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The New Economy — What Is Really New?

by

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Abstract:
This paper analyzes some of the elements of the new economy. What is really new is first of all the technological innovation. In economic terms what is new is a new product. The new IT product brought about by the new technology means two different things: a new device to handle data and to communicate and a new good "information". This should lead to an increase of productivity, to a larger production potential and to a higher growth rate. The new economy has implications for capital markets and especially for labor. Major issues are regulation and taxation.

Keywords: New technology, IT products, productivity effects, impact on growth and on labor, regulation, taxation
JEL classification: D0, D2, E1, J2.

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1. This paper analyzes what is really new in the new economy. The many labels that have been found for the new phenomenon suggest some of the relevant aspects: digital economy, Internet economy, network economy, virtual economy, weightless economy, e-business, e-lance economy, knowledge economy, and information society. We first study the technological aspect, that is the new technology (section I). The technological innovation means new IT products representing a new device and a new good "information" (section II). The innovation implies a new production function; it has a positive impact on productivity, the production potential and growth (section III). Capital markets have to provide the capital for new economy (section IV); labor will be affected in a considerable way (section V). Major issues are regulation (section VI) and taxation (section VII). Finally, the international division of labor in the new economy is discussed.

I. A new technology

2. Looking at the new economy from the technological angle, the essential change is a new technology. The new technology consists of the combined technological advancement of the microprocessor, of software and of network facilities. The microprocessor represents the brain of the computer; it is a rich set of algorithms designed to perform arithmetic and logic operations. It executes a collection of machine instructions including decisions and jumping to a new set of instructions on those decisions. This allows to store, accumulate, link and manipulate a large volume of all sorts of data and information in digital form. Software is a term for the various kinds of

programs used to operate a computer, for instance system software and application software. It makes it easier to use the personal computer, not only for the trained expert but for the general public, not only in firms but in private households as well. The network technology allows to link the numerous PC's and the platforms of digital systems. Standardized protocols make it possible to exchange data between computers that run with different systems and programs. Such protocols are the Hyper Text Transfer Protocol (HTTP) of the World Wide Web, the Simple Mail Transfer Protocol (SMTP for e-mail) and the File Transfer Protocol (FTP). The new technology is first of all a process innovation. The novelty is that this system can move masses of data within organizations such as firms as well as between the different subunits of the economy.

The Internet represents a network system that connects millions of computers on a computed network. Originally conceived to maintain communication paths in the aftermath of a nuclear war, it is a technique that allows to link all computers using all existing transmission paths available (Engel 1999) including wireless transmission. It is a decentralized network between Internet users. Each computer is connected to the Internet either by dedicated access (via a router) or by dial-up access (over a telephone line using a modem converting electrical (digital) signals from the computer to (analog) signals that can be transmitted over the telephone line). Companies, the Internet Service Providers (ISPs), provide dial-up access. Local ISPs connect to regional ISPs and regional to global ISPs. The network thus consists of two types of computers: servers, i.e., machines that provide services to machines, and clients, i.e. computers that use the servers.

In a way, the Internet has no own transmission infrastructure. It uses the long-range telecommunication lines (fiber-optic backbones) and satellite links for which Internet providers pay a flat rate. Although the Internet uses basically the same infrastructure as telephone companies there is a significant distinction between the transmission technologies used by phone networks and the Internet. Phone networks use circuit-switching, which means that an end-to-end circuit is set up between the two calling partners and a certain part of network resources is exclusively used by that connection. The Internet uses packet-switching: data are divided into small packets that are sent independently from each other to their final destination where the data package is reassembled again. No fixed end-to-end connection is required, but the network resource can be shared by many users sending and receiving data at the same time.

An Internet provider needs a server and provides the interfaces. Its customers are able to communicate with all other Internet stations. PCs need not be stationary, mobile PCs have access to the system as well. This will be developed further with the UMTS (Universal Mobile Transmission System); the “last mile” then loses its importance. Routing in the network is done by specialized computers able to send messages and speeding them up to their destinations along thousands of pathways taking into account capacity conditions (configuration tables).

Each computer has a unique address, the IP-address, that is necessary for it to be identified world-wide. This IP-address is transformed to domain names that can be handled by humans. There are two different classes of domain names: One signifies national abbreviations, for example those

ending with .de. The other class of domain names with abbreviations .edu, .com, .net, .org, .gov, .mil and .int denotes sectorial domains. Like the IP-address, the domain names are valid world-wide.

A browser is an application program that allows the individual user to systematically look for the information he needs on the World Wide Web and to interact with Web servers all over the world. The complete set of world wide information will thus be screened by search machines and made available nearly instantaneously.

The growth of the IT sector was driven by major technological developments.[1] The increase in internet host computers and major technological developments is portrayed in Figure 1.

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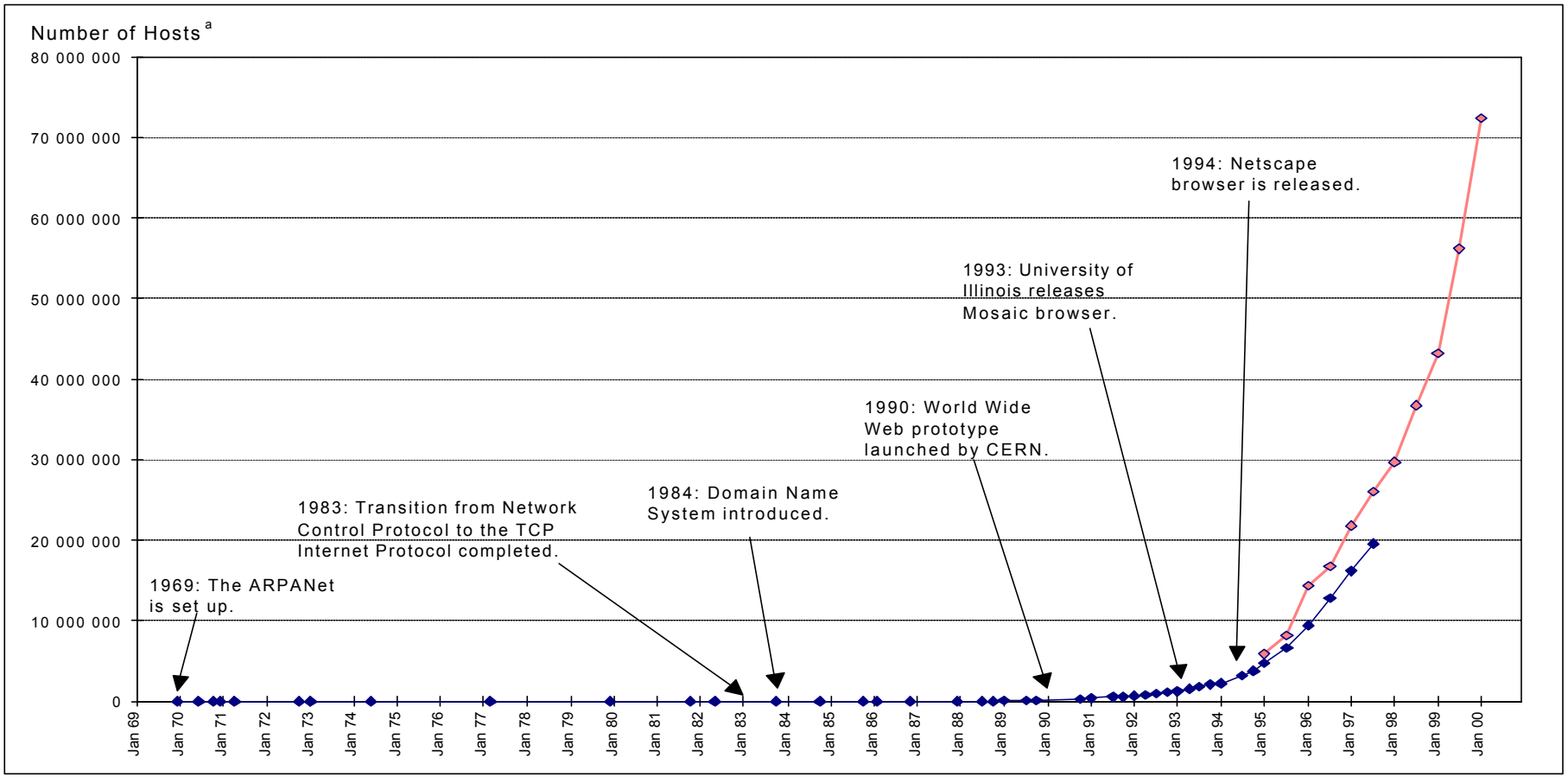
[1] For an account of the period before the IT revolution see Greenwood and Jovanovic (1999).

Figure 1: Growth of Internet Hosts and Major Developments



[a]A more accurate survey mechanism was developed in 1/98; host numbers from 1/95 - 7/97 are adjusted.
Source: Internet Software Consortium - Number of Internet Hosts (www.isc.org);
R. Zahkon (2000), Hobbes' Internet Timeline v5.1; (http://www.isoc.org/guest/zakon/Internet/History/HIT.html)

II. New products

3. Looking at the new economy from the point of view of products, the new economy means a larger set of goods. The production possibility set of the economy is enlarged, the transformation boundary as the envelope of all potential products shifts outward. There are two different interpretations of the new IT product (Figure 1). First, the new technology means a new technological device, representing an input to production and consumption activities. For firms, the new device is a process innovation; it represents a new investment good reducing transactions costs and opening up new choices for organizational solutions and new approaches in the different functional areas of firms such as procurement, production, marketing and financing. For households, it is a new durable consumption good making possible a different flow of utility over some planning horizon.[2] Second, not only the new technique like the personal computer represents a new good, in addition there is another new product, information, "anything that can be digitized — encoded as a stream of bits" (Shapiro and Varian 1998, p. 3). This output no longer is a natural product like a potato or a physical product like a steering wheel for a car. The new good is simply more and improved information. It is more than an information flow with reduced transaction costs: It is information itself that is a new good. In the real world, both interpretations, i.e. that of the technological device and that of information as a new good, are intertwined in the IT product.[3] The technological device can be viewed as an input in a production process for information.

4. There are some characteristics of the new product "information":

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[2] The distance between knowledge-production in the firms and the consumers is reduced (Quah 1999, p. 5).

[3] There are other aspects of new goods as well, for instance electronic currency.

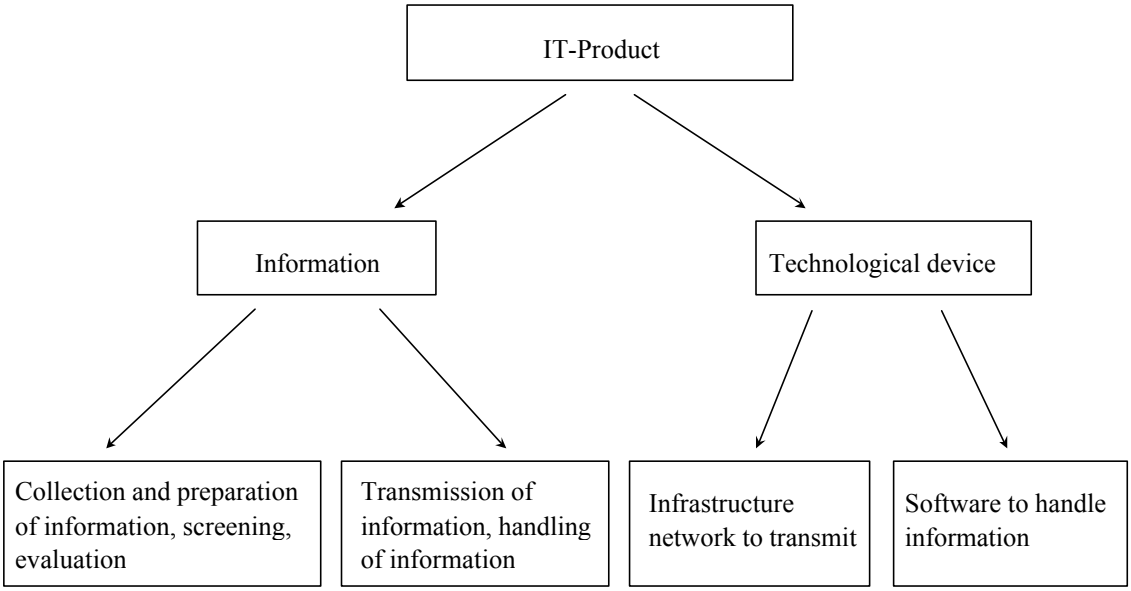
– Information can be shared and yet it is not lost for the first “owner”. Information displays “infinite expansibility” (Quah 1999). One may sell bits and ideas and keep them at the same time. This means that information can have public good properties. It can be non-rival because the information I use does not take away the information from you. In this interpretation, there is no competing use of information.

Information goods can, however, be made excludable, they can be appropriated, can become purely private goods through the institutional setting, e.g. through property rights, although in the new economy this may be more difficult to achieve. In addition, small variations allow to customize the information with low costs and thus produce individual solutions. Software is flexible allowing a wide variety of different applications. Thus, the public goods property does not hold for all information; it may pay to appropriate exclusive information in order to have an information advantage and to customize it.

– There are increasing returns to scale of distributing information. Information is costly to produce, it is inexpensive to reproduce. High fixed costs have to be incurred to produce the first bit of information, there are relatively low marginal costs to distribute this information to many users.
– The infrastructure of the new economy represents network goods with an interdependent positive utility. The utility of the existing network stations increases with an additional user.

Taking these characteristics together, there is a positive external effect per unit of IT-activity. This means that the law of diminishing returns no longer holds, at least until the network has reached its optimal (final) size (see production function below).

Figure 2: The supply side of the IT product



5. In addition, other aspects of the new good information relate to the demand for the new product. Information is an experience good: You can only tell whether you want to buy the information after you have seen it (Varian 1998, 1999; Shapiro and Varian 1998). This holds for any new product, but it is especially relevant for information that you have to experience a good in order to value it. Several mechanisms exist that help to solve this problem: browsing through part of the information gives a first impression, previews also are instrumental. Reviews by experts and critiques of the information that has been provided in the past represent a more systematic appraisal either of the information itself and its value or of the information provider. Reputation and brand names are also important.

Another related issue of the new product is information overload. The potential user of information is nearly drowned in a sea of news and material for the very

reason that it is so inexpensive to provide information. On the receiver's side, there is a need to filter incoming information; he may also want the right to keep his mailbox shut or to open it only to those information providers that he selects. This means information products will have to be differentiated; new product lines along specific interests will develop such as specific TV channels (for instance for history) or services for specific sectors or special hobbies. On the sender's side, attention management becomes necessary, so that the information is demanded by the users.

6. The terms data, information and knowledge are relevant terms for the new economy (Rowley 1998). Data means "facts or information, especially as basis for inference; quantities or characters operated on by a computer".[4] Information means "informing, telling; thing told, knowledge, (desired) items of knowledge, news, (on, about)".[5] Knowledge is "knowing, familiarity gained by experience; person's range of information; theoretical or practical understanding; the sum of what is known; certain understanding".[6] Data are in tangible form, information and knowledge are intangible. Information is a flow, knowledge is a stock of accumulated information. It presupposes mental activity and a framework (a paradigm) into which information can be placed and according to which information can be evaluated. The value of data that are received as information depends on the knowledge available. Information and knowledge reduce transaction costs because they allow cost reductions, point out arbitrage opportunities and reduce uncertainty.

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4 The Concise Oxford Dictionary, 1982, p. 242.

5 Ibid., p. 514.

6 Ibid., p. 556.

7. The new IT product means a new market with fascinating questions relating to the strategy of IT-firms. In the *terra incognita* of the new economy, firms have the first mover advantage and can establish themselves in a specific world market with at least a temporary advantage against newcomers. They may succeed in setting the standard which gives them a cost advantage, possibly excluding competitors or making life harder for the competitors. Speed is important. The half life of products is less than a year, in some cases less than a quarter of a year. Firms have to decide their product mix because they possibly cannot supply the complete range of all IT products. Path dependency is a relevant issue for the information economy. Users may be locked in to a specific technology and pricing may be instrumental in locking in the customer or in deblocking a situation when costumers are linked to another product line. Therefore, pricing strategies of firms are an important topic.

8. Pricing of network use is a major issue. Individual users pay flat (or zero) rates to connect to Internet providers (and telephone companies for using the line to the next local interface). Internet providers pay a flat rate to long-distance companies. So far, there is no scarcity mechanism in place for using the Internet. It will only be a matter of time until user charges develop in order to solve the congestion problem and to provide incentives to build up the infrastructure (McKnight and Bailey 1995). This implies either usage-sensitive pricing with a two-tier pricing system (one tier for connection, one for each bit sent or received, or peak load pricing) or transaction-based pricing depending on the characteristics of the transactions, for instance with priority assigned to messages by the sender. The appropriate technology (ATM technology) exists.

III. The Impact on Productivity and Growth

9. A strong impact of the new technology and of information as a new product on the performance of the economy as a whole and on society can be expected. At the center is the positive effect on productivity, that is the changed macro-economic production function. We distinguish the productivity effect within the IT industry and the effect of the new technological device and the new product "information" as a comprehensive technology for nearly all sectors of the economy.

10. Within the IT sector, a new product is produced. As other new goods, it's diffusion over time will follow a logistical S-shaped curve. It seems that in the last five years we are moving on the steep section of the S-curve, and market saturation does not appear to be in sight. Quite to the contrary, new technological possibilities continue to open up. How the S-curve will look like in the years to come depends, among other factors, on the strategies firms use and on the regulations that will be applied. With the highly competitive environment of the IT-sector, it can be expected that the competitive process will point out new technological and economic solutions. This process will be a driving force for the performance of the industry.

The new IT product which enlarges the product set of the economy brings additional value added. This means an increase in factor income and in output. Producing the various new technological devices and collecting, accumulating, processing, distributing and evaluating information represent new activities in the economy.

To some extent the new product will drive out traditional products. For instance, digital information downloaded on a PC will substitute the music or film cassette;

and a traditional product such as an answering machine for the telephone will be replaced by a voice mail system that is supported from some base in the Internet.

11. Beyond the changes in the information sector, there are implications for the other sectors of the economy. The new technology revolutionizes the organization of firms (Dunning 1997, Table 2). Production can be fragmented even on a world wide scale, firms can choose between different locations and relocate their physical production which can be better coordinated via the new communication technology. Small head quarters can steer large complex organizational structures, there is an increased decentralized responsibility of smaller units and of teams granting more autonomy at the decentralized level and also requiring more flexibility. Firms can reorganize their relations to their customers allowing a quick response to consumer preferences and to shifts in demand (b-2-c); they also can take advantage to cut costs vis-à-vis their suppliers (b-2-b) including their international suppliers from which they can import services via the Internet.

12. In the virtual economy, transportation costs are reduced because some of the products can now be transmitted via the Internet (like the voice mail system) instead of being physically shipped (like the answering machine for the telephone). This reduces transportation and transaction costs. It reduces energy input and means a smaller amount of pollution. However, even in the virtual economy, most of the goods still have to be shipped, and logistics still is important. To some extent, logistics will become even more important; there are quite a few cases where e-business requires new organizational forms of transportation such as delivery services for books and food.

13. As an overall result for the economy we should expect that productivity is increased. The production function of the new economy is different; the product set is enlarged, the capital stock is augmented by IT-investment. Human capital as

a factor of production will play a larger role. The technological relation between output and input is altered. In contrast to traditional production, individual activities have positive external effects on other activities. For network goods, the utility of users is positively interdependent; an additional user raises the utility of the network for the other users. In microeconomic production functions the law of diminishing returns seems to be repealed as long as the capacity limit of the network is not yet reached; rivalry in use seems not to hold any longer. All this implies that the new economy has a higher production potential; its supply side changes.

14. In the context of a growth model, the increase in the production potential means that the economy moves to a higher growth path. The steady state is on a higher level and the transition path to the steady state is a associated with a higher GDP level as well. Thus, it is conjectured that the high growth rate of 4 percent in the US in the second part of the nineties is at least partly due to the new economy. And the question is raised whether Europe is on a lower growth path.[7]

15. The new economy implies changes in society. In a wider interpretation, growth is always a process that transforms society, and the major technological breakthrough of the new economy can be expected to do just that. New patterns of behavior are likely to develop, a new way of life and a new "culture" with other attitudes of people and new informal and formal rules are to be expected

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7 Compare the data on the GDP growth rate and on capital formation:

Growth in the Industrial Countries, 1995–1999

	US	Japan	EU	Germany	France	Italy	UK
GDP-Growth rate per year	3.8	1.2	2.3	1.5	2.2	1.7	2.6
Increase in real gross private non-residential fixed capital formation per year	10.3	2.2	5.9	2.1	4.2	5.5	9.7

Source: OECD Economic Outlook Juni 2000.

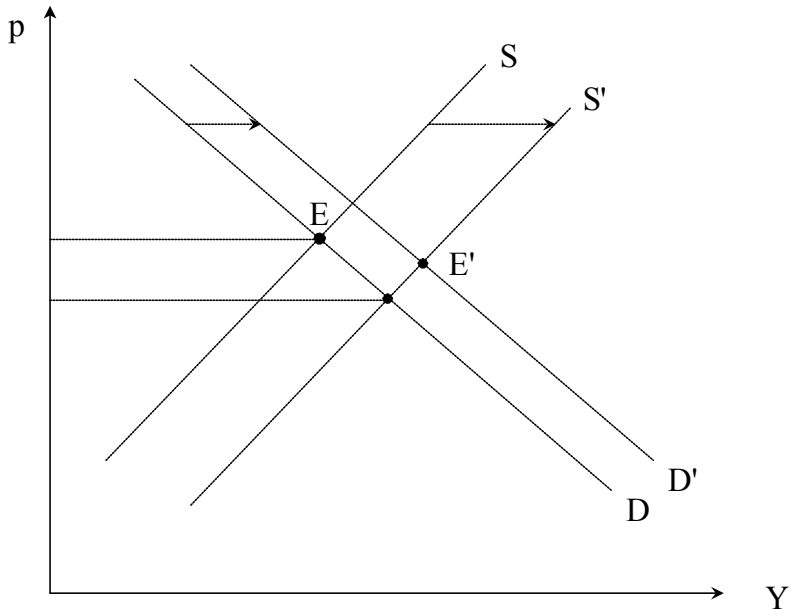
(Elkin-Koren and Salzberger 1999). Hierarchical structures will dissolve, new organizational forms will show up, systems and subunits have to flexible, to be able to produce new information and knowledge, to adjust and learn and to take more decentralized responsibility. Subunits of the economy have to get used to a continuous sequence of projects each of which represents a new combination of knowledge, capabilities and experience (Klotz 1999).

This is in stark contrast to the clumsiness of some of the decision-making in the continental consensus economies, especially in Germany where in the interface between the firms and the public interest quite a few procedural steps have to be observed in decision-making taking some time until participatory boards finally reach a decision.

16. Conceptually, we can illustrate with a simple diagram which macroeconomic impact the new economy has (Figure 2). It shifts the supply curve S of the economy to the right; due to higher factor income demand D shifts as well. This means a new macroeconomic equilibrium E' (instead of E) with a higher GDP.

17. The productivity paradox has been debated since Robert M. Solow's often quoted statement from 1987: "Computers show up everywhere but not in the productivity statistics". The issue is how strong the effect on productivity and growth is and whether it will be large enough to really change the industrial economies. Thus, it is debated whether the IT-revolution represents a technological breakthrough like the railroads in the 19th century and the automobile in the 20th century. Different approaches can be taken to determine the productivity effect.

Figure 3: A positive supply shock in a macroeconomic model



A first approach is to collect data on where the new technology is adopted. Surveys suggest that adoption varies considerably with the sector and the type of firms. IT intensity is high in financial institutions, banking, insurance, education, discrete manufacturing, utilities and communication & media (OECD 2000b, Figure 16). According to industry sources firms that are decentralized and that rely on team decision making use more IT products. Also high human skill intensive firms and firms with high-incentive based reward systems are users of the new IT products.

A second approach is to estimate the firm's production function and to determine the output elasticity of IT-capital. This requires to measure the capital stock of the IT-industry. Thus, Dewan and Kraemer (2000) estimate an intercountry production function with IT-capital and non-IT factors as inputs. For developed countries they find an output elasticity of IT-investment of 0.0057.[8] Multiplying this with the cumulative average growth rate of capital, IT capital contributes 1.58 percentage points to the growth rate. Other studies find similar evidence.

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8 The elasticity for non-IT capital is 0.16, for labor 0.823.

Thus Brynjolfson and Yang (1996) observe a strong relationship between IT and productivity at the firm level.[9]

The third approach is to use a macroeconomic production function and to account for the determinants of economic growth with special reference to the new economy. The focus is on whether the increase in total factor productivity that is observed since the mid nineties can be attributed to the IT industry and to the surge in IT investment. The empirical evidence of the productivity effect is disputed. Onliner and Sichel (2000) observe a doubling of total factor productivity increase in the nineties for the US; half of the productivity rate is explained by the computer industry (Table 1). Jorgensen and Stiroh (2000a, 2000b) also come to the conclusion that total factor productivity accelerated in the non-IT section of the economy in the late 1990s.[10] Gordon (1999), however, is skeptical. Whereas he finds for the US that the productivity increase is not only confined to the IT-industry, i.e. the computer manufacturing industry, the rise in cyclically adjusted labor productivity in the rest of the economy in the nineties is relatively small with 0.4 percent per year. If all durables (not only computers) are accounted for, no cyclically adjusted increase of labor productivity since the mid-90s can be observed.

In these econometric attempts measurement issues prevail. Thus, in sector studies as well as in macroeconomic studies, the IT-capital has to be estimated; the results depend on the quality of the data. It is open to what extent output in the computer industry is accurately measured; an issue is the decline of prices for IT products. Data revisions in macroeconomic accounting are frequent making

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9 See also Jorgensen and Stiroh (2000b).

10 See also Table 4.1 in US Department of Commerce (2000).

econometric estimates partly obsolete. Moreover, we are only at the start of the new economy and it may be too early to see the full impact.

Table 1 — The contribution of the computer industry to Multi Factor Productivity growth in the US

	Oliner and Sichel (2000)	Council of Economic Advisors (2000)
Period and coverage	Non-farm business sector, 1996–99	Total economy, 1995–99
Annual rate of multi-factor productivity growth	1.25 %	1.04 %
Annual contribution from the computer industry	0.62 % (computer sector plus semiconductur sector)	0.39 %
Annual contribution from other industry	0.63 %	0.65 %

Source: OECD (2000b), Table 4.

18. The new economy means a strong sectoral change towards the information society continuing the secular trend away from the industrial economy to the service economy. It now seems to be a secular phenomenon similar to the transition from the agricultural society to the industrial economy.[11] It is estimated that the IT-sector in the US broadly defined (including not only the computer manufacturing sector but also the IT employees in all sectors of the economy

[11] Here is an answer to those who are vexed by the question: How much industry does a country need?

using the new technological device) accounts for about 8.3 percent of GDP (US Department of Commerce 2000, p. vii) and 6.1 percent of the workforce (US Department of Commerce 2000, p. vii) . In most countries, however, official statistical data on the size of the new economy are lacking.

19. In terms of the business cycle, the productivity boost provided by the new economy may start a new cycle, and historically this may be a new Kondratieff cycle. This, of course, is rather speculative. It is also debated to what extent the nature of the business cycle changes. It can be expected that the new technology makes an economy more flexible; the capacity constraint of the production potential then is less rigid and the economic system can absorb external and endogenous shocks more easily. Also, an expansion of aggregate demand may be digested more easily by a flexible supply side. This, however, does not imply that the business cycle is dead. The components of aggregate demand may still move in a cyclical way, and slumps cannot be excluded even if the capacity constraint becomes more flexible.

20. If the supply side increases at a higher rate and the economy moves on a higher growth path monetary policy can follow. In accordance with a higher increase in the production potential the monetary authorities can choose a higher reference value for the expansion of the money supply. The implementation of such a policy in practice is, however, rather difficult. The increase in the production potential is an expected value. Moreover, it is a tricky problem to determine the production potential of an economy because data revisions in macroeconomic accounting are frequent and the methods to determine the production potential (estimating a macroeconomic production function or using the actual capital stock and a potential capital productivity) have their shortcomings. Most important of all, the central bank must choose between the risk to provide not enough liquidity to the economy in case of a strong supply side increase and the

risk to inflate without a structural shift in the supply side and without an increase in the production potential. Especially in Europe with its structural weaknesses this is a very important question for monetary policy.

IV. The impact for capital markets

21. In the transition to the new economy the capital markets have to provide capital to the new firms which have to build up a new capital stock. Market capitalization of the IT-firms reflects expectations on future opportunities and profits. They are at a multiple of the value of firms if measured in actual real assets such as buildings and taking into account actual revenue; they are higher than that of traditional firms if a series of indicators is used. At its highest share price, Microsoft with 36.000 employees had the same market capitalization as the twelve largest car manufactures of the world, or ten times that of General Motors with 390.000 employees.[12] For mergers, this market capitalization can be used to buy up firms of the traditional sector (AOL takes over Time Warner, Vodafone takes over Mannesmann). The impact on the financial market is impressive; in 1989 seven Japanese firms were under the global top ten, nowadays none is.

In quite a few cases, the high stock market prices do not reflect profits, and the price earning ratio is not founded on a high actual rate of return. Profits are low or even zero. It is expectations on future profits and future market potential that drive up the stock price.

For the US, estimates are that the firms of the new economy make up 10 percent of GDP whereas market capitalization is at 30 percent (Dornbusch 2000, p. 24).

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[12] For comparison see Gröhn (1999) ,Table 2.

The difference reflects the expansion potential of the new economy in the eyes of market participants.

22. A question that is difficult to be answered is whether and if yes, to what extent, the high market capitalization of the new firms represents a bubble. It can be expected that not all dreams will materialize and that failures are likely. Then financial capital will be lost. The reverse of the price-earnings ratio for the new firms which can be interpreted as a rate of return is much higher than the rate of return of 7 percent (and a price-earning ratio of 15) for S&P-500-Index in the period 1950–1999.

New approaches to explain the impact of the new technology on the capital market are offered. Thus, the emergence of a new sector means a Schumpeterian process of restructuring and of creative destruction. Other sectors will decline, at least in relative terms, and capital will flow to the new sectors. It will take time until the new firms add to the total value of the stock market; as a first effect the market value of existing firms that are negatively affected by the new firms is likely to decline (Greenwood and Jovanovic 1999, Hobijn and Jovanovic 2000). Yet another approach relies on a new production function where human capital plays a larger role (Hall 2000). The stock market values physical capital (plant and equipment) and e-capital which is produced by highly qualified labor (c-capital for college graduates). e-capital is the stock of knowledge and expertise that a firm has; it is an intangible. The difference between the market value of a firm and its physical value is the market´s evaluation of the firm´s e-capital; it is a value of the firm´s resources. [13],[14]

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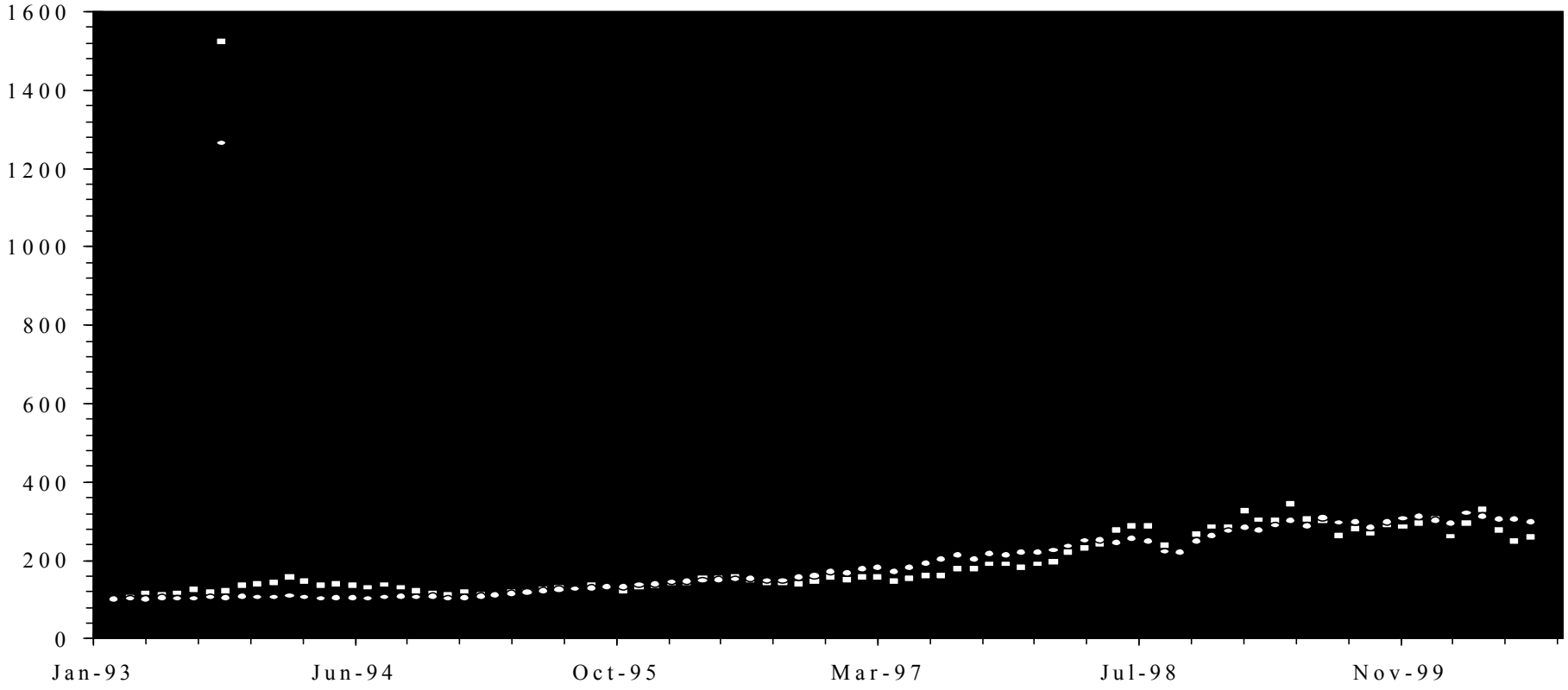
13 The question has been raised whether the value of a firm should be determined by its human capital.

Figure 4: Stock Market Indicatiors[a], 1993 - 2000.



a 1993 : 100

Source: Data Stream

V. The impact for labor

23. Demand for labor is a derived demand. If the product changes, the inputs change as well. There are new requirements for labor: As before, I distinguish the implications for the information industry and for the other sectors of the economy.

In the information industry, it is no longer the dexterity of the craftsman at the assembly line, nor is it any longer the friendly smile at the service counter, that are essential, it is ideas, creativity, associative power, it is brain. We have a different type of production function with human capital as the decisive factor of production. Routine work that can be standardized will be done by computers. The new IT-worker is a different animal, he is an entrepreneur for his job, for his part of the firm, he needs a strong motivation (different from a traditional understanding of the labor contract as in some continental countries). This has implications for the pay-system: creativity must get a premium. Profit sharing, share options and other forms of incentive pay become more relevant.

24. Beyond the implications for the information sector, there are implications for the realm of work in the traditional sectors of the economy. The organization of work changes, there is an increased decentralized responsibility with more autonomy at the decentralized level and requiring more flexibility.

Taking these changes in the IT-sector and in the sectors using the IT product together, the very definition of labor and work changes. Work can no longer be understood as a continuous effort to make a living, precisely defined with respect to time and space. The border lines between working and learning, between labor and leisure, between the office and home are disappearing. This means a new way of life bringing with it new institutional arrangements.

25. Human capital is decisive. For the individual worker, it is of utmost importance to develop his qualifications. The firms will be eager to attract qualified people (e-quality labor). Their market capitalization will depend on the quality of their human capital. “Mining human capital” is therefore an important strategy for firms; it is in their interest to qualify their personal.

The new economy implies a further shift in relative demand in favor of qualified labor and to the disadvantage of less qualified labor. In order to prevent a digital divide in the work force, building up human capital is an important strategy for society as well.

26. The implications for the institutional arrangements of the new economy are sizable. The information industry cannot be organized along traditional lines. Speed is important. The institutional arrangement must allow quick decisions. Consider the German institutional framework under these new conditions and its time-consuming decisions processes. It is not appropriate and will have to adopt. When you can conquer the bulk of the world market with your IT product in some months, you cannot do it in a 35-hour work week. You have to put in more hours. A law (as in France) forbidding to work more than 35 hours does not fit the new economy. Countries will get under pressure because firms can circumvent national regulations, they can import services via the Internet from abroad. This means that there is the pressure of virtual migration taking place via the Internet. Thus, if countries want to be competitive in the new economy, they have to change their institutional set-up.

27. For the trade unions, the new economy means that their environment abruptly changes. It is no longer the hierarchical structure of firms and also no longer the traditional conflict between capital and labor (as often seen in Europe,

at least in the public debate). The trade unions will have to adjust and redefine themselves if they want to represent the workers of the new economy. Life will become more difficult for them.

28. It is an interesting question to what extent the new technology will affect employment and unemployment. We expect labor productivity to increase, this implies a higher demand for qualified labor. There are three effects that work towards a higher demand for labor: First, the IT-sector needs qualified people for producing and servicing hardware and software and producing information. Second, the e-economy will generate additional demand for logistical services (e.g. delivery services). Third, the higher income will increase the demand for services and non-tradables in a general way. [15] The impact on employment and unemployment will depend on the institutional setting of the labor market. With the appropriate institutional arrangement and the right wage vector near-full employment can be attained, but in the three major continental countries in Europe, in Germany, France and Italy, these conditions are not given.

VI . Regulation

29. The new economy needs an appropriate institutional set-up. This opens up a whole set of new fascinating questions (Engel 1999, Elkin-Koren and Salzberger 1999). If information displays infinite expansibility, it can be used and consumed without depleting the stock of knowledge. An analogy to natural resources exists. Take the equation of motion of a renewable resource K

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15 Quantitative implications for the demand for labor cannot be reliably determined at this stage (see for instance Bosch 1997, Ifo-Schnelldienst 1997, Wyld 1998). .

$$\dot{K} = g(K) - q - \delta$$

where K is the stock of the resource, $\dot{K}$ the change of the stock over time, g(K) the regeneration function, q the quantity withdrawn, and δ the rate of depreciation. In the case of knowledge, the withdrawal q has no impact on the stock of knowledge K. If we only consider withdrawal with no impact on the stock of knowledge, marginal cost pricing for withdrawing the resource, i.e. information, should be applied. This, however, does not provide an incentive to increase the stock of knowledge, it neglects the g(K)-aspect of the $\dot{K}$ function. For such an incentive, institutional arrangements are needed, for instances David´s three P's: property, patronage and procurement (Quah 1999, David 1992). This raises the question on the optimal design and length of property rights.

Patents give a strong property right for a limited time and grant the winner of the patent a quasi-monopolistic position. It excludes others from the markets. The stronger the property right, the stronger the incentive to invent, but the greater the losses from the monopolistic position (Shapiro and Varian 1997). Open questions are which length patents should have and how the requirements – to be novel and innovative relative to the state of the art – should be interpreted. An issue is to what extent algorithms are patentable. Standards for software patents are high. In the IT-industry, many information products are protected by copyright and not by patent (computer software, entertainment products, Quah 1999, p. 6). This is a weaker form of protection.

30. Another issue is antitrust policy. As a general impact, the Internet will provide more information, lower transaction costs and reduce market segmentations intensifying competition and making markets more contestable.

16This holds for product markets as well as for factor markets, especially the capital markets.

With respect to the new product "information" suppliers of information will attempt to appropriate it and to make it exclusive but it is unlikely that in this area of information products monopolistic positions will develop. After all, market entry at low costs is possible for information providers.

It is only with respect to the new technological device, be it hardware, be it software, that the issue of monopolistic positions can arise. In a new market there is a first mover advantage, production costs fall quickly when output is increased. Whoever is established first can take advantage of large economies of scale in production. If a firm sets the standards having reached the critical mass of output, it may be able to dominate the market. Specific strategies can be used by the firms to reach a critical mass quickly. This includes giving away their main product for free (and making a profit on a complementary good) and establishing themselves quickly world wide (as was the case with Netscape and RealNetworks who conquered the global market within months). The firms that have reached such a position may be able to deter newcomers from market entry. In these cases, it is the role of competition policy to make sure that no misuse of market power takes place and that markets are kept open. Competition policy is basically national or regional (in the EU). It is only through bilateral or multilateral cooperation between antitrust authorities that competition policy can be effective vis-a-vis the global players in the new economy.

31. A further issue is whether the network itself must be regulated (MacKie-Mason and Varian 1995; Shapiro and Varian 1997). Traditionally common

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16 Price dispersion exists in spite of the Internet (Economist 1999).

carriers have been considered to be natural monopolies. The new literature, however, has correctly pointed out that property rights can be defined for quite a few common carriers. The Internet now exists as the result of private activity. There does not seem to be a need for too much regulation. Some standardization is necessary , but this was obtained by voluntary protocols. Other legal issues relate to privacy, decency and free speech, fraud and security, encryption and junk mail.

32. The development and the performance of the IT-sector will be influenced by the regulation of other sectors of the economy. Historically, a precondition for the new economy to develop was the deregulation (and in Europe the privatization) of the traditional telecommunication sector. A defensive regulation in favor of the telephone industry (for instance with respect to the “last mile”) will hinder a positive development of the new economy. The regulation of the finance industry and of capital markets can impede access to new funds. Regulation of other sectors such as transportation may handicap the necessary logistic base for some services of the new economy. Regulation of the labor market may be a brake to use the full potential of the new economy for new jobs. Besides these impact of regulation elsewhere on the IT sector, the development of information technology changes the conditions for regulation elsewhere. Thus, the Internet means competition for (local) telephone companies and may thus require less regulation in other sectors.

33. The IT revolution being a global phenomenon, international aspects of regulation arise (Elkin-Koren and Salzberger 1999). To run the system, some agreement of the private sector and between governments is necessary. The protocols already mentioned standardize sufficiently. Other issues such as decency can be solved by international agreement as well. Trade barriers related to the Internet are another issue. It seems that the problem of establishing some

rules for the functioning of the Internet internationally is more like rules that developed for international shipping[17].

VII. Taxation and Political Economy

34. The government taxes the private sector because it needs money for the purposes of allocation (the provision of public goods) and of distribution. We here distinguish general taxation that is applied irrespectively of the sector (and is therefore also applied to the IT sector) and sector-specific taxation applied to the IT sector only.

35. With respect to general taxation, for instance of income including corporate income and business taxes, the IT sector is taxed like the other sectors of the economy. The problem for the government, however, is that this sector is highly mobile internationally; this is not only true for the firms but for the highly qualified human capital. Thus, the IT sector has an even greater exit-option if taxes are too high and if they are not compensated by an excellent infrastructure, for instance a good university and research system, and a high level of education. Note, however, that the service activities of the IT sector for the economy at large such as taking care of hardware and software need local people. These local activities cannot avoid the national taxes.

36. With respect to indirect taxation, i.e. product taxes, sales taxes and value added taxes, taxation becomes more difficult. In the new economy, traditional products (the answering machine for the telephone) are substituted by digital information that can easily cross borders. Thus the government loses control of the

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17 On the analogy of regulation in a federal state see Burk (1997)

tax base. Witness the difficulty of the EU-countries to collect the value added tax from the new economy. The new EU-directive attempts to solve that problem in analogy to the mail-order business. Mail-order firms operating across the border in the EU have to nominate a fiscal agent in each country. Similarly, the idea of the EU is to force international IT-firms selling IT products, especially information, in the EU to have an official residence in a country of the EU. They are likely to choose the country with the lowest value added tax rate which means that the country of origin principle would be applied in the EU in taxing the international firms. Apparently, governments have only a limited or even no possibility to control the Internet transactions across borders. Therefore, the EU proposal is likely to fail. The US has applied a tax moratorium for e-activities; this seems to be a good idea for Europe as well.

37. Specific taxation of the IT-sector is another issue. Within the allocation branch of government, benefit taxation or charges for using the infrastructure represent specific reasons for raising government revenue. The IT infrastructure is, however, not provided by the government but by a spontaneous process of decisions of the private sector. Whereas in other cases of infrastructure (highways, airports) the government can argue that it supplies these goods and therefore can collect a toll for using them (according to the equivalence principle), there is no reason for the government to collect user charges for the Internet, for instance a toll for each transaction. The only reason for taxing the IT-sector is the need to raise revenue.

38. A different matter is the auctioning of licenses, for instance for UMTS. This may be justified by the need to raise revenue and by the practical consideration that other methods to collect taxes from the IT-sector, for instance through indirect taxation, are limited. Another argument is that auctioning is a method to evaluate property rights and thus to discover the willingness-to-pay of firms.

Some argue that these auctions only absorb windfall profits and have no allocative effect; ex post the payment for the licenses are sunk costs indeed. Ex ante, they may very well have an allocative impact. Note, however, that this argument does not imply that all activities of the new economy should be licenced. This would stifle the dynamics.

39. The IT technology may affect political power and change the political economy of in nations and of international organizations. Looking at national states, members of a state get additional options of voice and exit (Engel 1999); individuals get more voice internationally. The Internet provides an opportunity to express opinions and to organize political influence; NGO´s get an instrument to organize political support, for instance against international rule systems such as the WTO. Individuals also obtain an additional option of exit, either making real exit more easy through improved information or opening up virtual exit. National sovereignty is affected; states lose part of their monopoly power.

VIII. The International Division of Labor

40. The new economy represents a new technology that will be associated with a higher growth rate. All countries can benefit from it since the positive spillover of the network applies to all countries. Economic distance does not matter so much any more, market segmentations are reduced, globalization is enhanced and the periphery moves closer to the center.

For developing countries, new opportunities open up. Knowledge becomes more readily available, access to information is improved. Education can benefit from the world wide availability of the Internet. Human capital formation can be

improved. In principle, developing countries can leapfrog to new technology.. This can mean higher wages, also for less qualified who can be taken along.

41. The new economy can lift up all boats. The digital divide in the world is not an unavoidable scenario. The strongest benefits, however, will go to those countries that are able to develop a comparative advantage in the IT sector or in using IT products because comparative advantage still is important. Benefits will go to those that can move first and quickly. The first mover advantage not only holds for individual firms. Countries are therefore in locational competition for the new technology.

It is especially important that they have qualified people[18]. Human capital formation therefore is at the core of economic policy in the new economy. The organization of educational systems for the young, the dual system of schooling and training on the job as in some European countries, the organization of the universities and of basic research are the key policy parameters to participate in the benefits of the new economy.

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18 There is broad literature on the policy approaches to improve the conditions for the new economy to develop (Bassanini, A., S. Scarpetta, I. Visco (2000). Coppel, J. (2000). Engel, C. (1999). OECD 1997, OECD OECD Directorate for Science, Technology and Industry (2000a).. An important question is to what extent the European countries will be able to solve their structural problems.

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