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Trust, distrust and innovations. Business and Universities in a divided Germany (1949-90)

The notion of trust has gained some prominence in economics due to the rise of New Institutional Economics. However, so far there are only few studies that use it in business and economic history. In general, trust may refer to different matters: a psychological state of mind, a social relationship between two or more actors, or an "animal spirit" (Akerlof/Shiller 2009). As the term is used here, trust has a rational and an emotional side. While trust may arise out of enlightened self-interest and need not be altruistic in nature, it often also involves emotional aspects, especially in long-term relationships like friendships.

In this paper, trust is used as a concept to explore the interaction between business and universities (and other research institutes) in the two German states between World War II and German unification. Basically, it is argued that trust-based relationships were more likely to emerge in West Germany than in the GDR, where universities and business lacked autonomy and had to follow instructions from party or state authorities. In West Germany, co-operation between particular universities and business firms developed well despite rhetoric of "pure science" in the 1950s and 1960s. Later, increasing globalization put established relationships under pressure. Examples are taken from chemical and optical industries.

This paper is a result of a research project about the effects of university reforms in both German states on their respective innovative capabilities. The project was part of a larger research group which was concerned with German innovation culture. Essentially, the question was if there are distinctly national styles and approaches (loosely referred to as "culture") to science and technology which lead to different innovation strategies or outcomes. While this bigger question cannot be answered in this paper, it may be of interest to the reader to know the background of the study. The aim of this paper is more limited. It first tries to explain the notion of trust and its relevance in the context of (historical) innovation research (part one). Then it applies this concept to the GDR and FRG innovation systems. A rough sketch of the respective research policies is given in part two. Parts three to five provide a short version of case studies that are concerned with university-industry cooperation in the GDR (3 and 4) and the FRG (5). In addition, an effort is made to measure the influence of trust on economic performance and labour productivity (part 6). The concluding part sums up

the main results and asks what we can gain from the study of trust in economic and business history.

1. The concept: trust and its significance for innovation research

The concept of trust is not often used in innovation research. However, some studies recognize its importance in b2b-relations (Raub 1999). In general, trust in the sense of the term used here is not a psychological state of mind, but rather a social relationship between two or more actors (Preisendörfer 1995). Trust has to be distinguished from trustworthiness which is an adjective of persons or organizations that can serve to initiate a trust-based relationship (Hardin 2002). Further, trust is specific: I trust someone with something, i.e. it is specific with regard to persons and objects. I would trust some people with some things and other people with other things. In contrast, confidence is more general, as it refers to a generally optimistic outlook (Luhmann 1989). The question if trust is based on rational calculation or on emotion is a matter of considerable debate among social scientists. For the present purpose it suffices to state that trust can arise out of enlightened self-interest, i.e. it does not have to be, and usually is not, altruistic in nature (Coleman 1990).

If the notion of trust is important for innovation processes obviously depends on a number of factors, but foremost on the concept of how innovations come into existence. While a detailed innovation theory does not yet exist, the concept of innovation systems may be usefully employed. In short, it stresses the influence of a number of actors on innovations, like in the notion of a "triple helix" of industry, science (university) and government (Etzkowitz/Leydesdorff 1997). If all innovations really are a product of innovation networks (Rammert 1997), is less clear; however one does not have to go so far to acknowledge the importance of trust for innovation systems which imply the cooperation of more than one actor. This is not to deny that other factors play an important role, like research strengths or weaknesses, or financial resources for example. But if the existing resources can be effectively employed depends on a number of factors which determine the outcome of research cooperation, among them trust.

2. The context: research and educational policy from the 1960s to the 1980s

The following three case studies are taken from the research and development efforts in the two German states GDR and FRG in various fields of high technology (optics, biotechnology, chemistry). To understand them, it is important to put them into their political and economical context. First of all, the GDR economy was a centrally planned economy. That means that enterprises were mostly state-owned and, more importantly, were not free to take their own decisions but had to conform to centrally coordinated plans. This fact influenced innovative behaviour as well as other economic activities, from research & development activities to investment decisions (Kornai 1992). It is important to note, however, that in practice the various state-owned enterprises or combines enjoyed varying degrees of freedom in their decision making. Considering innovations, a centrally planned economy need not be a disadvantage. On the contrary, the central planners can push through major innovations much faster than in market-coordinated economies, if they are regarded as important for the economy as a whole. On the side of the FRG, innovations were not only coordinated by market actors either. The central and regional governments also intervened in various ways. Therefore, many social scientists have adopted the "triple helix"-model of university-industry-government relations (Etzkowitz/Leydesdorff 1997). It hypothesizes that there are numerous interactions and also overlaps between actors from these three sectors.

The GDR research policy is of course too complex to be accurately summarized here. However, an important phase of reforms lasted from the late 1950s to the early 1970s and culminated in the so-called third university reform 1967-69. Its aim was to strengthen the industrial research base by making contract research with industrial enterprises as partners mandatory for many university departments. Also, research at universities should be coordinated and concentrated on certain subjects that promised most economical relevance. Similar steps were taken in the case of the institutes of the Academy of Science (Fraunholz/Schramm 2005). The underlying logic of these reforms was clearly the idea of "big science" which dominated research policy in most European states in the 1960s and 1970s as an answer to a perceived American challenge (Ritter et.al. 1999).

In the Federal Republic of Germany, three phases of research policy can be distinguished (Fier/Harhoff 2002). In the first phase, from the mid-50s to the mid-70s, the aim was to enlarge the knowledge base both inside and outside the universities. There was a certain tendency to finance institutions as whole rather than specific projects. This changed only during the 1970s, when research policy beagn to aim at more institutional flexibility and

financed more cooperative projects. Further, technology transfer departments at universities were instituted in this period. In the third phase since the 1990s, research policy tried to further competition by sponsoring contests between regional cooperative networks.

3. Carl Zeiss and the Zentralinstitut für Optik und Spektroskopie [1]

The GDR inherited a strong optical industry. Germany had been a world market leader in this branch before World War II, but had lost this position to the USA during and after the war. In the first years of its existence the optical industry was not considered a priority in the GDR. It was only in the 1960s that its significance for the modernization of production was understood. In 1963 electronics and what was called "apparatus construction" (Gerätebau) were considered worthy of special support (Kowalski 1996). Also in the 1960s concentration of the industrial branch took place. Carl Zeiss was made a leading enterprise for the industrial branch consisting of itself and seven other state-owned enterprises. A formal combine came into existence in 1976 (Mühlfriedel/Hellmuth 2004).

One of the most exciting innovations of the 1960s was the laser. This case study focuses on the development of the dye laser. It is a laser which uses an organic dye as a medium, usually in the form of a liquid solution. Compared to lasers which use other mediums (such as ruby or helium-neon), it has the advantage of a wide bandwidth which makes a tunable laser possible with the help of a prism or diffraction grating. Apart from dye lasers, only semiconductor lasers are tunable over a wide bandwidth. Tunable lasers are suitable for a wide variety of applications, for example in analytical measuring, in medicine or biology. The first dye laser was built in the USA in 1965 and in West Germany in 1966, but it was only toward the end of the 1960s that tunability was recognized as its main advantage.

Physicists in the GDR like Hans Jancke also recognized the significance of tunability at an early stage. The GDR and especially Carl Zeiss had a comparatively early start in laser technology, presenting the first "socialist" laser at the Leipzig fair in 1964 (Albrecht 1995). The same applies for dye lasers, the first one having been built at the Zentralinstitut für Optik und Spektroskopie (ZOS), an institute of the Academy of Sciences, in Berlin in 1969. It was new in so far as it achieved a change in wavelength through a change in temperature rather than, as in other dye lasers, a change of the cuvette or energy source. In 1971 scientists from the ZOS handed over the first prototype dye laser to Carl Zeiss which filed patent applications

[1] The description of the case studies is taken from Schramm 2008:105-312, except otherwise noted.

in a number of Western European countries in the early 1970s. Internally, the dye laser was already regarded as a future top performance. But in 1974 Carl Zeiss withdrew their patent application in the FRG arguing that no commercial use was made and that such was not to be expected. Due to technical problems that occurred in 1973 Zeiss seems to have lost interest in the innovation.

The ZOS therefore began to produce a small test series of dye lasers and delivered about 40 of them until 1980 to different users in the GDR for testing purposes. That Zeiss regarded this laser as inadequate is revealed by the fact that in 1975 the enterprise ordered the ZOS to do more basic research on dye lasers. In 1980, dye laser development got off to a new start when the Zentrum für Wissenschaftlicher Gerätebau (ZWG), also an institute of the Academy of Sciences, developed a fluorometer that worked with a dye laser. It could be used in fluorescence spectroscopy where until then conventional energy sources had dominated. It was in 1982, two years later, that a formal cooperation between Zeiss, the ZOS and the ZWG came into being. A problem that arose early was the integration of a streak camera which Carl Zeiss demanded. As technical problems arose in that part of the planned apparatus in 1985, scientists from the ZOS declared they had always advocated the alternative boxcar technology. Indirectly they charged Zeiss of not giving full support to the common project. A first test series of a fluorometer was planned, but Zeiss cancelled the production in 1987, arguing they had more important tasks to fulfil – which was probably true, because at that time Zeiss began working on the microelectronics programme of the GDR, a programme of highest priority. The ZOS made a concept for a better version of a laser-fluorometer in 1988 which was commented on ironically at Zeiss by claiming that the ZOS was good at producing concepts for tomorrow, but weak at working on today's problems.

In the end, neither a commercial dye laser nor a laser-fluorometer was produced until the end of the GDR. It is of course difficult to tell if they had been produced had the GDR existed longer. But it must be stated that in both cases a considerable research and development effort was wasted for a number of reasons: interference of government agencies, shortage of adequate (electronical) supplies, bureaucratic procedures. But it should also be clear from the account that problems of cooperation and mutual understanding played a vital role. The partners, especially ZOS and Carl Zeiss, mistrusted each other and suspected that the other party was unwilling or unable to fulfil its contract duties.

4. Jenapharm and the Institute for Microbiology and experimental Therapy[2]

This case study looks at the cooperation between the Institute for Microbiology and experimental Therapy (IMET) in Jena and the VEB Jenapharm in the production of antibiotics. Both emerged out of a bacteriological laboratory which was founded in Jena in 1938 as part of the glass producer Schott. Already in 1942/43 it conducted research about penicillin, the new wonder-drug of the time (Pieroth 1992). In 1944 the institute was formally founded, and the production department was made a state-owned enterprise under the name of "Jenapharm" in 1950. Because of this common tradition, the initial relationship between the IMET and Jenapharm was harmonious. The IMET gave advice and conducted tests for Jenapharm. The two directors, Willi Köhler and Hans Knöll, knew each other well. The decisive break in the relationship between the two organizations came in 1955, when Köhler was fired as head of Jenapharm. It is not quite clear from the files why the Minister of Health, under whose direction Jenapharm worked, took this decision. Political motives cannot be excluded. Knöll lobbied to make this decision undone, but as Köhler left the GDR shortly afterwards, the matter was settled. After 1955, the relationship between the IMET and Jenapharm was strained. The trust-based relationship had been destroyed, and in the mid-60s it was described as a "war of nerves".[3]

This undeclared war came to a head in the mid-60s when increasing pressure was mounted on the IMET to change its research profile. It was supposed to conduct more industrial research. Also, Jenapharm wanted to move their own steroid research group into the Institute's rooms and abolish the steroid research group of the Institute. Director Knöll called this unbelievable and warned of a threatening destruction of his institute. The abolishment of his steroid research group would liquidate one of the internationally most renowned groups in the field. Similar reservations applied to research in molecular biology which was also supposed to concentrate on different areas of research.

At a meeting in August 1965, the Jenapharm director of science and technology, Karl Heller, was unaccommodating. He felt that Jenapharm had a right to claim research capacity with a value of 4 million Mark and several rooms in the IMET building because Jenapharm could not accommodate their research groups in their own facilities, but had to extend steroid research. If the IMET did not agree, he would appeal to the Council of Ministers which would take a decision in favour of Jenapharm.

[2] Schramm 2008:173-193.

[3] Archiv der Berlin-Brandenburgischen Akademie der Wissenschaften, Forschungsgemeinschaft 68.

This example is meant to show two factors with regard to trust and cooperation. For one thing, persons mattered. In the case of Jenapharm, the substitution of its director in 1955, probably for political reasons, lay at the heart of the following "war of nerves". Until then, a beneficial cooperation had taken place. The second point refers to the hierarchical structures in the GDR economy. Conflicts between different actors over scarce resources were not unusual, but they were resolved not by market mechanisms but by administrative decisions. What counted in the end was who had better connections to important government or party leaders. In this atmosphere, an attempt to settle relations between the actors involved did not come about. It was more promising for one of the parties to appeal to higher administrative powers.

5. The Institute of Chemistry at the Unviversity of Heidelberg[4]

The University of Heidelberg has a tradition of cooperation with the chemical industry which goes as far back as the 1880s. Scientists from Heidelberg played an important role in the rise of the German science-based chemical industry in the second half of the century. However, after 1900 the connection became somewhat looser because the chemical companies such as BASF or Bayer had successfully managed to build up their own research departments (Wetzel 1991).

From 1926 to 1956 Karl Freudenberg held a chair for Organical Chemistry at Heidelberg. He was a pupil of Nobel Prize winner Emil Fischer. His main areas of research were the chemistry of cellulose and lignin. In the interwar years he cooperated with Waldhof, a cellulose company in Mannheim. But he also maintained close contact with the IG Farben and particularly the BASF, which was newly created only in 1952. In particular, he was close to Walter Reppe and Carl Wurster, director of the BASF since 1952. Reppe had been director of the Ludwigshafen laboratory of the IG Farben since 1938. From 1952 to 1957 he was research director at the BASF. In 1949, he was awarded an honorary doctorate from the University of Heidelberg. Freudenberg, who held the honorary speech, praised the old relationship between Heidelberg and Ludwigshafen. At this time, the future of the IG Farben was still open and the transferral of an honorary doctorate in this situation far from commonplace.

The relationship between the Institute of Chemistry and the IG Farben/BASF becomes clear from the letters of Freudenberg which are preserved in the University archives.[5] Basically, it

[4] Schramm 2008:269-273.

was a “do ut des”-relationship based on mutual trust and understanding. As both partners had known each other for quite some time, there was no need for one party to demand immediate compensation for a favour they did to the other party. So the company contributed in a more than marginal way to the institute’s budget without attaching any immediate conditions. Further, the company could supply rare chemicals which were difficult to get in the after-war period. In return, the institute recommended suitable personnel and gave the company access to patents.

The relations of the Institute of Chemistry with BASF and IG Farben were based on interpersonal trust. They relied heavily on personal contacts. Formal contracts and money flows were less important. A strong continuity in personnel was helpful in building trust. The enterprise did not hesitate to support the Institute even without demanding any immediate favour in return. The professors in Heidelberg for their part found no problem in cooperating with industry and giving BASF preferential access to research results. To be sure, in chemistry this cooperation already had a long tradition. But this is a far cry from the official invocation of Humboldtian ideals in this period, which stressed the centrality of pure research (Ash 1997).

6. Modelling and quantifying trust

How can we quantify the influence of trust on innovation and economic growth? To assess the influence of trust on economic performance, it is necessary to have data not only for East and West Germany, but also on a wide range of countries. Therefore, the results of the World Value Survey between 1981 and 2004 are used.[6] In this survey, a question on trust was included (“Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?”). In principle, one must be careful about these very general questions ust because the observed behaviour may differ from answers to questions in social science surveys. However, as data on observed behaviour across a broad range of countries is not available, the World Value Survey data seem at the moment to be the best possible approximation. They include data from 85 countries worldwide. The World Value Survey was conducted in four successive waves between 1981 and 2004 (1981-1984, 1990/91, 1995-98, 1999-2004), but not all countries are represented in each wave. In a first

[5] Universitätsarchiv Heidelberg rep. 14/142 und 14/143.
[6] These results can be downloaded at http://www.wvsevsdb.com/wvs/WVSAnalize.jsp.

step, the data on trust were correlated with data on per capita GDP (in 1990 Dollars).[7] This was done in a first step for all countries where data were available and in a second step for European countries only. The results show a clear positive correlation between the level of trust and per capita GDP which is even more pronounced in Europe than worldwide (r^2= 0.2149 and 0.389 respectively; figure 1 and 2).

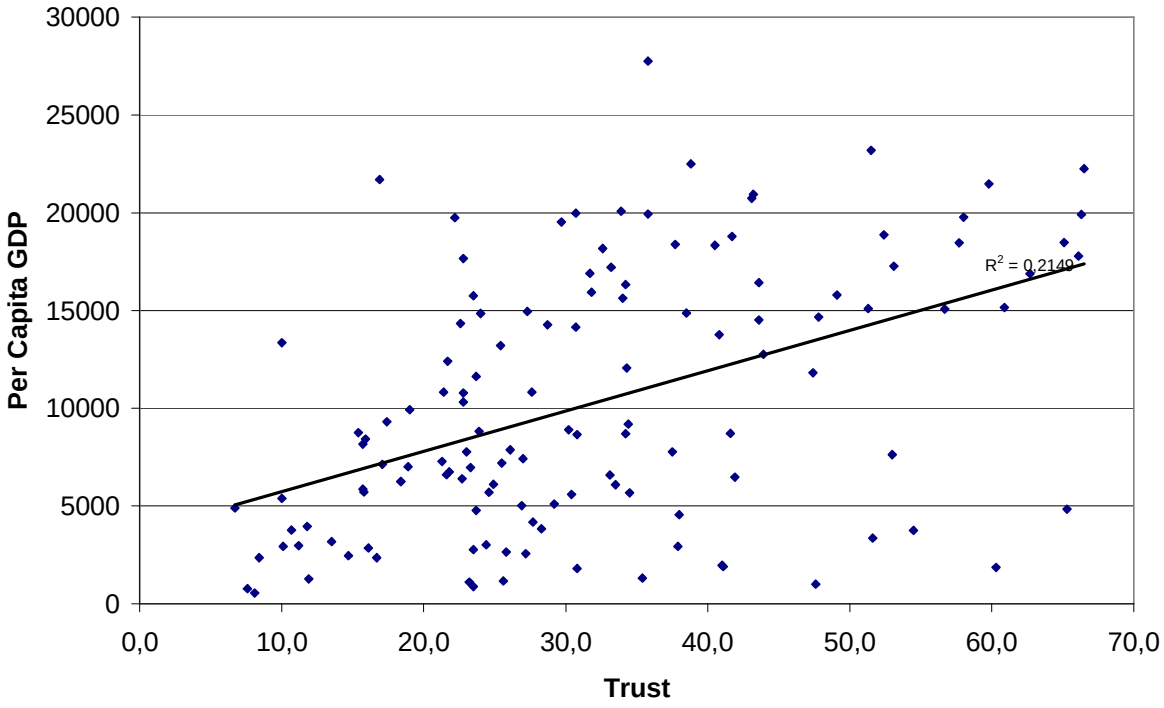

Figure 1: Trust and per capita GDP, all countries, 1981-2004 (n=128)

[7] Data on per capita GDP were taken form Angus Maddison´s homepage (http://www.ggdc.net/maddison).

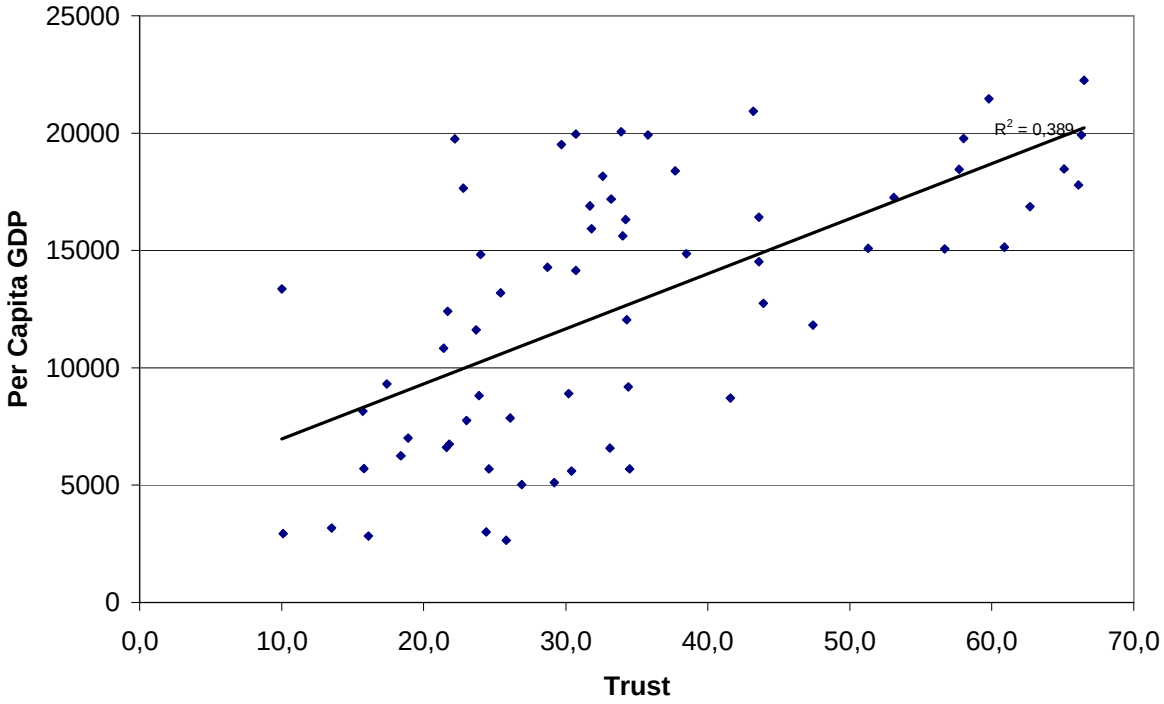

Figure 2: Trust and per capita GDP, European countries, 1981-2004 (n=63)

These data show a clear correlation between trust and per capita GDP both on a world-wide and on a European level. It can also be shown that the level of trust in Western Europe was higher than in Eastern Europe. However, data from the World Value Survey are not available for Eastern Europe before 1990. We do not know if the low level of trust in the 1990s in Eastern Europe is a legacy from the socialist regimes or if it is due to the transitional period. Setting the average level of trust in Europe at 100, the level of trust in Western Europe would be at 119 and in Eastern Europe at only 66. Likewise, the level of per capita GDP was much lower in Eastern Europe.

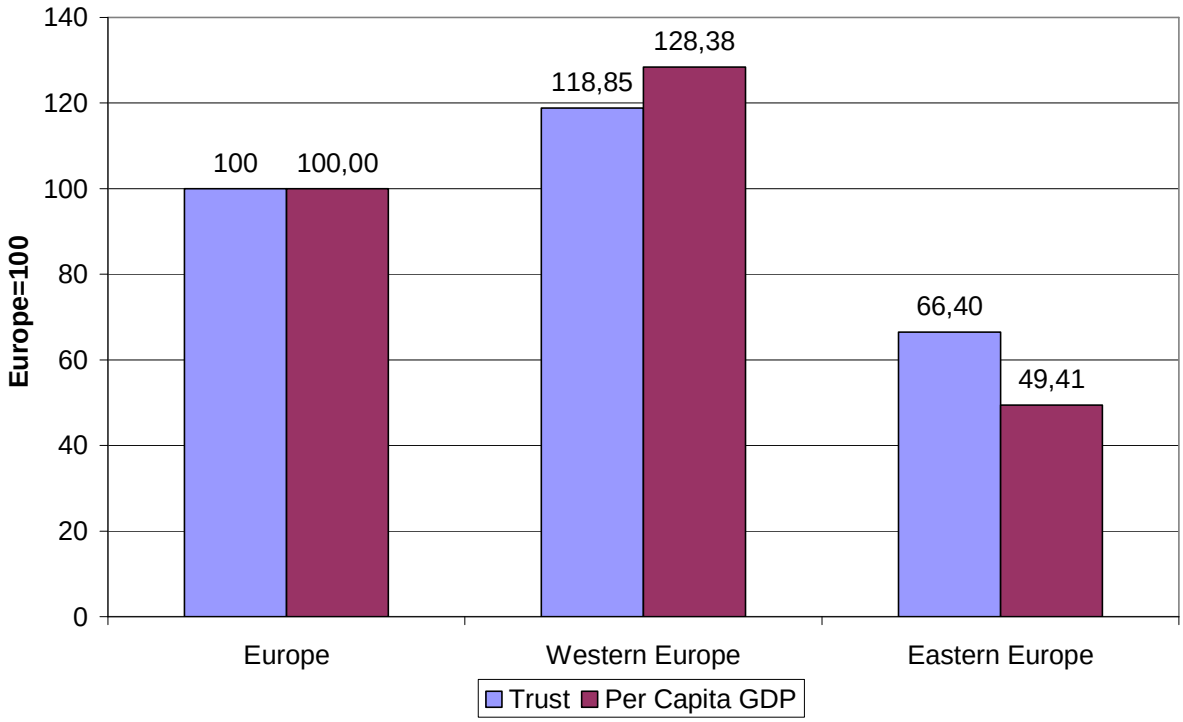

Figure 3: Trust and Per Capita GDP in Western and Eastern Europe in comparison (n=63)

So far the data would confirm our main hypothesis, the connection between trust and economic growth. However, it has been argued in this paper that trust does not influence economic growth directly but rather through a stimulation of co-operation in research and development and therefore, of innovations. These innovations should lead to higher productivity and therefore to higher growth rates, a connection which is known as Schumpeterian growth. To verify this connection, we use data on labour productivity assuming that more innovations lead to higher productivity.[8] These data were then correlated with data on trust and per capita GDP for 30 countries in 1992. The result is that there is a positive correlation between all three variables, the strongest between labour productivity and per capita GDP (r^2=0.8781). Trust shows a positive connection both to labour productivity (r^2=0.1354) and to per capita GDP (r^2=0.2266). So the assumed connection is possible according to these figures. It should be noted, however, that the correlation between trust and per capita GDP is stronger than the correlation between trust and labour productivity. This would suggest that trust influences economic growth not only through labour productivity but also through other channels which are yet unknown. Possible explanations could be positive effects on investment or lower transaction costs in general.

[8] Data on labour productivity are taken from Maddison (1995:47).

7. Conclusion

Economic and business historians neglect trust at their own peril. I suppose one reason for this neglect is that trust is difficult to measure precisely. This paper has tried to show two complementary ways to deal with the problem. The first is to conduct in-depth case studies where trust is likely to play a role, as in research networks. The other would be to use survey results, such as the World Value Survey, for cross-national analysis. It seems that the results are fairly conclusive, and do not contradict each other. They seem to suggest that trust was less developed in socialist economies, especially in the GDR. The reason for this lies in the fact that an autonomous civil society was marginalized and hierarchical social relationships were dominant. This discouraged the search for larger horizontal networks. Where they did exist, like in socialist brigades in the enterprises, they were often closed to the outside and operated on a small scale (Klessmann 2007). What were missing in the socialist economies were not resources, at least not in the first place, but rather an atmosphere of trust in which cooperation could have prospered. The lesson for the capitalist countries could be to further cooperation and not to undermine it by unduly stressing the virtues of competition. On a theoretical level, the message is in favour of institutionalism: trust can be seen as an informal institution in the sense of Douglass North (1990). It would be advisable if institutional economics were to turn to informal institutions instead of focussing exclusively on property rights (McCloskey 2010). Notions of trust and civil society hold great explanatory power for the economic performance both of business enterprises and of national economies.

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