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SIMPLIFICATION AND COMPLEXITY

- THE DILEMMA OF ECONOMIC THEORY -

by

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Simplification and Complexity
- The Dilemma of Economic Theory -

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Abstract

The actual economic problems connected with the transformation of the system in East Germany have different reasons. Some of the real reasons are:

- Too high wage increases not oriented by the productivity: "redistribution" without the designation of the payers.
- Abolition of the old centralized "marketing" organization and recommendation of the "market" without new marketing organizations for the production units.
- Orientation of the "Treuhand" only on the "profit" of the firm.
- The ban on high motivated former owners of the firms with historical bindings.
- Disregard of interdependencies between macroeconomic, interindustry, regional, or social relations.
- A sudden shock treatment instead of transformation with an amalgamation of old and new.
- Devaluation of real and human capital.
- Waiting for the next generation.

Many of these real aspects are due to deficiencies of economic science. The predominance of teaching many students only for the later practical profession instead for research may be one reason for the preference to present too simple theories. But, this is a myopic view. Simplified thinking of students of yesterday leads to a simplified decision making of the managers and politicians of today. The social sciences have a major influence to the object of their own investigation.

Partial instead of total analysis, comparative statics instead of dynamics, "verbal" and "graphic" models instead mathematical ones are easier to present and to understand. There is a deficit in theoretical and quantitative investigation of complex systems which must be seen as cybernetic processes with positive *and* negative feedbacks.

One of the reasons can be the fact that the scientist also tries to avoid cognitive dissonances in his scientific thinking. Complex connections in networks are repressed in order to avoid cognitive conflicts. To convince others one prefers linear chains of verbal argumentation - without ifs and buts - which are easy to understand. Therefore, it is necessary to store complex models in formal structures, in order to evoke cognitive conflicts again and again.

A theory by which the first derivative of the goal variable with respect to an instrument variable has always the same sign - a "the-more-the-better-theory" - can be seen as incomplete. That type of theory disregard countervailing forces which are prerequisites for the existence of moderate strategic equilibria.

Beside these reasons there is another failure based on the conventional statistical view of economic events: *The expected value represents the underlying relations which are only disturbed by some random numbers with a certain distribution.* Therefore, the econometric procedures can only reflect phenomena which happen frequently. Seldom and extreme events which lead to reversing effects are ignored. Thus, usual empirical models have relevance only in the near neighborhood of the old realizations. They must be complemented by theoretically derived and only seldom observed reactions to extreme events.

Some directions are shown in which research *and* teaching has to be intensified to reduce the mentioned deficiencies in the future. One of those is the development of a semi-normative theory:

What are the basic requirements of a descriptive theory suitable for prescriptive purposes?

Based on research in Experimental Economics it will be demonstrated that the idea of bounded rationality is central in this context.

Simplification and Complexity
- The Dilemma of Economic Theory -

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A. Introduction

The theme of the conference "**Economy and Culture**" gave me the idea to say something about the influence of economic science on the thinking and behavior of people. To show the importance of this influence, I will look at the economic development of East Germany after the reunification of Germany on the 3. October 1990. Some faults of economic policy are based on the shortcomings of economic theory. I will mention a few directions of research which can help to overcome these shortcomings.

I will here not take a moralistic position, and it is not my task and profession to give advice in economic policy. My intention is to improve the basics in economic research and education. Thus, I will show ways to develop an explicative theory with semi-normative properties.

The breakdown of socialism has indicated that policy based on an unrealistic picture of human beings will not work in the long run. The view that solidarity is the leading principle of behavior was just too simple. The market economies of the capitalistic type are in a similar risk, since they are also based on an **incomplete *model of man***.

B. The Phenomenon in Reality Faults of Economic Policy after the Introduction of the Market Economy in Eastern Germany

B.1. The fiasco of economic development in eastern Germany

Some figures on the economic state of eastern Germany may illustrate the situation. As ***Table 1*** shows, **production** in East Germany, excluding the construction sector, **decreased** in 1991 and 1992 to **only 70%** of its level in the second half of 1990. This downward trend is similar to that of seven other countries in Eastern Europe, while only Poland showed a small

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[1)] This paper was presented at the International Conference "Economy and Culture", Monash University, Melbourne, 1-3 October 1993. I thank *Gregor Brueggelambert*, *Christiane Goslar*, *Manfred Koenigstein*, and *Helga Tietz* for valuable suggestions and comments. A German translation of this paper is published as: "Vereinfachung und Komplexität – Das Dilemma der Wirtschaftstheorie", in: *Bernd Schiemenz* (ed.), Interaktion – Modellierung, Kommunikation und Lenkung in komplexen Organisationen, Berlin 1994, pp. 266-289.

Table 1: The Economic Development in Eastern Germany

			1991	1992	Change in % East	Change in % West
Production without construction (2nd half of 1990=100)			**72.0**	**68.1**	**-5.4**	**-1.2**
Dito construction sector			**98.9**	**129.3**	**+30.7**	**+7.1**
GNP (at 1991 prices)	DM bil.		**195.4**	**209.9**	**+7.4**	**+0.9**
Private consumption	DM bil.		**186.7**	**196.7**	**+5.4**	**+1.0**
Fixed capital formation	DM bil.		**82.9**	**102.9**	**+24.0**	**+1.5**
Export	DM bil.		**60.4**	**71.6**	**+18.5**	**+3.3**
Import	DM bil.		**223.5**	**252.5**	**+13.0**	**+5.2**
relation			*27.0%*	*28.4%*		
Foreign balance[1]	DM bil.		**-163.1**	**-180.8**		
Households' saving ratio			**6.4%**	**13.0%**		
Employed	Millions	**(8.9 in 1990)**	**7.2**	**6.3**	**-11.7**	**+0.8**
Unemployed	Thousands		**913**	**1170**	**+28.2**	**+7.0**
Unemployment quota[2]			**10.4%**	**14.8%**		
west			***5.7%***	***5.9%***		
Persons in job creation schemes, retraining, or early retirement	Thousands		**663**	**1393**	**+110.1**	
in % of dependent labor force			**7.6%**	**17.6%**		
Cost of living index (90/91=100)			**108.3**	**120.4**	**+11.1**	**+4.0**
Gross income per employee	TDM		**25.6**	**35.6**	**+39.0**	**+5.4**
Productivity	TDM		**25.9**	**31.4**	**+21.0**	
west	*TDM*		***89.4***	***90.2***		***+0.9***
relation			*29.0%*	*34.8%*		
Unit labor cost	DM		**0.99**	**1.13**	**+14.9**	
west	*DM*		***0.61***	***0.64***		***+4.9***
relation			*162%*	*177%*		

Source: Deutsche Bundesbank, Annual Report 1992, Monthly Report June, July 1993
(1) Balance of transactions in goods and services with the rest of the world including western Germany.
(2) Percentage of the dependent labor force.

increase in production between 1991 and 1992.[2)] In East Germany, only the construction sector had a 30 % higher production in 1992 compared to the 2nd half of 1990. In the meantime, there is a positive trend also in general production, whereas in the construction sector the growth rate is somewhat reduced.

There were positive trends, from 1991 to 1992, in the real gross national product, private consumption, investment (fixed capital formation), export, and import. All growth rates were distinctly higher than in West Germany. But the export amounts to 28 % of the import only, since both figures include the transactions with West-Germany. The **foreign balance** is negative and shows a **deficit** of 181 billion DM in 1992.

The reduction of production was accompanied by a dramatic **slump in employment**, which dropped from 8.9 millions in 1990 to 6.3 millions in 1992. In that year there were 1.2 million or 14.8% unemployed, three times the unemployment rate of western Germany. If we consider also **hidden unemployment** by counting persons undergoing vocational further training, persons participating in job creation schemes, and recipients of transitional benefits for early retirement, we get another 1.4 million unemployed, an additional rate of 17.6 %. In total this amounts 32.4 % unemployment of the dependent labor force.[3)] The German Sachverstaendigenrat (board of advisors) arrives even at 37 % of open and hidden unemployment.[4)] This unemployment total increased during the last year by more than 60%. A big social problem! However, the number of self-employed persons increased from 317 Thousand in 1989 to 580 Thousands in 1992.

One of the main reasons for the strong reduction in employment is seen in the high increase in wages in relation to productivity. In both years the **wages increased** by about 40 % each. The **productivity**, i.e. the gross domestic product (GDP) per employed person at 1991 prices, increased by 21%; nevertheless, with 31,400 DM it was only one third of the western level of 90,200 DM. Thus, the unit labor cost still increased to 1.13 DM; this is 77 % higher than in West Germany (0.64 DM).

An analysis of the Deutsche Bundesbank shows the impact of the cost situation based on the balance sheets of 863 East-German enterprises. The **profit ratio** in percent of the turnover was **negative**, namely -10.3% in 1990 and -13.7% in 1991.[5)]

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2) *Kane, Sara*, Reforming Centrally Planned Economies. What Have We Learned?, IMF Survey August 9, 1993. pp. 241,247-251, here 241.

3) These percentages may be somewhat too high, since not all components of hidden unemployment are counted in the shrinking value of the dependent labor force, used as denominator. On the other hand, the mentioned figures of hidden unemployment do not comprise all relevant persons.

4) *Sachverstaendigenrat zur Begutachtung der gesamtwirtschaftlichen Entwicklung* 1992, Fuer Wachstums-orientierung - Gegen laehmenden Verteilungsstreit, Jahresgutachten 1992/93, Stuttgart, p. 121. For similar estimates cf. *Hankel* 1993, p.69ff.

5) *Deutsche Bundesbank*, Monthly Report, July 1993, p. 33.

B.2. Possible reasons for these difficulties

Many reasons for the economic problems in East Germany are discussed at the moment.[6] I will mention some of them without arguing personally here for one or the other.

- The official **conversion rate** of DDR-Mark in D-Mark on the 1st of July 1990 was too high.
- Private money is used for **private consumption** of western products rather than for investment in eastern industry.
- **Wage increases** were too high and were not related to the productivity. This means "redistribution" without the designation of the payers, i.e. the whole society. Labor has become more expensive compared to that in other countries. The **cost** is **too high** for East Germany to be an attractive location for new capital.
- The **end of the armament race** reduces dramatically the demand for arms and primary products and calls for a structural change of industry.
- A sudden shock treatment ("**Big Bang**") instead of a smooth transformation with an amalgamation of old and new.[7]
- The adaptation of the production process to the changed **labor-capital-factor-price-proportion** needs time under the realistic assumption of a **putty-clay-production-function**. By the same reason, the adaptation of the production structure to changed selling prices from DDR- and CMEA-proportions to world-market proportions needs time.[8]
- The process of economic adaptation was not accompanied by sufficient **tax reductions** or **subventions** during a transition phase.[9] This was the usual practice to ease structural changes in West Germany in the past, e.g. in coal and steel industry, shipyards, or agriculture.
- Abolition of the old centralized "distribution" organization and recommendation of the "market" without establishing new **marketing organizations** for the production plants.

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6) cf. e.g. *Sinn* and *Sinn* 1992, *Hankel* 1993.

7) On this problem, cf. *Schneider* 1992, Tempo und Schrittfolge des Tranformationsprozesses, and the second paper (Korreferat) of *Norbert Kloten*, in: *Gahlen, Hesse*, and *Ramser*, 1992, p. 3-35.

8) *Sinn*/*Sinn* 1992, p.237-240. CMEA stand for "Council for Mutual Economic Assistance" = "Rat fuer gegenseitige Wirtschaftshilfe" (RGW).

9) On the proposal of wage subventions, *cf. Forschungsinstitut der Friedrich-Ebert-Stiftung* 1992, Finanzierung der deutschen Einheit.

- The **ban on former owners** of firms and land with their historical bindings and home instinct. Thus, some highly motivated people are prevented from working for the industrial rehabilitation of East Germany, persons who had no connection with the old centrally planned system.

- Instead, many leading positions in management and administration are in the same hands as before ("**old rope teams**" and "**management buyout**"). Thus, the adaptation to the leading ideas of democracy and social market economy is retarded and hindered.

- The undermining of the **constitutional basic right of property** by expropriation without the rules of compensation which are still unsettled although they have been imperatively prescribed for so long by the German constitution. The trust of potential investors in a country is based mainly on the guarantee of the property rights.

- Official payment of high **premiums**, up to 80 000 DM, to "Treuhand"-managers for accomplished **privatisation** plans.[10)] The coincidence of public and private interests is not guaranteed by this procedure. The abilities of the investors were not always inspected carefully enough to prevent unsuccessful privatisations.

- The sole orientation of the **"Treuhand"** and their inexperienced **young employees** to the "**profit**" of the individual, isolated firm without regard for indirect effects. Too many firms have been closed for this reason.

- Disregard of macroeconomic, interindustry, regional, or social **interdependencies**.

- **Devaluation** of real and **human capital**. The tendency not only to declare old factories and machines as worthless, but also to consider old employees, the human capital, as not retrainable for the new economic system, means that economic and social recovery has to wait for the next, a better "suitable" generation.

C. Shortcomings of Economic Science

Many of these real-world aspects may be due to deficiencies of economic science. The reproach that the economists in West Germany failed to prepare for the day X must be rejected. After the Cold War, in the **era of Coexistence**, nobody expected that such a sudden collapse of the Communist system could occur. That the name of the "Ministry for **All-German Affairs**" (gesamtdeutsche Fragen) was changed by Willy Brandt to "Ministry for **Inter-German Relations**" (innerdeutsche Beziehungen) in 1969 demonstrates that people and politicians had accepted the division of Germany. Thus, it is no wonder that nothing was prepared in advance for the economic and political reunification.

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10) *N. N.*, Treuhand, Chaos und ein böses Erbe, Der Spiegel 28, 1993, p.87.

My task here is to show that there is a general dilemma of economic theory, as in many other sciences, which may be characterized by the tension between ***simplification*** **and** ***complexity***. In order to arrive at presentable theories, the scientist must simplify complexity of the real world. But this process of simplification implies the risk that decisions may be based on a rudimentary picture of the world which may be faulty just in important relations that are actually relevant. Such an incomplete theory cannot be used for explicative and prescriptive purposes in unusual and new situations.

First, I will discuss the general influence of social and especially economic science on real-world behavior. Then we will look to some special aspects of simplification in economics and at their consequences.

C.1. Influences of economic science on society

During five years of studies students listen to professors for about 2000 hours. The explanations given for the real world influence the thinking of students even where professors take positivistic positions that are as clean as possible. "**Gutta cavat lapidem non vi sed saepe cadendo**.", as *Ovid* says. ("Steter Tropfen hoehlt den Stein." "Continual dripping wears of the rock." "The drop cuts into the rock not by power but by continual dripping.")

If there is an influence of teaching on the thinking and behavior of students, we can conclude that the teaching of economics has also an influence on the thinking and behavior of the whole society. The **predominance of teaching many** students, especially in business administration in Germany, only with a view to a later practical profession instead of preparing them to do research may be one reason for the preference of presenting only simple theories. But this strategy is myopic.

Simplified thinking of yesterday's students has led to simplified thinking of managers, politicians, and journalists of today. Then, the decision making of managers is based on a simplified picture of the world, at least as long as they are inexperienced in economic reality. The same is true for politicians, who have less often than managers the opportunity to get experience in the real economic world by their own economic success and failure. Many journalists also report on economic problems from a simplified viewpoint and influence many others through their medium. Economics and other social sciences have a major **influence on the object of their own investigation**, the economy and the culture of the society.

The simplification is the stronger the more crowded the university is. The situation in business administration in Germany: Professors have in their lectures 800 and more students who have to pass written examinations. Also the so called "tutorial groups" have 50 to 100 participants.

The economic theory presented by teaching is the more simplified the more the research also is still in a phase where models of the economic world are relatively simple. Thus, we have to ask, which consequences certain types of simplification in research may have.

C.2. Simplifying causality in order to escape cognitive conflicts

Many types of behavior may be explained by the psychological "... theory of **cognitive consistency**. At the most abstract level this means that persons are uncomfortable in maintaining two seemingly contradictory ideas."[11] The theory of **cognitive dissonance** was first developed by *Festinger* (1957). The scientist himself is subject to psychological rules. Thus, he also tries to avoid cognitive dissonances in his scientific thinking. The real world can be seen as a network of causal relation. The scientist **simplifies these networks by repressing complex connections**. Thereby he escapes cognitive conflicts.[12]

In the context of an oligopoly experiment ***Selten***[13] has shown in which different ways contradictory chains of **causal diagrams** are eliminated to reach **structural balance** in the sense of ***Abelson*** and ***Rosenberg***[14].

To convince others one has to exclude any doubts on the clearness of a theory and to avoid the rise of cognitive conflicts in the addressed partner. Therefore, additional simplification is needed. Only linear chains of verbal argumentation - **without "ifs and buts**" - are easy to understand and **convincing**.

C.3. The simplified structure

Presenting economic relations solely **"graphically"** and **"verbally**" is often very simplifying. Graphical presentation of a mathematical function is normally limited to not more than three variables. This makes it difficult to represent relations that are more complex.

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11) *Akerlof* and *Dickens* 1982: "At the most abstract level" ... the theory of cognitive consistency..."means that persons are uncomfortable in maintaining two seemingly contradictory ideas." p. 308. "Among other applications, persons who have made decisions tend to discard information that would suggest such decisions are in error because the cognition that the decision might be in error is in conflict with the cognition that ego is a smart person." p. 308f.

12) Cf. *Tietz* 1992a, p.303-305. On the relation between simplicity and cognitive consistency, cf. *Schlicht* 1984.

13) *Selten* 1967, p. 89-96.

14) *Abelson* and *Rosenberg* 1958.

Without mathematical generalization the application of this type of theory is restricted to very simple situations where only **few variables** are important. One thinks e.g. of the application of a production function with only two factors to a firm where more factors are relevant.

Preferring **partial analysis over total analysis** is done at the risk of **disregarding interdependencies** and **retroactions**. The incomplete structure may, e.g., not show the consequences of free-riding. More complex problems are then discussed verbally **outside the model** and without formal control of the consistency of the - sometimes dialectical - argumentation.

To avoid simplification, **complex models** must be stored in **formal structures**. This affords then the possibility of either **evoking cognitive conflicts** again and again by reflecting on all the influences that may be effective **or** of solving them by using the formal model. Which causal chains in the actual case are most important and predominant depends on the situation.

In simplified models **regional** aspects are disregarded. Thus, regional relations between firms and the surrounding area, direct and indirect via the employees, are neglected. Closing one firm which employs a large part of the work force of a region may not only quantitatively but also qualitatively have a greater total effect on the whole region than the direct effect of redundant workers of that firm just indicates. Because of lowered incomes consumer demands are reduced, and this in turn cumulates together with the reduction of demand for services by firms in that region. The economic power of the region is dramatically changed.

Likewise, the **Input-Output relations** between industries, branches, or sectors are often neglected in simplified models. Closing one firm in an Input-Output chain influences more or less all other industries which are directly or indirectly suppliers or buyers.

C.4. The simplified time dimension

In the predominant usual **static** and **comparative-static** analysis the dimension of time is disregarded. In this scenario reactions take place with infinite speed, and the system moves from one equilibrium to the other immediately. Nothing is said where the system is in the meantime and how much time would be needed to reach the new equilibrium. But in reality, reactions need time. In the intermediate state - characterized e.g. by high unemployment - the development may lead to economic behavior different from that near the equilibria, especially if non-economic influences come into play. High unemployment is not only a figure, but an enormous social problem and political dynamite!

Since **dynamic models** are more difficult to analyze and to solve than static models, they are not very often used in economics. The **models** are **adapted** to the **solution concepts**. The development of construction principles for dynamic systems could help to overcome this deficit. Dimensional analysis is such a tool.[15)] Dynamic **cybernetic systems** consist of networks with **positive *and* negative feedbacks** and **control circuits**. In such systems one can include reaction patterns which depend on the special situation. Such cybernetic models are found rarely. They do not attract much attention, because they seem to be too specific. Only simplified theories can claim generality. As a consequence, thinking in positive and negative intensifiers and feedbacks is not trained.

C.5. The simplified statistical dimension

There is another failure based on the conventional statistical view of economic events: *The underlying relations are represented by the **average** or the **expected value**. Deviations from it are interpreted only as **disturbances** by some **random** numbers with a certain distribution.* Therefore, the econometric procedures can only reflect phenomena which happen **frequently**. Also the postulate that empirical findings have to be statistically significant takes only frequently observed phenomena into account.

Seldom and extreme events which lead to reversing effects are ignored. Thus, usual empirical models have relevance only in the near **neighborhood** of the **old realizations**. They should be complemented by theoretically derived and only seldom observed reactions to extreme events.

Extreme values are very important for the reaction in cybernetic systems. If a signal-variable has reached an extreme limit, reactions are released to move the system in the opposite direction. A thermostat in a heating system works in this way. The limits can be seldom observed, but from the information about the average temperature we are not able to make a model of this self-regulating system. We need in addition the whole distribution or at least the extreme values.

Modelling the reaction to extreme values is also important for the semi-normative properties of descriptive theories which are used for prescriptive purposes, a point we will discuss later.

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15) *Tietz* 1973, p. 55-91.

C.6. The simplified model of man, the homo oeconomicus

Possibly the most important influence on thinking and behavior may come from the individualistic approach of utility or profit maximization. "The *'homo oeconomicus'* of contemporary economics is the *'homo rationalis'*", as *Hausman* and *McPherson* (1993)[16] mean. The maximization approach may be traced back to the Theodizee of *Leibniz* (1710). He introduced the infinitesimal calculus to justify God by the proof that the existing world is the best of all possible worlds.[17]

If this model of man is not used as a descriptive model, but only in a prescriptive-normative sense, employing in it also influences the **picture** of the **economic world** and the **behavior** within it. If the short-run profit maximization does not lead to a positive profit, the firm has to be closed. No other goals and obligations are seen. By subsuming many goals under utility, the model is immunized against any falsification, and it loses explanatory power if each realization is interpreted as optimal.

In the game theoretic paradigm of the **prisoner's dilemma**, as shown in **Table 2**, the individualistic maximization results in an equilibrium, where no other isolated action leads to a higher payoff. But a cooperation can give higher and pareto-optimal results to both. The short-run maximization rule induces to "defect" from cooperation, which - with the payoff of 2 $ for each - is better than the equilibrium payoff (1, 1) for both in the long run. To reach the more efficient solution, trust and rules of cooperation have to be established to withstand the temptation to gain 1 $ more by defection, so long as the other one plays the cooperative strategy.

Table 2: The Prisoner's Dilemma Game[18]

		Player 2	
		cooperation	defection
Player 1	cooperation	2, 2	0, 3
	defection	3, 0	1, 1

16) *Hausman* and *McPherson* 1993, p.688. *Simon*, Homo rationalis, 1993.

17) *Koslowski* 1991, p. 22, who relates this meaning to *Leibniz*, Die Theodizee, (1710), § 201 and §242. .

18) The left numbers are the payoffs of player 1, the right ones that of player 2.

The rules or norms of behavior may be established externally by the group or society or internally by the subject itself. The position of *Durkheim* (1893) that rational egoistic behavior destroys the norms which capitalism needs to work and that therefore also internal moral norms are still needed, could follow from this dilemma.[19] In an evolutionary simulation study *Schuessler* (1991) could at least show that in the prisoner's dilemma situation under certain conditions a special strategy of "egoistic cooperation" may be a superior strategy.[20]

Thus, the model of the homo oeconomicus may be used to investigate institutions, to see if they are stable against defective behavior in the sense of the prisoner's dilemma game. This "homo-oeconomicus test" is needed to ensure that the institution in question is organized in such a way that moral (or cooperative) behavior is not permanently exploited; this means that the permanent advantage of defective behavior must be small enough to keep from spreading over the whole society and eroding the institution.[21] In order to analyze whether a "**magic formula**" of economic policy is resistant against **free riders**, the model must be sufficiently complex to take interdependencies, also those of the long-run kind, into account.

The rule: "Put less in the system and earn more!" is based on the thinking only the others would pay. If all people think in this way, there are no others. Everybody has to pay and additionally also the cost of redistribution.

We must see that the approach of the maximizing homo oeconomicus works only under certain conditions. First, **non-economic aspects** are left out. They are seen as unimportant and difficult to quantify. Second, **simple decision situations** are needed which can be handled analytically. More complex situations are hard to analyze. Thus, this approach intensifies the tendency of simplification. This can lead to severe consequences, as we have seen in our discussion of economic problems in unified Germany.

There is some discussion of the growing importance of the "**imperialism of economics**" in other sciences.[22] The "economic approach to human behavior" in the sense of *Garry S. Becker*[23] is more or less "successfully" applied to topics as, e.g., family, marriage, or crime. This is due to the analytical stringency of this approach, which under simple conditions delivers a unique solution.

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19) *Schuessler* 1991, p. 94ff.
20) *Schuessler* 1991, p. 105. Cf. also *Schuessler* 1989.
21) *Homann* and *Blome-Drees* 1992, 95f.
22) *Radnitzky* and *Bernholz* 1987, cf. also *Held* 1991, p. 10.
23) *Becker* 1976.

But there are also **re-imports** from the neighboring disciplines to economics. The attempts to develop a theory of bounded rationality in the sense of *Simon* (1957) are influenced at least by psychology. This model of man takes into account that human beings have **restricted perceptional**, **cognitive**, and **intellectual capacities**.[24] Under these conditions the maximization principle is not applicable, since the **internal mental model** of the world is not in a form which is useful for this type of computation. Bounded rationality calls for other principles of behavior. The decision maker analyzes the situation in a discrete, classifying way and searches for a decision which leads to **satisfying** results.

On the basis of aspiration levels the decision maker judges whether the solution seems to be satisfying or not. If the outcome does not satisfy his aspiration level, he either has to search further for another solution **or** to adapt his aspiration level downwards. The aspiration level takes not only decision makers own personal preference into account, but it also depends on the attainability. In interdependent decision situations such as the prisoner's dilemma or in bargaining the attainability depends on the aspirations of the other players. It is boundedly rational to prepare for such decision situations by reducing the complexity of the situation. This **complexity reduction** can be attained by establishing an **aspiration grid** of potential aspiration levels. Such an aspiration grid consists of few values, which are prominent in the sense of *Schelling*[25]. The aspiration grid gives structure to the decision space and allows for well-planned actual decisions.

Under the rules of bounded rationality the computation of goal maximum in complex situations is hindered. A behavioral theory has to explain in which way the **decision maker reduces** the **complexity** of the perceived situation. Not the scientist has to simplify the situation, but he has to show how the decision maker simplifies the situation in order come to decisions with simple rules.

C.7. The consequences of simplification for the moral

Besides their thinking, teaching economics may also influence the moral positions of students. This was discussed recently in the Journal of Economic Perspectives[26] and in The Economist[27]. The question was whether "studying economics inhibits cooperation". On the one side, in accordance with the results of *Kahneman, Knetsch,* and *Thaler* (1986), *Carter* and *Irons* (1991) observed that the behavior of economists in ultimatum bargaining games is more

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[24] cf. *Tietz* 1992a, p. 298f.

[25] *Schelling* 1960, pp. 53-80.

[26] *Frank* et al. 1993.

[27] *N. N.*, How do you mean "fair"?, The Economist, Vol 327, No. 7813, 1993, p.71. Cf. also: *N. N.*, Aktion Gemeinsinn: Sind Wirtschaftswissenschaftler, wie eine US-Studie behauptet, besonders raffgierig und ruchlos, Der Spiegel 37/1993, p. 230.

along the rational/self-interest model of economics than that of non-economists. They conclude that the differences are more due to the self-selection than to learning economics.

On the other hand, *Frank*, *Gilovich*, and *Regan* (1993) report that besides this self-selection bias there is also an influence of teaching. In a **prisoner's dilemma experiment** the defection rate of economists is reduced only from 74 % (freshmen) to 70 % (sophomores). In contrast, the defection rate of noneconomic freshmen is only 54 % and is reduced even to 40 % in sophomores. The increasing cooperativeness with "movement toward graduation"[28] can not be observed for students of economics.

Table 3: Defection rates in Prisoner's Dilemma Game

	non-economic	economic
freshman	53.7%	73.7%
sophomores	40.2%	70.0%

The same authors made in addition an "honesty survey" by questioning whether, e.g., they would return a "lost envelope containing $100 and bearing the owner's name and address"[29]. The results are reported in the percentage of answers which could be classified as "less honest" compared to the same question asked four months earlier in the same class. Whereas in the control group, a course in astronomy, the proportion increased only by about 10%, the increase in a microeconomic course was larger than 25%. The less honest answers increased even to 29% in the case where the instructor was "a mainstream economist with research interests in industrial organization and game theory"[30]. The results for other related questions are similar. The authors conclude that **self-interested** and **cynical thinking** and behavior is not only more frequent in students of economics than in others; it is in addition relatively increased by training in economics especially by an instructor interested in topics, such as game theory, which are based on strict rationality. At least, the bias based on the self-selection is **enforced** by **economic training**.

The constant dealing with the simplified picture of the economic man, who maximizes only his own utility function, leads to a behavior which neglects the psychological and social dimensions of human beings.

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[28]) *Frank* et. al. 1993, p. 168.
[29]) *Frank* et. al. 1993, p. 168.
[30]) *Frank* et. al. 1993, p. 168.

By the change to a **materialistic** society **rationalistic** arguments gain more and more importance. The old norms based on religion have lost their importance. Besides individualistic orientation the modern society needs not only external but also internal global norms based on solidarity or something like that. Norms are useful for handling the complexity of the real world.

D. The Postulate of Semi-normative Properties

The discussed causal, structural, and statistical aspects of simplification and their faults are the main reasons for my emphasis on **semi-normative properties** of descriptive theories based on empirical research. These semi-normative properties are important when the theory gives the basis for prescriptions of policies, e.g. to firms or government.[31)]

First, let us summarize the effects of simplification. Counterforces are eliminated as linear causal chains are formed. Interdependencies are disregarded in structural simplification. Extreme values are neglected by averaging. In the resulting theory the first derivative of the goal variable with respect to an instrument variable has always the same sign. This type of a "**the-more-the-better-theory**" may be seen as **incomplete**. All three neglected aspects are important for the suitability of a theory for prescription, especially in drastically changed or new situations. This may lead to unsuccessful recommendations, since the predicted outcome will not result.

Taking into account countervailing forces and interdependencies is often prerequisite for the existence of moderate **strategic equilibria**. If these influences are regarded in a theory, the reaction of the goal variable on variation of a strategic variable should be limited from above and concave. This **non-monotonicity** ensures that extreme, very aggressive behavior leads to lower payoffs than moderate **aggressiveness**. By such a type of partial payoff-functions the existence of inner strategic equilibria is facilitated. I have discussed the semi-normative properties elsewhere.[32)] I use here the term ***normative*** in a strong sense only if recommendation can be given ***publicly*** and ***conformably*** with the theory in question. Otherwise the theory becomes a self-defeating or self-destroying prophecy. Semi-normativity is seen as a weaker approximative concept which is applicable to empirical theories.

The German economic policy in the seventies was based on the maxim - "**Better 5 % inflation than 5 % unemployment!**" - derived from the theory of the monotonic Philips curve. This policy resulted in both high inflation and in high unemployment at the same time.

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31) *Tietz* 1992a. On the term semi-normative cf. also *Klopstech* and *Selten* 1984, p. 31.

32) *Tietz* 1992a, p.306.

The explicative incompleteness of this theory in particular did not allow for public and theory-deviating recommendations.[33)]

E. Complex Experiments Explorative Research in Frankfurt

Before we discuss the general directions in which - I think - economics should go, I will speak of my own strategy which I have followed in the field of bargaining experiments.[34)]

My experimental research in Frankfurt was based on the **aspiration level approach**, which may be traced back - via *Sauermann* and *Selten* - to *Lewin* et al. (1944)[35)]. The basic idea was that decision makers prepare for decisions such as bargaining by establishing a grid of potential aspiration levels. As already mentioned, this **aspiration grid** is an instrument to simplify the complex situation. Aspiration grids evaluate and reflect both the **favorability** and the **attainability** of possible outcomes. Unlike the constraints in the traditional theory of maximizing a goal function the attainability is not objectively given; it is the subjective reflection on what is realizable by one's own means while also considering the interests of others.

To find the way in which decision makers perform the process of simplification, we must provide **complex environment** also in an experimental situation. I constructed a dynamic macroeconomic **computer model** of a closed economy, named KRESKO, in which the coordinations of the individual decisions were simulated by cybernetic processes of mutual adaptation of aspiration levels. The embodied endogenous technical progress allowed a development on a growth path overlapped by business cycles.[36)]

The experiment lasted over three months. The subjects obtained information on about 300 variables per period. To understand how subjects **reduce** this **experimental complexity** by simplification we used the ***"planning report method"***. Prior to their decision making, subjects were asked to state their **expectations** and **aspiration levels** on a form. The essential task of two subjects was to bargain in the roles of **employers' association** and **labor union** on variables of the **labor market**, such as standard working hours, standard wage rate, and periods of notice for employment contracts. A third player in the role of the **central bank**, had to decide on ten variables of monetary policy and act as a mediator in the labor market negotiation.[37)]

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33) *Tietz* 1990, p.662f.

34) An overview on this experimental research is given in: *Tietz* 1990.

35) *Sauermann* and *Selten* 1962; *Lewin* et al. 1944.

36) *Tietz* 1973.

37) *Tietz* 1972, *Weber* and *Tietz* 1978.

On the basis of the collected data we developed by extensive research[38] the *"**dynamic aspiration balance theory**"*.[39] This theory describes the process of negotiation in all details and is based on boundedly rational principles of behavior. Simple criteria or ***decision filters*** classify the actual bargaining situation. They are oriented to prominent figures, taking a threshold of perceptibility into account. Such a filter answers with "yes", "no" or "indeterminate". The whole decision process has a hierarchic structure. The empirical problem is not to estimate the best-fitting **parameters** but to find the best-fitting **structure** of the process.

The construction of the behavioral model follows the ***filter principle*** by which similar decision criteria are combined and evaluated. The ***aspiration securing principle*** modifies the simpler *principle of alternating concessions*. It takes into account the aspiration levels secured by the opponent's offer and ensures a balanced situation at an early phase of negotiation.

The aspiration securing principle is a dynamic fairness principle which leads to an agreement that is in accordance with the more static **fairness** principle of ***balancing aspiration levels***. Both principles help to overcome the complexity and the conflict of interests of the underlying bargaining situation by internal norms of fairness.

The size of the concessions is regulated by the ***strength principle*** derived from the discrepancy or coincidence of *decision filters*. For some details of this principle only very **few observations** of **extreme** situations were available. The strength principle was introduced also by theoretical reasons, since it explains why extreme demands do not pay and may have disadvantages. As mentioned above, the observation of extreme events is essential to reach the **non-monotonicity** of a model, the important semi-normative property.[40] Thus, rare events should not be neglected if one is interested in models which are suitable for **prescriptions** and policy advice.

The macroeconomic model was also used in seminars for **teaching** only. Dealing with the complex dynamic model based on nonlinear functions by forming expectations and by making decisions in the fields of labor market and monetary policy, the students **learned** to **think** in more **complex** structures. They learned especially that reactions on policy decisions are delayed and that the transition from one situation to another needs time to become conspicuous. To become aware of the forces and counterforces which have impact in the short and in the long run, each student had to **construct** a **qualitative model** of the underlying

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38) Cf. e.g. *Tietz* and *Weber* 1972, *Tietz* 1975.

39) *Tietz* 1976, cf. also *Weber* 1976, *Tietz* and *Weber* 1978.

40) *Tietz* et. al. 1988, *Tietz* 1991, 1992a.

economy in the form of a **netted causal diagram**. The advantage of using a fictitious economy instead of a real one lies in the fact that the students do not had the possibility of reproducing only the opinions of others, e.g. newspapers or government, about the economic situation; they had to analyze the data by themselves. In addition, they had the possibility of checking their own predictions and decisions by the simulated data of the next periods.

F. Summary Ways to Improve the Situation in Economics

We have seen in which way simplification in economic science may influence the society. We have to ask in which direction **basic research in economics** should be intensified. I think it would pay to give more money to universities for basic research in economics, since it promises high returns through its large multiplicative effects.

At the moment, many people in Germany argue for **shortening** the **duration** of **studies** in economics. I think at least as important is a **deepening** of studies by an early integration of qualified students into economic research projects. **Experimental Economics** is a field where this integration gives advantages to all.

The following directions of research should be intensified in order that the gap between complexity and simplification, between reality and theory may be reduced:

- **More** theoretical and quantitative **research** on **complex system**s!
- Investigation of **dynamic cybernetic systems**, in which equilibria are not singular points but ranges in which the system can move without global instability. We must know more about the network of forces and counterforces which result in **homeostasis**.[41)]
- Taking into account the fact that humans can behave in complex situations only in a **boundedly rational** way, we have to show by which procedures decision makers produce **simplified inner models** of the complex reality. I am looking forward to the lecture of *Alex Wearing* tomorrow.[42)] I hope we will learn more about qualitative models and the thinking in causal networks with counteracting forces.
- The **cooperation** of **psychologists** and **economists** in the fields of **Economic Psychology** and ***Experimental Economics*** is a fruitful basis for overcoming the mentioned deficiencies.

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41) cf. e.g. *Schuetz* 1990, pp. 146f.

42) *Wearing* 1993.

- The theories resulting from empirical research have not only to be tested for their **statistical significance** and judged by their descriptive and explicative qualities. They have also to be investigated for their **prescriptive qualities** for policy advice.

- The discussion on **semi-normative** properties of descriptive theories of boundedly rational behavior is just starting. The **non-monotonicity** postulate is such an important property, which facilitates the existence of dynamic equilibria ranges. [43)]

- In a realistic theory of the boundedly rational economic man, we have to explain to which fields attention and search activities are temporarily oriented. The three aspiration-oriented equilibria, concerning **decisions, rules, and interpersonal relations,** are first steps in this direction. An equilibrium in this sense is a situation where the actual aspiration level is satisfied. If this is not the case, either search for "better" decisions, rules, or partners is initiated or the aspiration level is adapted downwards.[44)]

- Cognitive processes, too, are selective. Experiments have shown that forming evaluations and expectations may be influenced not only by experience but also by the method of planning. The notion of the ***planning spiral*** takes these phenomena into account.[45)]

- The equilibrium idea takes as subjective dimension only the favorability into account. Under bounded rationality we need also a subjectively oriented efficiency concept which reflects the overall attainability dimension. Efficiency is not objectively given, but it is a question of cognition. I think, that the cognitive concept of ***aspiration efficiency*** is suitable. A situation is seen as aspiration efficient by a person, if he sees no possibility that he or any other person could reach a higher aspiration level without reducing the aspiration levels of others. Non-efficient situations may be improved by search activities for decisions, partners, collective external and internal rules or norms. A situation may be perceived as aspiration efficient by negation of relations, i.e. by simplification. Similar as aspiration equilibria an aspiration efficient situation can also be reached by downward adaptation of aspiration levels. In a non-efficient situation the possibility of an improvement for one-self or others is seen. This is independent of the question whether these improvements are reachable actually. The improvement is still latent. This concept may explain why subjects cooperate and establish external or internal norms of behavior, or do not.

- The conversation between **economists** and **moral philosophers** should be renewed.[46)] Ethics in economics is a growing field of research and may help to overcome the mechanistic view of the economic man.

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43) *Tietz* et. al. 1988, *Tietz* 1991, 1992a.
44) *Tietz* 1991, 1992a.
45) *Tietz* 1992b.
46) *Hausman* and *McPherson* 1993, p. 273.

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