example, the probability that a company changes its prices is a structural parameter that plays a central role in the New Keynesian macroeconomic model. We can infer the value of this parameter by estimating Phillips curves on macroeconomic data, which is subject to different auxiliary hypotheses and statistical samples of limited size (for example, 80 quarterly observations if you have 20 years of data). An alternative is to measure it directly using individual data on price changes, in which case there may be millions of data. Of course the microeconomic data have to exist and be available! Moreover, a systematic characteristic of microeconomic data is the presence of heterogeneity. Not all of the aspects of heterogeneity are relevant for the topic of interest at the macroeconomic level; a recurrent challenge is to ascertain which aspects of heterogeneity are relevant to understand the dynamics of the economy and which are of secondary importance.

How is the work carried out at the bank in this area placed?

The capacity to analyse individual data is, it seems to me, one of the strong points of the research conducted at the Banque de France. The expertise of the researchers who work here and the wealth of data available enable the Banque de France to have a certain comparative advantage in empirical research on topics such as household finance and wealth, bank lending and the analysis of exports – among others. For my part, as well as price setting issues,

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I have also participated in research using individual data on topics such as wage stickiness (Le Bihan et al. 2012) and the formation of expectations (Andrade and Le Bihan, 2013).

In particular, in the area of analysis of inflation and monetary policy, how are individual data useful?

The standard models used for the – in particular normative – analysis of monetary policy are based on microeconomic foundations. Ultimately, a model's macroeconomic properties depend on structural parameters that most often have a microeconomic interpretation. It is quite natural to make use of microeconomic data to parameterise and evaluate these models, particularly for those analyses that aim to rank policies using a criterion of microeconomic well-being. The recent article with Fernando Enrique Alvarez and Francesco Lippi (Alvarez et al. 2016) provides an illustration of the links between the microeconomic characteristics of price changes and aggregate inflation dynamics. We design a model that allows us to replicate the distribution of price changes observed on individual data. We show that, in this model, which is flexible enough to encompass a large number of "standard" models of price stickiness, two microeconomic characteristics of price changes (the frequency of price changes and the kurtosis of the distribution of price changes) determine the response of output to a monetary policy shock. Kurtosis and frequency appear here to be "sufficient statistics", i.e. magnitudes that can be fairly directly observed from data (microeconomic in this case) and that provide information about macroeconomic properties.

What are the challenges over the coming years for researchers working on inflation and monetary policy in central banks?

First of all, there is certainly progress to be made in the modelling of price adjustments. It is still difficult to find a structural model that allows us to account for all of the characteristics of price changes, including for example the presence of many small price changes.

At the same time, the situation of low inflation that has been observed notably in the euro area since 2013 needs to be better understood. It again raises the question of evaluating the (social) cost of low inflation, which requires the use of structural models, and is linked to my first point. More generally, the purpose of research in these areas is to contribute to thinking about the appropriate monetary strategy in an environment in which "structurally" low real interest rates and the effect of the zero lower bound increase the downside risks to price stability, i.e. inflation that is too often too low.

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How would you define your work as a researcher at the Banque de France?

My career at the Bank has always been centred on the idea of combining both operational work and research, with the clear aim of publishing papers in academic journals. This continues to be my goal as head of the DGEI's International Macroeconomics division. My main areas of interest relate to international economics, the modelling of time series and macroeconomic forecasting. More recently, I've focused on the topic of uncertainty and its impact on the real economy and on financial markets.

How do you explain the current popularity of the topic of uncertainty among policy-makers and in academic research?

The issue of uncertainty is particularly prominent in current debate as the global economy is facing new challenges, stemming from the global financial crisis and the Great Recession of 2008-09. The concept of uncertainty I would like to discuss here is not that linked to the use of models or data, but rather the uncertainty over the economic or financial outlook, which can notably be illustrated by the persistent over-optimism in global growth forecasts since the end of the Great Recession. The global economy is also regularly being hit by (uncertainty) shocks. The outcome of the June 2016 referendum on Britain's withdrawal from the European Union, or "Brexit", for example, was widely seen as generating uncertainty. Similarly, the Chinese government's decision to devalue the renminbi in August 2015 triggered a surge in volatility, which quickly spread to global financial markets.

But isn't there often some confusion over the definition of uncertainty? What about the difference between risk and uncertainty?

Absolutely! The main difficulty economists come up against is that uncertainty is not observable; we can only estimate it using statistical or econometric methods. That can lead to measurement errors, and to endless debates between experts. I would nonetheless like to raise two points.

First, the conceptual difference between risk and uncertainty. Franck Hyneman Knight (1921) made what I think is a very important distinction between the concepts of risk and uncertainty. Risk corresponds to a situation where the distribution of probabilities for a series of events is known. Uncertainty is where agents have no way of predicting the probability that the events will occur. Thus, Brexit corresponds more to the concept of uncertainty.

Second, economists differentiate between different types of uncertainty: i) financial uncertainty, which can be measured by financial market volatility or by indices such as the VIX; ii) macroeconomic uncertainty, which can be measured, for example, by differences in forecasts for macroeconomic variables or by divergences in survey forecasts; and iii) economic policy uncertainty, which Baker et al. (2015) measure by conducting textual analyses of different media and counting the number of times certain keywords occur. Recently, various works have appeared in the literature proposing ways of measuring uncertainty, and research remains very active in this field. A number of microeconomic measures of uncertainty have also been suggested (such as variations in the profits or share prices of a large number of companies).

How does uncertainty affect the economy and the world of finance?

The majority of the academic research on the subject highlights the negative impact of uncertainty on economic activity. This is mainly transmitted via the investment channel,

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which is well-known for having a significant multiplier effect on short-term growth. In the face of uncertainty, investors tend to opt for a wait-and-see approach and postpone their investment decisions. Another channel of transmission is precautionary savings, which tend to weigh on household spending. According to some studies, uncertainty reduces total factor productivity as it leads to inefficient factor allocation between companies. Increased uncertainty can also have a negative impact on the labour market, as it causes firms to delay hiring decisions and discourages workers from looking for other jobs. Risk premiums also tend to rise, which can restrict the flow of credit to households and businesses. There has been less research into the effects of an uncertainty shock on financial markets, but Alfredo et al. (2016) recently demonstrated that a rise in uncertainty leads firms to cut their debt (especially their short-term debt, leading to a lengthening of maturities) as well as their dividend payouts, and to increase their cash holdings.

What role can or should economic policies play with regard to uncertainty?

Given the potential negative effects, economic policies should aim to reduce uncertainty in all its forms in order to firmly anchor economic agents' expectations. The implementation by the major central banks of innovative tools, such as forward guidance, is a step in the right direction as it helps to reduce market volatility. Central banks' communication strategies also play a crucial role in generating or reducing uncertainty. Remember the volatility in global financial markets in May 2013, caused by Ben Bernanke hinting at the possibility of a tapering of the Fed asset purchase programme. Conversely, the Fed's communication strategy when it lifted interest rates for the first time in December 2015, after several months at the zero lower bound, enabled it to avoid triggering any major stress in the markets. In the case of fiscal policy, some authors have highlighted the negative impact of the instability caused by parliamentary decisions, notably temporary tax measures, which can disrupt agents' expectations.

How is uncertainty covered in your research work?

There are a number of studies in progress at the Bank. We've looked into the impact of high-frequency uncertainty shocks on the economy (Ferrara and Guérin, 2016), and found that there's no cause for alarm if, for example, the VIX rises – even significantly – for one or two days in a row. We've also measured the contribution of uncertainty to the decline in business investment in OECD countries since the Great Recession (Bussière, Ferrara and Milovich, 2015). Our results show that it has played an important role, even though the main determinant of investment decisions remains expected demand. We've also looked at the evolution of financial markets and proposed a way of measuring uncertainty based on oil prices (Joëts, Mignon and Razafindrabe, 2016), and, more recently, we've shown that financial contagion tends to increase in periods of heightened global economic uncertainty (Candelon, Ferrara and Joëts, 2016). The Bank is also particularly interested in monetary policy uncertainty and its effect on inflation expectations. Work conducted in-house has shown that uncertainty shocks tend to lower short-term inflation expectations and raise long-term ones (Istrefi and Piloiu, 2014). Lastly, we've proposed a subjective measure of interest rate uncertainty for a selection of advanced economies (Istrefi and Mouabbi, 2016). The measure takes into account market expectations regarding interest rates, as reflected in professional forecasts.

What are the possible future areas of research in this field?

The existing literature on the subject looks mainly at the domestic consequences of uncertainty. However, shocks originating in emerging markets or stemming from specific policies in advanced economies can have major repercussions for the global economy. It is important to invest in studying the issue of uncertainty in an open economy, as certain key variables in the global economy (such as capital flows and exchange rates) are vulnerable to uncertainty shocks. This is why, in May 2016, we organised a joint workshop in London on the topic, in conjunction with University College London. And the *Journal of International Money and Finance* is preparing to publish a special issue, which will be in part devoted to the papers presented at the workshop (Chinn, Ferrara and Giacomini, 2017).

It is also important for central banks to assess the extent to which non-standard tools (such as forward guidance and asset purchase programmes) are linked to this uncertainty. Lastly, one of the difficulties economists face is how to clearly identify uncertainty shocks given that they often occur in parallel with other shocks, notably financial ones. As a result, there is a growing body of research aimed at improving this identification process.

Accepted articles

Jude (C.), "Technology spillovers from FDI. Evidence on the intensity of different spillover channels", *The World Economy,* forthcoming.

Jude (C.) and Levieuge (G.), "Growth effect of foreign direct investment in developing economies: the role of institutional quality", *The World Economy*, forthcoming.

Mésonnier (J.-S.) and Stevanovic (D.), "The macroeconomic effects of shocks to large banks' capital", *Oxford Bulletin of Economics and Statistics*, forthcoming.

Mojon (B.) and Gilchrist (S.), "Credit risk in the Euro area", *The Economic Journal,* forthcoming.

Osotimehin (S.) and Pappadà (F.), "Credit frictions and the cleansing effect of recessions", *The Economic Journal*, forthcoming.

Py (L.), Mayer (T.) and Mayneris (F.), "The Impact of urban enterprise zones on establishment location decisions and labor market outcomes: evidence from France", *Journal of Economic Geography*, forthcoming.

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Credit risk in the euro area

Benoît Mojon became head of the Monetary Policy Division at Banque de France in 2008, then and Director of Monetary and Financial Studies and a member of the Eurosystem Monetary Policy Committee in 2011. He is an applied macro-economist specialised in monetary policy, its transmission, inflation dynamics and the business cycles. He obtained a PhD from the University of Paris-Ouest-Nanterre-la-Défense, before joining the ECB's Research Department in 1998 and the Federal Reserve Bank of Chicago in 2006. He has published several well-cited articles on monetary policy transmission and on global inflation in *The Journal of Monetary Economics, The Review of Economics and Statistics* and *The Economic Journal.*

The euro area has become the epicenter of world financial stress since the post-Lehman Brothers bank recession escalated into a sovereign debt crisis that began in 2010. The fear of a sovereign default and the possible break-up of the euro area has led financial conditions for debt issuers to diverge across member countries. This motivated the launch of the outright monetary transactions (OMT) in the late summer of 2012 with a view to "restoring" the transmission mechanism, i.e. the uniqueness of financial conditions within the euro area. Simon Gilchrist and Benoît Mojon introduced new credit risk indices for the euro area. According to them, credit spreads revealed that the financial crisis of 2008 dramatically increased the cost of market funding for both financial and non-financial firms in the euro area.

Although policy makers are still concerned about the fragmentation of the European financial system, gauging the extent of financial distress for countries within the euro zone is a considerable challenge nonetheless. There are very few reliable indicators of credit risk in the euro area and across euro area countries. Most statistics on euro area interest rates are restricted to either sovereign interest rates or bank retail interest rates. In principle, the latter reflect the effective cost of external financing for a large proportion of the population of euro area firms and households. In practice, retail bank interest rates are based on surveys rather than market-based indicators. They also reflect compositional changes among borrowers as well as varying degrees of competition between banks.

Market interest rates arguably provide better indicators of credit risk as they reflect what many investors believe, in real time. Simon Gilchrist and Benoît Mojon introduced new credit risk indicators for the euro area. These indices aggregated the information obtained from thousands of corporate bonds and hundreds of thousands of monthly observations on the yield to maturity of such bonds since the launch of the euro in January 1999. The authors constructed a credit spread at the bond level as the difference between the corporate bond yield and the yield of a German Bund zero coupon bond of the same maturity. By constructing credit spreads at the bond-issuance level, they avoided confusing credit risk premia with term premia. They then aggregated these bond-level credit spreads to obtain indices of credit risk for two sectors, banks and non-financial corporations (NFC), for the four largest euro area countries: Germany, France, Italy and Spain. By aggregating this information across countries, they were also able to construct credit spreads for the euro area as a whole.

According to the authors, credit spreads revealed that the financial crisis of 2008 dramatically increased the cost of market funding for both financial and non-financial firms in the euro area. Furthermore, in their paper, they established that there had been considerable divergence in corporate credit spreads across countries since the summer of 2010, similar to the divergence observed in sovereign spreads. The credit spreads of both financial and non-financial corporations in Italy and Spain widened dramatically during this time. The authors also documented a deterioration, although not as pronounced, in the credit spreads of financial institutions in France and Germany during the post-2010 period. In contrast, the credit spreads of non-financial firms in France and Germany remained below their 2009 peak.

In addition to documenting how credit spreads had evolved across countries within the euro area, the authors also analysed the information content of these credit spreads by examining their ability to predict commonly-used indicators of economic activity, inflation and bank lending. Their results implied that, for the euro area as a whole, both financial and non-financial credit spread indices were highly robust leading indicators for economic activity and growth in bank lending. In terms of aggregate spending components, they found both bank and NFC credit spreads to be particularly informative about the future growth in non-residential investment. In contrast, only bank credit spreads were found to be robust predictors of the future growth in consumer spending.

International banking and cross-border effects of regulation: lessons from France

Julia Schmidt works as a research economist at the Banque de France's International Macroeconomics Division. She is an active member of the International Banking Research Network (IBRN), which conducts research into international channels of transmission via banking activities. Her research covers financial flows, notably banks' international operations, as well as productivity and the economic aspects of technological standardization. One of her articles has been published in the *IMF Economic Review*.

The International Banking Research Network (IBRN) consists of researchers from more than 20 central banks as well as international institutions like the International Monetary Fund (IMF) or the Bank for International Settlements (BIS). The Banque de France plays an active part in the IBRN, which seeks to analyse issues related to global banks and their international activities. Member teams from each central bank notably examine questions pertaining to international banking by working on a common research theme, sharing the same methodology, so that they can compare results across countries. In this context, Matthieu Bussière, Julia Schmidt and Frédéric Vinas studied the effects of regulatory changes on growth in cross-border lending. They found that, in certain cases, this growth can be affected by regulatory changes, but that the effects are not systematic and economically small.

Prudential regulation has undergone profound changes in recent years, particularly since 2007 with the implementation of the Basel II agreements, followed by Basel 2.5 and Basel III. It is interesting to explore the extent to which these changes have affected cross-border lending. However, the anticipated effects are not straightforward. This is especially true when banks with global operations take advantage of differences in national regulations to circumvent national policies, thus contributing to what is called regulatory leakage.

Matthieu Bussière, Julia Schmidt and Frédéric Vinas looked at various regulatory measures, such as capital buffers, interbank exposure limits, concentration limits, loan-to-value ratio limits and reserve requirements to explore how regulatory changes abroad as well as in France affect cross-border lending. Three main findings stood out.

Firstly, growth in cross-border lending is driven by the business cycle in the respective destination countries and less so by regulatory changes. The authors only identified consistent and significant outward adjustment in response to changes in capital requirements, reserve requirements and interbank exposure limits. In quantitative terms, these effects are rather small.

Secondly, the reaction of French banks to regulatory tightening abroad depends on the type of regulatory policy. Growth in cross-border lending by French banks decreases when there is a tightening in interbank exposure limits, but increases when reserve requirements are tightened abroad. The capacity of French banks to adjust their cross-border loans depends on their balance sheet variables, notably the illiquid assets ratio and the dependence on net intragroup funding. If these two elements in particular are very high, banks might have less leeway to extend cross-border loans and actually decrease lending growth in response to regulatory tightening. All in all, the findings are indicative of regulatory leakage (for selected policy measures): when regulation abroad is tightened, growth in lending by resident banks ("locally regulated banks") presumably decreases, while French banks that are not subject to this foreign regulation stand in for the activities of locally regulated banks by increasing their cross-border lending growth.

Thirdly, the results showed that banks' balance sheet characteristics are important when it comes to the cross-border transmission of domestic capital regulation. Matthieu Bussière, Julia Schmidt and Frédéric Vinas found that a high Tier 1 capital ratio and considerable reliance on net intragroup funding significantly reduce growth in cross-border lending when French capital requirements are tightened. Conversely, the availability of inexpensive, stable funding due to strong reliance on core deposits could help sustain robust growth in cross-border lending in the event of such tightening. However, the economic magnitude of these effects is small.

The research efforts that the IBRN conducts in general, as well as within the framework of work on cross-border regulatory spillovers, highlights the necessity for comprehensive data collection to study international financial flows. Cross-country studies as conducted by the IBRN can help further our understanding of the broad drivers of economic aggregates, while also highlighting country-specific particularities and emphasising common factors.

Land collateral and labour market dynamics in France

Patrick Pintus is a professor at Aix-Marseille University and an honorary member of the Institut Universitaire de France, and is on secondment to the Monetary Policy Division at the Banque de France. He is a graduate of the École normale supérieure (ENS) de Cachan and holds a PhD from the École des hautes études en sciences sociales (EHESS). His research has mainly focused on the macroeconomic consequences of imperfections in capital and credit markets, and on the relationship between international financial globalisation and growth. His more recent work has looked at the effectiveness of monetary policy and at the empirical link between public infrastructure and income inequalities. His most recent articles have been published in *European Economic Review, Journal of Economic Growth, Optimal Control Applications and Methods* and *Review of Economic Dynamics.*

French data show that the market value of land owned by firms and their investment and hiring move together at business-cycle frequency over the 1978-2011 period. To account for such a pattern, we develop a theoretical framework in which firms face both adjustment costs when they change their hiring flows over time and a strict limit on how much they can borrow to help finance their expenses. Both the data and the theory accord with the notion that firms can take advantage of larger real-estate prices when they own land, that can be used as collateral to borrow more. In addition, fluctuations in land prices might have contributed to the dynamics of unemployment in France over the last 30 years.

It is a widespread feature in Europe that borrowing by firms is constrained by collateral requirements imposed by creditors, including banks. This in turn implies that the value of real-estate assets in a firm's balance sheet will affect its ability to obtain funding from a credit institution. An increasing market value of a firm's asset will relax its borrowing constraint, and hence improve its ability to invest and hire new employees.

Various microeconomic studies using firm-level balance sheet data have confirmed the positive correlation between the market value of firms' real estate holdings and their levels of investment and hiring. Leo Kaas, Patrick Pintus and Simon Ray unveil such a positive relationship at a more aggregate level, in French data over the 1978-2011 period, and show why it matters to understand the macroeconomic dynamics of investment, hiring and unemployment. The first important point to notice is that movements in firms' real estate holdings are largely driven by the price of land, as in other developed economies like the United States. The authors first construct the cyclical components of non-financial corporations' real investment, land value, and labour market tightness indicator (the ratio of job vacancies to jobseekers at national level). They then show that land market value, investment, job vacancies and labour market tightness are positively correlated with the aggregate output, whereas the number of unemployed is negatively correlated with output.

So as to shed light on the mechanisms behind the empirical pattern of French firms' land holdings, investment and demand for labour, Leo Kaas, Patrick Pintus and Simon Ray then constructed a stylized model that incorporates both a collateral constraint on borrowing and labour market matching frictions. In their setting, the economy is composed of three types of agents: firms, households and the government which levies taxes on wages in order to pay unemployment benefits.

A key dimension is that firms' land holdings not only contribute to the production process, but they also serve as collateral to guarantee loans from investors. This collateral function of land plays an important role in the overall dynamics predicted by the model, since a firm's ability to borrow and then to invest and create jobs is in part determined by expectations of future land prices. Households use their wage income to finance consumption and the realized wage is determined through bilateral negotiations. Unemployment results from a combination of job destructions (at a given rate) and the job search difficulties encountered by the unemployed in their job search (i.e. matching frictions between jobseekers and vacancies).

According to Leo Kaas, Patrick Pintus and Simon Ray, disturbances that drive land prices are transmitted to the labour market via two channels. First, as capital and labour are complementary, all other things being equal, the marginal productivity of labour will increase when investment increases. Thus, when a firm's borrowing capacity rises and hence its ability to invest does too, the value to be derived from hiring an additional worker will also tend to increase, leading to higher job creations. Second, a relaxation in borrowing constraints increases the discounted job value of an additional worker, leading to a rise in the firm's optimal number of positions to be opened as vacant.

Most importantly, the authors find that shocks to land demand, which directly affect land prices, explain the persistence, relative volatilities and correlations observed in French data on investment and unemployment. This suggests that fluctuations in land prices played a key role in business cycles and labour market dynamics in France over the last 30 years. In particular, booms in the real-estate market tend to favour investment and hirings, while a slowdown in this market tends to depress hiring and investment by firms in a prolonged way.

Local labour markets and taste-based discrimination

Clémence Berson is a senior researcher in the Banque de France Structural Reforms Division. Her research focuses on the labour market and its reforms. She is also affiliated to Paris 1 University. Before joining the Banque de France, she held a position as an economist at the French Treasury. Her main papers have been published in journals such as *Labour Economics, IZA Journal of Labor Economics* and *Revue Économique*.

Clémence Berson studies the impact of labour market competition on discrimination vis-à-vis workers using a spatial competition model applied to the labour market. This model examines worker preference with regard to geographical location when firms are located around a circle city. Her analysis is based on the following questions: Does monopsonistic competition have an impact on the wage gap between the minority and the majority? What policy can reduce the wage gap? She draws two main conclusions from her analysis: first, a single prejudiced firm is sufficient to produce a significant wage gap in the market; second, the wage gap does not disappear with more competition and public policies are needed to reduce it.

Clémence Berson introduces discrimination in a taste-based model where workers are not paid at their marginal productivity. Workers' utility functions include the physical distance to the firm. This distance can also be interpreted as a non-wage job characteristic offered by firms (type of contract, full or part-time, etc.), the characteristics of firms themselves (size, environmental and social policies, etc.) or informational frictions. This implies that different jobs are not perfect substitutes for each other. Heterogeneity in worker preferences allows firms to exercise market power in the labour market, which is thus oligopsonistic. In the presence of taste-based discrimination, it gives rise to an enduring wage gap between the majority and the minority without worker segregation. Consequently, this model does not exactly reproduce a geographical breakdown by ethnicity but fits gender better than race discrimination on the labour market.

Clémence Berson's main findings are: first, discrimination does not stem from a productivity gap between minority and majority-group workers; second, a single prejudiced firm is sufficient to produce a significant wage gap in the market. In addition, non-prejudiced firms discriminate against the minority without having any taste for discrimination or beliefs regarding the minority group. Furthermore, firms make more profits when they are located in an area close to similar firms. While greater competition reduces the wage gap, it totally vanishes if, and only if, commuting costs disappear or the number of firms tends toward infinity. Moreover, unprejudiced firms have no incentive to compete with prejudiced firms to drive the latter out as they benefit from the existence of discrimination. Consequently, discrimination can persist even in the long term.

Greater competition on the market reduces the wage gap but is not sufficient to make it disappear, except if commuting costs totally vanish. Complementary policy initiatives are required for this, but if economic agents maximise their revenues, governments have no incentive to introduce them for re-election reasons. Improving transport and subsidizing commuting costs are the most efficient measures; they also increase wages whatever the type of worker. Indirect policies do not affect the absolute wage gap between the two groups, but may be more likely to be used than direct policies, which reduce the absolute value of the gap. These policies are also associated with lower wages for the majority group.

Growth effect of FDI in developing economies: the role of institutional quality

Cristina Jude is a macro-economist in the Emerging Markets Division at Banque de France. Her research interests include development economics, international trade and FDI, with a focus on emerging markets in Eastern Europe and Asia. Her main papers have been published in journals such as *The World Economy*, *Economic Modelling* and *China Economic Review*.

In addition to its role in complementing local investment, foreign direct investment (FDI) is seen as an important stimulus for productivity gains through a spillover mechanism from foreign to domestic firms. As a result, FDI inflows have been particularly encouraged by governments in developing countries and large amounts of public funds have been devoted to FDI attraction policies. Identifying the specific conditions that foster benefits from FDI is therefore of great importance for policymakers. Cristina Jude and Grégory Levieuge shed light on this topic by exploring the modulating role of institutions in the FDI-growth relationship. They show that while FDI alone has no significant effect on growth, a minimum level of institutional quality is required to produce a growth enhancing effect.

Despite theoretical arguments in favour of the growth enhancing effect of FDI, empirical evidence is still broadly inconclusive, pointing to methodological issues and to the existence of several features determining local absorptive capacity. In this context, Cristina Jude and Grégory Levieuge note that countries with the same level of FDI experience very different growth outcomes depending on their institutional quality. Based on this observation, they explore the modulating role of institutions in the FDI-growth relationship in a large sample of emerging and developing countries.

Cristina Jude and Gregory Levieuge argue that a good level of institutional development can promote productivity spillovers by facilitating synergies between foreign and local firms, while also giving rise to complementarities with domestic investment. Conversely, an underdeveloped institutional framework may disrupt productive activities and prevent the capitalisation of knowledge spillovers by domestic firms. In order to provide some insights into this issue, they investigate several features of institutional quality such as political risk, law enforcement, bureaucratic quality, corruption and expropriation risk.

Additionally, they show that some features of institutional quality, such as democratic accountability and bureaucracy quality, produce a faster and steady increase in the marginal effect of FDI on growth. Conversely, other institutional features, like law and order and expropriation risk, need to improve considerably before becoming conducive to FDI growth effects.

Finally, Cristina Jude and Grégory Levieuge highlight two significant policy implications of their results. First, sequencing is needed in implementing economic policies, as governments should first improve the institutional framework before engaging in FDI attraction policies. Second, when designing institutional reforms, governments should consider complementarities between the different features of the institutional framework, which could potentially lead to an incremental effect of FDI on growth.

Measuring the impact of trade barriers on exports

Antoine Berthou joined the Banque de France in 2011 and currently works as an economist-researcher in the Structural Analysis and Competitiveness Division. He graduated in 2008 from the Paris School of Economics, University Paris I Panthéon-Sorbonne, and holds a PhD in economics. He worked as a researcher at the Centre d'études prospectives et d'informations internationales between 2008 and 2011. His research focusing on the behaviour of exporting firms has been published in academic journals such as the *Journal of International Economics*, the *World Bank Economic Review*, the *Scandinavian Journal of Economics*, and *The World Economy*.

In the context of various initiatives promoting the greater integration of economies (the Transatlantic Free Trade Area and Comprehensive Economic and Trade Agreement), and in the light of the intense debate among policymakers and within civil society about the winners and losers from globalisation, providing accurate quantification of the economic effects of integration is at the top of the agenda of researchers in the field of international economics. How does globalisation through the trade openness of economies affect the wealth of individual countries? Antoine Berthou and Lionel Fontagné use an innovative empirical strategy based on firm-level exports data for France to examine this question. According to them an increase in foreign tariffs of 1% would lead to a decline in individual firms' exports of about 2.5%.

Quantifying the gains from trade today remains a subject of controversy among researchers as it requires calibrating models with appropriate "trade elasticities", which identify the response of trade flows to changes in trade costs (tariffs on imported goods, etc.). Indeed, different estimation strategies may lead to different values for this parameter. For example, estimations based on aggregate trade data tend to suffer from an aggregation bias that reduces the value of the trade elasticity. Microeconomic data allow a more precise estimation of this parameter. There is also a similar debate especially with respect to the calibration of international business cycle models that require robust estimation of the elasticity of substitution between goods produced at home and abroad.

Antoine Berthou and Lionel Fontagné show that this elasticity can be accurately estimated using a novel empirical strategy based on firm-level exports data for France, which details the value of exports per product and destination for each individual exporter. This dataset is combined with data on tariffs on imported goods applied in foreign countries. Variations in tariffs are used to identify the impact of variable trade costs on firm-level exports. Here, the United States is used as a reference destination, and variations in import tariffs of any destination relative to the United States as a source of variation in trade costs. The methodology makes it possible to control for the unobserved characteristics of each destination. After controlling for possible biases due to changes in the composition of exporters across destinations and changes in their product mix, Antoine Berthou and Lionel Fontagné estimate their main parameter of interest with a value of –2.5, meaning that an increase in foreign tariffs of 1% would lead to a decline in individual firms' exports of about 2.5%. This elasticity may be used to assess the impact of various shocks associated with a change in trade costs.

Chloé Bellec holds an master in public law from the University of Rennes 1. She worked at the ACPR (French Prudential Supervision and Resolution Authority) before joining the Single Supervisory Mechanism of the ECB where she worked as a banking governance expert for two years and a half. She is currently a macroeconomist in the European Relations Division of the Economics and International and European Relations Directorate of the Banque de France.

Anne Duquerroy holds a PhD in finance from the University of Maryland, a master in economics from Sciences Po Paris and a master in business from Audencia Nantes. She worked as an economist in the Financial Stability Directorate of the Banque de France and she has just joined the Microeconomic Analysis Division as a researcher. Her research interests are in corporate finance and political economy and her current research focuses on SME financing.

Erwan Gautier graduated from Ensae and holds a PhD from the Paris School of Economics. He is professor of economics on leave from the University of Nantes and he has recently joined the Monetary Policy Division as a research economist. His research fields are price and wage dynamics and inflation.

Christoph Grosse Steffen holds a PhD from the Freie Universität Berlin (FU Berlin). He was a research associate at DIW Berlin before joining the Monetary Policy Division. He works on topics related to monetary policy with a special focus on the pricing of sovereign debt and effects of macroeconomic ambiguity.

Camille Lafond-Makris holds an master in applied economics from the University Paris Dauphine and Sciences Po Paris. At the Banque de France, she worked on financial stability issues, then on developed economies outside the euro area, before joining the Regional Economic Department of the French embassy in Singapore, as financial advisor and Banque de France representative. She is currently working in the Monetary Relations Division as senior economist.

Florian Lalanne graduated from the École Normale Supérieure (ENS) Cachan and Ensae Paristech. He worked as a macroeconomist and short-term economic analyst for the French Treasury. He is currently a macroeconomist in the Monetary Relations Division.

Claire Lelarge graduated from the Ensae after studying at the ENS Cachan. She holds a PhD from the University of Paris-Ouest-la-Défense and a post-doctorate at the Center for Economic Performance (London School of Economics). She was the head of the "Firms and Markets" Unit at Insee, the French statistical institute, before joining the Microeconomic Analysis Division and is presently working on topics related to industrial dynamics and firms' financing strategies.

Alphonse Noah holds a master in economics from the University of Paris-Ouest-Nanterre-La-Défense. He is currently preparing a thesis within the framework of a Cifre research agreement in the Franc Zone and Development Financing Division. His work focuses on financial depth, bank competition and digital financial inclusion in Sub-Saharan Africa.

Simon Ray holds a master and a PhD from Aix-Marseille School of Economics and a master in finance from Edhec Business School. After working as an analyst for the French strategic investment fund, he did a PhD on corporate real estate in the Microeconomic Studies Department thanks to a grant from the Banque de France. He has joined the Structural Policies Studies Division where he analyses the models for assessing structural reforms and carries out studies on the French real estate market.

Paul Sabalot graduated from the École centrale de Nantes (2015) and is preparing a specialized master in applied economics at Ensae Paristech. He is currently an economist in the Fiscal Policies Division and works on fiscal outlook for France.

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