

1. Key factors (cheap and universally available inputs),
2. Carrier branches (sectors or industries producing new or improved goods and services with the help of these inputs),
3. Organizational innovations needed to diffuse the new goods and services, which Perez calls “new technological styles” or “new techno-economic paradigms”,
4. The possibility of “mismatch” between technological opportunities and institutional requirements and conflicts about the design of the “regulatory regime”.

The authors associate this dynamic with the alleged phenomenon of “long waves”, the discussion of which is an important part of the book. I am not going to discuss the various pros and cons of this approach here. Suffice it to say that they do not adhere to the argument that long “waves” needs to be verified by aggregate economic statistics (which arguably would be a challenging if at all possible task). Rather, what they focus on is the qualitative aspect, i.e., qualitative changes that take place in historical time. This, however, implies that one may suggest different schemes (periods) depending upon which qualitative features one choose. They note that there is a different way to look at this, one associated with the works of, among others, Chandler and von Tunzelmann (three industrial revolutions), but do not discuss the merits (or lack of such) of these alternative approaches in much detail.

This is a very good and important book that is must reading for anyone interested in evolutionary economics and/or the relationship between history and economics. In addition, you get a very well documented and argued interpretation of long run capitalist development from the industrial revolution to the present that will be a standard reference (and that probably will provoke a lot of discussion). However, and of no less importance, it is also provides a first rate contribution to the discussion of how evolutionary economics should (may) develop. For instance, it makes a number of important points on issues such as social and biological evolution, history and economics and system-thinking/applications that deserve a central place on the evolutionary agenda in the years to come.

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Rami Zwick and Amnon Rapoport (eds.): Experimental business research.
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Experimental business research is a fairly recent endeavor. A main promoter of this area of research is the Center for Experimental Business Research (cEBR) at the Business School of Hong Kong University of Science and Technology (HKUST). The center was founded in the fall of 1998 by the psychologist Rami Zwick, who organized a conference on the topic in the winter of 1999 with his former teacher, Amnon Rapoport. Both are the editors of the conference volume, *Experimental Business Research*.

“The impetus for the conference is to promote the use of experimental methods in business research, expand experimental methodology through research and teaching, and apply this methodology to solve practical problems faced by firms, corporations, and governmental agencies.” This statement by the editors in the preface reflects the book’s mission very well. Given that attempts in this direction are rather new, it is not surprising that the focus is on contributions in *basic experimental research*, and it remains to be seen how this research translates into *solving practical problems*.

The conference volume contains 16 papers (each in a chapter) organized in four parts. The contributions are not unified by their themes, but rather by the experimental methodology. As the editors point out, the book “presents work in progress rather than a state of the art summary, or a guide for future research.”

Experimental methods are not new in economics. Experiments are run for several reasons. Following Roth (1995, p. 22), one category is “Speaking to Theorists,” and includes experiments to test the predictions of well articulated formal theories and to observe unpredicted regularities in a controlled environment that allows these observations to be interpreted unambiguously in relationship to the theory. The results, it is hoped, will feed back into theory building. A second category, “Searching for Facts,” includes experiments on the effects of variables about which existing theory may have little to say. As facts begin to accumulate, “Searching for Meaning” becomes possible, as theories of the observed behavior can be proposed and tested. A third category, “Whispering Into the Ears of Princes,” involves experiments intended to manipulate and to test the conditions of regulatory or market settings with regard to practical applications. The point here is to help develop market designs or regulatory environments, for example for administrative agencies.

Most of the papers collected in the volume fall into the first two categories. Two notable exceptions are Chapters 7 and 10, which study auction mechanisms potentially relevant to real-life regulatory settings. Although included in the mission statement, only a few papers (e.g. Chapters 2, 13, 15) appear to deal directly with actual business problems, and often it is left to the readers to draw conclusions regarding such problems. This lack of focus on practical problems may explain why the book is not organized along the traditional categories in business research, e.g. accounting, marketing, management etc. and why the partition (Parts I – IV) seems somewhat arbitrary. Several chapters reflect on earlier experimental results (Chapters 8, 11, 15, 16), while two chapters concentrate on questions of experimental methods (Chapters 5 and 12).

Part I, “Coordination and Dynamic Decision Making,” contains six chapters. In **Chapter 1** Anderhub, Güth and Knust present a “*Saving Game*,” where experimental subjects undertake investment decisions in a complex and highly stochastic environment. Their analysis of the stability of investment attitudes shows that people in this experiment are neither completely risk loving or risk averse, but rather are capable of both. The authors conclude from their findings that individual risk attitude matters more for self-imposed risk than for the ways of coping with exogenously imposed risks.

The study of “Dynamic Decision Making in Marketing Channels” by Gupta, Steckel and Banerji in **Chapter 2** looks at decision problems in the “*Beer Game*,” in

which a retailer receives orders from customers and places orders with a wholesaler, who in turn places orders with a distributor, and the distributor with the factory. These upstream orders are parallel to the downstream delivery of goods. The task is to minimize cost while taking care of ordering and shipping delays, and being able to deliver on time. The authors find that participants fail to pay sufficient attention to the downstream supply line and that this is effected by the complexity, i.e., the length, of the chain. They also report that changes in customer demand cause channel members to make separate adjustments to their desired inventory levels, which amounts to a lack of coordination. In sum, the authors suggest that speeding up cycling time, and improving communication and coordination among channel members would help to improve their individual decisions.

Chapter 3 by McCabe, Rigdon and Smith presents a study of “Cooperation in Single Play Two-Person Games,” in which players are matched anonymously. As in many previous experiments of this type, the authors find more instances of cooperation than predicted by standard economic theory, and report the punishment of players who defect from the cooperative strategy. The authors conclude that reciprocity as a cooperative mechanism for increasing the gains from exchange depends crucially on the irrational propensity to punish cheaters.

The paper on “Coordination Without Common Knowledge or Outcome Information” by Rapoport, Seale and Parco in **Chapter 4** looks at a *non-cooperative game* in which players have to make a *binary decision* as to whether to enter a market or stay out. The authors find that experimental subjects are able to coordinate on Nash equilibria even in the absence of common knowledge about entry cost and without the opportunity to learn through feedback (as in their previous research where common knowledge was established and feedback information was given).

In **Chapter 5** “Behavioral Accounting Experiments in Market and Game Settings”, William Waller advocates “re-setting the setting” of behavioral accounting experiments to include markets and games in interactive ways. Whereas previous experiments of this type have restricted themselves to non-interactive settings, the author proposes to use interactive market and game settings to study the extent to which individual behavior matters in determining aggregate outcomes.

Chapter 6 by Zwick, Rapoport and King Chung Lo on “Behavioral Strategies in Repeated Pure Coordination Games” studies a *tacit coordination problem* in which experimental subjects have to choose among independent lotteries with endogenously determined probabilities. The dynamic analysis of choices shows that the subjects did not behave adaptively in the sense of traditional learning theories, nor did they behave randomly. The authors “conjecture that although other adaption processes might take place, in our task their contribution to explaining individual level behavior is negligible” (p. 160).

A total of four papers are gathered under the heading “Auctions” in **Part II**. Paul Brewer presents an experiment on “Externalities and Alternative Auction Rules for Access to Rail Networks” in **Chapter 7**. The aim is to create and to test a prototype auction-based mechanism for deregulating publicly owned railways. As in previous experiments of this type, it is shown that in incomplete markets *conflict externalities* (arising from potential crashes between trains or other violations of safety criteria) as well as *synergy externalities* (arising from an ability of trains to

exchange passengers, cargo etc.) are not being priced or traded among the agents, leading to inefficiencies. The author shows, however, that in a complete and properly structured mechanism, efficient allocation can be restored.

In their paper on “Equilibrium Bidding Strategies under the English and the Second-Price Auctions” (**Chapter 8**), Chew and Nishimura provide a theoretical basis for the revenue equivalence hypothesis between the two types of auctions as investigated in an earlier experiment. They *formally* show that the equilibrium revenue under the second-price auction does not exceed the corresponding equilibrium revenue under the English auction, and argue that this provides a theoretical rationale for the prevalence of English auctions over second-price auctions.

Chapter 9 contains a paper by Dickhaut, Smith, McCabe, Peck and Rajan on the “Psychological Anticipation and Endowment Effects” by analyzing “Inferred Brain Function in the Formation of Allocations in an English Auction.” The study uses physiological data in the form of heart rate and heart-rate variability to infer different emotional and cognitive effort levels in relation to the arrival of information in an experimental auction market. The authors report three fundamental findings. First, for the two participants remaining in the auction, heartbeats per unit time tend to reach a maximum prior to the second withdrawal, indicating *aphysiological anticipation* of that withdrawal. Second, there appears to be a physiological *habituation effect* in that participants’ maximum heart rate and cognitive effort levels become further removed from other participants’ withdrawals as they engage in more auctions. Third, there exists a physiological *endowment effect* between auctions that distinguishes the person who obtains the good (the winner) versus those for whom there is no change in endowment.

In their paper on a “Bilateral Greenhouse Gas Trading Experiment” (**Chapter 10**), Hizen and Saijo study the roles of information on contracted prices along with information on marginal abatement cost curves in an *emissions trading market* using a 2×2 design. The aim is to test alternative information conditions in the laboratory with regard to the design of real-life emissions trading markets following the Kyoto Protocol. The authors first find that the efficiency of bilateral trading is quite high, regardless of whether the two types of information are provided or not. They also find that, although marginal abatement costs are equalized over time, contracted prices did not converge to the competitive price, and that experimental subjects who had market power did not use it.

Part III comprises three papers on “Learning and Construction.” In **Chapter 11**, Camerer, Hsia and Ho test their “Experience-Weighted Attraction” (EWA) learning theory in “Bilateral Call Markets.” Taking the behavioral data of 32 previous experiments in such markets, the authors argue that *EWA learning* produces a generalized adaptive model of behavior that includes elements of other competing learning models (such as reinforcement and belief-based learning) as special cases. This view is somewhat contested by Haruvy and Erev, who comment “On the Application and Interpretation of Learning Models” in **Chapter 12**. They argue that the different and sometimes conflicting conclusions reached by different learning models and learning studies may merely reflect *different research constraints* derived from the distinct short-term research goals. The paper aims to clarify these “confusing constraints” in a two-dimensional classification involving time-horizon

in one dimension, and generality of parameters in the other. It is argued that when the “unrealistic and confusing assumption” of well-specified research models is removed, it may be easy to see that the apparent contradictions reflect different yet robust and potentially compatible findings.

In **Chapter 13** Kardes, Chandrashekaran and Kellaris present three experimental studies on “Preference Construction and Reconstruction.” While most commonly-used procedures to elicit and to analyze consumers’ preferences in developing marketing strategies assume preferences to be well-defined, articulated and stable, the authors find that *preferences are constructed in decision making and re-constructed from memory*, and that the stability of preferences may be illusory (to experimental subjects and theorists alike).

Finally, **Part IV** offers three papers dealing with “Bargaining and Contracts.” James Cox, in **Chapter 14**, analyzes “Trust, Reciprocity, and Other-Regarding Preferences” among groups vs. individuals and males vs. females. The aim of the study is to discriminate between the three mentioned factors as alternative explanations for the high levels of cooperation observed in earlier experiments. The author reports that *neither males nor females exhibited significant trust*, but both showed high levels of altruistic other-regarding preferences. Also, males exhibited significant positive reciprocity while females did not. In addition, groups turn out to be much less generous in giving than individuals.

In **Chapter 15**, Gächter and Falk in a paper on “Work Motivation, Institutions and Performance” study four remedies by which to overcome the problems inherent with incomplete labor contracts: voluntary cooperation, long-term contracts, social embeddedness, and incentive contracts. The results of four previous experiments (run by the authors and other researchers from Zürich University) show that reciprocal motivation can be a suitable contract enforcement device, and that repeated interaction strongly mitigates the contract enforcement problem. However, social approval incentives turned out to be rather weak, and incentive contracts “crowded out” reciprocity and lead to a high degree of opportunistic behavior.

The final paper on “Using Experimental Data to Model Bargaining Behavior in Ultimatum Games” by Lin and Sunder (**Chapter 16**) draws on the data of Slembeck’s earlier ultimatum bargaining experiment. The authors specify and test two global static models of proposer behavior without adding social arguments to the preference function. They find that their models dominate the predictions of the equal split (fairness) doctrine, as well as the subgame perfect equilibrium prediction on that data set.

Overall, the editors managed the difficult job of putting 16 rather heterogeneous papers between the covers of a book remarkably well. In view of business researches and practitioners in industry as a target group (as mentioned on the back cover), the volume may have benefitted from a general introduction into experimental methodology and the respective standards. With this group in mind, it may have been desirable to organize the book around the traditional topics of business research, begin each chapter with a business problem (as in Chapter 2) and conclude the chapter with results – and possibly with recommendations – that have a potential to be employed in business or regulatory context. From a researcher’s perspective, it is regrettable that not all papers presenting original results include

the original instructions as used in the experiments. Including instructions or making them available via the Internet should be a standard procedure when publishing experimental studies.

It is not the volume's goal to introduce experimental methods to readers unfamiliar with experimental economics. For this purpose other books (such as Friedman and Sunder, 1994; Kagel and Roth, 1995) are recommended. However, the present volume includes contributions by some of the leading experts in the field, including 2002 Nobel Laureate Vernon L. Smith. Thus, the well-crafted and very readable chapters can be recommended to all interested in current research results in a variety of subject areas. Chapters 11 and 12 on learning may be of special interest to evolutionary economists since they not only study experimental results but also discuss ways to analyze evolutionary processes at an individual level.

In addition to experimental methods, another feature common to all the papers is that they make strong use of games or game theoretic models. Thus, readers interested in how actual people behave in game settings in a controlled environment will find a wealth of new results that indeed have a potential to "speak to theorists." For those who want to learn more about games and human behavior, an earlier conference volume by Budescu, Erev and Zwick (1999) that contains contributions of several authors in the present book is strongly recommended.

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