

The Survival of the Fattest

Evolution of needs, lust and social value in a long-run perspective

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Introduction

As recent data on average weight of human individuals in OECD countries vividly documents the primary metabolism of human individuals, e.g. physical reproduction, already produces deteriorating results. The concept of *needs* in the sense of desires for primary reproduction necessities has to be re-conceptualized.

What has been substituted for the power of needs was the desire for *lust*: Consumers are offered objects for which they subjectively should develop a substitute of an objective need, namely lust to consume. While the former concept (needs) has a physiologically rather limited range of extension, the latter one enables an evolutionary expanding dynamic with no evident limitation in sight. It is this contradiction that inspired the question posed in the title of this paper. To formulate it less metaphorical: If the demand side of the evolutionary development of modern societies is concentrating more and more on the emergence of goods and services that are independent of the primary metabolism of humans, will there be a feedback on this primary metabolism that endangers its further processing?

In hindsight the history of economic thought can be interpreted as providing answers to this type of questions in the form of theories of *social values*. A common denominator of these theories – perhaps the smallest one – is the contention that a model of the mentioned contradiction has to incorporate a systemic valuation system. Activities of members of societies should be regulated by a superimposed and commonly understood mechanism. While early contributions favored control by a set of direct behavioral rules, a command list, authors since Adam Smith in one or the other way refer to indirect regulation of economic activity via price structures. Note that Smith's argument concerning 'private vices becoming public benefits' already related a non-metabolic motive, the lust for profit, with the metabolic notion of social welfare. Smith preaches this contradiction as moral philosophy. Karl Marx puts Smith's observation in historical perspective; the productivity increasing capitalist system will be a necessary but finite episode in human history. And he adds an important

dimension: The contradiction between private motives and welfare will work only temporarily and will produce another social contradiction, the one between exploiters and exploited. This new amendment explains the central role of Marx' labor theory of value as a regulation device for the emergence of new contradictions. After Marx two strands of economic theory stand out as cornerstones of theories of social value: Jevon's price theory¹ and Schumpeter's price-breakers theory. The former managed to establish itself as mainstream economics till today; the latter – in a self-referential way – seems to re-appear again and again as subversive swarming of theory innovators.

Expounding Schumpeter's vantage point, it is argued that price structures essentially are to be interpreted as frictional forces that limit innovation, indices of scarcity that constrain abundant new ideas and evolution in general. Indeed modern techniques in credit and finance have found numerous ways to circumvent scarcity management, implying the new contradiction between overheated boom and global financial crisis.

But – coming back to the original problem – such a process of evolution of demand dimensions - of creative destruction of consumer needs (i.e. fashions²) - driving and driven by layered debt relations is bound to imply *dramatically shrinking time horizons*. And as we just start to realize at several pivotal points of the social metabolic process (e.g. pension systems, renewable resources ...) the 'fattest' components already are pretty close to cause heart attacks. Future evolutionary economics not only will be concerned with the evolution of technology and social institutions, but will have to turn some attendance to the evolution of social needs and desires, i.e. how to transform primary metabolic necessities into non-fat lust.

The following sequence of structured propositions is meant to summarize the just mentioned line of arguments. Since the interdependence between them, as well as their embedded ness in most areas of economic theory is extremely high, only short and strong statements are presented. They evidently call for comment and are meant to provoke discussions. In a conclusion a possible future trajectory of economics will be sketched.

¹ Of course, Jevons' role in the emergence of the neo-classical paradigm is not as one-dimensional as this short remark suggests. See Mirowski's recent contribution for a broader picture [Mirowski, 2002, pp. 37- 46].

² See [Hanappi and Kump, 2002] for a chaos model of supply induced fashions that covers some of these aspects.

A structured synthesis of current problems of political economy

1. At least in all OECD countries the immediate needs for reproduction and growth of human individuals are not scarce goods. For the average individual the primary metabolism is well supported. *Needs* (in the narrowest sense) is not an immediate motive for economic activity.
 - 1.1. The overshooting of the primary metabolism is an *important* phenomenon.
 - 1.1.1. The relative abundance of food in the mentioned areas leads to obesity as a mass phenomenon.
 - 1.1.2. The development in OECD countries is the most important determinant for global economic development – and therefore worth this special investigation.
 - 1.1.3. Overshooting in the fulfillment of needs is a general biological feature demanding for general theoretical consideration.
 - 1.2. *Demand dynamics* are characterized by the *emergence of new dimensions of the utility* space that appear in a relatively short period if satisfaction in the old dimensions is overshooting.
 - 1.2.1. *Utility innovation* can be both, *forced* by unexpected interferences of overshooting old dimensions, or *emerging out of bored fatness* in the abundant old areas.
 - 1.2.2. There is a *trend* in emerging dimensions that leads away from individual physical needs towards socially mediated spiritual needs, call them *lust*.
 - 1.2.3. In a commodity producing society utility innovation remains *latent* as long as supply dynamics do not transform them into manifest demand³.
 - 1.3. *Supply dynamics* in capitalist, commodity producing societies are driven by the *chase for higher profits*. To achieve this goal the central economic activity of production units is *innovation*, which comes in two varieties: Innovation to reduce inputs per output unit in existing production dimensions, and innovations that open up new commodity dimensions.
 - 1.3.1. *Both innovation areas* are to be considered as the *historical mission* of the capitalist stage of commodity production. To reduce necessary labor inputs for the primary metabolism, i.e. to provide abundant life time, is as important as to transform latent utility dimensions into manifest lust capacities of individuals.

³ This point is taken from Schumpeter, see [Schumpeter, 1911 (1964)].

Both achievements are here (in OECD countries) to stay and to be dispersed and developed globally in all future societies.

- 1.3.2. The production units currently carrying out this historical mission, *capitalist firms*, are *rapidly becoming dysfunctional*. The major reasons for this development can be grouped into three categories: dysfunctional monetary macro-flows, inadequate perception capabilities, and re-unification of political and economic power systems.
 - 1.3.3. To cope with this more and more apparent inadequacy of capitalist firms *all involved classes* of societies have continuously *developed institutions*, that is a *meso-level of regulation*⁴ that - at least temporarily - *ensures the social metabolism*⁵.
- 1.4. *Market mechanisms* are special parts of rule systems that are implemented by institutions. They are an essential ingredient for *continuing growth oscillations*⁶ that *eventually* lead to an *eruptive break-through* into *new* technology and/or preference dimensions.
- 1.4.1. Each *specific mechanism* thus is to interpret as a *social compromise* that *regulates* how *excess supply and excess demand translate into changes in economic activities*.
 - 1.4.2. So-called *microeconomic entities* (firms and households) are *logically of the same order* as the *meso-level regulation systems* (institutions) that determine their interactions. Both types of elements interact in a temporal oscillation, i.e. there is political economy at work.
 - 1.4.3. *Overshooting*, that is dynamically exploding oscillations, is experienced as crisis, but is *the most critical ingredient for the evolution of the system*. Since satiation phenomena regularly emerge, a *certain re-occurring 'fatness'* of microeconomic units as well as institutions *cannot - and even should not - be avoided*.
2. In *commodity producing societies* the *simultaneous emergence of surplus* of one commodity *and scarcity* of another one constitutes the basis of its micro- and meso-economic functioning. Interaction between its only temporarily existing components is the driving force of a *permanently disequilibrated evolution*. For *any time interval* long enough to permit actual commodity exchange of a sufficiently large amount of commodity

⁴ See [Dopfer and Potts, 2004] for an account of the importance of the meso-level in economic theory.

⁵ The idea of a definition of institutions as regulators that temporarily can stabilize social contradictions is central to the French regulation school (compare [Boyer and Saillard, 1995]) and provides an interesting complement to the Marx-Schumpeter tradition.

⁶ See [Hanappi, 2003] for an account of the importance to formalize economic entities as oscillators, or pulsators.

types, the amounts exchanged allow for a *static ex-post evaluation* of the *relative social value* of these commodities.

2.1. *Relative social values* appear as heterogeneous *quantity relations*, which are *mirrored* in respective *money relations*. *Money*, its provision, its social acceptance, and its implications for property rights are *institutionally embedded*. The *evolution of money*⁷ thus follows and feeds back on a *society's institutional meso-level*.

2.1.1. Relative *social values* of commodities lead a *double life*: First they exist as relations of *actual exchanges in past periods*, and second they exist as action guiding data *inside the memories of microeconomic units and institutions*.

2.1.2. *Households perceive* (i) their *times* spent in production activities, (ii) the *money received* for these activities, (iii) the *money they spend* for commodities they buy, and (iv) the *disutility and utilities* derived from work and commodity use.

2.1.3. *Time* is an *essential feature in both domains: reality and perception of reality*. Physical periodicity in reality (e.g. years and days) implies a dating of concepts perceived, in particular of those that describe the physical metabolism of the carrier entity of this metabolism.

2.1.4. Time comes in the format of re-occurring time units that can be ordered by an observer by the means of *difference and similarity*. With this device of a *memory* current decisions can be based on an *observed past*.

2.1.5. Self-observation of a social entity reveals its perception of its *power*: How far is it *able to change* the environmental *conditions that limit its primary metabolism*, i.e. its growth.

2.1.6. In a commodity producing society the *power to grow* – or, in the limit, to reproduce itself – thus is not only characterized by time spent relative to a vector of utilities derived. This relation of heterogeneous quantities is also reflected in a *homogenous monetary expression*, namely the ratio of money spent for the utility to money earned by spending time. This second characterization is immediately perceived as reality though it is mediated by a most complicated institutional framework which usually is not fully understood by households. There exists a *significant difference* between the *observation* of final historical *outcomes of real processes* and the *understanding* of the *real processes* that brought them about. Hypotheses about the latter should be consistent with the former, but pure description of the former lack semantics if they are not conditioned and conditioning with respect to the latter⁸.

⁷ Compare [Hanappi, 1999] for a brief account on the future evolution of money.

⁸ See [Hanappi, 1994, pp. 21-41] for a formal model of this aspect.

- 2.2. **Exploitation** is a common and necessary phenomenon in any institutional framework of commodity producing societies. It *derives directly from the diverse growth* of social entities.
- 2.2.1. Since *intrinsic growth factors* of entities are different, their abilities to interfere in growth processes of other entities also differ. **Co-evolution** thus always takes on the form of a *relationship between unequal partners*, of exploitation.
- 2.2.2. If the *control of power relations* uses up *to much inputs*, then *institutions* are set up. Their task is to manage conflicts according to a given set of power relations. This set is frozen at the time the institution is founded.
- 2.2.3. As social entities grow the growing field of conflicts implies *growing institutional needs*. *Due to their very characteristic*, namely to manage current conflicts on the basis of a frozen old power relations, *institutions tend to break up rather suddenly*. Representatives of institutions possess intrinsic inertness that grows as the breakdown approaches.
- 2.2.4. A *'fat' institution* thus could be characterized as an institution that manages conflicts on the basis of *power relations that are already obsolete*. The already unjustified exploitation, of course, favors the representatives of fat institutions, i.e. these representatives are exploiters heading for a fall too.
- 2.2.5. In *economics* a *household* is the *smallest institution* that exhibits *transcending existence*: Its members, the individual persons, all have finite existence, but due to their capacity to overlap into *newly emerging households* the *form* of households survives its carriers⁹.
- 2.2.6. *Households* thus *resemble individuals* with respect to their sudden start, their sudden end, and their finite lifetime. They differ, of course, in most other aspects: the role of the household as a source of biological evolution today is embedded in its functions as a political device.
- 2.2.7. The *continuing reversal* of the *direction of exploitation* within households¹⁰ is a *fundamental social pulsation* hidden beneath the national account aggregates that do not distinguish phases of households.
- 2.2.8. *Growth* is characterized by a *quantity measured in units* and a *dimensionless factor* describing the change of this quantity per time unit. In households this quantity is *time*. Children exploit parents by attracting part of their time that could have been used for the parents' individual growth processes otherwise. *Time accounting is the most basic type of accounting for economics*, since it works on

⁹ This feature can be considered as an archetype of what later in this text is called metamorphosis.

¹⁰ During education and in old age individuals in households withdraw more social value from the total social value that the household produces than they contribute, in between the net flow is reversed.

the smallest type of economic institution, the household. There it also designates the borders between evolutionary economics and biology¹¹.

2.3. In a *capitalist society production units are institutions called firms*. Firms *exploit* their *workers* by taking part of their lifetime for a wage that allows for positive profits, which in turn supports the growth of the firm. The *historical mission* of firms is that with their profits they are forced to increase labor productivity by *innovation*. Their *price setting power* is limited by *competition mechanisms*, *institutional control* and the total *effective demand*.

2.3.1. The most adequate foundation for a formal tool to capture observed interdependence of production consumption behavior is *dynamic input-output analysis in an evolutionary format*¹².

2.3.2. In a human social group total available labor time within a given physical time unit is fixed. Thus on an elementary level *all economic choices* concern *economics of time*¹³.

2.3.3. For each time period and for any given society there exists a *vector of relative social values* of products and services produced by this society in that period. This vector can be computed ex post, the units of this vector are time units expended for labor, which implies that the social value of a product can be interpreted as its *labor embodied*¹⁴.

2.3.4. The *empirical study* of the historical development of the vector of *relative social values* is a necessary pre-requisite for the *understanding of the long-run economic development*, i.e. for a structuring of economic history in a sequence of modes of production.

2.3.5. A *change from one mode of production to another* always involves *emergence and exit of essential economic institutions*. Dominant *economic behavior* of institutions therefore is always bound to the mode of production it lives in. During each mode of production the *interaction between institutions* creates *general disequilibrium*, i.e. the overwhelming majority of institutions are permanently trying to adjust their behavior. In doing so, their interaction also moves the point

¹¹ This statement is just a reframing of the statement that there is a qualitative jump in consciousness between animals and the human species. Only humans have a developed concept of time. Many interesting theories of evolutionary biology, e.g. [Hubbell, 2001], fail to be directly applicable to social sciences for precisely that reason: They lack to include this central characteristic of humans as builders of sophisticated dynamic (time dependent) mental models.

¹² Compare appendix 1 for a sketch of an evolutionary input-output approach.

¹³ This issue can indeed be traced back to a notion of classical economic theory (Smith, Ricardo, Marx): ‘All economics can be reduced to economics of time’.

¹⁴ Note that the concept of labor embodied from the (evolutionary) perspective taken in this paper does not coincide with the concept used in the discussions following Bortkiewicz [Bortkiewicz, 1906] and Steedman [Steedman, 1977].

of attraction for their behavior in a highly complicated manner that is not anticipated by single institutions¹⁵.

2.3.6. The *innovative behavior of firms* in the capitalist mode of production is an example of economic behavior producing *permanent disequilibrium*.

2.3.7. Since *price setting behavior* of capitalist firms' concerns products and services that are, or were, innovations *price vectors follow a disequilibrium path* too. Only detailed reconstruction of the specific economic episode allows to understand and - to a limited extend - even to forecast price developments by simulation¹⁶.

2.3.8. In the capitalist mode of production *financial intermediaries* - a specialized type of firms - enable credit¹⁷. Financial intermediaries are present *from the very beginning* of this mode of production¹⁸; their *forms are changing more rapidly in integrated capitalism* since World War I¹⁹.

2.4 The *primary metabolism of a capitalist firm* typically consists of (i) *getting credit* from capital markets, (ii) *applying capital*, i.e. exploiting workers, to achieve a net profit rate (net from capital cost) high enough to sustain their relative creditworthiness (relative with respect to competitors on capital markets). From a long-run perspective applying capital involves *permanent innovation*: Either innovation to *reduce cost* (process innovations, organizational change, coalitions with institutions ...), or innovation to *change the utility space* of consumers (product innovation, exploration of changing infrastructure and environment ...). By analogy a *fat firm* can be viewed as a firm with *overshooting metabolic input*, i.e. capital (including human capital), which *is not accompanied by an adequate social output*, i.e. innovations.

2.4.1. In all stages of capitalism and all sectors of production *diversity of firms*²⁰ is omnipresent. The test of creditworthiness selects on basis of this diversity. This test has a binary outcome, survival or bankruptcy. Since this procedure is elementary for the sheer existence of a firm it is called its *primary metabolism*²¹.

2.4.2. *Innovation activities* take a *longer digestion period than everyday exploitative business life*. It is therefore not difficult for a fat firm to hide its innovation inactivity in the mid-run, but in the long-run it will run into difficulties. More

¹⁵ It therefore is ignorance of (bounded rationality) entities that is responsible for periods of relative stability (compare [Hanappi, 1989]) of social settings.

¹⁶ The comparison between price vectors and the relative social values (in an evolutionary perspective) is pointless; the famous *transformation problem* does not exist.

¹⁷ Compare [Schumpeter,] for the importance of a well developed banking system.

¹⁸ The role of banking in Northern Italy was pivotal for the emergence of merchant capitalism, compare also [Hanappi, 1986].

¹⁹ Hilferding was one of the first to appreciate this speed-up of changing forms [Hilferding, 1909].

²⁰ Diversity, of course, is a central concept of evolutionary economics. Its formal definition though is still in flux, see [Hanappi and Hanappi-Egger, 2004] and [Delorme and Dopfer, 1994].

²¹ See [Hanappi, 2003b] for a discussion of primary and secondary metabolism.

generally spoken, time horizons play an important role and – appearing as reoccurring swarms - longer time horizons suddenly govern shorter time horizons.

- 2.4.3. **Cost innovation** in a closed global economy implies severe problems of spending capacity and **income inequality** in general²². This in turn calls for a set of institutional innovations that start to govern these deficiencies democratically.
 - 2.4.4. Satiations as well as running out of non-renewable resources are important sources for **utility innovation**. Since a quickly increasing share of utility can be attributed to products and services from the information sphere (movies, music, knowledge, religious believes ...) **supply increasingly shapes the carriers of demand**²³. As a consequence the power of utility-innovative firms tends to become overwhelming and might potentially threaten the primary metabolism of the human species.
 - 2.4.5. The **accumulating difficulties of innovation activities**, given that they are core features of capitalist firms, indicate that a **major change in the nature of production units** (currently called firms) is approaching.
3. **The survival of the fattest is very unlikely**. Evolutionary selection works against entities on this extreme side of the range of diversity, but still it does its work slowly and stochastically. A **large set of fat entities** – not the fattest - will be **present** in the **process of metamorphosis** in households and production units that we are currently approaching. The positive role of fat entities in the course of this transformation will consist of **their time reserves for abundant ideas**, of their **possibility to muse**.
- 3.1 The **world economy** recently underwent **several crises in seemingly disparate areas**, geographically as well as with respect to economic processes. A more developed evolutionary economics will claim to cover them with an **overarching theory**. The concept of an **overshooting primary metabolism**, of fat entities, will be part of such a theory.
- 3.1.1. The **crisis in employment** is an instance of the implications of cost-reducing innovation behavior of capitalist firms – full employment is the short and passing episode, unemployment is the rule. A grand redesign of **time assignments** of the working force will be necessary to ameliorate the situation. Such a redesign clearly is only possible if the basic character of capitalist firms is changed dramatically.
 - 3.1.2. **Currency crisis** typically involves creditworthiness of nation states. Since persistent devaluation for third world countries is a major source of exploitation on a global level, sudden breaks in currency relations indicate difficulties to monitor and to control this process. The concerned financial intermediaries thus necessarily

²² In [Harris and Goodwin, 2003] some of these conflicts are developed in detail.

²³ A revival of the discussion on 'true needs' of the late sixties thus seems to be inevitable. Of course, theory has advanced since and results hopefully will be more elaborated.

fail to act as political institutions. They are fat in one dimension and missed to develop a necessary new dimension.

- 3.1.3. ***Global income inequality of nations*** is an immediate and obvious instance of fatness of entities.
 - 3.1.4. The ***crisis of pension systems in OECD countries*** is an attempt to devalue an option on future income, i.e. to abolish the pay-as-you-go system, often with the aim to redirect public revenues towards subsidies for firms with deteriorating profit rates. From an evolutionary perspective changing life expectancies surely imply changes in implicit social contracts between generations, but they do not imply that the social character of generation wide agreements has to be substituted by private individual contracts. Quite the opposite should be aimed at – an ever more linked world economy calls for a better macroeconomic design of more explicit agreements between generations. Again, some fat institutions (e.g. government bodies) fail to open up a new dimension of the problem.
 - 3.1.5. The ***ecology-economy crises*** are numerous. They are characterized by an interaction between ecological and economic dynamics that cannot be disentangled (hence the name), and that already started to endanger the primary metabolism of human societies. Contrary to obesity these dangers come from influences of the environment on the human species. They mainly are owed to the incredible speed of growth of production of the human species, and thus are immediately linked to the behavior of firms.
- 3.2 The accumulating and accelerating crises elements will eventually lead to a ***metamorphosis²⁴ of the global political economy***. In particular the role of production units will be redefined, and global – hopefully democratic - governance will have to be installed.
- 3.2.1. The ***existing forerunners*** of more global governance ***are not fat institutions*** - yet. Moreover, neither the European Union nor the United Nations Organizations (or smaller comparable organizations) do already possess a primary metabolism adequate for the importance of their tasks. They usually depend on the contributions of a single donor country (USA and UNO) or are under the influence of a certain socioeconomic group (European transnational firms and the EU). In other words, ***the metamorphosis of the global political economy still lies ahead***.
 - 3.2.2. Behind the veil of demagogic propaganda for ‘privatization’ in many large firms a ***countermovement towards more political embeddedness*** took place in the last 40

²⁴ Metamorphosis is understood as a profound change in structure that usually is ***initiated*** by growing inner contradictions of the old structure, but still has some free element of a new design working on a recombination of existing elements that is brought in from ‘outside’, from a meta-level.

years. The current debate on shareholder and stakeholder approaches might be interpreted as a preview on a possible change of the role of production units.

- 3.2.3. *Production units will always be necessary elements* supporting the primary metabolism of the human species. Even if a *secondary metabolism* in the future might gain dominance, it will be based on a smoothly working primary metabolism. *Designing and implementing* the latter thus is a necessary prerequisite to proceed to the former.

- 3.3 The *theoretical leitmotif* for explaining this metamorphosis is *not the standard apparatus of calculus* that suited early theoretical physics so well. This new leitmotiv rather emerges from metaphors that describe *dynamics that hit borders of well-defined areas*. ‘What happens there?’ will be the question, ‘How do new dimensions of a system come about?’.

- 3.4 *Muse* is an important ingredient for the *creation of novelty*.

- 3.4.1. There has been a long and still surging dispute whether the creation of novelty is initiated by *need or by muse*. In innovation theory this question has partly been translated into the question of the timing of innovations: Do they appear in the nadir of the business cycle or around the highest upswing movement? From an empirical point of view the answer is rather clear – creativity needs both, need and muse, innovations appear in between.

- 3.4.2. The capitalist mode of production entered its historical role under the sign of the *division of labor*, and this feature *is here to stay with us*. Creativity of the human society thus will be driven by both – *somewhat fat entities*, with some of them being *specialized in directing their muse towards those in need for a change*²⁵.

²⁵ This, of course, is just to paraphrase the possible role of more progressive branches of evolutionary economic theory.

Conclusion

This paper hinted at a kaleidoscope of issues relevant and urgent for evolutionary economics. Moreover it tried to structure them in an attempt to proceed from a tiny but touching question - obesity in industrialized countries - towards deep economic and methodological questions.

As any other synopsis of a wide range of topics this one also mainly can highlight what remains to be done. But in selecting the focus, the story just presented tries to achieve more:

- Overshooting and the emergence of novelty, the fat entity, should be studied closer
- The evolution of utility structures is as important as the evolution of production technologies
- The meso-level, including institutional structures, has to be brought more in the forefront of economic theory
- Evolutionary input-output analysis will reinforce the importance of time as basis for social value
- ‘Economy’ necessary means ‘Political Economy’, and even more so in the last decade
- Formal methods are going to change substantially to support a new leitmotif – metamorphosis
- Creativity moves closer to the center of economic inquiry²⁶, inducing new theories of need and muse

The fattest entities will not survive, but necessary diversity implies that fat in the form of redundancy will play an important future role for creativity.

Bibliography

Bortkiewicz L., 1906, *Wertrechnung und Preisrechnung im Marxschen System*, Archiv für Sozialwissenschaft und Sozialpolitik, Bd.23, Tübingen.

Boyer and Saillard, 1995, *Regulation Theory. The State of the Art*, Routledge, London.

Delorme R. and Dopfer K. (eds), 2004, *The Political Economy of Diversity*, Edward Elgar, Aldershot.

Dopfer K. and Potts J., 2004, *Micro-Meso-Macro*, Journal of Evolutionary Economics.

²⁶ Compare [Witt, 2004] for a most interesting treatment of that question.

- Hanappi H., 1986, *The Stages of Industrial Capitalism*. Invited Paper on the International Workshop "Technological and Social Factors in Long Term Fluctuations", University of Siena december 1986. Published by Springer Verlag 1989, editor: A.Vercelli et al.
- Hanappi H., Kump O., 2002, *Collect now - Consume later: On Innovative Products in Electronic Commerce*, Decision Support Systems, 2002/4.
- Hanappi H., 1994, *Evolutionary Economics. The Evolutionary Revolution in the Social Sciences*, Avebury Publishers, Aldershot.
- Hanappi H., 1999, *Die Zukunft des Geldes (The Future of Money)*. Research Project of the Austrian National Bank, (1997-1999).
- Hanappi H., 2003, *Algorithmic Foundations of Evolutionary Economics*, invited paper at the Wartensee Seminar (organizer: Kurt Dopfer), Wartensee (CH), July 2003.
- Hanappi H., 2003b, *Critical Masses and Prophecies*, paper presented at the Max Planck Institute for Comparative Economic Systems, Jena, July 2003
- Hanappi H. and Hanappi-Egger E., 2004, *New Combinations Taking Schumpeter's concept serious*, Paper contributed to the bi-annual conference of the ISS, Bocconi University (Milano, Italy), June 9-12, 2004.
- Hanappi H., 2004b, *Evolutionary Economic Programs*, in: "Studien zur Evolutorischen Ökonomik IX" edited by Wolfgang Kerber, Duncker & Humblot, Berlin.
- Harris J. and Goodwin N. (eds), 2003, *New Thinking in Macroeconomics*, Edward Elgar, Aldershot.
- Hilferding R., 1909 (1968), *Das Finanzkapital*, Europäische Verlagsanstalt, Frankfurt a.M.
- Hubbel S.P., 2001, *The Unified Neutral Theory of Biodiversity and Biogeography*, Princeton University Press.
- Mirowski Ph., 2002, *Machine Dreams. Economics becomes a Cyborg Science*, Cambridge University Press.
- Schumpeter J., 1911 (1964), *Theorie der wirtschaftlichen Entwicklung*, 6th edition, Duncker & Humblot, Berlin.
- Steedman I., 1977, *Marx after Sraffa*, Verso NLB, London.
- Witt U., 2004, *On Novelty and Heterogeneity, Papers on Economics and Evolution*, Nr. 0405, MPI Jena.