János Kornai
Harvard University, Collegium Budapest and Central European University

INNOVATION AND DYNAMISM

Interaction between Systems and Technical Progress

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INTRODUCTION[1]

The term *Annus Mirabilis*, the year of wonders, has different meanings to different people. For us, gathering here for a seminar, and for our fellow "transitologists", it is 1989, the year of the first almost free elections in Poland, cracking the Iron Curtain on the Hungarian-Austrian border, the Prague velvet revolution, and the opening of the Berlin Wall. We came here to celebrate the 20th anniversary of the beginning of the post-socialist Great Transformation.

The essence of the transformation can be easily summarized in a few words: a large set of countries moved from socialism to capitalism. This shift itself is the strongest historical evidence of the superiority of capitalism over socialism. Nevertheless, it is our obligation to continue the impartial and unbiased comparison of the two systems. All the more so, since we are living in difficult times, and nostalgia for the failed old regime can be felt by an unignorable portion of the population. We have to convince our fellow citizens that we are heading in the right direction. There are several arguments to support this optimistic belief. I would like to spell out today only one virtue of capitalism: its innovative and dynamic nature. In the first part of the paper I argue that rapid innovation and dynamism are not a random phenomenon which may or may not occur, but a deeply rooted *system-specific property* of capitalism. We can say the opposite about the socialist system. Its inability to create great revolutionary new products and to be slow in other dimensions of technical progress are not due to some errors in policy, but are a deeply rooted system-specific property of socialism.

Unfortunately, this highly visible great virtue of capitalism does not get the appreciation it would deserve. It is completely ignored by most people and even by most professional students of alternative systems – and I feel angry and frustrated watching that neglect. This feeling of anger and frustration has motivated me to choose the theme of my paper.

Entering the world of capitalism *creates the conditions* of innovative processes and faster technical progress, and also *increases the chances* that the country will take this opportunity. But it does not guarantee full success right away. The second and third part of my paper will discuss problems of the transition period.

[1] I express my gratitude to Julian Cooper, Zsuzsa Dániel, Zsolt Fekete, Philip Hanson, Jerzy Hausner, Judit Hürkecz, László Karvalics, Zdenek Kudrna, Tibor Meszmann and Dániel Róna for their valuable comments and their devoted help in collecting data and readings, and to Collegium Budapest for the permanent support and stimulating research environment. I highly appreciate the help I got from Rita Fancsovits, Anna Patkós, Ildikó Pető, Andrea Reményi and László Tóth in editing the paper.

The "Great Transformation" is an ensemble of several processes.

Firstly, there were changes in the *political* domain: the transition from a single-party dictatorship to a multi-party democracy. This transformation put an end to the state-protected privileges of the Marxist-Leninist ideology, and gave the green light to the competition of various schools of thought. Then there were changes in the *economic* domain: the pre-dominance of state-ownership was replaced by the pre-dominance of private ownership. Associated with the transformation of ownership forms, the relative influence of various coordination mechanisms also went through radical changes. The impact of centralized bureaucratic control became much smaller, and the influence of market coordination and other decentralized procedures increased dramatically. These profound political and economic changes associated with several other changes jointly mean the change of the *system*, i.e., the transition from socialism to capitalism.

The post-socialist region went through another class of changes in the domain of *technical progress* as well. I apply the term "technical progress", because we are used to this expression. However, what I have in mind is a much wider phenomenon. It is based on the stream of new products and new technologies, but its effects go far beyond the technical aspects. It is a part of *modernization*, generating profound changes in the way how we live. The meaning of the term "technical progress" in the context of my paper will become clear as we go along the discussion of my theme. Technical progress went on, of course, all the time, also before 1989, but following 1989 it has accelerated spectacularly.

In our profession, or sub-profession, all the experts on post-socialist transition have been concentrating their attention on the study of political, economic, social changes as part of the Great Transformation. Let us confess frankly, we perhaps briefly mentioned technical progress once in a while, but we have not studied thoroughly the interaction between changing the *system* on the one hand, and changing our profile in generating and using new products and new technologies, on the other.

I have certainly missed this point before. I have written two papers summarizing the main consequences of the changes after 1989, but they discussed only political and economic changes and their interaction (Kornai 2001, 2006). I start today to make up what I missed before. Thus, the subject of the second part of my paper is the interaction between the post-1989 change of the system and the acceleration of technical progress.

CAPITALISM, SOCIALISM AND TECHNICAL PROGRESS

Revolutionary new products

The complex process of technical progress is composed of several sub-processes. Let us begin with the great, break-through, revolutionary innovations. Instead of explaining the concept of "revolutionary innovation", Table 1 shows a list of 88 examples.[2]

As we take a look at the role of socialist countries in creating revolutionary new products, we have to go back in time to the birth of the Soviet Union, the first socialist state. Therefore the period covered by the list starts in 1917.

Since 1917 many innovations of great significance have been born. It is debatable why exactly these 88 are the ones included in the table, as we could perhaps find additional twenty or fifty which might have no less significance. The selection is arbitrary, yet the list seems to be apt to demonstrate that all the innovations mentioned here in a narrower or wider scope fundamentally change the everyday practice of people's lives, work, consumption, recreation, and the relationships to others.[3] The rapid development of the "high-tech" sector, the revolution taking place in the spheres of information processing, information flow and communication play a prominent role in the process of technical progress. However, Table 1 demonstrates that when discussing technical progress, it is not enough to talk only about the development of the high-tech sector and its direct effects. The office and the factory, transportation, shopping, housework, education have all changed. The tie between the home and the workplace differs, travel has changed as well – and we could continue listing, at great lengths, the effects of innovation causing permanent upheaval and reorganization of life. The modern world is made dynamic by the perpetual flow of innovations. We consider our times more dynamic compared to earlier periods, because many more innovations are being introduced, which are generating much deeper changes in our everyday life.

Out of the 88 innovations about 25-30 are related to computers, digital equipment and information. This subset attracts the most intensive attention of the public and the academic world. A large and fast-growing literature is studying the social effects of the Information

[2] The literature on technical progress and innovation distinguishes new *products* and new *technologies*. The appearance of these two categories is often intertwined. The Xerox machine is a new product, and introduced a new technology of printing. Table 1 is listing new products, because I felt that they are more „tangible", more „visible" in every-day life.

[3] Certain classes of innovation were excluded at the selection. Criteria of exclusion are explained partly in the footnote at the bottom of the table, and partly in later sections of the paper.

Society. (Perhaps the most influential work in this area is Castells, 1996-1998.) My paper cannot penetrate *deeply* in this exciting subject, because I would like to cover a *wider* set of innovations. Around 60 out of 88 in the list are innovations unrelated or not closely related to the revolution in the information-communication sphere. Admitting wholeheartedly the extraordinary importance of information and communication, there have been and there will be innovations in many areas outside this area. For the poorest inhabitants of a poor Albanian or Siberian village the introduction of the refrigerator or the appearance of a supermarket might contribute to relevant changes in life-style – the use of the computer will come later. I would like to discuss certain issues of technical progress as a whole, i.e., the technical change related and unrelated to the revolution of information and communication.

Innovation is preceded by *invention*. The first step is made by the inventor: the professional or amateur researcher, the academic scholar or the company's engineer is the one to whom the *new idea* occurs. However, the originality of the idea, its novelty, and its ingenuity are not at all enough. In the second step the invention becomes innovation: *the practical introduction* begins, i.e. the organization of producing and the diffusion of a new product, or the application of a new organizational form.

If we turn our attention towards this second phase, to the practical execution of the change – we can see that Table 1 indicates the country in which the innovation was first introduced –, we will, w*ithout exception, read the names of capitalist countries here.*
As the time period captured in the table includes the entire era during which the socialist system existed, it is clear that in *no instance did the innovation pioneer in a socialist country*.[4]

Following the pioneers, the diffusion of innovation

While revolutionary innovation is the most important component of technical progress, there are other components as well. The pioneer has followers. Beside the first innovator, after some time-lag, various other organizations participate in minor quality improvements, implementation of small but not negligible inventions, and in the process of *diffusion*. The innovation appears first in a certain country, but then followers show up in other countries as well.

The socialist system in numerous spheres follows the pioneering inventions occurring first in a capitalist country. Following takes place in diverse forms. Sometimes it is just

[4] Table 1 excludes innovations which started in the *military sector* of the economy, as innovations introduced for the sake of strengthening the military power of the country is a different problem. In the military sector we find innovations which appeared for the first time in a socialist country. I return to that point later.

imitation. The mere reproduction of the model, perhaps its makeshift copying is simple. Then there is a somewhat more difficult task: breaking up the secret. The reinvention of the innovations protected by patents and business privacy has virtually developed into an art in socialist economies. Industrial espionage, the stealing of intellectual property is a further possibility. However, despite the diverse attempts, regarding these processes the socialist economy sluggishly trudges behind the capitalist economy.

Let me draw your attention to two details. First, in the socialist countries this delay, the followers' lag behind the pioneers, is significantly larger in magnitude than in the capitalist countries.(See for example the data on Tables 2 and 3.) Examining a longer time period, the lag measured in years is mostly growing instead of shrinking.

And second, the diffusion of new products and new technologies is much faster in the capitalist economies than in the socialist ones. (For example see Table 4 and Figure 1.)

Only a few tables and figures are shown here, just for the sake of illustration. There is a large amount of empirical evidence in the comparative economic literature to support the proposition that the socialist system is sluggish in following the pioneering innovations.[5]

Innovative entrepreneurship under capitalism

Thus, capitalism produced all the break-through innovations and was much faster in other aspects of technical progress – *historical experience* grants irrefutable evidence. Nevertheless, let us add the *causal explanation* of the crucial systemic difference.

In capitalism the entrepreneur plays a distinguished role.[6] My paper adopts this term in the sense used by Joseph Schumpeter (1912/1934). Beyond terminology, Schumpeter's theories about development and the nature of capitalism leave their mark on the message of this paper.[7] (See also Baumol, 2002. Already the title of his book catches the real essence of the phenomenon I am going to discuss: *The Free-Market Innovation Machine: Analyzing the Growth Miracle of Capitalism.*)

Innovative entrepreneurship is a *function*, a *role*, which can be fulfilled by an *individual* alone or by teaming up in a small community, or with the support of a *small firm.* Or even a *large firm* can function as an entrepreneur. The main point is that the entrepreneur is the one who brings together the necessary financial and personal conditions that the

[5] The most important empirical work on the subject are the books by Amann, Cooper and Davies (1977, 1982). See also Berliner (1976), Hanson (1981), Hanson and Pavitt (1987).
[6] Not all entrepreneurs are innovators (Baumol and Schilling, 2008). This paper is focusing on one extremely important class, the entrepreneurs engaged in the process of innovation.
[7] On Schumpeter's contributions to social science see Hertje (2006) and McCraw (2007).

innovation calls for, in other words, the human resources, the physical instruments and financial resources essential to the activity. S/he is the one finding the place of application; s/he directs the execution of the change. Often long time passes before a promising invention is taken up by a true entrepreneur. (One can find numerous examples for this delay in the 1995 book of Rogers. See also Freeman, 1982, p. 111-112.) Probably it happens many times that an invention or discovery and an entrepreneur do not find each other. Fortunately, it is quite frequent that the match is made.

From Table 1 it emerges how many different types of innovation are possible: not only new products, or new production technologies, but new organizational forms as well.
In most cases the Schumpeterian entrepreneur drives the innovation process during the *first realization* of the revolutionary innovation. Mostly entrepreneurs drive the process that *follows* the pioneering innovation, i.e. the *diffusion* as well.

At the beginning of the sequence the initiative appears. For example, in 1996 Larry Page, a Ph.D. student at Stanford, is searching for a dissertation topic. Some specific issues about browsing the internet attract his attention. He teams up with another student Sergey Brin. They develop a "search engine". On the homepage of Stanford it receives the name: *google.stanford.edu*. In this story these two men unite the two usually separated roles: they are the inventors and at the same time they are the innovators. Skipping over all the intermediate stages, let us jump to where we are right now. Google is one of the world's largest and wealthiest companies.[8] Its world-wide network is using about 450,000 servers. I would not like to play lightly with words, but the influence of Google has proved to be of revolutionary significance.[9] (I will again and again refer to the Google story, but only to illustrate the *general* characteristics of the innovation process taking place in the capitalist environment.)

Below I am summarizing those specific characteristics of the capitalist economy which do not only make it possible, but which also induce, constantly develop and propel the innovation process.

A. *Decentralized initiative*. Larry Page and Sergey Brin *did not receive any orders* from their superiors to solve a specific innovational task. They did not have to ask for permission from their superiors to work on a special direction of an innovative action. The individuals and the decision-makers of small firms, or the chief executives of large companies

[8] For a concise introduction to the Google story, see the company's own brief summary (Google, 2009) and the entry on Google in Wikipedia (2009a).
[9] Based on my personal experience, I admit that it has changed my research habits as well. It is different to be a researcher in the Google age than it was earlier, in the Gutenberg era.

– in other words, the separated entities functioning inside the entire system – determine for themselves what they want to do.

B. *Gigantic reward.* Today Page and Brin are among the richest men of the world.[10] It is not the task of this paper to analyze the difficult ethical dilemmas of income distribution. How large is the reward that is "proportional" to performance? One point is certain: the most successful innovations usually (not always, but very often, with high probability) result in enormously large rewards.[11] The range of the reward spreads rather unevenly. At the end of the scale one can find the owners of gigantic wealth: people like Bill Gates, or in the older generations the Fords or the Duponts. The entrepreneur leading the technical progress is able to gain a huge *monopolistic rent*. It is worth being the first – even temporarily – because it creates a monopolist position. The enormous financial reward is usually accompanied by prestige, fame and reputation.

C. *Competition*. This is inseparable from the previous point. Strong, often ruthless competition is taking place to attract the customers. Faster and more successful innovation is not the exclusive instrument for that purpose, yet it is highly important to gain advantage over one's competitors.

D. *Extensive experimenting.* There must have been hundreds, perhaps thousands of entrepreneurs wanting to find suitable tools to search the internet. Only a few achieved almost as great a break-through as the founders of Google, however, others have been also able to realize innovations with fairly large, medium or small success. And there must have been many, quite many who have tried, but failed. Moving beyond the example, so far no one has assessed the volume of innovational attempts constantly occurring in all spheres under capitalism and the distribution of their success and failure. Those gaining an impression about this highly important activity can only intuitively sense that the number of the attempts are enormous, and compared to that such spectacular successes like the story of Google, Microsoft, Tetrapack, Nokia or Nintendo are rather rare. Many highly talented people are motivated exactly for innovation, because – although with quite a small probability – a phenomenal success is promised, and even with a larger probability a more moderate yet still substantial success materializes – and that is why it is worth taking up the risk of failure.

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[10] According to the well-known ranking of *Forbes* magazine, they are in tie for the rank No. 5 in the USA.

[11] The Google-story can rather be considered as a unique case, where the pioneering inventor and the role of the innovator are played by the same people. Where these roles are separated (and this is more frequent), the inventor in some cases partakes in the large rewards, in other cases s/he attains no benefits at all from the invention or the discovery. This is what happened in the case of the *mouse* used for the computer. The inventor Douglas Engelbart has received no financial reward for his genius invention. Apple, the innovator company pioneering the mass introduction, has made an enormous profit on this innovation.

E. *Reserve capital waiting to be invested; the flexibility of financing.* The two founders of Google gained access to financial resources enabling them to launch the innovative activity, the distribution. A successful researcher and innovator, Andy Bechtolsheim (who happened to be also a wealthy businessman) at the very beginning of the process reached into his pocket for his checkbook and signed a 100,000 dollar check.

It rarely happens that an innovative enterprise is being realized solely from one's own resources, although there are examples of this as well. Resorting to outside resources is much more common.[12] There are many forms to open up resources: the entrepreneur receives a bank loan, or one or more investors are willing to take part in the business. There are "venture capital" institutions specialized on particularly high risk and – in case of success – high reward projects (Bygrave and Timmons, 1992). Basically, there is a need for flexible disposable capital in order to realize the pioneering introduction and the quick diffusion of innovations, including wide range experimenting, and within this, eventually unsuccessful attempts.[13]

I do not claim that the Schumpeterian-type entrepreneurship is the only way to generate innovative processes in a capitalist system. There are several other, non-Schumpeterian frameworks. Let me mention only two.

(i) In several instances an important innovation is initiated, financed and implemented by the *military*. For example, in the 1960s there was a strong demand expressed by the Pentagon to find ways of a completely decentralized mailing service. The idea was to assure that the destruction of the center of the postal system would not lead to a breakdown of written communication. This requirement of the military and the generous financial support of research in that direction led to a revolutionary innovation, the creation of *e-mail*, a completely decentralized "invisible hand" device for communication. At a later stage the free-of-charge, non-profit e-mail system intertwined with more commercial profit-oriented activities. Nevertheless, e-mail is a classical example of a non-Schumpeterian innovation.

While under socialism competition was eliminated in the centralized, bureaucratically managed civilian economy, the Soviet Union and its allies were fatally involved in the

[12] No doubt that there is a connection between the economic booms of the great innovative periods and „running up" the available amount of credit. Easily accessible money helps technical progress – but also entails the danger of a bubble formation. It is timely to reread Schumpeter when analyzing the history preceding the current crisis (Schumpeter 1939, especially Chapter IV.) I would feel a great temptation to dicuss this aspect of the topic – but the time limits command me to resist the temptation.

[13] Experimentation has an invaluable role in the processes of invention and innovation. Only amongst a huge number of unsuccessful trials appears one successful invention. And after that stage, out of many viable and useful inventions only one breaks through and develops into a commercially successful innovation. (On the importance of experimentation see Thomke 2003.)

military race with the West, first of all with the USA This life-and-death competition put the innovative process under sufficient pressure for generating great innovation. The first satellite, the Sputnik, was created by the Soviet Union. The sluggishness of technical progress in the civilian sector was overruled by the overall objectives of the leadership, to keep pace with, or even jump ahead of, the development of the Western military forces. But when it came to the civilian utilization of a military innovation, the inferiority of the socialist system did show up again. In the USA after the pioneering military applications came the use of satellites for civilian use, leading to rapid quality and efficiency improvements in all areas of telecommunication. In the Soviet block the civilian application followed only after a long delay. The example of the satellites demonstrate that focused action in a highly centralized bureaucratic system might produce spectacular results – but these do not have the same strong spillover effect as great innovations appearing in a decentralized, entrepreneurial capitalism.

(ii) In several instances important innovations are initiated, and also executed by an ad hoc ensemble of researchers, or by an association, or by a non-governmental and non-profit organization. That is the way how, for example, one of the most significant, truly revolutionary innovations, the *world-wide-web* started. (See the memoirs of the pioneer, Berners-Lee, 1999.) Many other important innovations in the sphere of computers, digital applications, information and communication started in this civilian, non-profit, associative way of non-Schumpeterian innovation.

Admitting the relevance of non-Schumpeterian processes, the larger part of break-trough innovations follow the Schumpeterian path. That is certainly true for the innovations targeted at the market of consumer goods and services, for practical use in everyday life. And even the non-Schumpeterian starts are followed typically by many profit-oriented applications, and innovators with a commercial orientation execute the larger share of wide diffusion.

<u>The impossibility of innovative entrepreneurship under socialism</u>

Moving on to socialism, let us begin by stepping back to the preceding phase of innovation, namely *invention*. Creative minds lived in the socialist countries as well. Excellent scientists and engineers worked there, who made important discoveries and inventions that were revolutionarily significant and had a potential to be applied in industry and commerce. Let me mention the Soviet physicist Abram Joffe, who is regarded in the history of science as one of the pioneers of the *semiconductors,* today playing a fundamentally important role in the electronics industry. He had already come forward with his discoveries during the 1930s –

just the economic environment did not allow for the introduction of their industrial applications. Much later the manufacturing of semiconductors became dominated by the U.S., Japan, Taiwan, South-Korea – the Soviet Union trailed behind among the slow followers of the leaders.[14]

Jacek Karpinski, a Polish engineer and scientist invented the first *mini-computer* between 1971 and 1973. His name is recognized among the great pioneers of computer technology. However, his invention did not become a widely dispersed innovation while he lived on Polish soil. Karpinski later emigrated, and his invention, in competition with similar discoveries, became a widespread innovation in the capitalist world.

The most famous Hungarian example is the story of *Rubik's cube*. I listed this ingenious toy among the breakthrough innovations, and I am sure that it has a legitimate place there. The inventor, Ernő Rubik, tried to initiate the worldwide distribution, after seeing the enthusiastic reaction of everyone getting familiar with this intellectual masterpiece, but with a rather moderate effect. It became a fantastic success when a well-known, truly entrepreneurial American toy company bought it and started worldwide marketing.

Even in Hungary only a few know that the *floppy disk*, the plastic covered simple data storage device for personal computers used by millions, was invented by a Hungarian engineer, Marcell Jánosi. The invention was born in 1974. Jánosi offered the well functioning prototype to the Hungarian industry and exporters in vain; the leaders of the socialist industry did not see the great business opportunity in the invention. They felt reluctant to risk mass production and worldwide distribution; they did not even supported the extension its patent protection. The inventor was not allowed to take the marketing of his intellectual product in his own hands. At the end, a Japanese firm "reinvented" it, and it was first there that the innovative process of mass introduction developed.[15]

After these sad stories of frustrated inventors, we turn to the *innovation* phase. Surely, even in the socialist system many individuals had entrepreneurial talent, but it was lying dormant. Perhaps a large project's leader could to a certain extent unfold his talent, provided that he was picked for his position because of his abilities and not because of his party

[14] Joffe was first showered with the highest state awards, and he received high academic honors. During the last years of Stalin's terror he was removed from his high positions as a „Zionist". One thing is certain: even when his scientific work was acknowledged and supported by the state, his discoveries did not turn into a revolutionary innovation, either.

[15] The Hungarian inventor is still alive. Since his retirement he has been living on a very modest pension. See the story of the floppy in Kovács (1999) and Drávucz (2004).

connections. However, the inherent characteristics of the system did not allow the development of a Schumpeterian-type entrepreneurship.[16]

Let us look again, one by one, at the conditions reviewed earlier when discussing capitalism, and look now at the situation under the socialist system.

A. *Centralization, bureaucratic orders and permissions.* The plan of technical innovation is one chapter in the state plan. The central planners set those more important changes to be carried out regarding the composition and the quality, together with the production technology of the products. What follows is the disaggregation of the central plan numbers into plans for sectors, sub-sectors, and at the end to companies. The "command economy" among others means that firms receive detailed orders about when they should replace one product with a new one, and which old machinery or technology when should be replaced with a new one.

Before the final approval of the plan company managers could make suggestions, so among other things they can initiate the adaptation of a new product or a new technology, that is to say, they can join in the process of innovation diffusion. However, they must ask for permission to the realization of all significant initiatives. If an action happens to be of large scale, then even their immediate superiors cannot decide by themselves, instead they have to turn to the higher levels of the hierarchy for approval. The more extensive an initiative is, the higher one has to go for the final decision, and the longer the bureaucratic process preceding the actual action is.

If in capitalism a very promising innovation is turned away by the company to which the inventor first offers it, there could be another one willing to embrace it. Decentralization, private property and the market make this possible. In the centralized socialist economies the innovative idea goes through the official pathways, and if a negative decision is declared, no appeal can be made.

B. *No or only insignificant reward.* Of course, in the practice of the socialist economy financial rewards are not unknown. There are significant differences between individual earnings, and different kinds of regular and special rewards exist. If the higher authority deems a technical innovation in a factory unit successful, then the manager and perhaps his immediate colleagues would receive a bonus, the amount of which equals at best one or two months of salary. Needless to say, these rewards hardly compare to the income made by the innovator-stars of capitalism.

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[16] For empirical studies see the references in Footnote 5. For a theoretical explanation see Berliner (1976), Gomulka (1983) and Kornai (1980 and 1992).

C. *There is no competition between producers and sellers.*[17] Production is strongly concentrated. Quite many companies enjoy monopolist positions, or at least a (regional) monopoly in producing an entire group of products. The chronic shortage of products creates a monopolist behavior even where many producers operate in parallel.[18] The shortage economy, one of the strongest system-specific properties of socialism, paralyzes the forceful engine of innovation, the incentive to fight for the favors of the customer (Kornai 1970, 1980, Kornai 1992, Chapters 11-12.) The producer/seller is not compelled to attract the buyer by offering him a new and better product, since the latter is happy to get anything in the shop, even an obsolete and poor-quality product.

D. *The tight limits of experimenting.* Capitalism allows for hundreds or thousands of barren or barely fruitful attempts – so that afterwards one out of the hundreds or thousands would make it and bring immense success. In the socialist planned economy actors are to avoid risks. As a result, the application of revolutionarily significant innovations are more or less excluded, since those always mean a leap into the dark, as success is necessarily unpredictable.

In the camp of followers, including non-socialist countries as well, some economies follow up quickly, others slowly. The socialist economies belong to the group characterized by the slowest pace. They rather maintain the already known, old production procedures, produce the old well-tried products – new technologies, new products have too many uncertain characteristics making the planning of the directives difficult.

E. *There is no capital waiting to be utilized, investment allocation is rigid.* Central planning is not dealing miserly with the resources devoted to capital formation. The share of investment carved out from the total output is typically higher than in the capitalist economies. However, this enormous volume is appropriated ahead of time to the last penny. Moreover, most of the time in fact over-allocation takes place; in other words, the ensemble of all project plans prescribes the requisition of more resources than the required amount to execute the plan. It never happens that unallocated capital is waiting for someone with a good idea. The allocators do not search for an entrepreneur who would step forward with a proposal for innovation. Flexible capital markets are unknown. Instead, the rigid and bureaucratic

[17] As mentioned before, the defense industry is an exception, because in this area the Soviet empire was in a truly fierce competition with West.

[18] During World War II the shortage of raw materials spurred innovating activities to develop „Ersatz" materials in order to make up for regular raw materials, for instance the German chemical industry spread synthetic rubber and other plastics. We can see similar phenomena in the socialist economies as well. Companies attempted to tinker together the missing spare parts with great technical resourcefulness. However, these inventions did not become widely universalized innovations.

regulation of project activities takes place. And it is unconceivable to devote capital resources to activities with possibly uncertain outcomes. No such a foolish minister of industry or factory manager could be found who would demand money for ventures and admit in advance that the money may be wasted and the innovation may not succeed.

When arriving this far, it worth running through the points from A to E again. What I have said about the mechanisms of innovation in these points are really the results of the *basic characteristics* of the capitalist and the socialist systems. We reviewed phenomena that are direct results of private property and market coordination in one system and of public property and bureaucratic coordination in the other.

I do not claim that a country's pace of technical progress solely depends on its being governed by a capitalist or a socialist system. Numerous other factors play significant roles: the country's state of economic development, the level of education, including the training of researchers, the level and the institutional framework of financing academic research and industrial R&D activity, research financed by the military and so on. It is undeniable that luck also plays a role. It was a matter of luck why it is in Finland, and not Denmark or Norway, where a company like Nokia has appeared and reached unparalleled success in the diffusion of mobile phones. There is rich literature discussing the problems of leaders and followers in the innovation process (see e.g. Davila, Epstein, and Shelton, 2006, Freeman 1982, Rogers 1995).[19]Admitting the relevance of all other explanatory factors, I maintain the proposition: the *system-specific effect* is quite strong.[20]

Political factors and technical progress

The decisive factor explaining the nature of the innovative process is the influence of the system-specific features of the *economy*, and that is, of course, *ultimately* determined by the political structure of the system. There are, however, several *direct* linkages between the political structure and technical progress. I will briefly touch upon a few linkages.

Communist dictatorship aggressively promoted innovations in the information-communication sphere when it provided efficient technology for political propaganda and

[19] Perhaps the most quoted work in the literature written for businessmen and managers interested in the practical issues of innovation is Rogers (1995). In this otherwise excellent and very carefully written book the name Schumpeter is not even mentioned, nor any other *economic* theory of innovation.

[20] The experience of the divided Germany is especially instructive. East Germany was, beside Czechoslovakia, the most developed country in the socialist region. It started with an excellent research infrastructure and devoted resources generously to higher education, academic and industrial research. Yet it was not able to step forward with even one break-through revolutionary innovation. In spite of having first-rate, highly skilled experts at disposal, the rate of following the pioneering innovations was in most sectors slower than in West-Germany (Bauer, 1999, Stokes, 1990).

more generally, the spreading of the official ideology. Lenin was among the first political leaders understanding the relevance of the cinema for propaganda purposes. Also, the USSR was among the fastest countries in introducing television broadcasting, since it was a highly centralized medium in the first period, concentrated in a single or only a few studios, and subject to the tough political control of the Party. Also, the program of the radio-stations could be easily controlled, and transmitted through loudspeakers even to remote villages.

Radio and television was supported by the communist regime as long as tough central control was feasible. Luckily, as the IC technology developed further, complete centralization and censorship became technically impossible. There was a wall in Berlin which did stop people to cross the border of the two worlds. But no wall could be built to stop radio and TV waves to move through the Iron Curtain from West-Germany to East-Germany, from Munich to the whole Eastern Europe. Jamming was a poor device to stop the destabilizing impact of Western broadcasts and TV stations. There are certainly several factors leading to the collapse of the socialist system. One of the contributing factors was the *technical* impossibility of airtight isolation of the Soviet Union and other socialist countries from the voice coming from the rest of the world.

The last turmoil in the socialist block occurred in the period when e-mail and the internet became available even in this area. Gorbachev called for *Glaznosty*, openness – and through the open doors of the internet, e-mail, radio and TV waves information flowed from abroad, and later also from open-minded awaking domestic citizens in ever larger volume. It had a devastating effect on old dogmas, frozen beliefs, misleading party propaganda and it liberated the minds of more and more people (Shane 1994, Kedzie 1997a and 1997b, Stolyarov 2008).

Let me come back to the relationship between political structure and technical progress at a later point.

<u>First summary: Systems and technical progress</u>

Assume for a moment that the vision of Marx, Lenin and Trotsky had been materialized, the world-revolution was victorious all over the globe, and there is not a spot of capitalism left. In that case we would never get the computer and the transistor radio, the refrigerator and the supermarket, the internet and the escalator, CD and DVD, digital photography, the mobile phone and all the other revolutionary technical changes. Our way of life, at least with respect to the use of various devices and equipment, would more or less stagnate at the standard taken over from the last spots of capitalism before its final defeat.

We arrive here at fundamental issues of understanding and explaining the long-lasting trends of human history. The technologies (instruments, devices, equipments etc.) utilized in *all* activities (not only in production of goods, but in all other individual and social activities) is developed in a complex social process. That complex process is what we call concisely "technical progress." The speed and other properties of technical progress are determined by several factors. The general philosophy underlying this paper (and of my other writings) is this: one of the strongest explanatory factors is the *system*. There is a strong causal relationship between the type of system (capitalism or socialism) as one of the *causes*, and the speed and other properties of technical progress as the *effect*.

I am using the concept "technical progress" generally accepted by the whole economic profession. We have to be aware that the second word, "progress" has an appreciative or even laudatory sounding. It reflects a value-judgment: it is better to live in a world with automatic dishwashers and CDs than in a world without these products. But is it really better? Nobody, even the most enthusiastic fans of modern technology would reply with a simple yes, without qualifications and reservations. Since the invention of the fire and the knife all new instruments and technologies have been used for good and for evil purposes. It is a trivial, but still extremely important, fact of life that the latest great wave of technical progress, namely the stormy development in the sphere of computers, electronics, digital instruments, modern technologies of information and communication can serve criminals, sex-offenders, terrorists, and extremist political movements. It opens the new technology for tricky advertisement misleading or at least bothering people. Sitting in front of the screen of the computer or TV day and night can distract children and adults from more worthy studies and entertainment. Technical progress has been and will be used not only for peaceful, but also for military activities, and not only for the defense of the homeland but for aggression as well. Yet, I belong to the majority of people who call the direction of technical changes *progress* – because it brings more, many more benefits than drawbacks or dangers. (Later I will cite surveys showing that this is the majority's opinion.)

Based on this value-judgment I regard the promoting impact of capitalism on technical progress one of the greatest virtues of that system, and the retarding impact of socialism on technical progress one of the greatest vices of that other system. This observation alone would be a good reason to celebrate the fall of the socialist system.

TRANSFORMATION AND THE ACCELERATION OF TECHNICAL PROGRESS

Entering the world of capitalism the door was opened in all post-socialist countries for entrepreneurship, path-breaking innovations, fast diffusion of new products and new technologies. The change of the basic features of the economy has created the conditions for the acceleration of technical progress in this part of the world.

Formulating these sentences I tried to be cautious. Capitalism has a built-in tendency for entrepreneurship, innovation and dynamism. However, this is just a tendency, an inclination, a disposition -- and not more than that. It is not like a law of physics, which *must* materialize. Entrepreneurship, innovation, dynamism come to life through human action. How far and how quickly the tendency is breaking through depends on the social, political and legal environment created by human beings. It depends on the business climate. And it depends to a large extent on the courage, inspiration and competence of individuals who might become entrepreneurs.

New innovator entrepreneurs

Let us start with innovations introducing revolutionary new products.
The first example is *Skype*, listed among the great revolutionary innovations in Table 1. The two inventors are Scandinavian, Niklas Zennström is Swedish and Janus Friis Danish, but the company launching the world-wide distribution was founded and is registered in Estonia. Therefore – according to the criteria applied in this paper – we look at an Estonian innovation. It was so successful that the USA-based e-Bay paid almost two billion euros for the pioneering company when it took over and continued the innovative process.

The second, less spectacular, but still remarkable example is the story of the Hungarian high-tech company *Graphisoft*. The inventor-innovator, Gábor Bojár, a former senior fellow in an academic research institute, created a *program for three-dimensional design* targeted for utilization mainly by architects. While his software is not unique in the field, but competing with other procedures, it is elegant, efficient and therefore commercially successful in several countries. Bojár's company is marketing the product worldwide. This is a classical example of a Schumpeterian entrepreneurial career. What a difference there is between the stories of the two Hungarians: floppy disk inventor Jánosi not succeeding in the

pre-1989 era, remaining poor and virtually unknown, and Graphisoft creator Bojár reaching fame, reputation and a big fortune!

The third story about *data-recovery from damaged hard disks* starts also in Kádár-era Hungary, which was characterized by half-way market reforms. At the time there are already quite a few computers around, but they are rather expensive in the Hungarian environment. If a computer breaks down, the most valuable part, the hard drive, should not be dumped. It is worthwhile to restore it and make it ready for use in another computer, put together from used parts. Two brothers, János and Sándor Kürti acquire special skills in the restoration of hard drives. And then comes the creative idea: the same skill can be used if the data stored on the hard disk get lost. Everybody knows the traumatic feeling when we lose a large set of information on our computer. The Kürtis learnt the technique, or more precisely the art, of conjuring data believed to be lost forever from the damaged disk. After 1989 this very special knowledge became a marketable service. The Kürti brothers founded a company, trained several others in their art. They have now customers from all over the world (Laki, 2009). This is another story of the highly successful Schumpeterian innovators.

Two out of the three examples come from Hungary, because here I have personal connections to people familiar with these cases. I am convinced that there are similar stories in many other post-socialist countries. Perhaps my colleagues here at the conference will help me to include more examples in later versions of this paper.

The acceleration of follow-up and diffusion

As post-socialist economies were moving forward in enlarging the private sector and creating the institutions of market coordination, technical progress accelerated in many ways, including the faster follow-up of innovations introduced elsewhere.

Access to a telephone line has been regarded self-evident to everyone in the West in the last decades. But the least so for citizens of socialist countries, where it was a service in very short supply, reserved for the privileged and provided for others only after a waiting period of several years! There were not enough lines, because planners assigned it a low priority, and allocated resources to other sectors. As long as socialism prevailed it seemed to be hopeless to change the relationship of supply and demand in telephone service. Then followed the change of the system – and together with it the situation completely reversed in the telephone sector. Table 5 shows that in a relatively short time old-style cable phone service became accessible to everyone. In addition, a revolutionary new product, the mobile

phone appeared and conquered the phone market[21] (See Tables 6, 7 and 8). The penetration of these services occurred in stormy speed. (Cooper 2009.)

The use of phone has become unconstrained on the supply side, only the demand constraint is effective. There is a clear causal relationship between capitalism and the abundant supply of phone service at two levels.

First, transition to private ownership based on the liberalized market economy put an end to the shortage economy. Phone service is supplied because domestic or foreign entrepreneurs are aware of the profitability of this business. Because of the close substitutability of the cable-connected telephone by mobile phones the first one cannot remain a monopoly. On the contrary, we witness very strong rivalry between phone companies. Thirty years ago in the Soviet Union or in Eastern Europe the would-be-customer begged the bureaucracy for the great favor of getting a phone line. Nowadays phone companies are bidding for the favor of the customer. The liberalized entry of foreign companies has opened the door for the large transnational telecom companies to enter the post-socialist market, and extend supply up to the limits of demand.

I, for one, remember well my own troubles due to the lack of a phone line in my home, and I am grateful to post-socialist transition and to capitalism that now I have a phone at home, and all members of my family have their own phones. I know that "gratitude" is a word missing from the vocabulary of economics and political science. Yet I want to use exactly that term, because it clearly reflects not only my *rational understanding* of a positive causal relationship between capitalism and innovation in general, and the shift toward capitalism and the availability of phone services in particular, but also a strong *emotion* toward the post-1989 changes. In spite of all shortcomings and lost battles I genuinely *celebrate* the anniversary – and one of the important reasons for celebrating the advent of capitalism is this: all the products of technical progress are finally available also for us, for the citizens of the post-socialist region.

Tables 6, 7 and 8 show similar results for quite a few other, not less important diffusion processes: the use of computers, access to the internet and so on. The speed of following the pioneering countries has accelerated quite spectacularly. The gap between the

[21] In some countries, e.g. in Hungary it did not only stop the further increase of cable-connected phone service, but actually started to replace it in many households.

most developed countries and the post-socialist countries has not disappeared, but is narrower now, in contrast to the socialist era when this gap typically increased over time.[22]

Creative destruction

There is a close association between the process of innovation and the dynamics of firms' entry and exit. Schumpeter coined the name "creative destruction" for the latter, describing concisely and precisely the two inseparable sides of fast technical progress. It is easy to appreciate happy arrivals to the business world, especially if they appear in the form of successful innovators. But there is no fast progress without the sad events of bankruptcies, business failure, exits and the accompanying bitter phenomena of lay-offs and unemployment. Transition economies have had the bad fortune of experiencing two big waves of creative destruction. I called the first one *transformational recession* in an earlier paper (Kornai 1993). It caused trauma in all post-socialist countries, leading to a huge number of exits and creating the first shock of mass unemployment after decades of over-employment and job security. The present recession is not yet over, but – looking with some degree of optimism into the near future – it will probably lead to a smaller fall of production than the decline of output under the transformational recession. That was probably the deepest recession in economic history, but the world paid less attention to it than to the present crisis – because only we, the citizens of the former communist region, were the victims of the transformational recession, and the rest of the world did not share the painful experience.

The transformational recession carried a dreadfully high price-tag of suffering – but it created benefits as well. It compelled quick adjustment to a radical shift in the composition of the internal and external market, and also cleared the way to more dynamism, more innovation and higher productivity. Many obsolete production lines, smoky and rusty factories, and poorly supplied shops disappeared and brand new production units located in modern buildings and equipped with the latest technology, new supermarkets and shopping centers appeared.

There are well-organized data on entry and exit in the post-socialist area. The paper by Bartelsman, Haltiwanger and Scarpetta (2004) provides a careful report and analysis of the process of creative destruction across 24 countries, including several transition countries, Estonia, Hungary, Latvia, Romania and Slovenia. The researchers used firm-level data. We

[22] According to the *Information Society Index*, reflecting the development of various aspects of „Information Society" in a synthetized way, several post-socialist countries, e.g. the Czech Republic, Hungary, and Slovenia have achieved a decent position in the ranking (Karvalics, 2009). The whole group of countries observed is moving ahead, and is getting higher values each year. It takes strong efforts just to hold the rank achieved today.

present here only one diagram for the sake of illustration. (See Figure 2.) It covers firms with at least 20 employees in the 1990s.

In the first years of transition the number of entries was much larger then the number of exits – which was different from more mature market economies, where the difference of these two flows is usually smaller, or is in the negative. Many large (formerly state-owned) companies went out of business, and small business entered in huge numbers. Total firm turnover (exit + entry rate) was between 3 and 8 percent in most industrial countries, and more than 10 percent in some of the transition economies in the 1990s..

The turbulence caused by the fast turnover and the short life-span of newly created firms later calmed down. By the end of the 1990s the characteristic demographic data of the firm-population came fairly close to those observed in other countries. Figure 3 shows the trend towards a more balanced ratio between entry and exit. The red line is approaching the zero position, where the numbers of employee-weighted entry and exit rates cancel each other out.

But it took several years to get over the worst phase of the destructive side of the Schumpeterian process. Post-socialist economies started to grow with increased efficiency, producing a much more up-to-date output-mix – when suddenly a new, external, shock, the impact of the global recession shocked the economy. We celebrate the 20th anniversary of *Annus Mirabilis* at a time when the people of our region are going through the second painful recession. It is quite understandable that nowadays the word "capitalism" does not resonate nicely in the ears of the citizens of post-socialist countries.

It is too early to ask the question whether the present recession – beside causing disturbance and suffering – has a cleansing effect in the Schumpeterian sense. Does the destruction clear the way for more construction in the post-socialist region? We will meet at the 25th anniversary and then discuss the answer to this highly relevant question.

It would require a separate long paper to discuss the policy implications of the positive description provided above. What I can do here is just offer a few hints at policy options and the dilemmas associated with the choice between the options.

1. Accepting the basic Schumpeterian idea of creative destruction does not imply an automatic approval of all specific manifestations of destruction. If the blind market forces lead to the exit of a firm, some organizations (the central or local government, the financial sector or some other entities) might consider a bail-out. Here we are in the middle of a huge area of theoretical and practical problems discussed in the literature on the soft budget constraint and moral hazard. I have discussed this issue in several papers (Kornai, Maskin and

Roland 2003, Kornai 2009). At this point I want only to add one remark: the Schumpeterian process of innovation is accompanied by the spectacularly rapid growth of exactly the sectors and sub-sectors which are the most promising and most "fashionable". (Remember the mass entry and stormy growth of "dot-com" firms.) This is a process which has inevitably two sides: many projects are needed for the few great successes – and at the same time, we *get too many* of them. But then follows "natural selection" – and we must not fight for the survival of each species destined for extinction. Policy-makers might rally strong arguments in favor of certain bail-outs, e.g. to protect the *economy as a whole* from far-reaching serious macro-economic damage caused by excessive numbers of exits. However, the counter-arguments must be also carefully considered.

2. The debate about the causes of the recent recession is going on. A well-known train of thought refers to the easy-going lending policy of the financial sector and is calling for much more rigorous, more conservative lending rules in the future. I do not refuse this line of thinking, but I must add a warning. The Schumpeterian process of innovation requires relatively easy access to capital for risky projects which might fail – or might lead to the fantastic achievements of technical progress. (See Conditions D and E in the above survey of circumstances necessary for enfolding the Schumpeterian process of innovation.) The general mood calls for caution and stronger risk-aversion than before the recession. I agree, more caution is needed than before – but it would be a fatal mistake to apply very conservative attitude blindly. Lending criteria should be carefully differentiated so as to leave the chances for financing risky, but promising innovative projects open.

3. We hear loud calls for regulation and warnings against the unfettered rule of market forces. There is a legitimate component in these calls and warnings, but up to a certain limit. Beyond that we might enter the area of over-regulation, bureaucratic obstacles of starting businesses, which can dampen the vigor of the entrepreneurial spirit. In quite a few post-socialist countries it is still a difficult obstacle-race to start a business. (See the report of the World Bank and the International Finance Corporation (2009) on "Doing business".) Policy-makers should avoid both types of mistake; going too far in deregulation, or introducing too much (and/or ill-targeted) regulation.

4. The public mood is upset because of sky-rocketing earnings of many business people and top managers. We hear calls for practical measures against this phenomenon. The anger is morally justified and psychologically understandable. Nevertheless an (unpopular) *caveat* is needed. One of the conditions of the Schumpeterian process (Condition B in the above listing) is the gigantic reward in the case of success. Not simply a large, but a huge

reward! That does encourage the would-be innovators to take the large risk of failure. Let us remember that in this context it is not only the first pioneers of introducing the great break-through inventions who deserve the name “innovators”, but also the entrepreneurs quick in following the (domestic or foreign) pioneers. On the other hand, how difficult it is to imagine the work of an honest and competent jury able to draw the line between a well-deserved and an undeserved high reward! I am not prepared to propose a feasible procedure, just want to draw the attention to the two (mutually contradictory) aspects of very high business income.

REFLECTION OF HISTORICAL REALITY IN PEOPLE'S MINDS

The basic phenomenon: Lack of understanding

In the previous parts of the paper I tried to describe the *historical reality* of the interaction between the Great Transformation, i.e. the change of the system and technical progress. Perhaps there are errors in the description, although I am convinced that I got it basically right, and there is sufficient evidence to support the findings.

We have to separate the description of historical reality and the *reflection* of that reality in people's minds. The reflexive process works differently in different people. The reality described in the earlier sections is perceived, understood and evaluated differently by each individual, depending on his/her social status, education, personal history and character.

The first question we must raise is about the evaluation of technical progress. Do people regard the past and future appearance of inventions and innovations, new products and new technologies as advancement or are they afraid of the process and regard it as harmful or dangerous? The question has been asked in some international surveys; Tables 9 and 10 give us interesting insights. Considering benefits and harms caused by technical progress, two thirds of Polish and Hungarian respondents find the positive effect stronger than the negative. In that respect a larger proportion of citizens of these two post-socialist countries are in favor of technical progress than in Austria, Finland, Italy and Spain, and in the post-socialist Czech Republic. The proportion of respondents approving technical progress is much higher when the question is asking about the *future* impact (see the fifth column of Table 9 and the first column of Table 10).

The second question is not about evaluation but causality. I take the risk and start with a bold general conjecture. The large majority of citizens in the post-socialist region do not understand the basic causal relationship between capitalism and technical progress. Although the innovations of the last 50-100 years and in particular the revolutionary change of information and communication technology has dramatically changed the life of everyone, and most people enjoy the advantages of fast technical change, they do not attribute this great change to capitalism.[23] On the contrary. A large part of the population has moderate or even

[23] In an earlier section, talking about the shortage of telephone lines under socialism and the abundant supply after 1989, I made a subjective remark: I am *grateful* to capitalism for this change of my life. Perhaps I am not the only one who has this feeling, but I am afraid, we are a small minority.

vehement anti-capitalist feelings – while taking advantage of the mobile phone, the internet, the bar code in the supermarket, the plastic materials and synthetic fibers, the modern household appliances, the Xerox copier and so on and so on, without acknowledging that all of them, without exception, are creations of the despised or hated capitalist system.

That is a conjecture – and to my regret, I cannot refer to one single survey, public opinion pool or value survey supporting, correcting or refusing that conjecture. With the help of my assistants we have tried to check the most respected surveys carefully.[24] Among the hundreds of more or less relevant questions asked from the informants, nobody ever asked in any form the question formulated here: What do you think and how do you feel about the interaction between the overall system (capitalism, socialism, transition from socialism to capitalism) on the one hand, and technical progress, on the other?

Let me maintain the conjecture until I get the first survey data providing a reliable insight in people's minds concerning these questions and the results call for the modification of the conjecture. The lack of surveys seems, in some strange way, an indirect support of my conjecture. If professional researchers studying the understanding of social change and people's sentiments vis-á-vis the changes are completely ignoring this set of questions – what can we expect from the average citizen? The complete lack of surveys related to these vital issues is a clear indication of intellectual indifference toward the understanding of the relationship between the political and economic sphere and the acceleration of technical progress.

Public opinion is shaped by a complex social process. Everyone is taking part, the parents and the teachers in the kindergarten and the primary school, our neighbor at home and our colleague at the workplace. I would make a few remarks about professional groups carrying special responsibility for shaping public opinion.

The responsibility of the economic profession

What do we teach to students? The exciting and important new current of growth theory, inspired to a large extent by Schumpeter (Aghion 1998, Grossman and Helpman 1991), is acknowledged by the rest of the profession, and usually respect is expressed in a polite footnote, but without profoundly penetrating the way of thinking in mainstream economics. Highly distinguished economists (Baumol, Litan and Schramm 2007, Phelps

[24] We have checked the four best-known transnational surveys looking for the question formulated above in the text and did not find anything resembling the content of that question. The results of these surveys are on record and available from the author.

2008) put a heavy emphasis on entrepreneurship in explaining the virtues of capitalism. The recent representatives of the Austrian school (see e.g. Kirchner 1985) never get tired in drawing the attention to the innovative nature of spontaneous market forces. Nevertheless, these valuable ideas do not get through in the routine education of young economists.

There is a simple, but decisive test: let us check the most influential introductory textbooks. Take Gregory Mankiw's (2001) textbook, which is one of the most widely used texts in the USA, and is also translated into several languages. It is used as a textbook in my country, Hungary as well. It is a masterpiece in didactics, well-written, full of interesting illustrations of the main propositions. Yet not a single sentence on the Schumpeterian innovative process can be found! There are several dozen names in the Index – but Schumpeter's name does not appear. There are a few pallid paragraphs about the increase of factor productivity and technical progress, but that does not compensate for the lack of the vivid description of the innovative process and the profound explanation of the dynamism of capitalism. I have glanced through several other textbooks and ended up with similar results.

Mainstream economics is often accused of being advertising the favorable properties of capitalism. If so – it is doing a rather poor job in teaching, lacking the mention of one of the main virtues of the system, its inclination toward unstoppable stormy innovation.

The GDP has become the dominant indicator when it comes to the measurement of growth – it is a great achievement of economists and statisticians to have an operational definition and methodology for measuring the GDP, uniformly accepted all over the world. But this important success has generated some kind of laziness in evaluating success and failure. Attention is focused on GDP growth rates to an exaggerated extent. Perhaps a few other indicators get also attention: inflation, fiscal balance, current account, measures of inequality, and a few more. But there are no widely accepted indicators of measuring success or failure, acceleration or slow-down of technical progress -- understanding this term in the spirit of the present paper. Post-socialist economies in Eastern Central Europe reached the pre-1990 level of GDP around 1994-2000, and the successor states of the Soviet Union even later or are still below that level. Yes – but in the meantime the way of life has completely changed for a large part of the population. Here, in the context of the present paper, I do not refer to the changes in the political environment, income distribution and social mobility. Beside all these very important changes, I refer to the accelerated use of new products and new technologies created by the capitalist innovative process. We lament about troubles with the level of the GDP – but a large part of the population is now connected to the rest of the society by a phone and by the internet, a much larger number of people have cars and modern

household appliances and are using many other new products formerly available for people in the West only. We should elaborate appropriate measures in order for the appropriate and fair observation and demonstration of the effects of technical progress on everyday life.

The need to complement the measurement of GDP with other indicators to reflect other aspects of welfare and development is well-known to every economist and economic statistician. Important new initiatives are enfolding to improve the measurement of growth, and are complementing the data on aggregate output with various indicators reporting on health, education, income distribution and so on. [25] I am worried that the aspect highlighted in this paper – the impact of technical progress on the way of life – is left out again, and does not get the attention it would deserve.

The responsibility of politicians

Politicians are, self-evidently, in charge of governmental policy. Everything mentioned before with respect to the policy implications of the analysis belongs to the competence of political decision-makers. Right now, however, I would make a few remarks about another aspect of political activity. Political leaders are also *educators* of their nation. With the help of my assistants and a few colleagues living outside Hungary we have read some public speeches of political leaders of the following countries: Croatia, Czech Republic, Hungary, Poland, Serbia, Slovakia and Slovenia. In each country we chose the president and/or the prime minister, and the leader(s) of the most influential opposition party (or parties). We tried to select speeches or written statements offering a general overview of the country's successes and failures (like the State of the Union address in the USA.) mostly delivered at the occasions of great national holidays and events. Most of the texts we analyzed were delivered during the first eight months of 2009. In some cases we were able to find a speech celebrating the 20th anniversary of the 1989 events, and providing an overall evaluation of the post-socialist transition.[26]

The general finding is easy to summarize. There was not a single political speech explaining the *causal linkage* between capitalism and technical progress and the impact of this progress on the life of people. This virtue of capitalism was not spelled out in order to

[25] The President of the French Republic has invited a group of economists and statisticians, chaired by Joseph Stiglitz, Amartya Sen and Jean-Paul Fitoussi, to work on new proposals for improving the measurement of growth and development. At the moment the group is circulating the first drafts of the report Stiglitz, Sen and Fitoussi, 2009.)

[26] Altogether 19 speeches and written statements of leading politicians were selected That is a small, non-random sample, since we analyzed only documents delivered by the paramount leaders of a country recently at special distinguished occasions. -- The list of documents studied is on record and available from the author.

convince the people that moving from socialism to capitalism meant a shift to the world of innovation, modernization and dynamism.

There are political leaders, who say a few words about technical progress. The same politicians or some others speak favorably about the capitalist system. (Let us add immediately, very few are ready to take a stand for capitalism.) But we did not find even in their speeches the argument just explained.

Of course, more political speeches and written statements should be checked. I would welcome any additional information, including counter-examples, i.e. speeches which underline the role of capitalism in generating innovation, and add the acceleration of technical progress to the list of successes achieved in the era of transition. However, as long as it is not refuted, I maintain the proposition: politicians at all points of the political spectrum carry heavy responsibility for neglecting the explanation of the relationship between "capitalism→innovation→changes in the way of life". Understanding this crucial linkage would be an effective antidote against anti-capitalist sentiments – and our political leaders do not provide the antidote.

Neglect is the milder sin. What I find most irritating is populist demagoguery against capitalism – while making practical use of all the discoveries and innovations generated by capitalism. It is morally repulsive to see political activists mobilizing people for an extremist anti-capitalist meeting or protest demonstration – using a personal computer, mobile phones and communication channels provided by satellites and optical fiber. That is happening in the post-socialist region: political activists, denying even the simple fact that the change of system has already happened, put their populist anti-capitalist slogans on a blog or an internet site, give inflammatory speeches to a mob through electronic loudspeakers, communicate with each others via mobile phones – exploiting the technique generated by capitalism.

Interconnectivity and democracy

While we know practically nothing about the *understanding and evaluation* of the "capitalism→innovation→changes in the way of life" causal linkage in people's minds, we have some insights into the opposite direction of interaction, namely the effect of technical progress (or more precisely, of progress in the information-communication sector) on the political views of people in post-socialist countries .Tables 11, 12 and 13 summarize survey-data where respondents in the post-socialist area were asked about their attitudes toward democracy, capitalism and the former socialist system. In the tabulations presented here the population was divided into two classes: people who are using the internet frequently and the

others who do not. The difference is quite impressive. Those connected to the world of modern IT technology have more favorable views on capitalism and democracy, and are more critical of the past regime. That is an encouraging sign. The users of the internet are more immune to the sentiments of nostalgia for the old socialist order – a feeling which has grown stronger in many people, especially since the recent economic crisis.

The empirical results reported above fit well into the findings of another line of studies: the research on *interconnectivity*. The intuitive meaning of the term is clearly indicated by the name: individuals are connected to each other by various technical instruments and procedures. E-mail plays a particularly important role in this respect. The more people are technically able to send e-mail to others, the tighter the network of connections is. That phenomenon is certainly observable and measurable.

I rely here on an exciting paper of Christopher R. Kedzie (1995), who refers to a metric measuring "interconnectivity". Since I am not an expert of that field, I cannot judge whether the metric used in Kedzie's study is the best available for the purpose he is using it. Conditionally accepting his choice, the basic results of his study are certainly worth mentioning. He looked, beside other calculations, on the correlation between "democracy" (measured by various indicators) and "interconnectivity". This correlation turns out to be 0.73, stronger than the correlation of democracy with per capita GDP (0.57). I report the proposition with some reservation, due to my lack of knowledge in the area utilized by the interconnectivity index. A more recent study by Frisch (2003), however, supports Kedzie's findings. Hopefully, research in that direction will continue.

At this point I recall what I said earlier on the role of modern information-communication technology in dismantling the monolithic power of the Communist party and the official Marxist-Leninist ideology. There I looked at events which happened 20 years ago in the former Soviet Union and in the socialist countries in East Central Europe. The problem is, however, not outdated at all. There are two small countries, Cuba and North-Korea, where not much has changed in the economy, and heavy-handed Communist dictatorship still prevails. And then there are two giants, where far-reaching reforms have been introduced and have moved the economy close to capitalism – while the political structure has changed very little, remaining a single-party dictatorship. What will be the impact of modern information-communication technology on these countries? China and Vietnam are eager to make use of all advantages provided by the revolutionary achievements of technical progress – and at the same time they are scared of the consequences. These two objectives of the leadership – maximum gain from technical progress and maximum protection of the monopoly of power –

diametrically contradict each other. The result is hesitation, steps forward and backward, ambivalence.

Another major problem to analyze is about the prospects: what is the future of the interaction between the forthcoming waves of innovation and the way of life?

On my pessimist days I could foresee various evil scenarios. Even without a special talent for prophecy we can easily predict the misuse of technical achievements. I read several reports about efforts of the Chinese government to apply political censorship of the internet, block the transmission of certain TV channels or shut down outspoken blogs.[27] Since an ever-growing share of all computers used in China is produced domestically, it is easy to enforce the incorporation of a centrally controlled censorship-software into the operation system. Sadly, large Western corporations – scared of losing the huge Chinese market – are willing to cooperate with the officials in their efforts of introducing political censorship.

When Orwell wrote his book *Nineteen Eighty-Four* sixty years ago (Orwell 1949/1950), Big Brother did not have the equipment envisaged in the novel. But nowadays there is no technical difficulty to install cameras and listening devices in every flat and office. Imagine a future Stalin with the latest gadgets of observation and telecommunication, resolved to use it for watching all citizens!

But then, on my more optimistic days I escape the nightmarish visions, and hope that modern technology gives birth time and again to decentralization – whatever efforts dictatorships devote to assure centralization. If the centralizator invented a new way of blocking information, there will be hundreds and thousands of decentralizators, inventive computer users who break through the blockades and barriers.[28]

[27] See Chao (2009) and Timmer (2009) on Chinese efforts to enforce political censorship. For a general overview see the entry on internet censorship in Wikipedia (2009b).

[28] In the former footnote I referred to an article by Timmer (2009) published on the internet. The editor asked for comments. Here is the first comment: „So what's there to keep Chinese citizens from reformatting their hard drives and installing pirated copies of Windows?"

CONCLUDING REMARKS

My paper covered a vast array of topics. I did not intend to limit the study to one or two issues. We are looking at a huge white area on the otherwise colorful map of research in comparative economics and post-socialist "transitology". The purpose of my paper is to give a *general overview* of the white area.

There is a great number of valuable studies on several topics, some of which are mentioned in my paper. The trouble is that each topic has it own large body of literature – but these bodies are sharply separated from each other, without referring to each other. A key word and a key technical instrument of modern communication is the link (in blue characters, underlined, helping us to jump from one text to another). Unfortunately, studies on post-socialist changes in politics, the economy, public opinion, technology, information and communication are not linked together. I suggest creating the links – all students of the separated fields will gain important new insights. I did not insert the actual links in the text waiting for your click – but at least I tried to inspire your imagination where the links should be placed. The emphasis of my talk was not the detailed description and analysis of one or the other linkage, but to give you an impression of the totality of interactions.

And there are also dozens of themes deserving penetrating research, empirical observation and theoretical analysis, which are barely touched upon or not even mentioned in my paper. The study of technical progress and its relationship to society is going on in a multi-dimensional space. The points discussed in my paper are located in a sub-space – and I am aware that there are relevant dimensions outside my sub-space.[29]

I wish I were younger, with all the energy needed for the careful exploration of the white area as a whole. What an exciting, and intellectually challenging subject for research! I

[29] Let me mention a few dimensions not appearing in my paper:

--- What is the effect of the new technique of information and communication on the relationship between individuals, social groups, settlements, countries, and states? What can be expected concerning the relationship between high-tech information and communication, on the one hand, and the nation-state and globalization, on the other? (Castells 1996-1998, Nyíri 2004, Webster, 2004).

--- The future of capitalism. Does the new age of information lead to a radical change of the basic properties of capitalism? Or does it create a new system which cannot be called capitalism any more? (Two Hungarian economists, Katalin Szabó and Balázs Hámori (2006) wrote an interesting book with the following subtitle: „Digital capitalism or a new economic system".)

--- How does the revolutionary change of information and communication technology affect the *practical* mode of running a business, especially in the financial sector?

--- What are the implications of the new Information Age concerning property rights, especially with respect to intellectual property.

--- A quite different direction of thought: we have to reconsider at a more abstract philosophical level our general understanding of human history. What is the role of the changes in the technology of production and human interaction on the institutions of society, and on the functions of the government?

hope that my paper will encourage others to enter this largely under-researched field. In any case, I would like to continue the study of the interaction between the change of the political and economic dimensions of the system and the properties of technical progress.

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Table 1
Revolutionary innovations

Innovation	Year	Country	Company
COMPUTER, INFORMATION, COMMUNICATION			
Integrated circuit	1961	USA	Fairchild
Touch-tone telephone	1963	USA	AT&T
Optical fiber cable	1970	USA	Corning
Pocket electronic calculator	1971	USA	Bowmar
Word processing	1972-74	USA	IBM, Wang
Microprocessor	1974	USA	Intel
MS-DOS operating system	1974	USA	Microsoft
Laser printer	1976	USA	IBM
Modem	1978	USA	Hayes
Hard disk drive	1980	USA	Hard disk drive
Graphical user interface	1981	USA	Xerox
Laptop	1981-82	USA	Epson, Microsoft
Touch screen	1983	USA	Hewlett-Packard
Mobil telephone	1983	USA	Motorola
Fax	1984	Japan	Sharp
Web search engine	1994, 1998	USA	WebCrawler
Pendrive	1999-2000	Israel, USA	M-Systems, IBM
Mouse	2000	USA	Apple
Skype (peer-to-peer phone)	2001	Estonia	Skype

Table 1
Revolutionary innovations
(continued)

Innovation	Year	Country	Company
HOUSEHOLD, FOOD, CLOTHING			
Tea bag	1919	USA	Joseph Krieger
Hair dryer, hand held, electric	1920	USA	Hamilton Beach
Wall plug	1920	UK	Rawlplug Co.
Spin-dryer	1924	USA	Savage
Automatic pop-up toaster	1925	USA	Waters Genter Co.
Steam electric iron	1926	USA	Eldec
Electric refrigerator	1927	USA	General Electric
Neon light	1935	USA	General Electric
Instant coffee	1938	Switzerland	Nestle
Nylon	1935	USA	DuPont
Electric clothes dryer	1938	USA	Hamilton Manufacturing Co
Espresso machine (high pressure)	1946	Italy	Gaggia
Microwave oven	1947	USA	Raytheon
Air Conditioning, home	1927	USA	Carrier Engineering Co.
Drive-through restaurant	1948, 1978	USA	In-n-Out Burger, McDonald's
Saran plastic wrap	1949	USA	Dow Chemical
Hook-and-loop fastener (Velcro)	1957	USA	Velcro
Polyester	1953	USA	DuPont
Tefal kitchenware	1956	France	Tefal
Food processor	1960	USA	Roboot-Coupe
Tetra Pak	1961	Sweden	Tetra Pak
Beverage can	1963	USA	Pittsburgh Brewing Co
Athletic shoe	1964	USA	Blue Ribbon – Nike

Table 1
Revolutionary innovations
(continued)

Innovation	Year	Country	Company
HEALTH, COSMETICS			
Facial tissue (Kleenex)	1920	USA	Kimberley-Clark
Adhesive bandage (Band-aid)	1921	USA	Johnson&Johnson
Paper towel	1931	USA	Scott Paper Co.
Electric shaver	1931	USA	Schick
Aerosol container	1946	USA	Airosol Co.
Disposable diaper	1949	USA	Johnson&Johnson
Transistor hearing aid	1952	USA	Sonotone
Roll-on deodorant	1952	USA	Mum
Halogen lamp	1959	USA	GE
Quartz wristwatch	1969	Japan	Seiko
Disposable razor	1975	USA	BIC
Liquid detergent	1982	USA	Procter&Gamble
OFFICE			
Ball point pen	1940	Argentina	Biro Pens
Adhesive tape (pressure sensitive Scotch tape)	1945	USA	3M
Correction fluid	1951	USA	Mistake Out
Copy-machine	1959	USA	Haloid Xerox
„Post-it”	1980	USA	3M
TRANSPORT			
Escalator	1921	USA	Otis
Parking meter	1935	UK	Dual Parking Meter Co.
Scooter	1946	Italy	Piaggio
Black box (for aeroplanes).	1958	UK	S.Davall & Son
Jet-propelled passenger aeroplane	1952	USA	Comet

Table 1
Revolutionary innovations
(continued)

Innovation	Year	Country	Company
	LEASURE		
Drive-in cinema	1933	USA	Hollingshead
Instant camera	1948	USA	Polaroid
Walkman	1949	Japan	Sony
TV Remote control	1956	USA	Zentith
Plastic construction toy	1958	Denmark	Lego
Barbie doll	1959	USA	Mattel
Video Casette Recording (VCR)	1971	The Netherlands, Japan	Philips. Sony
Rubik's cube	1980	USA	Ideal Toys
CD	1982	The Netherlands, Japan	Sony, Philips
Portable video-game	1989	Japan	Nintendo
Digital camera	1990	USA	Kodak
Book trade on the internet	1995	USA	Amazon
DVD	1996	Japan	Philips, Sony, Toshiba
	COMMERCE, BANKING		
Supermarket	1930	USA	King Kullen
Shopping cart	1937	USA	Humpty Dumpty Supermarket
Shopping mall	1950	USA	Northgate Mall
Charge card	1957-1959	USA	Diners Club, American Express
Credit card	1958	USA	Bank of America
Automated Teller Machine (ATM)	1967	UK	Barclay Bank
Bar code	1973	USA	IBM
Express shipping	1973	USA	Federal Express
e-commerce	1997	USA	eBay

Note. Entries are selected out of a larger set of innovations surveyed in various collections and lists of relevant inventions and innovations. The main *inclusion* criterion was the relevance for large groups of users, well-known to the majority of people, and not only to small groups of experts. Some of the criteria of *exclusion* are discussed in the text: (1) The list contains only Schumpeterian-type innovations. Accordingly, innovations initiated and financed mainly by the military are excluded. (2) New products and services used for medical care, i.e. medicines, diagnostic equipments etc. are not included, simply because of the difficulty of selection of the greatest innovations out of hundreds or thousands of new drugs and new medical instruments. (Perhaps at a later stage of research this sector might be included.)
Source. The source of several entries was Harrison 2004, 2005. The source of each entry is on record, and is available from the author at request.

Table 2

Time-lag in following the leaders of innovation: Plastic materials

Product	Innovator		First Follower		Second Follower		Soviet Union	Delay behind Innovator (years)
Cellophane	France	1917	USA	1924	Germany	1925	1936	19
Polystyrene	Germany	1930	USA	1933	Italy	1943	1955–1959	25–29
PVC	Germany	1931	USA	1933	Japan	1939	1940	9
Silicon polymers	USA	1941	Germany	1950	Japan	1951	1947	6*
Epoxy resins	Switzerland	1936	USA	1947	Germany UK	1955 1955	1957–1959	21–23
Polypropylene	USA Germany Italy	1957 1957 1957	U.K.	1959	France	1960	1970	13

* In this case the Soviet Union followed faster the pioneering country than the capitalist economies.

Source. Amann, Cooper and Davies 1977, pp. 272–285.

Table 3

Time-lag in following the leaders of innovation: Controlled machine tools

	Reached by USSR in	USSR (+ in advance; – behind) in relation to			
		USA	UK	Japan	FRG
Start of research	1949	–2	–1	+4	+6
First prototype	1958	–6	–2	–	–
Start of industrial production*	1965	–8	–2	+1	–1
First machining center	1971	–12	(–10)	–5	–10
First third generation control system	1973	–7	(–5)	(–5)	(–5)
First use of computer for control	1973	–6	(–4)	–5	(–4)

Note: ( ) estimate.
* 50 units or more per annum.
Source. Amann, Cooper and Davies 1977, p. 41.

Table 4

Penetration of modern technology: Steel-industry, continuous casting
(Percent)

Country	Continuous casting per total production		
	1970	**1980**	**1987**
SOCIALIST COUNTRIES			
Bulgaria	0	0	10
Czechoslovakia	0	2	8
East Germany	0	14	38
Hungary	0	36	56
Poland	0	4	11
Romania	0	18	32*
Soviet Union	4	11	16
CAPITALIST COUNTRIES			
France	1	41	93
Italy	4	50	90
Japan	6	59	93
Spain	12	49	67
United Kingdom	2	27	65
United States	4	20	58
West Germany	8	46	88

*1986.
Source. Finansy i Statistika (Finance and Statistics, Moscow) 1988, p. 109.

Table 5

Telephone lines: Comparative data

(Number of lines per 1000 people)

Year	Bulgaria	Hungary	Poland	Romania	Soviet Union	Germany	Greece	Italy
1979	91	53	53	67	67	308	226	216
1980	102	58	55	73	70	332	235	231
1981	129	60	56	76	79	351	247	245
1982	127	61	58	79	84	366	259	259
1983	152	64	61	81	90	381	276	275
1984	157	67	64	85	96	399	296	290
1985	167	70	67	88	103	416	314	305
1986	178	73	70	93	109	429	330	319
1987	194	77	74	96	115	442	347	334
1988	210	82	78	98	123	430	360	349
1989	222	88	82	101	131	422	375	370
1990	242	96	86	102	140	441	384	387
1991	246	109	93	105	150	438	408	407
1992	274	125	103	113	154	437	436	417
1993	285	146	115	114	159	455	462	424
1994	295	173	130	124	163	476	477	429
1995	305	210	148	131	169	514	494	434
1996	317	260	169	140	175	538	509	440
1997	323	305	194	150	192	551	516	448
1998	331	336	227	160	199	567	522	453
1999	343	367	263	167	211	587	528	462
2000	353	372	283	174	218	610	536	474
2001	366	368	295	184	227	635	529	472
2002	366	362	307	194	241	651	572	481
2003	361	356	318	199	252	657	550	459
2004	352	355	326	203	279	662	586	447
2005	323	332	307	203	280	661	567	431

Source. United Nations Statistics Division, Industrial Commodity Statistics Database (Radio, television and communication equipment and apparatus). In: http://data.un.org/Data.aspx?d=ICS&f=cmID%3a47220-1. (Retrieved on July 16, 2009)

Table 6

Penetration of modern communication technology in EU countries

15 old EU member states (EU15) versus 10 new post-socialist member states (EU10)

Indicator	Unit of measurement	Group	1995	2001	2007
GDP	per capita, constant 2000 USD	EU15	19,706	23,747	26,781
		EU10	3,469	4,425	6,295
GDP	per capita, PPP, constant 2005 USD	EU15	25,831	31,134	35,058
		EU10	9,758	12,286	17,570
Personal computers	Per 100 people	EU15	16	35	37
		EU10	3	12	33
Internet users	Per 100 people	EU15	3	32	64
		EU10	1	14	48
Broadband subscribers	Per 100 people	EU15	NA	2	24
		EU10	NA	0	12
Mobile phone subscriptions	Per 100 people	EU15	7	77	116
		EU10	1	40	118

Notes. Figures are simple means for each country group. For missing data (NA), see source for details.
Source. World Bank (2008)

Table 7

Penetration of modern communication technology in EU countries

Five Visegrád countries versus 3 South European countries

Indicator	Unit of measurement	Group	1995	1997	1999	2001	2003	2005	2007
GDP	per capita, constant 2000 USD	S3	10,406	11,020	11,847	12,642	13,054	13,623	14,289
		V5	3,865	4,194	4,435	4,756	5,108	5,635	6,338
GDP	per capita, PPP, constant 2005 USD	S3	18,620	19,721	21,200	22,618	23,345	24,357	25,545
		V5	11,550	12,535	13,228	14,176	15,237	16,821	18,956
Personal computers	per 100 people	S3	5	7	9	14	15	17	28
		V5	4	6	9	12	18	23	39
Internet users	per 100 people	S3	1	3	10	16	26	33	41
		V5	1	2	6	13	29	39	50
Broadband subscribers	per 100 people	S3	NA	NA	0	1	3	8	14
		V5	NA	NA	0	0	1	5	11
Mobile phone subscriptions	per 100 people	S3	3	12	40	74	88	100	115
		V5	1	4	14	46	72	92	113

Notes. Figures are simple averages for each country group. V 5 = Visegrád countries: Czech Republic, Hungary, Poland, Slovakia, Slovenia; S 3 = South European countries: Greece, Portugal and Spain.
Source. World Bank (2008)

Table 8

Penetration of modern communication technology in Russia and some other countries

Indicator	Unit of measurement	Country	1995	2001	2007
GDP	per capita, USD	Russia	1,618	1,870	2,858
		Brazil	3,611	3,696	4,222
		Mexico	4,892	5,864	6,543
GDP	per capita PPP	Russia	7,853	9,076	13,873
		Brazil	7,727	7,910	9,034
		Mexico	9,949	11,927	13,307
Personal computers	per 100 people	Russia	2	8	NA
		Brazil	2	6	NA
		Mexico	3	7	NA
Internet users	per 100 people	Russia	0	3	21
		Brazil	0	5	35
		Mexico	0	7	23
Broadband subscribers	per 100 people	Russia	NA	0	3
		Brazil	NA	0	4
		Mexico	NA	0	4
Mobile phone subscritions	per 100 people	Russia	0	5	115
		Brazil	1	16	63
		Mexico	1	22	63

Source. World Bank (2008)

Table 9

Evaluation of technical progress

	Scientific and technological progress will help to cure diseases such as AIDS, cancer, etc.	Thanks to science and technology, there will be greater opportunities for future generations	Science and technology make our lives healthier, easier and more comfortable	Science and technology will help eliminate poverty and hunger around the world	The benefits of science are greater than the harmful effects it could have
AT	82	71	71	33	48
FIN	89	77	77	21	50
IT	82	73	76	50	57
SP	79	66	73	37	57
PL	89	93	83	45	65
HU	94	81	79	34	63
CZ	85	74	70	35	44

Note. The following question was asked: „Do you agree with the following statements?" The table shows the proportions of positive answers in per cent of the total number of respondents.
Source. Eurobarometer, special survey on science and technology. Fieldwork: January-February 2005. http://ec.europa.eu/public_opinion/archives/eb_special_240_220_en.htm. Retrieved on August 22, 2009.

Table 10

Expectations concerning the impact of new technologies

(Percent)

Country	The next generation will enjoy a better quality of life	Solar energy	Computers and information technology	Biotechnology and genetic engineering	The Internet	Mobile phones	New energy sources to power cars	Air transport
EU15	47	90	85	63	77	67	90	79
EU10	72	84	87	64	81	70	86	79
Germany	75	95	89	65	75	57	92	72
UK	82	91	92	65	81	61	90	80
Hungary	82	87	87	74	78	67	81	75
Poland	91	89	92	63	86	80	88	88
Romania	83	78	86	65	82	75	84	85

Note. The following question was asked: „Do you think the following new technologies will have positive negative or neutral effects?" Only the proportions of positive answers are shown.
Source. Eurobarometer, special survey on social values, science and technology. Fieldwork: January-February 2005. http://ec.europa.eu/public_opinion/archives/eb_special_240_220_en.htm

Table 11

Satisfaction with democracy:

Population divided into users and non-users of the internet

Country	Internet users		Non-users	
	mean	percent	mean	percent
Central-Eastern Europe	2.6	30	2.8	70
Czech Republic	2.5	42	2.8	57
Hungary*	2.2	23	2.4	77
Poland	2.7	34	2.9	66
Russia	3.0	14	3.1	86
Slovenia	2.2	57	2.1	43

Note. In the second (resp. fourth) column the share of users (resp. non-users) of internet. The following question was asked: "How satisfied are you with the way democracy works." Answers were expected at a 4-degree scale: 1 = completely satisfied; 2 = somewhat satisfied; 3 = not very satisfied; 4 = completely dissatisfied. The table shows the mean (not weighted.)

*I have reservations concerning the Hungarian data on internet-users. The figure seems to be too low compared with other statistics. JK.

Source. New Europe Barometer, Centre for the Study of Public Policy, University of Aberdeen, Scotland. Fieldwork: from October 1, 2004 to February 27, 2005 http://www.abdn.ac.uk/cspp/view_item.php?id=404 Retrieved on July 27, 2009

Table 12

Evaluation of the capitalist economic system:
Population divided into users and non-users of the internet

Country	Internet users		Non-users	
	mean	**percent**	**mean**	**percent**
Central-Eastern Europe	1.9	30	0.4	70
Czech Republic	2.5	42	0.7	58
Hungary*	0.7	23	–0.5	77
Poland	1.1	34	–0.9	66
Russia	0.9	14	–0.8	86
Slovenia	1.6	57	0.7	43

Note. In the second (resp. fourth) column the share of users (resp. non-users) of internet. The following question was asked: "How satisfied are you with the capitalist system." Answers were expected at a 21-degree scale: -10 = worst, 0 = neutral, +10 = best. The table shows the mean (not weighted.)

*I have reservations concerning the Hungarian data on internet-users. The figure seems to be too low compared with other statistics. JK.

Source. New Europe Barometer, Centre for the Study of Public Policy, University of Aberdeen, Scotland. Fieldwork: from October 1, 2004 to February 27, 2005 http://www.abdn.ac.uk/cspp/view_item.php?id=404 Retrieved on July 27, 2009.

Table 13

Evaluation of the socialist economic system:
Population divided into users and non-users of the internet

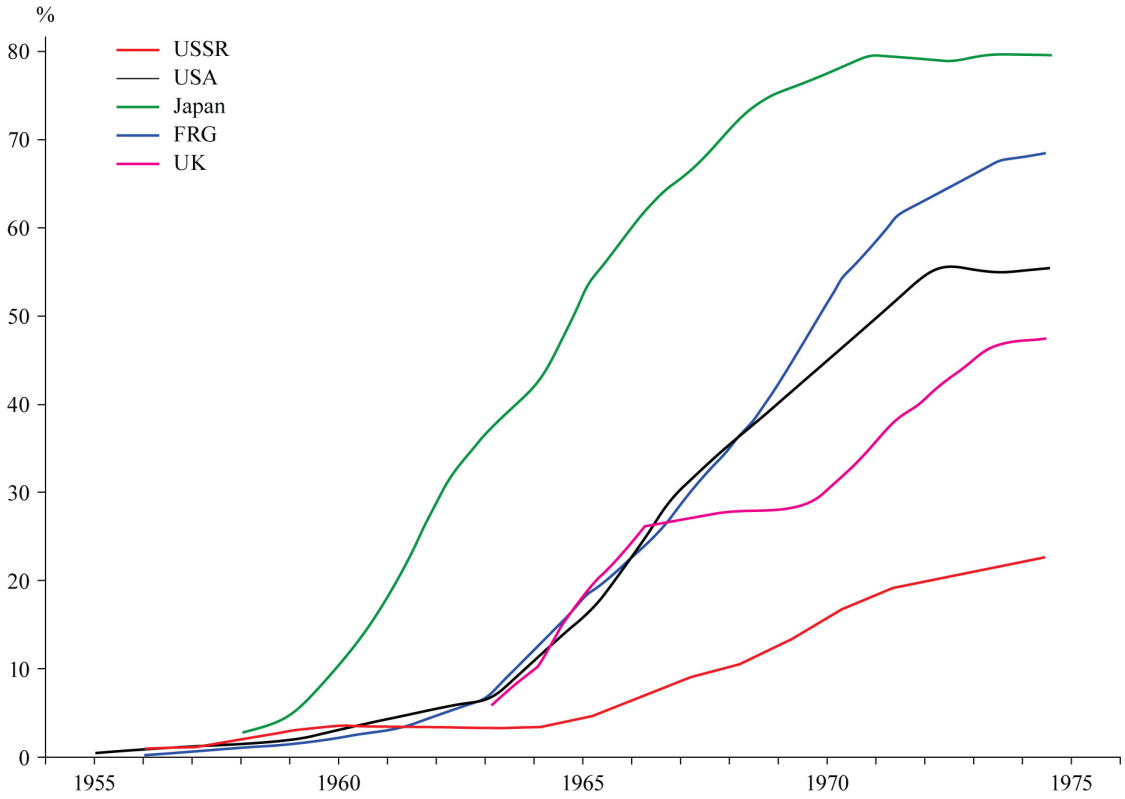
Country	Internet users		Non-users	
	mean	**percent**	**mean**	**percent**
Central-Eastern Europe	1.1	30	3.7	70
Czech Republic	–2.6	42	0.6	58
Hungary*	0.2	23	3.0	77
Poland	–0.4	34	3.4	66
Russia	1.6	14	4.4	86
Slovenia	3.0	57	4.0	43

Note. In the second (resp. fourth) column the share of users (resp. non-users) of internet. The following question was asked: "How satisfied were you with the former socialist system." Answers were expected at a 21-degree scale: -10 = worst, 0 = neutral, +10 = best. The table shows the mean (not weighted.)
*I have reservations concerning the Hungarian data on internet-users. The figure seems to be too low compared with other statistics. JK.
Source. New Europe Barometer, Centre for the Study of Public Policy, University of Aberdeen, Scotland. Fieldwork: from October 1, 2004 to February 27, 2005 http://www.abdn.ac.uk/cspp/view_item.php?id=404 Retrieved on July 27, 2009.

Figure 1

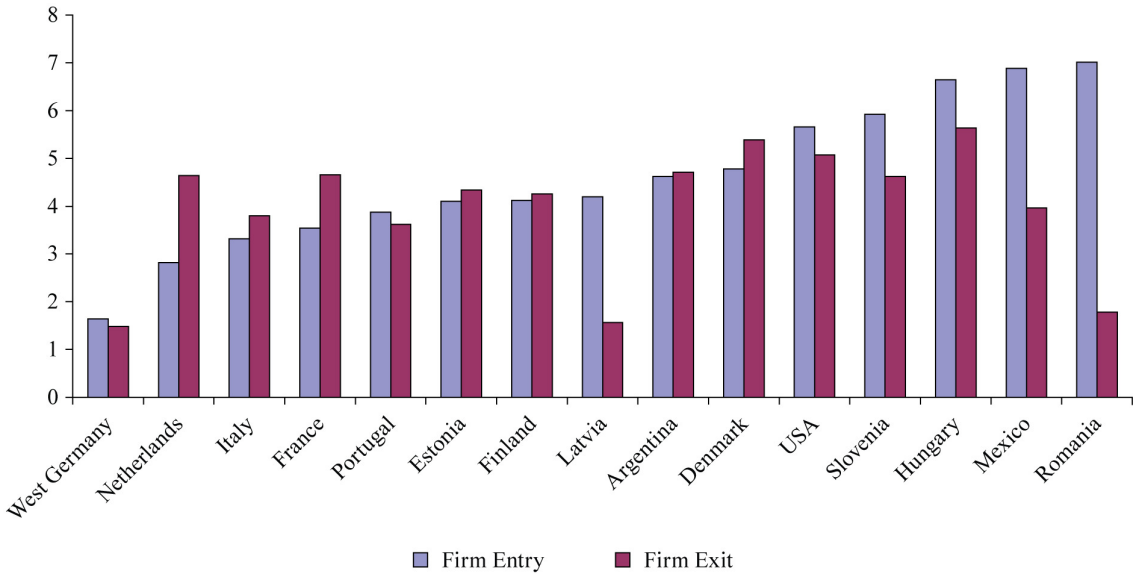
Penetration of modern technology: Steel-industry, oxygen steel

(Oxygen steel as a proportion of total steel output, percent of total)



Source. Amann, Cooper and Davies 1977, p. 97.

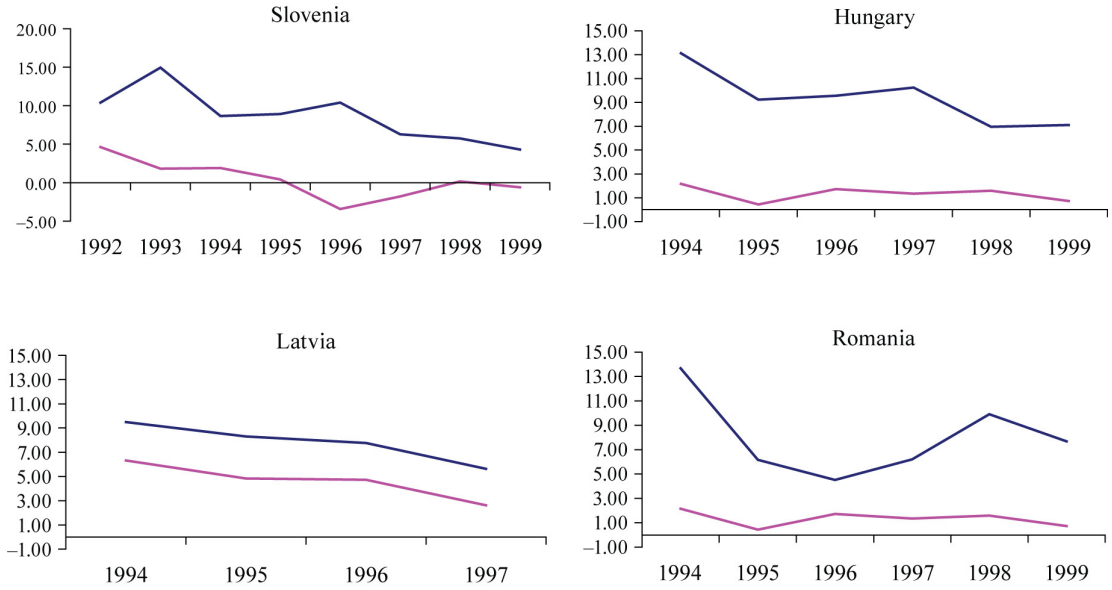
Figure 2
Firms' entry and exit rates in the 1990s



Note. Columns in blue show the entry rates, defined as the number of new firms divided by the total number of incumbent and entrant firms in a given year. Columns in purple show the exit rates, defined as the number of firms exiting the market in a given year divided by the population of origin, i.e. the incumbents in the previous year.
Source. Bartelsman, Haltiwanger and Scarpett 2004, p.16, Panel C.

Figure 3

The evolution of gross and net firm flows in transition economies



Note. The calculations cover the whole business sector. The black line shows the total turnover (entry rate plus exit rate), the red line the net flow (entry rate minus exit rate.)
Source. Bartelsman, Haltiwanger and Scarpetta 2004, p. 17, Figure 2, Panel B.