

# Interview with Fabio Canova\*

(Katalin Szilágyi, István Kónya)



*Fabio Canova is currently a full-time professor at the European University Institute (Florence). He has taught in numerous universities around the world and given professional courses at central banks, as well as held consultancy positions with the Bank of England, the European Central Bank, the Banca d'Italia, the Banco de España and the International Monetary Found (IMF). He is also program director of the Budapest School of Central Bank Studies. His research interests are in quantitative macroeconomics; monetary economics, time series econometrics and forecasting, international business cycles and growth policies. He has published over 70 articles in international journals and his graduate textbook, *Methods for Applied Macroeconomic Research*, was published in 2007 by Princeton University Press. He has been ranked in the *Econometrics and Applied Econometrics Hall of Fame* and in the *Top 100 most productive economists*.*

- Tell us about your involvement with practical macro issues, including central banking.

**Fabio Canova:** I was interested in theoretical and applied macro issues but always from a theoretical point of view. So I wanted to see in practice how policymaking works. About 10 years ago I got involved at the Bank of England as an advisor, building their macro model, and from then on I did a bunch of other consulting activity with other central banks (ECB, Banca d'Italia), a bunch of Latin American central banks (Columbia, Argentina, Brazil). Essentially, my interest was motivated by their desire to use dynamic macro models, as developed in academics, and to see how they are employed in practical situations. And in the process I discovered a few anomalies, primarily due to the fact that they used these models in a different way from academics. That also stimulated some of my own research, because I could see a mismatch between what was available and what were their interests, and I tried to fill in with new tools and new ideas.

**Katalin Szilágyi:** What is the main difference between practical and theoretical macro modeling?

**F. C.:** There has been a convergence of interest between academic and central bank economists and that convergence is both in terms of tools and in term of languages. So the models that academics and central bankers use these days, are common. Their language is the same: people talk in terms of preferences, constraints, optimization, which was not the usual language in the past. Although there has been a process of convergence, the way macro models have been built by academic economists is very different from the way central bankers employ them. When academic macroeconomists build a model, they don't intend this model as being the true data generating process in the real world. A model, by definition, is a simplified representation of what reality is. And they try to derive implications, which allows them to understand better how the economy works. This is not the point of view of central bankers. Central bankers want a model to understand the economy, not a simplified representation of it. That is a very big mismatch. The way it is typically resolved, is that central bankers try to build more complicated models to add realistic features. The cost is making models much more complicated, larger and more complex to understand, and not necessarily better in terms of forecasting. Complexity generally makes it very difficult to understand the outcomes of these models. One of the beauty of academic economists' models is that it is relatively easy to understand the mechanisms driving their dynamics. It much-much more difficult to understand them in the typical models available at central banks. With hundred equations, the interactions are most of the time which are very difficult to disentangle.

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\* The views expressed in this article are those of the author(s) and do not necessarily reflect the official view of the Magyar Nemzeti Bank.

**K. Sz.:** So is it better to have a small model? Can you afford to have a small model in a central bank?

**F. C.:** Well, again, it's a tradeoff. It's a big tradeoff. In the past, in central banks, there's been the idea that there should be one model. And this model should be built to explain every possible question that the management may ask. I think this is the wrong attitude, because we don't know the right model. We may have sub-models, which are good to explain different aspects of the economy, but we are not able to integrate them yet in one framework. Given these difficulties, I think it is much better to have small-scale models, specifically designed to tackle certain problems, and a bunch of them, not only to answer different questions, but also to answer the same question. Because a model may not be the correct representation of reality, you may want to cover yourself against mistakes you can make. Generally my advice in this respect is to have a suite of models: these could include a bunch of general equilibrium models, a bunch of time series models, and a bunch of semi-structural models. The task of the policymaker is simply to combine the information they provide into one policy decision. The work of a policymaker is essentially trying to combine these many inputs into one possible output, which is the decision making.

**K. Sz.:** But we perhaps still need a core model to put this information together in a consistent way. Or can we avoid that?

**F. C.:** You can do it in two ways. One is informally: there are different groups, which use different models, and they provide their input to MPCs or members of the board. And the members of the board see different possible scenarios, outcomes, and they combine them themselves in an informal way. The alternative is to use formal methods, statistical decision-making theory to combine the information of the output of different models, and provide policymakers with one outcome. I guess which option is taken depends on the preference of the policymaker. There are policymakers, who prefer to see different outcomes from different models, and then combine them in their own way, and others, who prefer just to see one possible outcome.

**István Kónya:** Is there a sort of honest way of doing that? Or is it very subjective?

**F. C.:** Again, it depends on the preference of the policymaker. I can give you an example of the Federal Reserve Board at the time when Greenspan used to be there. He did not like models. He had the answer to most of the questions, except in a very small number of cases. In the latter case, he asked advise and when people presented scenarios, he picked the model which matched his prior, rather than combining their outputs. That's a fine statistical criterion: you want the model to replicate some stylized facts, which you have in mind. And it is perfectly legitimate, under a particular loss function. If you tell me what is your loss function I can give you an optimal criterion. If you don't give me a loss function, then I am not sure I can do a statistically optimal or credible way of combining different outputs.

*– Macroeconomics has been heavily criticized for not being able to predict the crisis. Do you think this criticism is justified? What do you think were the main problems with pre-crisis macro?*

**F. C.:** Yes, true, we've been criticized a lot. But my usual answer here is: when there is an earthquake, do seismologists get criticized because they can't predict earthquakes? Or when there is a volcano eruption, do volcanologists get criticized? It's a rare event, typically we do not have many observations to predict, so the best you can do is to develop some early warning indicators. It's true that people did not pay enough attention to early warning indicators in this case. There were some indicators, which kind of told you that we were not on the right track, but that did not necessarily mean that the probability that the crisis would occur was high – financial and banking indicators were poor also in other situations that did not lead to a crisis. In that sense, I think the criticism is wrong. So I think the lessons that people should learn from the crisis – I don't know if we should call it current or past crisis, is that there should be a lot more monitoring. Not just macro variables or financial variables, but also monitoring of micro data, of balance sheets. And trying to assess if parameters essentially have gone out of the range that historically have been standard in the world economy.

**I. K.:** People are very good at inventing new theories. So the stock market breaks through, I don't know, 10,000 and we are in a new economy, justifying that. I guess that's just human nature.

F. C.: There is a tendency to behave like this. I mean, on the one hand, it was more than 50 years that no one saw a big crisis in the developed world – historical memory plays a role here. One of the things we like to assume in a lot of fields is what’s called ergodicity which means the memory just fades out; if something does not happen that often, then the probability essentially declines and we pay less and less attention to these things. It’s not a criticism; simply the probability that a crisis like this has occurred was very small a priori. Now that it occurred, it is easy to say ‘yeah, I could predict’ or with hindsight say, ‘yeah, if we had looked at these indicators, we could have predicted that’. Ex-post everybody can do that. I don’t see that as a very academic way of looking at problems. I don’t see the idea of creating theories ex-post it as a very practical way of proceeding. The general story is that many important actors failed to monitor the economy. Again, looking at microdata, is crucial, even if for macroeconomists it is something relatively new, looking more at heterogeneities, asymmetries. This I think, is the lesson to learn here.

*– There are many efforts to improve on DSGE-type models including financial and other frictions. Do you think preserving the core RBC paradigm is the right way to go, or should we try something completely different?*

F. C.: The question is: what’s the alternative? My favorite take here is that since there is no true model, the best you can do is having different models on the table, and trying to understand what are their structures, and their implications. I think the current models with this RBC paradigm, which I understand meaning rational expectations plus optimization, are obviously a useful benchmark to understand how far you are from this ideal world, and they are perfectly ok for academic purposes. Again, for central bankers they may not be what you want. There has been some development, for example, eliminating rational expectations, adding learning, in these models. Others have started using the idea of rational inattention: people pay attention only if the signal brings you to a completely different area; if it is a small signal you just don’t pay too much attention. So I think there are improvements, but they are going to complicate quite dramatically the setup. So my best take is: let’s have models in which we can do storytelling, like DSGE models. Let’s have models, which are good at fitting the data. Let’s have models, which are good at forecasting. Let’s try to see how different it is what they predict. And if they predict roughly the same thing, then that’s fine. If they have differences, then try to understand what the difference is, and either pick or combine the outcomes of different models.

I. K. Have you had any experience with agent-based models? They are sometimes advocated as alternatives, to building from the ground up, using simple heuristic rules but having kind of complex interactions of the agents, so basically abandoning rational expectations, even equilibrium.

F. C.: My impression is that these models are not, mathematically, sufficiently developed. I mean heuristically they are fine, but they are not sufficiently developed to give you a precise answer to a question. If your governor wants to know, what do I do if the exchange rate is too high, do these models allow you to answer this type of question? I’m for the proliferation of models. I don’t think having one point of view only is the best way to approach economic questions. I think variety here gives you a much better understanding of issues. And variety also gives you a way of improving your models in a way or the other. You can take up different models and try to combine them in a hybrid setup, which has different features. But I have been trained with rational expectations, and I think it’s still very useful. RBC and rational expectations I think are very useful benchmarks to understand how the true economy differs from this ideal world.

*– One of your main research areas is to try and reconcile the tight structure of DSGE models with the flexibility needed to match the data. Can you elaborate on this a bit?*

F. C.: This is not easy. I think there is a tradeoff here: giving up some of the tight structure does not allow you to interpret your model as before. On the other hand, it may allow to do better in forecasting. So there is obviously a tradeoff here. I remember when I was at the Bank of England these two objectives were clearly specified in the model. There was a part of the model, which was used for interpretation, and a part of the model, which was used for forecasting. The structure was unique, but there were features which were turned off or on depending on the scope of the analysis. When the scope was simply interpretation, then the more flexible part was turned off in the model. When you were doing forecasting, both could be useful, both the structural part and the less structural part were used. I think depending on the objectives, it is not a bad idea to have a structure like this. Ideally, we would like to have a model, which does both. We are not there yet, so we have to compromise. Models like DSGE-VAR models, DSGE-factor models are essentially ways to combine different sources of information in a way that help you to catch two birds with one

stone. I am not sure if they've had a lot of applications in central banking yet. But there are at least some regional FEDs who are using these mixed frameworks. Obviously, it is very important to specify what's your objective function, your loss function before you do anything like this. In principle, there could be even complete separation of the two, and choose, for example, a model for forecasting, just for forecasting, and I am going to build a model, which is optimal for that, and a model for interpretation purposes. I don't see anything wrong with that.

*– What do you see happening in central bank modeling and forecasting after the crisis?*

F. C.: Yes, I think there has been at least couple of changes I have noticed. First of all, there is much more attention to micro data. When I talk about micro data, it's not simply banking data. For example, I am talking about differences in labor markets; I'm talking about how imbalances in one country feed into imbalances in other countries. I am talking about cross-country, cross-region, cross-market links. At the ECB, before the crisis, people were talking constantly about the Euro Area. Everything was the Euro Area. Now they are talking about how the economies of the Euro Area interact with each other, and how a shock generated in a particular region can be transmitted. The general idea here is simple: if a country sinks, the Euro Area will sink. It would be the Euro Area, not just some countries in the Euro Area. A few weeks ago someone told that the Euro area was like the Titanic: when it hit the iceberg not only that third-class passengers went down, also first-class passengers did. If there is a disaster, there is a disaster for everybody. For this reason, there is much more attention to these interactions than in the past. And there is also much more awareness now of the possibility of extreme events. I don't know if it's an exact characterization, but my general impression is that before the crisis, the loss-function of policy makers was close to quadratic, they weighted up and down from the target more or less the same. Now there is a much more important penalty for getting it completely wrong. So the worst possible outcome now is becoming something that you want to try to avoid as much as possible.

K. Sz.: Can I ask something about this micro data – you mentioned it already twice. What kinds of data are gaining importance?

F. C.: Definitely there is much more monitoring of bank balance sheets, for example. But I'm thinking also of, for example, how regional economies behave, the finances of regional governments, rather than the overall balances of a country. How these impact, for example, on national deficits and what repercussions they may have. I'm thinking about how imbalances in labor markets in a particular region may spread out. The general awareness is that the world economy is not homogeneous and attention should be paid to that because heterogeneities may create imbalances which may turn out to change the outcome at the macro level or aggregate level.

*– It has been argued by Peter Howitt that the connection between central bank practice and academic macro research is much weaker than academic economists would like. What are your views on this, and how should interaction be improved?*

F. C.: Well, I already implicitly answered to this. I wouldn't be as negative as Peter on this. I think there has been a lot of convergence. If I look back at what people in central banks used to do 20 years ago, I think we are much closer now. Still there are differences, essentially in objective functions. For example, often because of the structure of central banks institutions, central bank economists just pick models build in academics, and use them for their own activities. That may not be the right way of proceeding, simply because the objectives are different. Again, the tradeoff between good empirical fitting and some macro storytelling, is not particularly interesting, nor particularly developed in academic economics. As long as you match some moments, that's fine. An extreme characterization would be that central bankers are much more interested in tracking the time series, like engineers, meteorologists, or the military. You don't care that much about the average; you want to hit the particular target. Academic macroeconomists happy as long as the average is right, how you get there is not particularly important. Or at least it's not as important as (in central banking). Once I was in a central bank and I have asked them: you are inflation targeters, what is it that you dislike, level difference, or variation? They answered we never thought about it. But that is important. If you don't like level differences, you may choose policy paths that are different than those you follow if you do not like variation around that. In general some of the tools developed for academic economists do not fit exactly the objective functions of central bankers. But again, we have made a big improvement relative to what it used to be 20 years ago, definitely.

– *Central bank forecasts try to balance numerical accuracy with meaningful storytelling, and expert opinion with macro modeling. How can this tradeoff be resolved in a meaningful way?*

F. C.: I don't think there is an easy way to get a solution here. The best way to proceed would be to approach the problem from a Bayesian viewpoint, recognize there is model uncertainty, parameter uncertainty, and stochastic uncertainty and try to design some kind of optimal decision rule, which takes this uncertainty into account. You don't like the worst possible outcome, then build a loss function, which given the uncertainty you face, tries to minimize this worst possible outcome. There are lots of papers in macro, which try to find the optimal policy conditional on a particular model. But how do we know that this is the best model? Others find the optimal policy log-linearizing the decision rule, or taking a quadratic approximation of the decision rule. How do we know that this is enough? There are a lot of uncertainty, which are not taken into account, and probably the best answer here would be to try to robustify decisions; at least in the direction that you care most about. Given potential numerical difficulties, the question is, how much we want to push in that direction. If you are happy with some kind of approximation, I would work more on the side of parameter uncertainty and model uncertainty. I don't know if here (*in the Magyar Nemzeti Bank – the editor*) it's the same, but in central banks there has always been an attempt of separating expert opinion and macroeconomic modelers primarily because it is very difficult to make them talk the same language. But I think this is possible: there is a lot of information that these expert opinions have, which is not used in macro models. I'm thinking about consensus forecasts, specific information they have about micro-economy, and micro-markets that have no use in macro. People now are working on adding all this information to macro models. There is a very recent paper by Schorfheide and Del Negro,<sup>1</sup> which is going to be in the *Handbook of Economic Forecasting* some time in the future, in which they are trying to use this information. And surprisingly enough, they show that if you add information in real time, your understanding of the financial crisis could have been dramatically improved. To be clear, the DSGE model is standard, but extra information, which was available and no one looked at the time when it was produced, is used. Here the information set you have may be more important than the model that you use. There is a lot of essential information in expert opinion, which is simply disregarded in more formal macro models.

– *Being an Italian who spent many years in Spain, and who is married to a Greek macroeconomist, you probably have strong views on the current Euro crisis. Any thoughts you could share with us on this topic?*

F. C.: So now we have the final, the Mediterranean question. Yeah, I do have a strong opinion. I think the Euro crisis is the result of politicians, more than economic actors; politicians failing to understand exactly the consequences of their actions; failing to understand the dynamic implications of their choices; and essentially playing with fire. Any reasonable economists could have told you 20 years ago when the Maastricht treaty was signed that there was no easy way to get out of a crisis, given the setup that was designed – there was no exchange rate devaluation, or an easy way of readjusting the economy. The only available option was defaulting. Over the last 20 years, it was a very low probability event, but it happened and politicians simply disregarded the problem, thinking it will solve itself. I attended a talk by Charles Wyplosz in December, which was very-very informative, at least visually informative. He plotted the spread dynamics of the ten-year bonds against the German bund, against the meeting of the political leaders. And the day after every meeting they had done, the spread increased, every time.

I. K.: Pre-crisis, as well as during the crisis?

F. C.: Since the situation of Greece was known. Every time they met and every time they agreed to have found a solution, the reaction was there. The day in which they announced, the spread fell, meaning the market thought they found a solution. As soon as the markets processed the details, and found them either unspecified, smoky, or not clear enough the spread rose. They created a rescue fund but it was not big enough to rescue anybody and measures like this. The reputation, built over the last 10 years of relatively good management, has been totally lost. My impression is that now politicians are really playing with fire, in the sense that – and I said that before – not only third-class passengers will sink, also first class passengers will sink. People know that the problem is general, that you have to find a way to solve it, but they act as if it doesn't concern them. I've seen recently an estimate that claims that if the Euro breaks, German GDP will fall by 10 per cent and the unemployment rate will increase by 4-5-percentage points. My

<sup>1</sup> DEL NEGRO, MARCO AND FRANK SCHORFHEIDE (2012), "DSGE model-based forecasting", *Staff Reports*, 554, Federal Reserve Bank of New York.

solution is simple. First, clean up the mess and then make new rules, not the other way around. Politicians seem to think exactly in the opposite way. First, we make the rule, which will become operative by 2020 or 2025, and that will help us to drive the economy out of the mess today. The problem is that the mess is so big that unless something is done the economy will break. I just don't see the right actions being taken. There are simple actions I think, which will calm down markets, make borrowing and the adjustment easier. In the current conditions, there is no chance for Greece or Spain to readjust – it will take forever. And the adjustment will have repercussions everywhere in Europe. So it is not just a problem of the Mediterranean, it is a problem of everybody. Politicians – probably because of electoral conditions – do seem not to understand. But, as I said, they are playing with fire. The amount of money, which is now circulating in financial markets, is enough to sink the European economy if they really want to do it. There is no way that the Spanish government will be able to afford 7 per cent real interest rates on their government bonds for more than a very-very short amount of time.

**K. Sz.:** What should be done?

**F. C.:** My solution is radical. The ECB should use its capital to buy government bonds. Not all of it but, say, a large amount. Or – which would be the same essentially – slowly inflate away this amount. The second thing I would do is to create a central authority with some taxing power to be able to back this up. Unless you proceed this way, there is no way to convince the market that the policy is feasible. Once the situation is stabilized, then rewrite the rules. But these rules should be very-very simple, otherwise they are not going to be enforceable, as the Maastricht Treaty rules that have never been enforced. The idea to solve the problem with a balanced budget every period is wrong, I think, but balanced budget over, say 4-5 years, seems a reasonable target, you can adjust to. And if this is not enforced, there should be some measure, but not fines. The government should step down; it should be taken over by some kind of supernational authorities. I mean if there is someone irresponsible, and he is threatening your house, you want to take measures against them. I think there could be different ways of doing this, but you need some kind of clear and enforceable rules. Until you see politicians going to these Euro area meetings and saying, 'yes we are going to balance the budget', and then announcing the day after that the deficit will be 5 per cent of GDP in that year, what kind of credibility the institutions will have? What is missing right now is a realistic assessment of the situation, and an understanding on how to solve the short-run problem without endangering the long run sustainability of the economy. I think it is wrong to have default as the only way of rebalancing distorted economies. The situation is difficult, but there should be some other mechanism of adjustment, which is now not there in place.

**K. Sz. and I. K.:** Well, thank you!