

From Individual Human Decisions to Economic and Financial Policies

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It is a great honor for me to have received the *University Latsis Prize* from the *Fondation Latsis Internationale*. In this text, I describe the research for which the prize has been awarded and the research agenda to which these works belong. In a nutshell, my work analyzes how individuals make economic and financial decisions, when outcomes are uncertain and when the laws governing economic behavior are unknown. These individual decisions usually differ from the rational utility maximization assumed in traditional models. My work then tries to understand to what aggregate outcomes and policy implications such boundedly rational behavior leads in financial markets, in the macroeconomy, and in public finance and public economics.

1 Introduction

Economists have long believed that humans are fully rational and selfish. That is, economists believed that humans make no mistakes, always doing what is best for them, and that they only care about their own material well-being and about nobody else. With this assumption, models were built aggregating the choices of several identical copies of such a homo economicus to derive aggregate economic behavior (including the movement of aggregate variables such as inflation, unemployment, or asset prices). Based on these models, conclusions were then drawn about optimal economic and financial policies. However, human economic and financial decisions in the real world do not follow these assumptions of full rationality and selfishness. Real people use heuristics to make decisions, they make mistakes, and they do care about other people. Evidence of this has been accumulated within economics at least since the pioneering work by [Tversky and Kahneman \(1974\)](#).

If humans are not fully rational and selfish, how do they make their decisions? And how do the conclusions about desirable or non-desirable economic and financial policies change, when actual humans are the economic actors rather than copies of a machine-like homo economicus? These are the questions underlying my work. For instance, how do people form expectations about future inflation, and how does a central bank's optimal monetary policy change, when using a model of individuals' expectations that is more realistic than the assumption of rational expectations? How do people perceive labor taxes, and how should governments design labor taxes, when people have a wrong perception of the amount of taxes paid by themselves or by their employers?

My work makes use of the collection and analysis of experimental data, of theoretical modeling, and of the analysis of observational field data, with a focus on experimental work. Some economists are still skeptical of the use of experimental methods in economics, in particular experiments in "artificial" settings, such as the laboratory, where participants (often university students) are gathered to make decisions. How can one learn something about economics or finance, about things like inflation, labor supply, or asset pricing, in such an artificial setting? At the bottom of this skepticism are probably a misconception about what experiments are and exaggerated confidence in certain economic theories. This is together quite problematic – economics has long suffered from economists blindly believing in rational choice without being willing to put the models to a test. If observational data is not in line with theory, one can always claim that something else is responsible for that rather than the theory not describing human economic or financial behavior well: in the real world, in general not all assumptions of theoretical models are perfectly fulfilled. In experiments, it is possible to

create a setting that corresponds one-to-one to the economic theory in mind. This allows for real scientific tests of whether the predictions derived from a theory correspond to observed behavior in an experiment. If economics and finance have the ambition to be scientifically rigorous disciplines, they have to accept the use of experiments to test theories, just as other disciplines, reaching from medicine over physics to psychology. Otherwise, claims about human economic behavior would not be falsifiable.

Most of my work tackles a certain part of individual human decision making jointly with its effect on a certain domain of economic life. Consequently, the rest of this text is divided into the three broad subfields of economics and finance into which almost all studies fall, namely decision making in financial markets (Section 2), macroeconomics (Section 3), and public finance or public economics (Section 4).

2 Financial Markets

Understanding how people make investment decisions and to what asset prices these decisions lead has consequences for household finance, consumer protection, and financial stability. In [Kopányi-Peuker and Weber \(2021a\)](#), we contribute to this understanding. In a series of experiments, we find large asset price bubbles if cash constraints are not binding (that is, when participants have enough cash available to buy assets repeatedly even at very elevated prices). These bubbles reappear also with experienced subjects. Furthermore, adding information about the fundamental value of the assets does not improve pricing (this finding mirrors the observation outside the laboratory that a lot of information has become available over the last decades as a consequence of digitalization, while asset markets have not become less volatile).

If neither missing experience nor missing information can explain the formation of the asset price bubbles, one may wonder what does. We provide a theoretical model that can explain such price bubbles. In the model, there are naive agents, who extrapolate trends, and more sophisticated agents, who react optimally to the behavior of these naive agents. In the literature, such behavior is called level- k reasoning (for recent literature on level- k reasoning, see, for instance, [Mauersberger and Nagel, 2018](#), and [Hanaki et al., 2019](#)).

Our model leads to behavior that is extremely similar to the pricing behavior that we observe in the experiment. To see how similar the price paths look, take a look at Figure 1. Which of the two panels corresponds to price paths from actual human decisions in the experiment? And which corresponds to price paths simulated by the model, entirely without any data input?¹ If you have taken your guess, you can find

¹Small random disturbances distributed according to a normal distribution with a variance of two

the solution in the last footnote of this section.

Our experiments and theoretical model suggest that not missing experience or missing information are responsible for asset price bubbles but trend-following behavior by naive investors. A greater number of sophisticated investors in the market does not lead to more stable prices but, in contrast, to even faster rising bubbles (as the sophisticated investors anticipate the rising prices due to the trend followers). This suggests that policies that try to broaden stock market participation (for example to improve the retirements savings portfolios of the middle class) seem unproblematic from a perspective of financial stability.

[Weber et al. \(2018\)](#) deals with bond markets. It is obvious that the fundamentals of a firm or a government issuing bonds affect the prices of the bonds, and thus the financing costs of the bond issuer. However, the prices can also have an influence on the fundamentals. Which role this feedback from prices to fundamentals plays in actual financial markets is hard to assess with observational data, because of the two-way interaction and because fundamentals are not observable. In our study, we analyze this in a controlled laboratory environment. We find that participants price the bonds quite poorly when they do this for the first time, but that they learn to price these bonds rather accurately after having gained experience in trading such bonds.

Most asset market experiments in the literature make use of an end time that is known in advance and of a relatively low number of trading periods. In an ongoing research project ([Kopányi-Peucker and Weber, 2021b](#)), we analyze whether these design choices drive the results of asset market experiments. We find very similar pricing behavior, independent of whether the end time is short, long, definite, or indefinite. We view this finding as support for the experimental method, as it suggests that the findings from previous asset market studies in the literature are not driven by the choice of the trading horizon.

In [Weber et al. \(2019\)](#), we analyze the role of credit default swap (CDS) regulation experimentally. We find that it is possible, in the laboratory, to introduce CDS regulation that increases the usage of CDS for hedging purposes while decreasing speculation. Regulation is also the topic of [Lehmann and Weber \(2022\)](#), work that is not experimental. Making use of econometric analyses of data from a regulatory change in Japan, we analyze the effects of two different IPO mechanisms (auctions and bookbuilding) on IPO underpricing and aftermarket price accuracy. We find that auctions lead to lower IPO underpricing and higher aftermarket price accuracy, suggesting that the regulation mandating the auctioning of IPOs had been successful.²

have been added to the starting values for the simulations. These are small disturbances compared to the fundamental value of 125 and bubbles reaching above 1000.

²The solution to the question about Figure 1 is that the upper panel contains entirely simulated price paths while the lower panel contains data from the human-subject experiment.

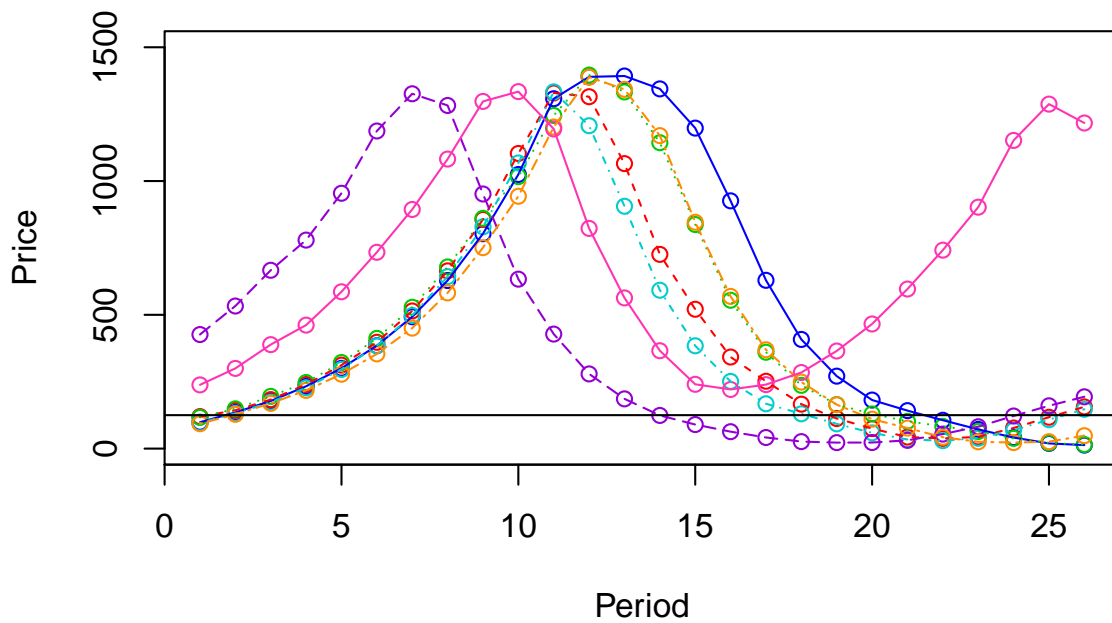
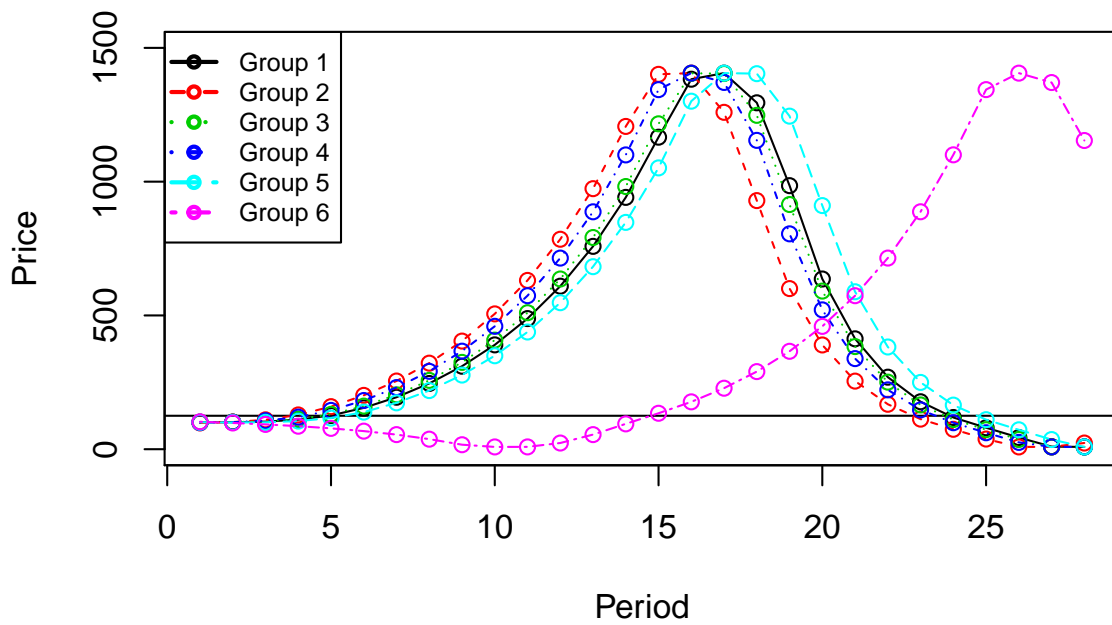


Figure 1: Are the price paths from experimental data or simulated?
 Source: [Kopányi-Peuker and Weber \(2021a\)](#)

3 Macroeconomics

My work in macroeconomics revolves around non-rational expectations. It is generally accepted in macroeconomics that expectations are important for aggregate economic variables, such as inflation and unemployment. What people expect to happen in the future has implications for their actions now and thus for economic variables. However, what has usually been assumed in the literature is that all people form their expectations rationally. In economics, rational expectations means that people know all mathematical laws governing economic behavior, and that their view of the future is always correct, except for completely random disturbances, which are on average zero. To be able to form rational expectations, people would not only need to know the equations governing economic behavior (which are already complex in relatively simple stylized academic papers and certainly many times more complex in the real world); in addition, people would need to have the computational ability to solve these equations for the solution that is in the future correct on average (essentially solving a mathematical fixed-point problem).

Obviously, people do not know the laws governing the economy, and the vast majority of people do not have the mathematical ability to solve the equations for the rational expectation solution, even if the equations were known.³

There are already several academic works showing that people do not form expectations rationally (e.g., [Carroll, 2003](#); [Branch, 2004](#); [Pfajfar and Santoro, 2010](#); [Cornea et al., 2012](#)). What my co-authors and I use in our work in macroeconomics to model human expectations is a so-called heuristic switching model (as, for instance, also used in [Anufriev and Hommes, 2012](#); [Assenza et al., 2021](#)). People use relatively simple heuristics, such as trend extrapolation or “anchoring and adjustment” (a heuristic that partly extrapolates short term trends but also assumes that variables return to their historic averages in the long run). To make sure that modeling with such simple heuristics does not lead to overly irrational expectations, evolutionary learning is used to determine which heuristics are used by how many people. The better a heuristic worked in the recent past to forecast variables, the more people use it now.

Using such an evolutionary learning model with heuristic switching to model ex-

³Some economists defend rational expectations with the argument that expectations may not be formed rationally by everyone, but that it should be equally likely for deviations from rational expectations to be above or below the true solution, so that these deviations “cancel out.” However, this would only hold if the ways that different people form expectations were completely unrelated to one another. This is extremely unrealistic: if, for example, trend extrapolation plays a role in how many people form expectations, the deviations from the rational expectations solution would be correlated and would not cancel out. It is surprising that in particular mainstream macroeconomists, who put particular value on so-called microfoundations (that is, modeling the economy from individual behavior instead of just resorting to aggregate equations), are willing to accept this black box of “somehow deviations from rational expectations magically cancel out.”

pectations can lead to different policy implications than using rational expectations. In [Hommes et al. \(2019\)](#), we show that central banks should react with their interest rate decisions to changes in unemployment, even if the central bank is ultimately only interested in keeping inflation close to the inflation target. The reason is that changes in unemployment now affect expectations of future unemployment and thereby people's choices that have an impact on inflation. To back up these theoretical results, we conduct a learning-to-forecast experiment, in which all choices except for expectations (elicited as forecasts) are computerized. The experiment supports the findings from the macroeconomic model with evolutionary learning (and stands in contrast to the fully rational version of the model).

[Hommes et al. \(2019\)](#) treats a closed-economy model of the macroeconomy. Given that the evolutionary learning model of expectation formation can successfully be used in such a macroeconomic model, one may wonder whether the evolutionary learning model may also be useful in modeling a monetary union (i.e., a currency union), such as the euro area. Economic behavior in monetary unions is particularly interesting. Aggregate variables have been very different in the different countries of the euro area, and the differences between countries have been quite persistent over time rather. [Figure 2](#) shows inflation output gap in the euro area (the output gap can roughly be thought of as unemployment, with positive numbers denoting below average unemployment and negative numbers above average unemployment). These patterns are difficult to explain with models based on full rationality.

Introducing the evolutionary learning model of expectation formation into a macroeconomic monetary union model is what we do in [Bertasiute et al. \(2020a\)](#). In that article, we provide the first behavioral multi-country New Keynesian monetary union model. This model can straightforwardly be applied to monetary unions with any number of countries. The behavioral model significantly outperforms the rational model in describing inflation and output gap data in the euro area, as shown in [Figure 3](#).

In addition to providing a model that can yield improved forecasts of inflation and output gap, there are a number of relevant policy implications arising from this research. The model shows, for instance, that a high level of economic integration between the countries of the monetary union is essential for the functioning of the union. The fact that it is difficult to keep economic behavior in a monetary union stable with monetary policy alone also suggests that a macroeconomic stabilization tool at the country level would be very useful. This calls for fiscal policy, as the only natural candidate, to be made available for countercyclical stabilization tools at the country level (strict debt rules at the EU level thus seem problematic, from this point of view).

The research documented in [Bertasiute et al. \(2020a\)](#) was carried out entirely before the Covid-19 crisis hit. However, the findings are relevant for that crisis. The findings

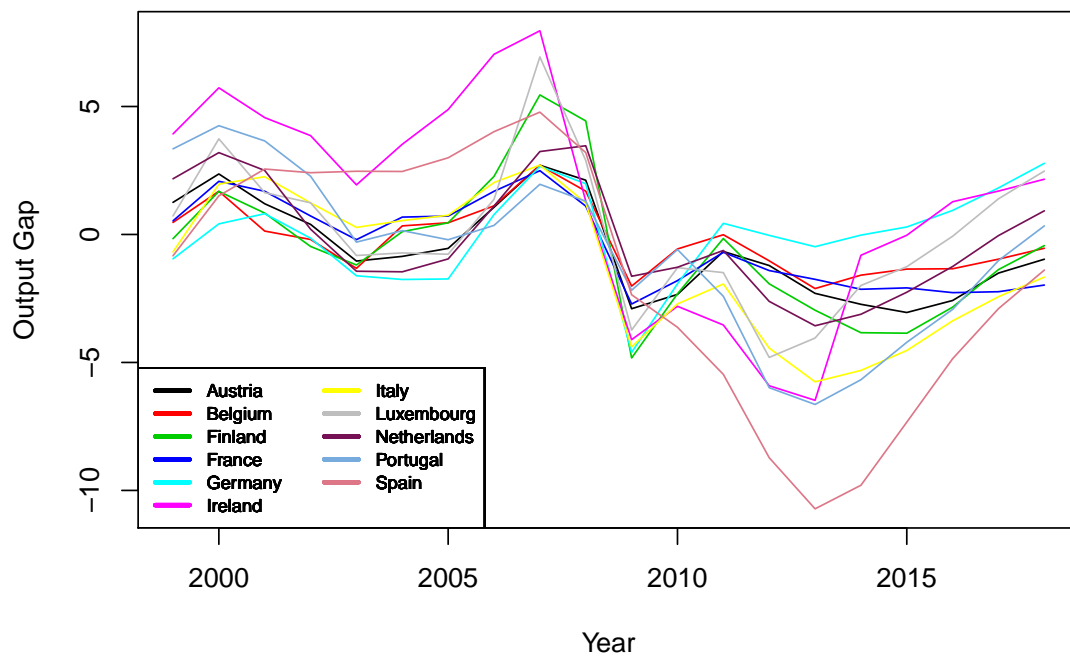
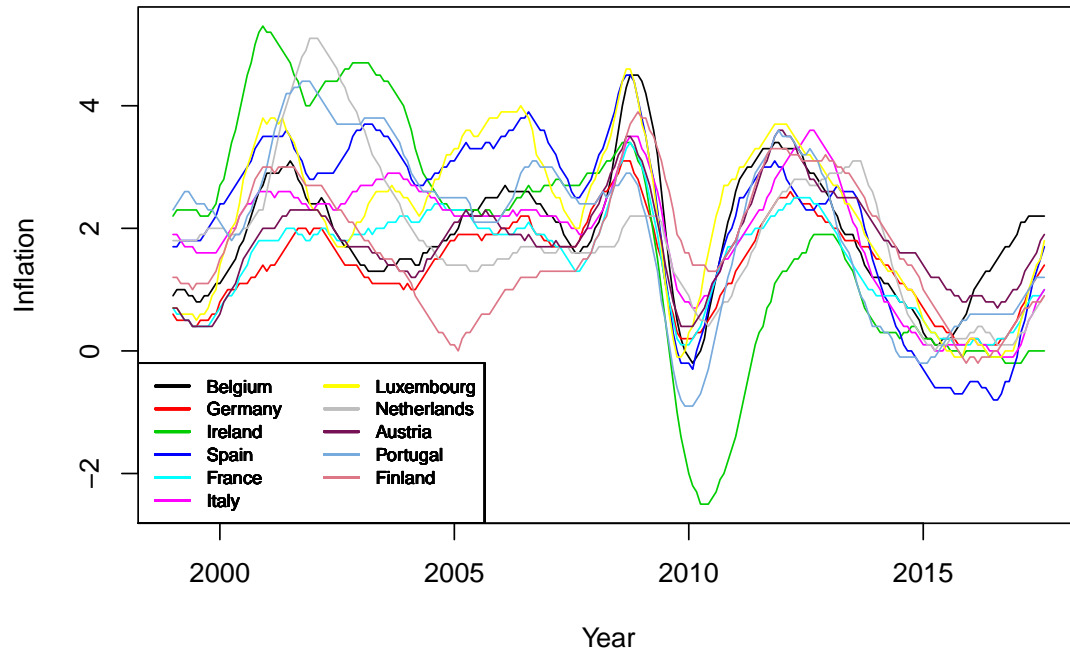


Figure 2: Inflation and output gap in the euro area

Data sources: Eurostat (inflation) and OECD (output gap)

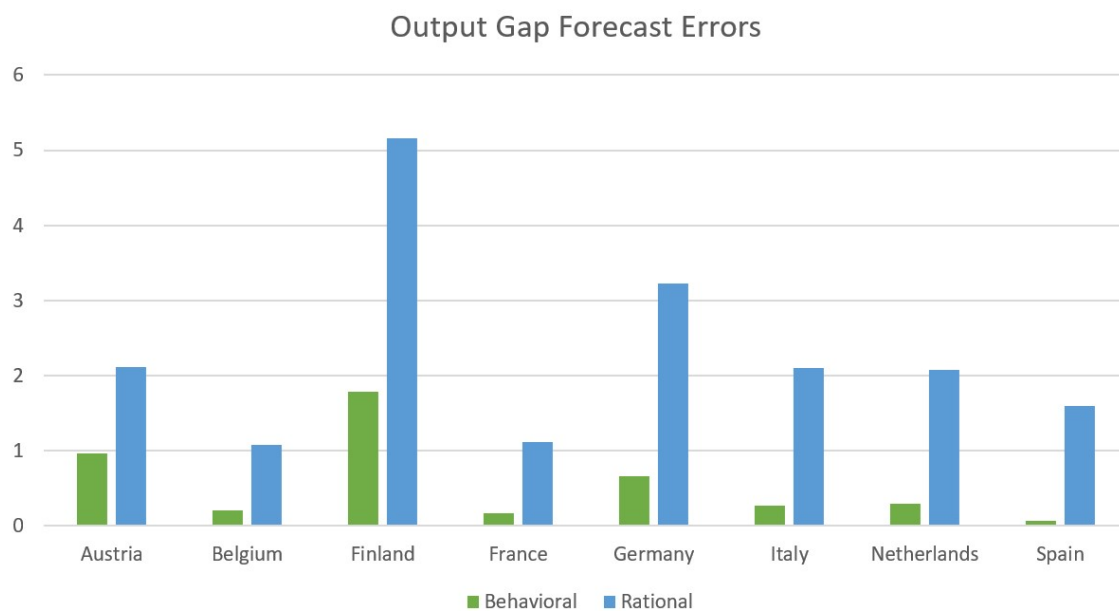
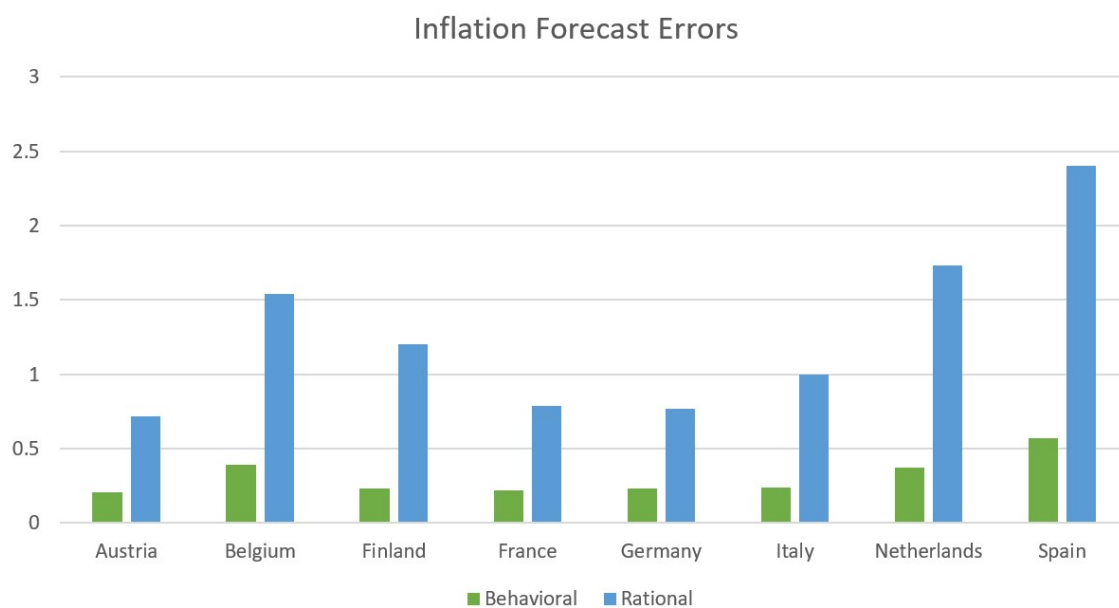


Figure 3: Forecast errors of predictions with the behavioral and the rational versions of the monetary union model

Source: Bertasiute et al. (2020a) / Bertasiute et al. (2020b)

suggest that border closures between euro area countries inhibiting trade are macroeconomically problematic for the union. We have described this in a short contribution for the general public ([Bertasiute et al., 2020b](#)).⁴

4 Public Finance and Public Economics

In [Weber and Schram \(2017\)](#), we analyze the non-rational perception of and reaction to labor market taxes. According to classical economics based on full rationality, it does not matter whether taxes are levied on employers or employees. However, if the two types of taxes are perceived differently, so that people may react to them in different ways, this equivalence no longer needs to hold. We find that participation in the labor market is higher when employees are taxed, an effect that we attribute to the net wage being less salient in this case. When employees are taxed, gross wages are higher, and if people do not fully account for the taxes that they have to pay, they will perceive the net wage to be higher than it actually is. We find further that subjective well-being of employees is higher when employers are taxed. In addition, participants prefer higher taxes to fund a public good, when the taxes are levied on the employer's side than when they are levied on the employee's side.

A smaller theoretical contribution to public finance is contained in [Weber \(2021\)](#). In that paper, I illustrate how the policy implications of classical optimal taxation literature can change when a behavioral effect is present. The behavioral effect that I consider is changing aspirations over the life cycle, as empirically documented by [Easterlin \(2001\)](#). If aspirations change over the life cycle, a lump sum tax, taxing every individual in the society by the same amount, is less attractive from a welfare perspective than would be the case if all people were fully rational (and identical in terms of wealth and ability).

[Skliastyte and Weber \(2021\)](#) deals with intellectual property rights. Intellectual property rights have the disadvantage that they award the creator of an artwork or an idea monopoly rights that are harmful from an economic perspective. However, on the other hand, creators need an incentive to be active, and some people argue that intellectual property rights are therefore desirable. What we show in this piece is that, in cases where there is a dual market to the market where the property rights are usually assigned (such as the concert market in addition to the market for music recordings or movie theaters in addition to movies watched at home), it may be beneficial to

⁴Relatedly, in [Weber \(2020b\)](#), I suggest a set-up of eurobonds, potentially labeled as coronabonds, with the ECB acting as lender of last resort and with credible sanctions in case of default. I then investigate with a simple analysis (that I have not seen applied in this form before) what implications the issuance of such bonds would have on the financing of euro countries. I find that such eurobonds would benefit the member states facing relatively high borrowing costs considerably, while hardly affecting the borrowing costs of the member states already facing low borrowing costs.

subsidize the dual market while removing intellectual property right protection in the first market. The framework with which we analyze this novel argument is a partial equilibrium model.

Weber (2020a) investigates fairness preferences regarding voting rules in assemblies of representatives. Voting in an assembly of representatives takes place when there are different groups, and when these groups send out representatives who vote on issues, possibly with their votes having different weights. Such groups can in general be very large, such as countries (as in the UN General Assembly, the Council of the EU, the IMF, the WTO, or the OPEC), but the groups could also be very small, for example in professional or non-professional associations. Just using weights proportional to population size is in general not a good idea – one group with just a little bit more than half of the total population would, under majority voting, dictate all decisions. There is a large theoretical literature on how the voting weights should be distributed in such an assembly depending on the population size (for literature on such voting within the EU, see, for instance, Laruelle and Valenciano, 2002, Baldwin and Widgrén, 2004, Beisbart et al., 2005, and Le Breton et al., 2012). Weber (2020a) conducts an experiment in which participants are placed behind the veil of ignorance, thus not knowing which group they belong to, while stating their preferences over voting systems (implementing such a veil of ignorance is possible in the laboratory but impossible with observational data). It turns out that participants behind the veil of ignorance prefer a distribution of voting weights that is in between the famous square root rule (stemming from Penrose, 1946, and Banzhaf III, 1964), allocating a group’s representative power that is proportional to the square root of the group’s population size, and weights proportional to population size.

In addition to the work on voting in Weber (2020a), some smaller contributions to the voting literature include a technical note about the so-called inverse power problem (Weber, 2016) and articles offering perspectives on trends and issues in the voting power literature (Kurz et al., 2015; Weber, 2019).

5 Concluding Remarks

As described, most of my work revolves around actual human decision making and its implications for economics and finance and therewith for economic and financial policies.⁵ A study analyzing individual decision making that has consequences for analyses in all of the discussed fields without containing any applications in the study itself is

⁵Very few works fall neither within behavioral economics or behavioral finance nor within one of the three broad domains making up the sections of this paper. While I believe that these works (e.g., Weber, 2018; Weber et al., 2021) also have value, I view them as orthogonal to the described research agenda.

Lampe and Weber (2021). In that recent paper, we analyze how the famous prospect theory, developed by Tversky and Kahneman (1992) for situations not involving a time dimension, should be applied in situations when outcomes arise at different points in time. Given that prospect theory has been so much analyzed and is so well understood in situations without a time dimension, and given that many (maybe even most) situations in economics and finance do involve outcomes at different points in time, it is surprising that it is to date still not clear how the theory should be applied in such situations. To find out, we conduct an experiment on a sample that is representative for the population of the Netherlands. People evaluate different risky outcomes that appear immediately, with three months delay, and with six months delay. In addition to finding out how prospect theory should be applied in intertemporal situations, this allows us to provide parameter estimates for prospect theory applications with quarterly data.

Incorporating psychology into economics and finance is an exciting research agenda and certainly relevant for policy making. I look forward to work further in this direction.

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