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The Essence of the New Economy

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KIELER DISKUSSIONSBEITRÄGE

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375

The Essence of the New Economy

by Henning Klodt

CONTENTS

- The New Economy should not be discounted as a temporary stock market phenomenon, but should be recognized as a real and sustainable phenomenon. The basic feature of the transition towards the New Economy is the rising importance of information—both as output and input good—in virtually all sectors of the economy.
- It would be fallacious to interpret the New Economy as a sector-specific phenomenon. Information increasingly constitutes a crucial input factor both in modern and traditional industries, and the information content of a final output is continuously rising throughout the economy.
- Present technological change, which is based upon modern information and communications technologies and on biotechnology, measures up to the industrial revolutions of past centuries. It would be premature, however, to identify fundamental trend shifts in aggregate productivity growth, because certain measurement issues are still unsettled and the observation period is still too short.
- Private firms must develop new business strategies in order to cope with potential market failure resulting from the properties of information goods as public goods, network goods, and experience goods. Bundling and versioning of products, attracting free riders, and —above all— establishing reputation are among the most important business strategies for the New Economy.
- The New Economy can be expected to reshape the structure of firms and industrial relations. On the one hand, reduced transaction costs will foster small, network-oriented niche suppliers. On the other hand, the New Economy will create substantial firm-size economies of its own—resulting from low marginal costs of information goods and competitive advantages from bundling and the exploitation of reputation. In addition, new types of incentive contracts that can serve to monitor knowledge-intensive activities will gain ground.
- Since human capital will replace physical capital as the crucial factor of production, improving the qualifications of the labor force is essential to successfully cope with adjustment challenges of the New Economy to the labor market.

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Contents

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1 Introduction

Expectations and hopes about the New Economy gave rise to exciting high tides in the stock market over the past year. At times, the stock market value of Yahoo, a search engine with about 1,000 employees, even exceeded the ones of Boeing or Daimler-Chrysler, which employ a more than hundred-fold number of workers. The dot.coms of the New Economy seemed to promise the king's road to wealth and fortune, where one would not need to care about sound business strategies, appropriate price-earnings ratios, positive cash-flows, and other relics of the old economy.

Enthusiasm for the New Economy vanished with the turn of the tide at the NASDAQ and other new markets. For many observers, the New Economy now spells as speculative bubbles, which do not contain any solid economic substance. Such a reaction is comprehensible — but misleading. Highly developed countries — and other countries as well — are nowadays facing a fundamental transition of economic structures, which reaches far beyond mere stock market fluctuations.

This paper attempts to explore the economic essence of the New Economy both from a macroeconomic and a microeconomic perspective. Part 2 discusses the concept of the New Economy as applied in this paper and briefly comments upon changing relative scarcities. Part 3 surveys the productivity debate on the New Economy and puts it into a historical perspective. Part 4 is concerned with the response of private suppliers of information goods to different types of potential market failure. Part 5 is addressed to changes in the size and structure of firms. Part 6 presents some provisional policy conclusions, which partly rely upon the analyses presented here and partly establish a link to additional research contributions from the Kiel Institute to the entire project on the New Economy.

2 A New Paradigm: From Physical Capital to Human Capital

The basic feature of the transition to the New Economy[1] is the rising importance of information — both as output and input good — in virtually all sectors of the economy. In the course of this development, the economy fundamentally changes its face, but these changes can still be grasped by well-established concepts of economic theory.[2] The New Economy is mainly driven by modern information and communications technologies (ICT). They give access to almost any kind of information at almost unlimited speed at almost any place on earth.

The transition to the New Economy is accompanied by structural change where those industries are gaining the upper hand that extensively take advantage of modern information and communications technologies. It would be fallacious, however, to interpret the New Economy as a sector-specific phenomenon. Information increasingly constitutes a crucial input factor both in modern and traditional industries, and the information content of final output is continuously rising throughout the economy. It is not so much the displacement of old by new industries which establishes the New Economy, but a rise in the information content of goods and in the information intensity of production processes thoughout the economy. Change may take place at different speed in different industries, but it will eventually embrace the whole economy.

Information has turned into a cheap and ubiquitous production factor which increasingly substitutes traditional production factors (Siebert 2000). A similar development took place two hundred years ago, when scarce and expensive energy from animal and human muscles was replaced by fossile energy from coal which could

1 Almost-synonyms are the "information economy," the "knowledge-based economy," the "weightless economy," or the "virtual economy," whereas the "Internet economy" or the "e-conomy" are subsets of the New Economy.

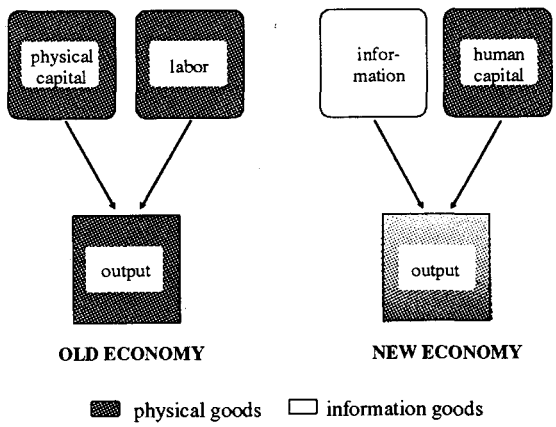
2 "Technology changes. Economic laws do not" (Shapiro and Varian 1998: 2).

be converted into mechanical energy by the steam engine (Wrigley 1988). This technological change paved the way for the first industrial revolution, as the energy intensity of production instantaneously increased, old industries were reshaped, and new industries emerged.

Presumably, the world economy presently faces a structural reshaping and reshuffling which compares to structural change two centuries ago. This development is driven by shifts in the relative scarcity of production factors. In the agricultural society, land was scarce and labor was abundant. With the advent of the industrial society, land lost its dominant position and was replaced by physical capital which was combined with the newly abundant factor energy. As a result, economic wealth shifted from landed to industrial magnates.

In the New Economy, information is the cheap and abundant factor. It can be expected that the crucial scarce factor will be human capital, i.e., the ability to convert information into knowledge (Figure 1). Of course, physical capital will not disappear, but it will lose its dominant position. Production in the New Economy will still require physical capital — in the same manner as industrial production requires land. But relative scarcities will substantially change at the expense of physical capital. Will economic wealth pass over from industrial magnates to intellectuals? Probably not.

Figure 1: Paradigm Shift



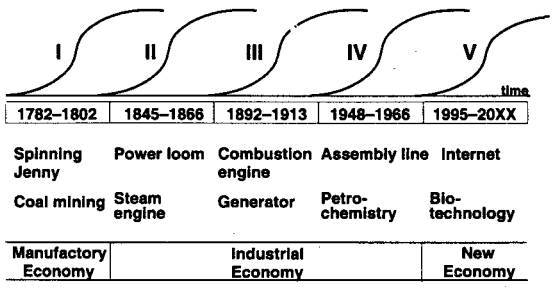
3 The Macroeconomic Perspective: A New Kondratieff?

Today's technological change predominantly rests upon the basic invention of the *micro chip*. Its development reaches far back into the past (first transistor in 1948; first integrated circuit in 1970), but the diffusion of microelectronics significantly gained speed only recently — especially in the ICT area. At present, there is almost no industry which can do without microelectronic equipment or microelectronic components.

In the view of Danny Quah (1999), *biotechnology* constitutes the second corner-stone of the New Economy, because it also bears the potential of becoming a general-purpose technology for a large variety of industries. This view is shared by several natural scientists, for instance by Rodney Brooks (2000), who is in charge of the MIT Institute on Artificial Intelligence and who argues that the human body will mainly consist of easily replacable parts within some decades. If this vision comes true, the transition to the New Economy would be driven by two basic technologies which match the basic technologies of the first industrial revolution and which could well initiate a powerful and sustainable growth and productivity push.

This view is illustrated in Figure 2, which — in the sense of Schumpeter — relates long-term economic growth to basic inventions. It is still an open question whether economic growth actually takes place in long waves and whether periods of rapid growth are caused by technological or sociological events. Anyway, Schumpeter himself was convinced that technological inventions are at the roots of so-called Kondratieff cycles. He distinguished between the industrial, the bourgeois, and the neomercantile Kondratieff (Schumpeter 1939). There are diverging appreciations about the basic inventions of the individual Kondratieffs, and Figure 2 only presents a selection which is mainly based upon Landes (1969, 1998), Mokyr (1990), and Jewkes et al. (1969) and which could easily be extended. The dating of the Kondratieffs follows van Duijn (1983: 23).

Figure 2: Kondratieff Cycles



Actual empirical work on the growth perspectives of the New Economy mainly concentrates on the issue of whether the expected productivity push of the New Economy can already be statistically observed (for a survey, see Stiroh 1999). Average labor productivity growth in the United States has significantly accelerated in the late 1990s, whereas in other industrial countries a comparable push is still missing (Table 1).

Table 1: Annual Growth Rate of Labor Productivity[a] in Selected OECD Countries (percent)

	1981–95	1996–99	Difference
Germany	2.26	2.14	–0.12
United States	1.19	2.30	1.11
France	2.95	1.61	–1.34
Italy	2.49	0.67	–1.82
Japan	3.03	2.07	–0.96
United Kingdom	2.73	1.47	–1.26
Australia	1.59	3.12	1.53
Denmark	2.99	0.86	–2.13
Finland	3.87	3.10	–0.77
Ireland	4.45	3.96	–0.76
Netherlands	3.23	0.35	–2.88
Sweden	1.76	1.96	0.20

[a]Real GDP per hour worked.

Source: Gundlach (2001).

There is a lively debate about whether international productivity differentials can be traced back to different methods of price adjustment. In the United States, quality improvements of electronic devices are evaluated by hedonic regressions which indicate that the price of computers and peripheral equipment has decreased by 80 percent over the 1990s, whereas German price statistics, which are based on traditional concepts of inflation adjustment, reveal a price decline of only 20 percent (Deutsche Bundesbank 2000a).

According to OECD calculations, however, measured annual economic growth in Germany would increase by less than 0.1 percentage points if ICT investment had been deflated by the U.S. methodology (Schreyer 2000). Moreover, the measurement bias is completely irrelevant for France, Sweden, and Denmark, where national statistical offices apply the same hedonic regressions approach as in the United States (Scarpetta et al. 2000).[3] Hence, the statistically observed growth and productivity differentials between North America and Europe can be regarded as a real phenomenon. At the maroeconomic level, the New Economy has obviously not (yet) arrived in Europe (van Ark 2000; Funk 2000).

It is far from clear whether the acceleration of productivity growth in the United States itself reflects the advent of the New Economy or whether it is caused by other factors — for instance by favorable macroeconomic conditions. For solving this issue, several authors have tried to identify the impact of ICT investment on productivity growth since the mid-1990s.

- According to Gordon (2000), an acceleration of multi-factor productivity growth can only be observed in a few investment goods industries, whereas the remaining 88 percent of the U.S. economy even had to face a deceleration.
- Oliner and Sichel (2000) are more optimistic. They identify an increase of productivity growth not only in computer production, but also in those industries which extensively make use of ICT. Hence, their results tend to support the New Economy hypothesis.
- A broad productivity push across industries is also observed by Jorgenson (2001) and Jorgenson and Stiroh (2000).[4] On the other

3 However, unobserved quality improvements in general are reaching a considerable size. According to the Boskin Report, economic growth in the United States is underestimated by about 1.1 percentage points per year, because quality improvements are insufficiently taken into account (Boskin et al. 1996). Corresponding calculations for Germany indicate an underestimation of about 0.8 percentage points per year (Hoffmann 1998).

4 Jorgenson (2001) provides an excellent survey of the productivity debate on the New Economy.

hand, they are puzzled by the low rate of productivity growth especially in those service industries which make intensive use of ICT and which could be expected to establish the core of the New Economy.

A major reason for the different assessments of the New Economy effect in productivity growth stems from different concepts of cyclical adjustment. In the view of Gordon, almost half of the productivity acceleration can be traced back to the business cycle, whereas Oliner/Sichel and Jorgenson/Stiroh completely refrain from cyclical adjustment.

It should further be noted that none of these studies has solved the identification problem, which is well known from traditional growth accounting and which makes it impossible to unambiguously separate technology-induced productivity growth from productivity effects of factor accumulation without restrictive theoretical assumptions. As Gundlach (2001) demonstrates, total factor productivity in the U.S. economy has increased by 1.8 percent under the assumption of Hicks neutrality, by 2.7 percent under Harrod neutrality, and by 5.4 percent under Solow neutrality over the period from 1996 to 1999. There is no unequivocal criterion for applying one or the other concept. And there is even no reason why actual technological progress should follow any of these neutrality concepts at all.

All in all, macroeconomic productivity analyses about the New Economy still provide mixed evidence. Presumably, the observation period is simply too short for identifying trend shifts. At present, euphoric appraisals of New Economy-induced productivity boosts would be as premature as a complete denial of new growth and productivity potentials.

The significance of the New Economy should not be evaluated, however, exclusively on the basis of its visible impact on productivity. It could well be imagined that the transition to the New Economy would even be accompanied by a temporary productivity slump. Restructuring of productive capacities requires withdrawing scarce resources from traditional activities, while the establishment of new activities may be subject to certain gestation delays. Old structures might have to break apart before new structures can emerge.

At present, it appears to be more promising, therefore, to concentrate on the microeconomic implications of the New Economy, which are analyzed in the remainder of the paper. The next section is concerned with new business strategies for information goods. Markets for information goods represent only a fraction of the New Economy, but this fraction can be regarded as the most dynamic and most exciting one.

4 Bumblebees Don't Fly: Business Strategies for Information Goods

Natural scientists have proven that bumblebees are unable to fly. They are too stout and heavy, their wings are much too short, and their aerodynamics is completely misfitted.[5] Fortunately, bumblebees are not aware of these problems.

In a sense, information goods are like bumblebees:

- They are public goods, where optimal pricing would require a fine-tuned personal price discrimination and where it is difficult to exclude consumers who are unwilling to pay.
- They are network goods, where the establishment of functioning markets requires overcoming certain thresholds and where competition exhibits winner-take-all properties.
- They are experience goods, which cannot be inspected prior to purchase and which will be purchased no more after inspection.

Economists are as worried about these market failures as biologists are worried about bumblebees. Fortunately, market participants do not seem to care, and the markets for information goods are rapidly expanding.

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5 On average, a bumblebee weighs almost a gram, has a wing area of a square centimeter, and cruises at a speed of about 1 m/s, which is technically inconsistent (Zetie 1996).

4.1 Information as a Public Good

Information can be regarded as the prototype of a public good. The utilization of information for production or consumption does not reduce its available amount for other users; i.e., there is no rivalry in utilization. Furthermore, it would be socially inefficient to exclude any potential user whose marginal utility from the specific information is above zero. Private suppliers would only produce an optimal amount of information if they were able to charge prices that equal the marginal utility of each consumer (Varian 1984: 253).

In reality, such a perfect price discrimination (known as Lindahl pricing) is almost impossible to achieve. It would require consumers to reveal their true preferences and to refrain from interpersonal arbitrage, which can easily be accomplished in the case of information goods because they can be duplicated almost without cost. Under competitive conditions, therefore, it should be expected that the supply of information goods is suboptimal. If free-rider behavior is dominant, it can even be expected that private markets for information goods cannot be established at all, since suppliers would be unable to cover their costs.

Apparently, the markets of the New Economy do not follow these theoretical considerations. The problem of real life seems not to be the short supply of information, but the "information overload." Nevertheless, the blossoming of information markets should not be misinterpreted as an indicator of the irrelevance of potential market failure in the area of public goods. Private suppliers have to develop specific business strategies which allow them to earn sufficient profits from the provision of information goods.

Bundling of public and private goods is one of the most important business strategies for this purpose (Varian 1999). For instance, freely available information on web-sites is often financed by providing advertising space to other firms.[6] As earnings from selling advertising space can be expected to be positively related to the quality of the offered information good, the provider of the web-site has strong incentives to offer valuable information, although nobody is willing to pay for the information itself. The strategy of bundling does not completely cure the market failure, but it at least allows to establish viable markets for information goods which could hardly be sold on their own at a positive price.

An interesting variant is the bundling of different types of information goods. As Bakos and Brynjolfsson (1999, 2000) have demonstrated, such a strategy allows "economies of aggregation" to be gained, which are not available from private goods. A simple numerical example may help to clarify the point: Let there be two consumers (A and B) and two information goods (W and S), say a word processor and a spreadsheet calculator. A is willing to pay a price of 3 for W and 2 for S, and B's reservation prices are 2 for W and 3 for S. If the two goods are offered separately, the price will be 2 for each and total earnings will amount to 8. If both goods are bundled together, each bundle can be sold at a price of 5, which would raise total earnings to 10. If it is further assumed that fixed production costs for each information good are equal to 4.5, then bundling would even constitute a necessary condition for the private supply of these goods.

In essence, bundling of information goods mimics personal price discrimination. Bakos and Brynjolfsson show that such a business strategy is both profitable and welfare-enhancing if the marginal costs of production are low — this condition is surely met by information goods.

A further approach to price discrimination is "versioning" (Varian 2000). Under this strategy, an information good is offered in different qualities to different types of consumers, even if the producer has to bear certain additional costs of designing a low-end version of the product. A popular example cited by Shapiro and Varian (1998) is the strong price differential for Windows NT for servers and Windows NT for

6 The reader might object that advertising itself consists of information and should thus also be regarded as a public good. It should be noted, however, that Yahoo and others do not sell advertising, but advertising space on their web-sites, which is undoubtedly a private good with strong consumption rivalries.

PCs, although the two systems are technically almost identical. Another example is the free Internet version of Netscape and its priced offline version stored on a CD and accompanied by a handbook and access to technical support.

Shapiro and Varian (1998: 62) have specified several cases where there are promising opportunities for the versioning strategy. They suggest to discriminate between patient and impatient users, casual and experienced users, business and home users, student and professional users, occasional and frequent users, lay and professional users, and certain other types of customer groups (see also Smith et al. 2000; Brynjolfsson and Smith 2000).

All in all, bundling and versioning are certainly no perfect substitutes for Lindahl pricing, but they at least contribute to the establishment of markets and facilitate the flight of the bumblebee.

4.2 Information as a Network Good

Further potentials for market failure are related to the fact that many information goods are network goods. The utility of such goods for the individual consumer not only depends on their technical properties, but also on the total number of consumers. The classical example from the old economy is the telephone set, which is of no use at all if nobody else owns a telephone. Each additional telephone user generates additional utility for each other user without being compensated — i.e., there is a network externality which results in suboptimal incentives for joining the network. As a consequence, existing networks will tend to be of suboptimal size (Katz and Shapiro 1985, 1994).

And what is more, new networks may fail to be established as long as certain thresholds are not surmounted: a telephone network with three participants will probably not be worth its costs, and there are no incentives for a fourth participant to join if her positive network externality will not be compensated for by the other participants. In addition, technological progress may be hampered if new network technologies are unable to gain acceptance over existing, technologically inferior networks, which already have of a broad installed base. Such path dependencies (Arthur 1989; David 1985) may well impede the development of new markets and may thus retard aggregate economic growth.[7]

A typical example of network goods in the New Economy are word processors, which are valued by consumers not only by their technical capacities but also by their market shares, because most consumers are interested in cooperating with other word processor users. Network effects were at the heart of the recent antitrust case against Microsoft. It was argued that Microsoft's free-of-charge supply of its Internet Explorer would unfairly undermine the market position of Netscape. The Explorer would enlarge its installed base to such an extent that future users would not consider buying Netscape any longer (see, e.g., Sachverständigenrat 2000: 142 f.).

The QWERTY system of typewriters, the victory of VHS against Betamax as VCR standard, and the dominance of DOS/Windows over Macintosh are further examples of technologically inferior network goods driving technological superior ones out of the market. However, the work of Liebowitz and Margolis (1994, 1999) has raised considerable doubts against the view that these cases are really explained by network externalities and path dependencies. They point out that empirical tests with ergonomically superior keyboards did not yield higher typing speed than QWERTY keyboards. Moreover, Betamax has never been able to produce cassettes with a capacity that is able to tape a complete movie or football match. And the Mac system, finally, was more expensive than Windows and was not backward-compatible.

The Macintosh–Windows case also illustrates the importance of adapting business strategies to the conditions of the New Economy. In the old economy, producers are well advised to exclude those customers who are unwilling or unable to pay. Macintosh followed this strategy by protecting its software against unlicensed copying. Microsoft also declared unlicensed copying ille-

[7] For a graphed illustration of this line of argument, see Klodt (1997: 302).

gal, but did not truly prevent it. As a consequence, many non-business users installed their Windows software without paying licence fees. Hence, Microsoft was able to attract many free riders who created substantial network externalities for all users. The market value of Windows programs was thus raised, and Macintosh software was eventually almost completely driven out of the market.[8]

The dominance of network effects for market structures and competition intensity basically depends upon the relative size of switching costs between different networks. According to Shapiro and Varian (1998: 103), high switching costs and related lock-in effects are quite common in markets for information goods. Such switching costs may result from technical incompatibilities, but also from repeated contracts or product-specific learning costs. As technology proceeds, producers are increasingly able to shape the extent of switching costs and to utilize them for their individual business strategies (Besen and Farrell 1994).

As a rule, customers are always interested in low switching costs in order to prevent monopolistic exploitation. For producers, however, the appropriate strategy depends on their market position: High switching costs establish significant barriers to entry and can thus protect the market position of dominant firms. New entrants, by contrast, should strive for low switching costs which are less intimidating for new customers and which allow them to benefit from externalities of related networks.

But even monopoly positions in network markets may be contested. In the recent past, increasing numbers of professional users have switched from Windows to Linux, which is continuously being improved by many software specialists around the world and which provides all these improvements and its basic source code freely available on the Internet. In a sense, Microsoft has been beaten at its own game: Previously, the installed base of Windows was extended by illegal copying. Today, the installed base of Linux is extended by its free availability on the Internet. Its open source code enables continuous product improvements by many anarchically organized users who are fed up with the Microsoft monopoly.

4.3 Information as an Experience Good

The distinction between experience goods and inspection goods was introduced by Nelson (1970). Customers cannot evaluate the quality of experience goods in advance, because their relevant characteristics are only revealed via usage. If the proof of the pudding is in the eating, then pudding can be regarded as an experience good. Another — and more important — experience good is information. This property may give rise to further market failure in the New Economy.

Markets for experience goods are in general more difficult to establish than markets for inspection goods. In the case of information goods, further difficulties arise from non-rivalries as discussed in Section 4.1. The combined result of these two types of market imperfections is the so-called information paradox, which has already been described by Kenneth Arrow (1962: 171): "There is a fundamental paradox in the determination of demand for information; its value for the purchaser is not known until he has the information, but then he has in effect acquired it without cost." The traditional market mechanism, which leads to a contract if the market price does not exceed the reservation price, will fail because the purchasers do not know their own reservation price prior to contracting.

The information paradox can be dissolved by vertical integration. For instance, most firms prefer to carry out their research and development activities in-house instead of relying upon external contracts, because the results of R&D — typical information goods — are difficult to trade. Moreover, many strategic alliances on R&D of the 1980s and 1990s have long been destroyed either by dissolution or by merger and acquisition.

Another approach to the information paradox is to create an atmosphere of trust between buy-

8 As Stolpe (2000) has shown, many other software producers also renounce protection against illegal copying, because they rely upon the extension of their market share by attracting free riders.

ers and sellers. Trust may be established via repeated contracts or a high reputation of sellers. For instance, the decision to buy a certain newspaper will not depend on the content of the individual copy, because nobody would buy this copy who already knows its content. Instead, the buying decision will be based upon the content of previous copies or upon the general reputation of the newspaper. Similar decision mechanisms are commonly applied for choosing Internet search engines, chartered accountants, or business consultants. As the information content of virtually all types of goods tends to rise in the course of structural change, even motorcars or washing machines are gradually converting into experience goods. Hence, reputation can be regarded as the crucial factor for gaining a competitive edge in the New Economy.

5 Firm Structures in Flux

The New Economy does not only reshape market structures but also the structure of firms. At present, it seems difficult to assess which new trends will emerge and which trends will eventually gain the upper hand.

On the one hand, the new information and communication technologies can be expected to favor small firms which are able to cooperate with other suppliers and customers in flexible networks. Such networks require intense and frequent communication, and the relative costs of communication are considerably reduced by the new technologies. Moreover, the physical capital requirements are in general quite low in the New Economy. The relevance of these considerations is demonstrated by the large number of technology-oriented start-ups and by the high dynamics of technology-intensive segments of the stock markets.

In addition, the hierarchies within firms are flattened by lean management and outsourcing of activities outside the own "core competencies." These observations are well in line with the transaction cost approach of Coase (1937) and Williamson (1973, 1989), which basically explains the optimal size of firms by the relative level of transaction costs under different organizational structures. As transaction costs of coordinating economic activities over the market — which mainly consist of information and communications costs — are declining with the transition to the New Economy, average firm size should decline, too.

On the other hand, the New Economy creates new firm-size economies of its own. As discussed above, information goods are subject to large economies of scale, because marginal costs are close to zero. In addition, the business strategies of bundling favors large firms (economies of aggregation). Furthermore, network externalities require surmounting critical masses, which is easier for large firms than for small ones. Finally, reputation can be regarded as a quasi-public good within firms, which can be exploited in different plants and different business fields without substantial additional costs.

These new firm-size economies may help to explain the current wave of mega-mergers, which started around 1995 and which is largely motivated by the exploitation of reputation and other headquarter services on globalizing world markets (Kleinert and Klodt 2000).[9] Typical headquarter services are the establishment of a brand name, the provision of R&D results, and the development of efficient management and marketing systems — all of them involve information goods which are of increased importance in the New Economy. In this view, today's merger wave does not generate the dynosaurs of tomorrow, but fits well into the adjustment requirements of the New Economy, where firm-size economies resulting from the internal provision of information goods are predominant. All in all, it seems premature to expect that average firm size in the New Economy will generally be lower than in the old economy. At present, it appears to be most likely that there will emerge a co-existence of specialized, network-oriented

[9] The term "headquarter services" was coined in the theory of multinational firms which is based upon industrial economics and the new trade theory (see, e.g., Helpman 1984; Markusen 1984; Markusen and Venables 1998).

niche suppliers and horizontally integrated, globalized large firms.

A similar dichotomy can be expected for the development of industrial relations:

- On the one hand, network-oriented firms look for flexible, team-oriented workers who are ready for project-related short-term contracts and do not insist upon life-long employment.
- On the other hand, the decisive asset of the firm in the New Economy is the human capital of its employees. This asset needs to be handled with care and needs to be retained. Moreover, work effort is difficult to control in human-capital-intensive activities, which calls for worker participation in long-term profit development, for instance by long-term stock options (Rajan and Zingales 2000).[10]

It is difficult to assess, therefore, whether work contracts in the New Economy will be more or less mutable than in the old economy. Most likely, industrial relations will become increasingly disperse with a variation that corresponds to the variation in firm size. There should be no doubt, however, that the transition to the New Economy will be accompanied by rising qualification requirements across all skill levels, which will further reduce the employment opportunities of low-skilled workers (Siebert 2000).

6 Economic Policy for the New Economy

The previous analysis has shown that bumblebees' life is not easy, but manageable.[11] Their environment is governed by non-rivalries, network externalities, and the information paradox, where marginal cost pricing and other traditional business strategies are most likely to fail. Appropriate business strategies for information goods include bundling and versioning, attracting free riders, surmounting critical masses, and exploiting lock-in effects. Above all, establishing and retaining reputation is the key factor for gaining a competitive edge in the New Economy.

The new environment provides ample space for various species of bumblebees. The New Economy gives rise to substantial firm-size economies, but also offers rich opportunities for small, flexible, and network-oriented niche suppliers. In addition, relations between queens and workers are going to be reshaped. Presumably, several new types of incentive contracts will gain ground, which can serve to monitor knowledge-intensive activities.

The New Economy is subject to any kind of market failure. This does not imply, however, that the visible hand of government should try to improve the performance of the invisible hand. Direct government intervention does not constitute the appropriate response to static allocative inefficiencies in markets for information goods. Bumblebees have to learn how to fly on their own account. There will be many trials and many errors, but any attempt of government to prevent private agents from errors would undermine dynamic efficiency, which counts in the long run. Nevertheless, economic policy should take notice of the fundamental structural change that is associated with the transition to the New Economy, because new challenges will arise to public agents as well.

The policy implications of the New Economy are not explicitly addressed in this paper. They are analyzed, however, in other studies from the Kiel Institute related to our project on the New Economy. This work suggests that economic policy will have to be adjusted especially in the following areas:

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10 For a survey on incentive contracts and their role in motivating skilled workers, see Gibbons (1998).

11 The reader who is eager to learn how real bumblebees manage to fly should read Heinrich (1979). Cross-species analyses for 28 birds and insects and 9 aircraft have revealed, however, that the efficiency of bumblebees in airborne transport is in fact extremely low. They exhibit a cost-of-transport index (COT) of 19.33, whereas fruitflies (drosophilae) achieve a COT of 8.50, and the Boeing 747 is travelling at a COT of 0.19 (Videler 1992). According to this source, the average bumblebee (bombus) weighs about 0.5 grams and achieves a cruising speed of 4 m/s. The difference to the parameters given by Zetie (1996) may be due to the fact that there are many different species of bumblebees.

- Central banks will probably have to adapt *monetary policy*, because productive capacities will be restricted increasingly less by physical capital and increasingly more by human capital (Gern 2001).
- The systems of *social security* will have to face an erosion of their traditional financial base which heavily relies upon payroll taxes. As conventional labor contracts will continuously be replaced by project-oriented short-term contracts and various new forms of self-employment, social security contributions should be detached from earned income, and self-reliance, and individually designed social security packages should be strengthened (Siebert 2000).
- *Fiscal policy* will have to take into account the limited potential for taxing virtual transactions and should try to directly price public infrastructure wherever possible. In addition, the tax burden will have to be relocated from internationally mobile investors to immobile factors of production and to consumption (Stehn 2001).
- *Competition policy* has to recognize that traditional concepts of antitrust will run dry in markets which are governed by winner-take-all competition. In such markets, the control of market shares of dominant firms is no longer adequate. Instead, the focus should be laid on closed standards and high switching costs between networks, which may establish artificial barriers to entry and may reduce the contestability of markets for information goods (Klodt 2001).
- International policy coordination should develop new tools of *global governance*, because the New Economy largely ignores national borders. Frictionless international flows of goods, services, and production factors require consistent, transparent, and enforceable international rules. For this purpose, behind-the-border practices and norms and standards should be included more comprehensively into the WTO framework (Piazolo 2001).
- *Educational policy* should endow workers with the key qualifications for the New Economy. In periods of rapid structural change, basic skills are more relevant than specialized skills. In addition, the principle of life-long learning should be strengthened, which is even more important in the light of an aging population (Foders 2001).
- And last but not least, *labor market policy* should enable people to take advantage of the rich opportunities of the New Economy. It should give way to flexible forms of employment and should try to prevent a digital divide between online and offline workers (Christensen 2001).

Ready or not, the New Economy is on its way. Economic policy will not be able to slow down or to control structural change. But it can facilitate adjustment processes and thus reduce avoidable frictions.

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