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Macroeconomic equilibrium models without the Walrasian auctioneer

Macroeconomics has changed considerably in the last few decades. Modern macro is based on neoclassical economics and microeconomic foundations. It started in the 1970s, and is constructed on two important building blocks. The first is the rational expectations approach of Nobel Prize winner Robert Lucas. The second is the dynamic stochastic general equilibrium (DSGE) model. Although DSGE models are often referred to as Real Business Cycle (RBC) models, because in earlier versions aggregate productivity was the sole exogenous random variable, many other shocks have since been considered. Finn Kydland and Ed Prescott received their Nobel Prize for developing this type of model. All three laureates did much of their path-breaking work at Carnegie Mellon University. When I was a student at Carnegie Mellon, economists from the “salt water” schools were still very critical of the new approach promoted by the “fresh water” schools. These days, DSGE models are taught to PhD students across the world. The current generation of DSGE models, however, looks quite different from the first one.

Modifications to first-generation DSGE models

DSGE models are more difficult to analyse than their predecessors, i.e., large Keynesian computer models. If agents are forward looking, and current economic behaviour depends on expectations about the uncertain future, then solving the model requires solving for agents’ decisions for all possible realisations, not just the ones that are realised. Instead of solving for a time path, one must therefore find a solution in a function space.

As computational and mathematical challenges were met, the models were modified in many different ways. For example, robust control and rational inattention are recent developments that provide alternatives to rational expectations. With robust control, agents are forward looking, but do not know the complete structure that is generating economic outcomes. With rational inattention, agents cannot costlessly form rational expectations, and are limited in the amount of information they can process.
Another important modification involved allowing for heterogeneous agents— for example, by relaxing the complete market structure, which leads to the representative-agent paradigm. My more recent research incorporates matching and contracting frictions in macroeconomic models with heterogeneous agents.

**Matching and contracting frictions**
The matching paradigm, developed by Mortensen and Pissarides (1990), allows a much more realistic description of the way in which market participants find each other and what contracts they can write. The classic way to model competitive markets is to use the concept of a fictional Walrasian auctioneer who collects information from the demand- and supply sides and then calls out the price at which no further trades are desirable. This modelling technique, however, does not seem appropriate for the labour market or the market to obtain firm financing, for example. Why? It is costly to find trading partners, information asymmetries are important, and there are benefits to long-term relationships. In the spring issue of *TI Magazine*, Pieter Gautier pointed out that the presence of the matching friction is useful in explaining several market outcomes— for example, that seemingly identical workers receive different wages. Because of the cost of searching, workers that receive a low wage may choose not to enter the matching market to find a better match (and thus a higher wage).

Models about information asymmetries and contracting problems are well developed when only two trading partners are involved. Problems with multiple agents, however, are more difficult. The beauty of the matching friction is that—at least within one period—it “locks” two trading partners into a relationship, turning the problem into one that is tractable. Negotiating with other market participants is still possible, but is part of the outside option (i.e., part of the alternative to continuing with your current transactions partner).

**Whereas the standard real business cycle model magnifies shocks by 55%, the model that we develop magnifies them by 185%.**
Macro models with frictions
Incorporating the matching framework into macro models leads to several key insights, illustrated below.

Magnification and propagation
Observed economic fluctuations are large relative to the observed fluctuations in external shocks such as changes in productivity, monetary policy and fiscal policy. The model itself must therefore magnify and propagate shocks. Den Haan, Ramey and Watson (2000) show that a macroeconomic model that incorporates a labour-market matching framework does exactly that. The idea is the following. A bad economic shock leads to the destruction of productive relationships. The lower employment levels reduce the resources available to households, which implies lower savings levels. Lower savings levels have an upward effect on the interest rate, which in turn lowers profits. Lower profit levels have an upward effect on the destruction of existing jobs and reduce the number of new firms entering the market. This reduces savings even further. We build a computer model to quantify these feedback effects and show that they are quite substantial. Whereas the standard real business cycle model magnifies shocks by 55%, the model that we develop magnifies them by 185%.

Inefficient economic fluctuations
The result that a fairly simple model with no frictions and only technology shocks could generate business cycle patterns came as a big surprise to the profession. An even bigger break with conventional thinking was that in standard RBC models, economic downturns are optimal responses to reductions in productivity. The idea that it is “optimal” for so many more workers to suddenly stay at home does seem implausible and has been quite controversial.

In matching models, economic fluctuations may not be efficient. In the model described above, households do not take into account the fact that a reduction in savings leads through an increase in the interest rate to more job destruction. Similarly, changes in the tax burden are not taken into account when job creation and destruction decisions are made.

Although there may be important inefficiencies in matching models, the decision itself to create or destroy a job is ceteris paribus typically efficient. In Den Haan, Ramey and Watson (2003), this is not the case. The relationship between the borrower and the lender is characterised by a moral hazard problem in which the borrower can choose for a good or a bad implementation of the project. The bad implementation is more attractive to the entrepreneur (consider the example of a more risky implementation). The entrepreneur’s choice, however, is not contractible. The entrepreneur will consequently choose the good implementation only if he is rewarded by getting a high enough share of the proceeds. If the lender does not have enough liquidity, however, such a reward is not feasible, and a bad implementation is unavoidable. In that case, the lender is better off ending the relationship. Both the entrepreneur and the lender would be better off if the relationship would continue and the entrepreneur would choose the good implementation. Separation is thus inefficient. Continuance cannot happen, however, because the entrepreneur deviates from his promises as soon as the relationship continues.

Den Haan, Ramey and Watson (2003) show that this standard moral hazard problem leads to interesting insights when it is combined with matching friction and is incorporated into a macro model. The saving decision in our model is standard and depends simply on the rate of return earned. The process through which savings are allocated among intermediaries is subject to frictions. That is, funds may not necessarily go to the intermediary that has the most productive use for them. These frictions are less severe, however, if more intermediaries are in a relationship with entrepreneurs (that is, if the financial network is healthier).

Suppose that the financial network becomes damaged, due to a financial crisis. A number of relationships thus break up. This destruction in the financial network exacerbates the inefficiency of the allocation process, which in turn lowers savings. If intermediaries receive fewer funds, then a greater number of intermediaries will not have enough funds to overcome the moral
hazard problem. Consequently, even more relationships will be destroyed and the story continues.

Our study analyses whether the economy will eventually recover or collapse. If the matching probability is not sufficiently high, then the economy collapses. Consequently, this model suggests a clear role for the government during a crisis in providing enough liquidity to maintain the network of relationships.

Concluding comments

Macroeconomic models with frictions and heterogeneity have been used to better understand macroeconomic fluctuations. Moreover, because of the heterogeneity, this type of model has a much richer set of predictions and can therefore be much better used to distinguish between competing specifications. For example, Covas and Den Haan (2006) use US data to show that equity issuance is procyclical for most firms, but countercyclical for the largest firms. Because the largest firms are really large, aggregate equity issuance is roughly acyclical. If one would ignore the heterogeneity in the data, then one would try to build a model with acyclical equity issuance, while in reality equity issuance is very cyclical, but differs for different firm categories.

Computational difficulties still compel us to be creative and parsimonious in modelling heterogeneity and frictions. The integration of microeconomic theories into fully developed macroeconomic models, however, is likely to continue and to accelerate as computational constraints are relaxed and more cross-sectional datasets become available.

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Notes

1 Harvard, MIT, and Penn were called “salt water”, because they are close to the eastern sea border, while Carnegie Mellon, Chicago, Minneapolis, and Rochester are located inland.

2 See, for example, Hansen and Sargent (2001).

3 See, for example, Mankiw and Reiss (2002) and Sims (2003, 2005).

4 It also came as a surprise to Kydland and Prescott. They started out with models that included policy shocks, but they discovered they did not “need” them.

5 Den Haan (2006) shows that this externality could be the reason behind the persistently high unemployment rate in several European countries.
At the beginning of their very first lecture on microeconomics, undergraduates are told that economics is the study of how people make choices under scarcity. Adding that essentially every choice involves an element of scarcity, the lecturer concludes that economics is therefore about all kinds of decisions that people make in their lives. It is about trivial decisions: shall I turn off the television? It involves important personal matters: shall I ask Maria to marry me? It is about highly complicated and controversial decisions: shall we invade Iraq?

A person with only a superficial knowledge of economics may easily get the impression that economists treat trivial decisions in the same way as complicated decisions. Standard economic models analyse the decision of how much salt to buy in a framework similar to the one used to analyse the decision of how much labour to hire for a new plant in China. It all amounts to comparing marginal benefits to marginal costs. For a study that focuses on how people choose, surprisingly little attention is paid to precisely how people arrive at their decisions. Let us mention three differences between the way in which many trivial decisions are made (buying salt) and the way in which more complicated decisions are made (hiring employees). First, a complicated decision is often made by a group of individuals rather than by a single individual. Usually, the idea behind group decision-making is that two heads are better than one. Second, many complicated decisions
are taken on behalf of others. For instance, politicians make decisions on behalf of citizens, and CEOs make decisions on behalf of shareholders. One reason why complicated decisions are delegated is that making these decisions requires expertise. Third, complicated decisions have to be prepared and sometimes have to be implemented. The preparation phase typically involves splitting up the problem into smaller parts, collecting and processing information, exchanging views, etc. Sometimes, the ‘real work’ of a decision starts when the decision has been made. If an asset manager has decided which portfolio best fits his fund’s strategy, he merely has to contact a broker to adapt the fund’s current position. But when the Romans decided to build a 50 km long aqueduct to bring water to the city of Nîmes, or when

**Implications for studies of complicated decisions**

The above discussion has two implications for the way in which more complicated decisions should be studied. First, taking a decision is part of a process. For complicated decisions, the organisation of the process itself is a matter of choice. How many persons should participate in the decision-making process? Who should collect what information? Should the final decision be made by majority rule? Who should carry out the decision? Is it desirable to be able to quickly reconsider the decision taken and therefore to continue gathering information about changing circumstances? Does it matter whether implementation is essentially instantaneous or rather an enterprise in itself? Second, delegation of decision-making may raise principal-agent problems. When people make decisions on behalf of others, decision-making often becomes their main activity. The career perspectives of such professionals depend, among other things, on how their decision-making abilities are perceived by others. It is therefore likely that besides being interested in making the correct decision, professional decision-makers are concerned about how decisions shape perceptions. Economists refer to such concerns as reputational concerns. The implication of the existence of reputational concerns is that it may become more important that people believe that you have taken the correct decision than that you have actually taken the correct decision.

Over the past few years, we have focused on aspects of the decision-making process. A recurring theme in our research is that decision-makers are concerned about their reputations, and that decision-making can best be thought of as a process consisting of a number of stages.

**Explaining decision-making pitfalls: group pressure**

Anyone who has been on a committee knows that group pressure can be very strong. Irving Janis (1982) invented the word ‘group think’ to describe specific patterns of conformism and collective misjudgement of risks. He saw these patterns at work in important decision-making processes leading to grave errors such as the invasion at the Bay of Pigs in Cuba in 1961. Staunch promoters painted too rosy a picture of the
chances of success of this unorthodox way of overthrowing the Castro regime. Others refrained from venting their doubts in public.

Another stylised fact concerning committees is that they show a tendency to speak with one voice after the meeting. The Federal Open Market Committee (FOMC; the United States monetary policy committee) is a case in point. The FOMC decides on the funds rate. Once the decision has been made, the votes are made public. Since the transcripts of the meetings are published with a delay of five years, the exchange of views is far less public than the final votes. Analyses of the transcripts show that members regularly held conflicting views on the proper rate decision. These conflicts, however, do not show up in the voting records, which suggest wide consensus among FOMC members. In fact, the data is consistent with a statement by Schultz, a former Vice-Chairman of the FOMC, “We should argue in the Board meetings, but close ranks in public”. In Visser and Swank (forthcoming), we argue that the desire to speak with one voice, the inclination to paint too rosy a picture by some members, the suppression of scepticism by others, and the attractiveness of an unorthodox decision can be explained by the wish of committee members to come across as well informed.

Lack of agreement?
Lack of competence?

What explains the united front once the decision has been taken? The answer is that disagreement would signal lack of competence. After all, competent, well-informed persons analyse a ‘situation’ in the same way. So, once the decision has been made, both proponents and opponents have an interest in speaking with one voice.

What makes the unorthodox decision more attractive from a reputational point of view? Sometimes, what constitutes the best decision is clear. This is the case when the analyses of all members point in the same direction. In case of a lack of agreement, then the conventional decision is the best option– the decision a committee member would have chosen without further analysis. This will often be the status quo. As a result, a conventional decision may signal either that all members agreed that this decision was best, or that there was little agreement. The unconventional decision, however, signals a large degree of agreement– and this

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boosts a member’s reputation. The more a member cares about his reputation, the more inclined he becomes to push the committee towards the unconventional decision. This explains why strong promoters of the unconventional decision can be found among those who care most about their reputation. Others, sceptical of the adequacy of the unconventional decision, may go along, as their reputation also benefits. Of course, for the unconventional decision to remain attractive from a reputational point of view, this decision should remain the one that is taken less frequently.

**Designing decision-making structures**

Although group decision-making may not lead to optimal solutions, the alternative (single-person decision-making) is often less attractive. Much effort is therefore put into the design of decision-making structures. The medical profession offers a good example. The variation in the way in which physicians diagnose a given patient (taking a history, doing a physical examination, reading laboratory tests, recommending a treatment) can be substantial. Variation in perceptions of the outcome of interventions can be enormous as well. Eddy (1990) provides numerous examples. This variation causes patients to be treated differently. Although variation in treatments used is necessary to establish their relative merits, it may mean that some patients receive inferior treatment. This has been a continuing source of concern in the medical profession. One way of addressing this concern is by organising health expert consensus panels. These committees of experts attempt to establish what treatment is best for a given diagnosis. There is a bewildering variety in terms of the ways these committee meetings are organised and can be organised. More theoretical guidance would be welcome in sorting the pros and cons of possible choices.

**Anonymity and peer pressure**

One important issue is anonymity. Should physicians meet in person or should the decision-making process be anonymous? Or, should only certain parts of the process be made anonymous? One obvious concern with having physicians meet in person is that they may fall prey to the group pressures described above. One way of stopping this from happening is by organising the processes of information generation and exchange and of decision-making so that they are anonymous. Physicians could be asked to fill out questionnaires. The answers they provide could be aggregated and fed back in statistical format to all physicians. Instituting anonymity has at least two drawbacks, however. First, it complicates the careful weighing of arguments, as one cannot observe who said what. Second, reputational concerns may induce a physician to exert additional effort to present his case in front of his peers (see Holmström (1999) and Suurmond, Swank and Visser (2004)). In general, however, it can be said that fewer face-to-face meetings may lead to less peer pressure.

**Avenues for future research**

Design questions of this sort abound. Who should be the moderator/organiser of the panel? How much consensus should be sought? How free should physicians be in following the consensus? Should the consensus be made public as standards, guidelines or options? How might the choice of the degree of freedom influence the deliberation in the consensus panel and the clarity or vagueness of the consensus statements? A number of questions remain for scientists interested in decision-making.

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Pollution problems are classical examples of interest conflicts between short-term gains and long-term costs. Moreover, those who bear the costs are usually not those who enjoy the gains. In the case of pollution it is widely accepted that social welfare stands to benefit from regulation, or rather, long-term planning. The standard way to approach this issue is to consider the (discounted) sum of benefits that result from use of the natural resource under consideration, and to posit a social planner who tries to optimise these, taking into account the dynamics of the pollutant. This leads to models that have the form of standard growth models with a non-concave “pollution production function”. Although these models are difficult to treat analytically, sophisticated mathematical tools can provide deeper qualitative insights into their structure, leading in the end to a kind of “comparative dynamics” of their solutions.

I first encountered dynamic pollution problems in 1999, when Aart de Zeeuw gave a lecture on the shallow lake model in the CeNDEF seminar series. My Ph.D. in dynamical systems was still fresh, and I was eager to do something with my knowledge of phase diagrams, structural stability and bifurcation theory. Aart just smiled and asked me what modern dynamical system theory could tell him about the economics of shallow lakes. So I set to work.

Ecological-economic conflicts of interest

What makes pollution an insidious problem is the fact that many ecosystems have some natural resilience, which allows them to absorb a certain amount of pollutant. If pollution increases above a certain threshold level, however, the ecosystem may “flip” to a strongly polluted state.
Lakes, especially shallow lakes (Scheffer, 1997), are in a fair way of becoming a textbook example of a pollution problem. Ecologists have studied lakes intensively, focusing on the complex biological mechanisms at work in these lakes. A clean (“oligotrophic”) lake harbours an intricate food web, at the base of which are the water plants that keep the lake clear.

Most lakes act as water drains of the surrounding fields. Farmers use artificial fertilisers to obtain bigger crops, but the fertilisers are never wholly absorbed. One of the main components in these fertilisers is phosphorus, which is washed by rainfall off the fields and into the lakes. Algae living in the lake, like crops growing on the fields, thrive on phosphorus and start multiplying. If there are too many of them, the water plants fail to keep the water clear and the lake flips into a turbid (“eutrophic”) state. The plants lack light and die. Once this has happened, the lake cannot return to a clean state at all: it is irreversibly damaged.

This scenario describes a lake with a low resilience. But even for highly resilient lakes, where there are always some water plants that survive, the inflow of phosphorus has to be lowered significantly before the lake can move back to the clear state.

There are more ecosystems that have undergone catastrophic flips (a survey can be found in the Nature article of Scheffer et al. 2001). The big question is of course whether global warming might trigger such a flip of the global climate, and whether we can afford to find out.

An ecologist looking at a lake sees an ecosystem: an economist looking at a lake sees a facility offering services to different agents (Carpenter et al. 1999; Brock and Starrett 2003; Maler et al. 2003). To farmers, the lake is basically a waste dump of phosphorus. Communities around the lake may use it as a source of drinking water; holidaymakers consider it as a tourist attraction. It is natural to consider the total benefits derived from the lake, and to let a social planner try to optimise those benefits.

It turns out that lakes with a low resilience usually allow for two steady states of the optimal management problem, the one corresponding to a clear lake, the other to a turbid lake. This is a consequence of the particular non-linear structure of the ecological dynamics. The initial state of the lake determines to which steady state equilibrium optimal management will lead; and there will be one “hairline” state, where the planner is indifferent between two optimal policies that end up at either of the steady states. Such a state is called an indifference, or “Skiba”, state (Skiba, 1978). Skiba signalled this kind of phenomenon in the context of growth theory. The policymaker has to make a decision of kind, not of degree. Moreover, the policymaker has to make sure that the decision is “right”, as the policy leading to the turbid lake may be irreversible.

**Non-linear (structural) analysis**

In economics, models have parameters—often many parameters. One of the common tasks of economists is to identify likely (“typical”) values of these parameters. To a mathematician, a model with parameters presents a family of models; a single model is only specified when all parameter values are fixed. Such a single model is called a member of the parameterised family of models. The shallow lake model is then a family of non-linear dynamic optimisation problems. By the way, “non-linear” means that it is not possible to derive analytic expressions of the solutions; other methods must be employed, such as numerical simulation or topological arguments. Structural analysis employs both; moreover, it analyses the whole model family, making it easy to see the consequences of changes in parameter values.

The doctrine of structural stability constitutes a powerful approach to non-linear problems. Although it has been widely popularised by the work of Arnol’d, Zeeman and especially Thom (1975) in the 1970s, its origins trace back to the end of the 19th century. It is the mathematics of qualitative properties.

Structural stability gives a precise meaning to the word “typical” in the clause “for typical parameters”. A parameter value is typical, or “stable”, with respect to some property if for all values that are sufficiently close to the given value, the model still enjoys the property. Of course, not every property is a “stable” property in the sense that there exist stable values at all.

The classical example, illustrated in figure 1, is that of a two-parameter family of functions \( f_a(x) = -x^4 + ax + b \). Depending on the values of the parameters \( a \) (on the
horizontal axis in figure 1) and $b$ (vertical axis), the function $f_{a,b}$ has either one or two local maxima. The cusped curve in the figure divides the space of parameters into two regions, denoted I and II. The functions in region I have a single local maximum; those in region II have two separate local maxima. Region II can be subdivided further, according to whether the left- or the right maximum has the higher value.

The properties “number of local maxima” and “which local maximum is global” are examples of stable properties; on the other hand, the property “$a$ local maximum equal to 1” (or any other numerical value) is not a stable property, as it can be destroyed by, for instance, changing the value of $a$ slightly.

In this way, structural analysis provides a method to obtain answers to qualitative questions that might be put to a model. Actually, this is the kind of question a policymaker wants to pose when a question of kind has to be answered (“shall we support farming, or is it better to promote tourism?”), rather than a question of degree (“what is the effect on the state of the lake if we restrict the maximum use of fertiliser by 5%?”).

With regard to the shallow lake system, an appropriate question is whether it is always optimal to steer the lake to the clean, oligotrophic, steady state, or to the turbid, eutrophic, state, or whether this decision depends on the initial state of the system. The result of the corresponding structural analysis is depicted in figure 3 (from Wagener, 2003). In the region labelled “unique equilibrium”, the lake is resilient enough that only the eutrophic state can be obtained (so that policymaker preferences play no role).

The parameter on the horizontal axis of this figure describes the natural resilience of the lake: this is a physical parameter, which can in principle be determined for different lakes. The parameter on the vertical axis is an economic parameter measuring the relative weight of the interest of lake users (tourists and communities) against those of farmers: this parameter will, in the last resort, be determined by political considerations. The strength of the structural approach is that information about the system is obtained for a whole range of parameters, such that it is immediately clear what the consequences are of changes in, say, the economic parameter $c$.

Of course, other aspects can be taken into account, such as the relative weight of future- against present interests, which is expressed in a discount factor. Alternatively, consider the relative importance in the stream of benefits and costs: how much variability of this stream is the policymaker willing to accept? Or, the policymaker can determine, for a given initial state, the regions of parameters for which the optimal policy leads to the oligotrophic state versus those for which it leads to the eutrophic state.
state. Finally, these questions may also be asked in the context of a dynamic game, where there are several social planners—say, several countries that all border on the same lake.

**Conclusion**

Mathematically speaking, the “natural production function” of the “bad”—in this case, the pollutant phosphorus—has a convex-concave shape. It is well known that such a situation may imply the existence of multiple equilibria and history-dependent steady-state outcomes. In figure 3, the “Skiba” region is exactly the parameter region for which there are history-dependent outcomes. In a sense, structural analysis can be viewed as a kind of “comparative dynamics” analysis, comparable to the more familiar comparative statics analysis of steady-state equilibria.

A natural next step is to analyse the precise impact of the discount rate in the shallow lake problem: decreasing this rate takes the interests of future generations more heavily into account. Also of interest is the case in which several countries border the lake, where there are several lake managers playing a dynamic game, or the situation in which there are several interconnected lakes. Moreover, we can consider the case in which the government “invests” into the lake by cleaning it; this has actually been done in some cases, by completely draining and refilling the lake. Such investment is “lumpy”, as there are fixed costs involved. We may ask under which conditions cleaning is part of an optimal management strategy. Since in economics interest in nonconvexities is increasing, there are many more possible applications (see e.g. Semmler, 2005). Together with my Ph.D. students, Tatiana Kiseleva and Saeed Mohammadian Moghayer, I have started to explore some of these, but we are only just beginning. I fancy structural analysis has a future.

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**Letters from Alumni**

*life after the PhD thesis defense*

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**Combining theory and practice**

_Ewa Mendys*

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They seemed difficult to combine, the two things that I wanted to pursue when I was putting the finishing touches on my thesis and brooding about my future career. Certainly, I needed a change. I had just spent four years building theoretical models of markets and I was more and more often overwhelmed (as I sat staring at my computer) by doubts about the relevance of my work. I longed to do something of which the relevance would be seen immediately. Yet, I wanted to maintain contact with the academic world and keep the possibility open that one day I might go back to science.

So when my supervisor, Maarten Janssen, asked if I would like to work at SEOR (Sociaal Economisch Onderzoek Rotterdam) and become a fellow of the newly established Erasmus Competition and Regulation Institute (ECRI), I accepted the position with enthusiasm. SEOR is a commercial research institute affiliated with the Faculty of Economics of Erasmus Universiteit, while ECRI is a virtual network of researchers from SEOR and various departments of Erasmus Universiteit doing applied research in the field of competition and regulation. Both institutes aim to make use of scientific insights to solve ‘real-life’ problems and to feed this practical experience back into scientific research. Answering a research question presented by a customer thus begins by studying the relevant scientific literature, where my experience as a PhD student has proved invaluable. My colleagues and I also try to select scientifically interesting questions out of consultancy projects and to develop them further, so that they can result in publications. The time that we do not use for commercial research can be used to pursue our own academic interests, not necessarily related to the consultancy work.

The Competition and Regulation section of SEOR consists of only six people, which means that the scope for specialisation is limited, and everyone works on a variety of topics. During the last three years, I have worked on competition and regulation in mobile telephony, bicycle- and notary markets, but also on other topics such as the competitive position of Dutch companies in Europe. Most of us, however, have a field on which we focus most. For me, it is telecommunications– broadly understood– including, for instance, the TV-cable market. We usually work in small teams, writing reports for private companies on regulatory measures proposed, for example, by the Dutch regulator of the telecommunications market (OPTA). I’ve enjoyed hearing practitioners discuss market developments and seeing how they deal with the ‘eye-opening ideas’ developed by academics. At such a moment you have the feeling that, as a famous psychologist Kurt Lewin once said, nothing is more practical than a good theory.

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*with a thesis entitled, “Essays on Network Economics.”*
pursuit of higher expected profits. In oligopoly, entry fees increase the probability that the market entrants coordinate on a collusive price path. Firms that embark on a collusive price path earn higher average profits at the cost of an increase in the variance of profits. In monopoly, taking more risk does not make sense, since average prices are already close to the profit maximising price.

The political economy of corporate control and labor rents

The concept of a distinct Anglo-Saxon financial market model is well established. Evidence suggesting that English legal origin is associated with better investor protection and financial development (provided, for example, by LaPorta et al.) has confirmed this view. Yet the world has not always looked this way. Many European countries with civil law traditions, such as France, Austria and Belgium, had larger capital markets than the US before World War I. Historical studies show that in those days investor protection laws were better in continental Europe than in the US. Even in Germany, where banks played a central role, banks did not function mainly as lenders, but as investment houses/agents placing listed securities with the public, and holding little equity. During the 20th century, capital markets in most of Continental Europe shrunk dramatically (with some exceptions such as Switzerland and the Netherlands), while capital markets in Anglo-Saxon economies grew (Rajan and Zingales, 2003).

This article models a ‘political economy’ explanation for such a reversal in investor protection. In the model, middle class voters are pivotal in the choice of the governance system. Among voters, citizens with savings prefer more investor protection, and thus more developed equity markets. Less wealthy workers have labour income risk (which cannot be insured), and thus prefer less risky corporate strategies. They therefore support control by risk-averse investors such as banks, undiversified shareholders or the state. As shareholdings by the middle class decrease, political support shifts away from favouring equity markets to banks, and from investor protection to labour protection laws.

The empirical part of the paper argues that large inflationary shocks after WWI reduced the financial stake of the middle class in Continental European countries, causing a seismic political shift away from investor protection. Prior to WWI, Europe had a long period of peace and price stability, where long-term contracts and debentures were common. Although there were market crashes and failed banks, nominal savings were safe. WWI developed unexpectedly into a major conflict with devastating damage. Government spending rose sharply during and after the war, and in many countries the printing of currency was the only short-term solution. Prices jumped dramatically in France, Italy and Belgium. Austria and Germany experienced enormous hyperinflation.

The devaluation of long-term nominal assets hit the middle- and lower middle classes hard. A similar disaster hit the Japanese population in 1946 with hyperinflation. The empirical analysis shows that those countries with high inflationary experiences shifted from a security market to a bank-oriented financial system, which is consistent with our model. The UK, the Netherlands, Switzerland, Australia, Canada and the US experienced little inflation, and accordingly maintained more support for security investors. This group of countries further diverged from most of continental Europe in response to the 1929 stock market crash. The Great Depression led everywhere to more social programmes, but countries with a market-friendly orientation actually strengthened investor protection, with the US establishing the Securities and Exchange Commission (SEC) in 1933 and limiting the role of banks in corporate control. In contrast, an economically and financially enfeebled middle class throughout most of Europe sought a more corporatist governance structure, greater politicisation of control, a reduced role for markets, and greater social insurance. By 1980, continental Europe had diminutive capital markets and a large role for banks. This process has been partially reversed, however, in recent years. Privatisation and pension reform have promoted broader participation in financial markets.

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immigration on local wages, Longhi, Nijkamp and Poot I reported that a 1 percentage point increase in the share of immigrants in the population would lower wages by about 0.1 percent. When immigrants are about one-tenth of the population, this translates into a 1 percent increase in immigration lowering wages by as little as 0.01 percent.

This discussion paper used meta-analysis to summarise previous studies of the impact of immigration on employment. A comparison of nine recent studies that yielded 165 estimates of the impact of immigration on job displacement among native workers found, similar to the results of the 2005 article, that a 1 percent increase in immigration would lead to an employment decline of a mere 0.02 percent-numerically larger than the wage effect, but still leaving natives on average virtually unaffected. However, the impact was somewhat larger on female employment than on male employment. The negative employment effect also appeared to be greater in Europe than in the United States.

Given that these conclusions were drawn from a rather small number of studies, the authors have now embarked on a much larger scale meta-analysis. The more qualitative approach adopted for the present project will focus on the statistical significance of the impact rather than the magnitude, which is expected to offer more comparable study results.


Perfect equilibria in a negotiation model with different time preferences

Ariel Rubinstein showed the uniqueness of the subgame perfect equilibrium outcome in a model in which two players alternate in making offers and counteroffers until acceptance. The negotiation model developed in this paper extends this procedure by incorporating threats, such as a strike during wage negotiations or trade wars in tariff negotiations. Threats are modelled as a game in normal form played every time after an offer is rejected, and before the next counteroffer. This model has streams of payoffs and stationary agreements. For common time preferences, many equilibria exist, including some with costly delay. However, for the heterogeneous case, published results about each player’s lowest equilibrium payoff are contradicting. The literature has overlooked the implications of Pareto efficiency in case of streams of payoffs. For example, consider division A and B in case of two periods, and one dollar per period, where the impatient player, say player 1, receives 0.5 dollar today and zero tomorrow, while B specifies 0.25 in both periods for this player. Adding the player’s normalized discounted sum of payoffs implies a total for A above B’s total of 1. For infinite streams, all conceivable combinations produce the nonlinear curve in Figure 1 above the decreasing line reachable by stationary agreements. However, Pareto-improving paths consisting of payoffs in the normal-form game prior to some stationary agreement do exist in the negotiation model, where the 0.5 for both players could be payoffs in a normal-form game. Therefore, the Pareto frontier has an outward bulb causing the breakdown of the standard technique to solve for the lowest equilibrium payoff, because it wrongly assumes a linear Pareto frontier. Complications arise since the impatient player cannot be pushed to zero but only to his lowest equilibrium payoff between zero and 0.5. This TI paper provides the correct modification of the standard technique, taking into account Pareto-improving paths. Unfortunately, no formula exists for each player’s lowest equilibrium payoff.


By Simonetta Longhi (University of Essex), Peter Nijkamp (VU), Jacques Poot (University of Waikato), The Fallacy of “Job Robbing”: A Meta-Analysis of Estimates of the Effect of Immigration on Employment TI DP 06-050/3
Antitrust in Open Economies

Transatlantic frictions on merger policy, as well as the targeting of multinational firms like Microsoft by different national competition regimes, have sparked a nascent literature on international regulation of competition. While this literature addresses pertinent issues, it has a major weakness in that it builds on partial equilibrium frameworks. This paper examines international competition in general equilibrium. This approach makes it possible to relate strategic and distributional aspects of competition policy to basic trade policy concepts. The results imply that a single-industry approach can lead to inappropriate guidance on mergers and related matters.

Key results include the following. On the national front, what matters is the difference in the degree to which different sectors diverge from perfect competition. The markup in a particular sector is thus not a valid predictor of misallocation of resources or the costs of imperfect competition. In addition, indices of competition that rely on costs, such as Lerner indices, exaggerate the misallocation of resources. While matters to consumers is producer dichotomy that enforcement of perfect competition regimes, have sparked a nascent literature on international regulation of competition. While this literature addresses pertinent issues, it has a major weakness in that it builds on partial equilibrium frameworks. This paper examines international competition in general equilibrium. This approach makes it possible to relate strategic and distributional aspects of competition policy to basic trade policy concepts. The results imply that a single-industry approach can lead to inappropriate guidance on mergers and related matters. On the international front, there is a certain political logic behind attempts to achieve a competition policy agreement within a structure such as the WTO. This is, in part, because such an agreement would enhance trade. Moreover, since a competition policy agreement may require side payments, a trade agreement such as the WTO or regional schemes offers plenty of scope for members to trade off gains under one agreement with losses under another. At the same time, FDI can itself be pro-competitive, undermining the scope for a competition policy agreement.


By Joseph Francois (EUR) and Henrik Horn (IIES, Stockholm), Antitrust in Open Economies TI DP 06-006/2

Voting in the laboratory

Almost every week, national elections are held somewhere in the world. Many more elections take place at federal and local levels of government. Surely, these are important events to many of us. This thesis aims at providing a better understanding of why and how people vote in elections. The thesis develops three original modifications of Palfrey and Rosenthal’s (1983) participation game, and uses these to study voter turnout theoretically and experimentally. In the basic game, each voter supports (i.e., prefers) one of two exogenous candidates, and privately decides between voting at a cost and abstaining (without costs). The candidate receiving the most votes wins the election (ties are broken randomly), and each supporter of this candidate receives an equal reward, independent of whether or not she voted. The first study (published in the American Political Science Review) analyses the effects of social embeddedness on turnout, assuming that voters may be influenced by observing the decisions of other voters around them (e.g., within a family or workplace environment). The experimental results show that the social context matters: this information increases turnout by more than 50%. The increase is greater when neighbours support the same candidate, rather than when they support opponents. The second study investigates the effects of public-opinion polls on voter turnout and welfare. Poll releases resolve uncertainty about the level of support for each candidate caused by ‘floating’ voters, whose preferences change across elections. This information increases turnout in the laboratory by 28-34%, depending on the fraction of floating voters in the electorate. If polls indicate equal levels of support for both candidates (in which case aggregate benefits for society are not affected by the outcome), then welfare decreases substantially due to costs from excessive turnout.

The final study features elections preceded by competition between two candidates, who simultaneously announce binding policy offers in which some voters can be favoured at the expense of others through inclusion and exclusion in the budget. The results suggest that policy offers attract 33% more voters – yielding a smaller budgetary share for each-when voting is compulsory rather than voluntary. Evidence is also found of political bonds between voters and parties. Overall, in all three experiments many subjects react strongly to economic incentives (i.e., benefits, costs and informational clues) often in line with what is observed outside of the laboratory.

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