

Network Europe: Households, Firms and Nations

Hardy Hanappi
Institute of Economics, University of Technology, Vienna
hanappi@pop.tuwien.ac.at
(Version 2, 8.10.2003)

Introduction

From the point of view of Europe's political economy, the last twenty years have been characterized by a continuous decrease of the scope of power of nation states and an according increase in the agenda of a continental institutional entity: the European Union. This development has not been paralleled by comparable processes in North America and Asia. Of course, the USA did initiate NAFTA to enhance cooperation with Canada and Mexico, but this did not imply a loss of power for the United States as a nation state. Certainly Asian nations under the economic umbrella of Japan and with the background of the sleeping military giant China advanced cooperation as ASEAN group. But with Japan's banks falling, and the enduring historical conflicts between China and Japan unsolved, the ASEAN initiative is doomed to remain insignificant at least in the mid-term.

Indeed, Europe seems to be the only continent that has made fast and lasting progress towards unifying smaller national units into a larger political entity. In this enormous historical laboratory experiment the conditions for unification were set rather challenging:

- The second upsurge of US hegemony in the aftermath of the breakdown of the Bretton Woods system (i.e. a falling Dollar that conquered world markets), amplified by Ronald Reagan's military initiative (i.e. US budget deficits driving world interest rates up) left all European nation states in a sudden state of emergency – collapsing exports and growth, rising unemployment and budget deficits. Europe had to react.
- Deeply rooted differences between European nations, in language, history, culture in general as well as economic background. Unification certainly will be difficult.

So from an evolutionary perspective there was both, *high selection pressure* and *hard choices* to be made. In fact the extraordinary drive towards European unification in the early eighties does not take wonder under these circumstances. Without interpreting further details of the reasons and reactions in Europe, after 20 years it is pretty clear that one of the major world historic processes is on its way. The way it advances - sometimes slow, almost invisible, sometimes with a sudden jump – raises doubts about the existence of a control center steering it. There is a good reason why even now a European constitution is not really in sight. Too many actors with countervailing, almost equal power and influence again and again block fast advance, and only rarely, in certain exceptional moments, a sweeping new

motion is possible. In other words, what we witness is the working of an incredibly large social network, in which top down command structures are not consistently present, which actually struggles to develop into an alternative to traditional hierarchical empires: continental democracy.

Quantity matters. As the great physician Erwin Schrödinger emphasized when he wrote his essay on the emergence of life on earth [Schrödinger, 1944], growth towards large quantities of elements of a system often seem to initiate a qualitative jump of the basic character of that system. There are something like 380 million persons living in the European Union, for biologists not a very impressive number, they have to deal with probabilities of 1 to 10^{40000} in explaining the non-randomness of first life (compare [Kauffman St., 1993]). And as microbiology and physics still are stupified on their search for smallest elements, economics too has to face this problem. In this paper the proposal is to consider not individual persons, but **households** as smallest units. Reasons are simple. Households on the average constitute financial micro-units that in principle have the possibility to reproduce beyond average individual life expectations. They are linked to each other in a local environment. Reproduction of households means that the process of primary metabolism (i.e. nurture, air, sexual reproduction, etc.) gets sufficient inputs and produces sufficient output (i.e. commodities, social structure, etc.) to work properly. Production units for this metabolism historically have separated from households and now are concentrated in two other types of social nodes: firms and social institutions. European **firms** thus are the production units that provide commodities (including services). With respect to the social institutions framing the political economy of Europe, thus providing structure for the behavior of households and firms, a plethora of different forms has occurred. The 20th century, despite two world wars, has been characterized by a trend towards democracy, i.e. towards an institutionalized feedback loop that periodically allows citizens to exert some power (e.g. voting power in elections) on those who otherwise occupy the monopoly of power. The major reference point for governance clearly was the social institution called nation state. And it is precisely the demise of the nation state, its substitution by a continental political institution in Europe that currently is debated. It is therefore straight forward to take a look at the network of **nations** in Europe, simply represented by the EU member states, to gain some insight into the central dynamics of social institutions.

In the following chapters each of these networks – households, firms and EU member states – will be sketched. Their development in the last 50 years is discussed to prepare treatment under the perspectives provided by modern network analysis. The latter has experienced a tremendous upswing in the last decade¹, though originally developed by physicists (e.g. [Barabási A.-L., 2002], [M. Gell-Mann, 1994]) and mathematicians (e.g. [D. Watts, 1999, 2003]), its influence on the social sciences will be tremendous.

¹ For a summary of the progress made so far compare [R. Albert & A. Barabási, 2002].

From a formal point of view the smallest network to be investigated is the network of EU-states, it consists of 15 nodes (plus additional 5 nodes in May 2004). It also is the one highest in hierarchy, because it most of the time sets and executes binding constraints on the behavior of nodes of the other two networks while there is only rather indirect influence in the other direction. It therefore will be dealt with first. The network of European firms is second in size, it furthermore already is segmented in its national sub-nets. So while it is much larger than the network of states they share at least one property, nodes entertain links with nodes outside Europe. The network of firms will be dealt with second. The household net is the largest net. Households are linked with numerous types of links with each other, to the firms' net and to the states' net. The chapters on European firms and households evidently can only provide a quick and dirty first look, any more detailed analysis would go beyond the scope of a research paper.

The final chapter then describes the interaction of the three networks and draws conclusions for policy design as well as for the usefulness and perspectives of network analysis.

States

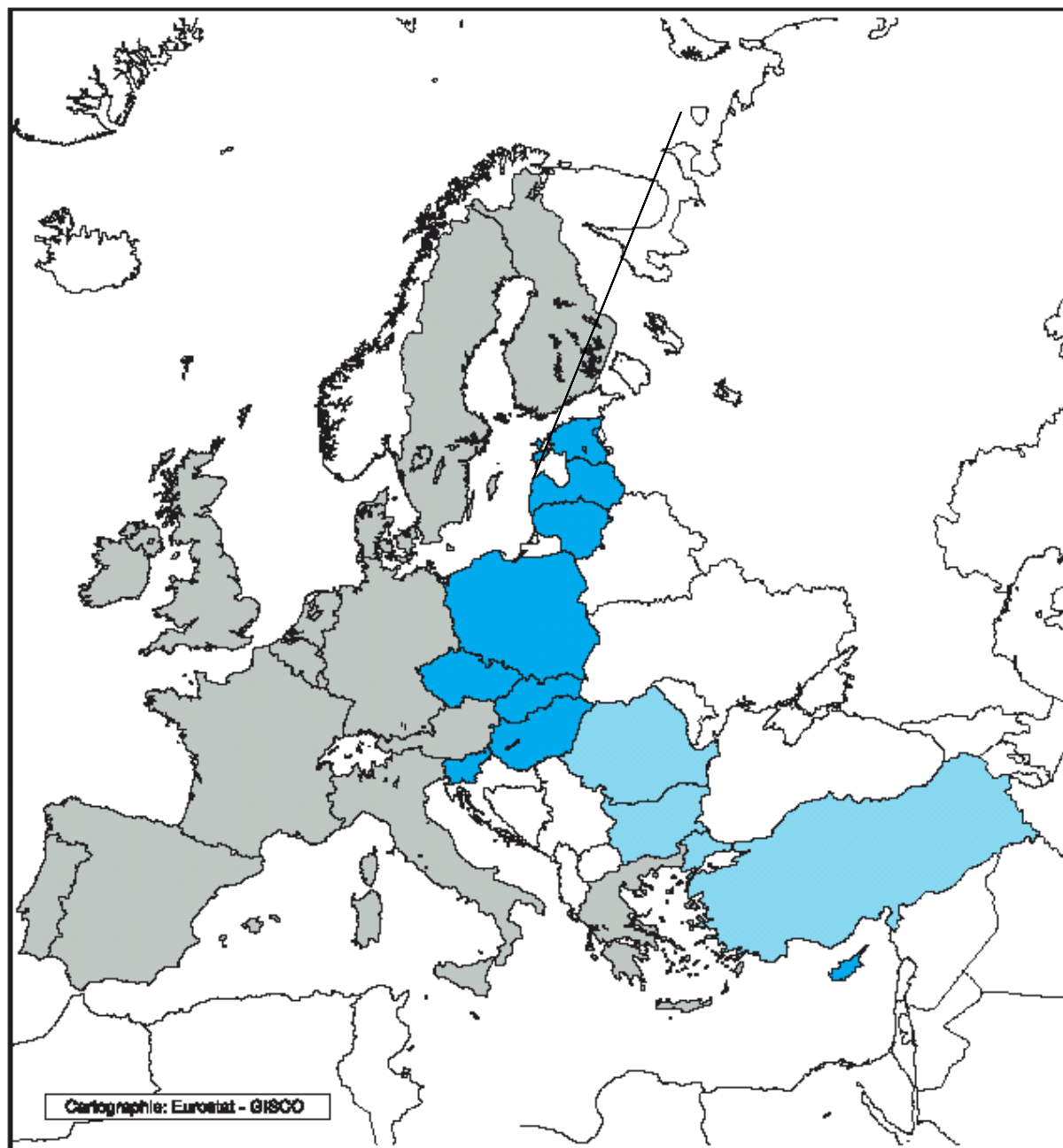
Take a look at the map of Europe (figure 1). For network analysis of EU states geographical location certainly plays an important role, it has important implications for the strength of cultural, political and economic links. On the other hand, network analysis for the sake of clarity of graphical presentation often transforms the nodes to locations on a circle. Placing yourself in Switzerland and looking around you would give a sequence of EU states on a circle which looks like in figure 2. Only a few links between states are inserted, but it is clear that each of the states has political and economic links to all the other states. Thus a tightly knit network is the result.

One of the more interesting ideas of network analysis is clustering. There is a precise notion, the clustering coefficient, which measures the amount of clustering in a network – but if all nodes are connected it does not make sense. To find clusters it is necessary to distinguish between important and less important links, and to drop the unimportant ones. How importance is measured is not evident. One possibility is to start with economic relations, e.g. trade flows. Looking at only the three largest trade partners, either for exports or for imports, of each state gives a different network (figure 3). Still there seems to be some geographical influence, the circle is visible, but something else dominates: Germany has 14 links, a link to every other state (i.e. it is one of the three largest trading partners of each state). This dominance is unchallenged. The next highest degrees of nodes² are France (9), United Kingdom (8) and Italy (7). These four states clearly, under the lead of Germany, dominate

² The degree of a node is its number of links.

Europe's trade structure³. Looking at the development since World War II shows that this structure has become more and more accentuated.

Figure 1: Europe



The structure between European nation states therefore might have been following a similar dynamic as the structure of cities, which followed Zipf's law (a power distribution) surprisingly close: The strong get stronger. With the new shift towards a European institution

³ The clustering coefficient of a node is $C = 2n / k(k - 1)$, with k being the number of its links and n being the number of links between its k neighbours.

replacing this evolving network of states such economic dynamics will have to be encompassed in the new political structure.

Figure 2: Network of states (not all links inserted)

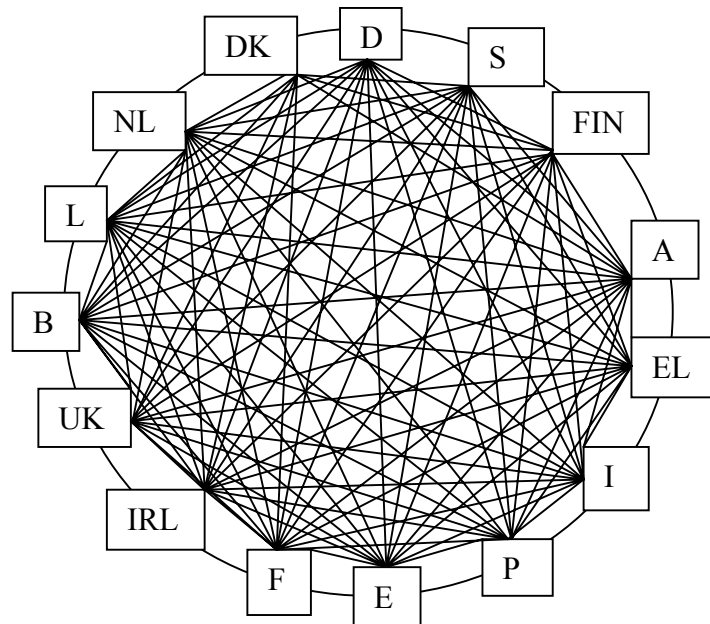
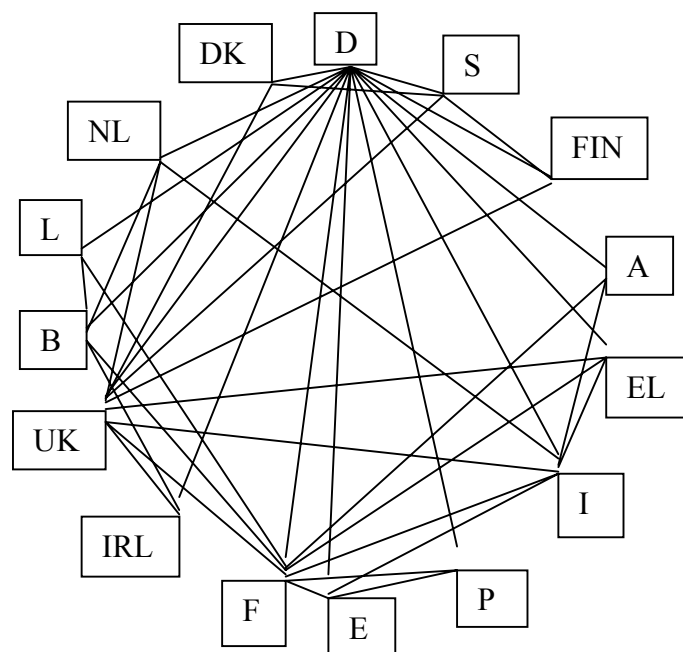


Figure 3: Trade filtered network of states



Firms

European firms can be divided in two large groups: The large number of firms that remain completely within the borders of their respective state, call them local firms, and those firms whose activities regularly cross borders, call them international firms. Of course, even local firms are influenced by European developments, but only via channels (interest rates, prices of inputs bought from domestic providers that in turn import them, etc.) involving other domestic actors.

The most telling economic representation of the network of firms would be an input-output table. Unfortunately such tables need extremely detailed statistical work and only exist on the basis of whole industries in time intervals of 5 or 10 years. For local firms for the first decades after World War II activities nevertheless seemed to be stable enough to be well represented by such tables. But with the new EU initiative of the eighties and in particular with the breakdown of the Soviet Union and its satellites in the early nineties, globalisation on the firm level gained momentum. The share of international firms in total firms increased, only moderate if measured in numbers, more dramatically if measured in revenues.

The group of international firms already had played an important role in the emergence of the European Union, but now – with turmoil on world markets, globalisation of input and output markets and possibilities of new information and communication technologies – their influence becomes overwhelming. Indeed, from the point of view of empirical investigation the work of linking activities of firms becomes simpler: there are ever fewer and ever larger players driving the rest of the lot into defensive or passive reactions. Strategic behavior, and therefore game theoretic analysis, becomes more and more important (the number of competitors becomes small enough).

It is tempting to describe these dynamics as an evolving network of hierarchies in the way recent network research has developed⁴. But again, an extensive amount of empirical work, application of clustering concepts and related concepts have to be considered as precondition for such a description.

In fact, the whole working of production units in a continental social unit probably will have to be changed. Contrary to current practice, production units will have to be fully embedded in the political and economic feedback loop that regulates system behavior. This is more and more mandatory for social units that via their products steer households utilities, and via the labour markets direct income streams of employees. In that context much of the current privatization debate is completely mistaken and sounds terribly anachronistic. What really is needed is intelligent integrated design of the process of political economy of a very large social unit.

⁴ Barabasi, following Herbert Simon, has re-introduced the idea of preferential attachment: a node gets more links with a probability that is proportional to the number of links it already has. This works phantastically well with respect to the empirically observed size distribution of cities – it is known as Zipf's law.

Households

It is surprising that only in the last decade economic policy rediscovered the importance of long-run implications of household behaviour. Pension funds' problems, cutting of social transfer payments, demoeconomic influences on future labour supply and other topics only started to flourish as restrictive, mostly conservative ministers of finance came into power in European countries. Of course, economic theory for a whole century (since Walras in 1874) had praised individual (not household) preferences as the ultimate motor of economic development. But that was at best mathematical esthetics, at worst it was ideological manipulation. When Keynes introduced constants of social psychology, i.e. his famous propensity to consume, this was more a short-cut to explain developments of aggregate magnitudes than a proper theory about household behaviour. Later, Keynesians like James Duesenberry added more economically plausible interpretation. It was not only the old devil of methodological individualism that hindered economists in investigating household behavior, though households certainly are not individuals, they are not even added up individuals. They are organisations developing non-linear adaptive behavior in response to their local and global environment. Such a view calls for network analysis.

But even crude analysis shows that the network under consideration is impressive: Note that on the average a European woman has 1,7 children, assume that there were only standard families consisting of 3,7 persons (one woman, one man and 1,7 children), then with 380 million people there would be about 100 million families. What helps is the fact that most households for most areas act local, i.e. they are involved in local consumer and labour markets. Similar to local firms they also still are regulated by nation states. A modeling strategy for a network of European households thus could try to get away with types of households per country, which might reduce the number of nodes considerably.

The most radical impact on household behaviour in the current transition period probably comes from ICT. Communication behavior has changed dramatically with the wide spread use of new technology. But not only has the allocation of time been shifted towards more time for these activities, there also is a deeper influence on the worldviews, on the models held by people in households. The general trend in Europe probably is towards a converging interpretation, i.e. events will be interpreted in more similar ways from Stockholm to Athens. Life styles too, at least as far as local environments admit it, will converge. But, as Duncan Watts in his recent book [Watts, 2003] shows, there also is that possibility that increased communication possibilities in an almost closed cluster can result in an amplification of the more traditional traits leading to an ever stronger separation from mainstream behaviour. Radical views, leading to radically diverging behavior therefore are also in store if new ICT is introduced. But while this is surely bad news if religious communities are concerned, it

also applies to the possibility of non-mainstream, creative and innovative groups of scientists - and this certainly is good news.

Conclusion: Network Dynamics

Finally take a view at the interaction of the three layers of networks. Start again with the nation state level. The deeper historical reason for the emergence of the political feedback loops of democracy - or more precisely, the reason for its emerging dominance – can be found in its feature of faster adaption to changing environments. As long as environments did change slow, production methods remained traditional (firms), primary metabolisms and life styles of households were regulated by restrictive religions (households), as long as these circumstances prevailed there was not much need for adaption of governance. But as productivity increased, leisure times and new areas of utility emerged, while on the other hand the pressure for sustaining profit rates lead to domestic and international conflicts between classes and nations. To succeed in such a wild battlefield – and this is the image that the first half of the 20th century in retrospect is – quick adaption and feedback with all domestic social strata was advantageous. Indeed this is on the agenda of Europe's new design too, though for a whole continent.

As mentioned before, the network of production units has to be directly integrated into the political framework. If one believes that some blind forces of competition between firms that only are devoted to profit rate maximization can substitute for intelligent design of the political economy, then one falls prey to a bad old legend that never was true. Of course, production units need control, they have to fit to the needs of households and price signals alone are an insufficient tool in a world full of information garbage and strategic manipulation. The benevolent dictator - a mythical figure traditionally used for the didactic goals of economists - must reappear, but this time political engineering must make sure that this ruler is derived directly from the preferences of households. So while the network of production units certainly will be embedded in a setting of scarcity indicating prices and well tailored market mechanisms, it also will be supported by a guiding general policy process. What urgently is needed for its design is a concise map of the European production unit network, the current naturalistic view of firms growing and dying like trees in a wood is completely inadequate.

Meanwhile the European household network is under heavy reconstruction. Unemployment rates will remain high until some radical change in firm behaviour and in the design of labour markets occurs. Under these sinister signs the social contract across generations will be opened for discussion again. Since pension funds as well as social security funds are enormous amounts of money, their administration will need tight and direct control. Here the household network will need continuous direct links to the governing political nodes. On the other hand labour market relations to a large extent will remain local – contrary to current mobility fetishism physical movements will remain a difficult and unattractive task for

households. As a consequence, the household network will need direct links to the local production unit network. What sporadically already has developed, namely some right to work, some institutionalized access point of households to production units, will have to be redesigned and intensified. 200 years of growing productivity in principle have provided households with the possibility to work much less hours. How to distribute the remaining work time and how to use the potential spare time is not only a question for macroeconomic policy-makers, it is a question for each household. Again links to central policy nodes as well as to local production nodes will have to be activated.

As these few, somewhat speculative remarks should make clear, the work waiting for European network scientists is overwhelming and urgent. Some tools of network analysis can already be usefully applied – if the relevant empirical data sets are available. Other tools, often the ones more important for political economy, are still in development (e.g. evolution of networks, directed dynamic networks). Computer simulation of network approaches will prove as a most helpful tool, and in some cases it might even inspire one of these compact analytical formulations that mathematicians adore.

Bibliography

- Albert R. & Barabási A., 2002, Statistical mechanics of complex networks, Reviews of Modern Physics 74, 47 (<http://www.ndu.edu/~networks/papers.htm>).
- Barabási A.-L., 2002, Linked. The New Science of Networks, Perseus Publishers, Cambridge (UK).
- Gell-Mann M., 1994, The Quark and the Jaguar. Adventures in the Simple and the Complex, W.H. Freeman & Co., New York.
- Kauffman St., 1993, The Origins of Order. Self-Organization and Selection in Evolution, Oxford University Press, Oxford (UK).
- Schrödinger E., 1944, What is Life? The Physical Aspect of the Living Cell, Cambridge University Press, Cambridge (UK).
- Watts D., 1999, Small Worlds. The Dynamics of Networks between Order and Randomness, Princeton University Press, New Jersey (USA).
- Watts D., 2003, Six Degrees. The Science of a Connected Age, W.W. Norton & Co., New York (USA).