

**Marcin Piątkowski**

Research Assistant to the Director

TIGER – Transformation, Integration, and Globalization Economic Research,  
Warsaw, Poland

e-mail: [mpiatek@tiger.edu.pl](mailto:mpiatek@tiger.edu.pl), web site: [www.tiger.edu.pl](http://www.tiger.edu.pl)

## **The Impact of the ‘New Economy’ on Economic Growth in Post-socialist Countries: The Relevance of Institutional Infrastructure<sup>1</sup>**

### *Abstract*

The contribution of the ‘new economy’ (NE) to economic growth in developing countries has so far been minimal. Despite the recent hype, the ‘old economy’ will for long be the fundamental force behind economic growth in transition economies. Nonetheless, in the longer run the NE offers great potential for faster economic growth in postsocialist economies. Realizing this potential is however not automatic. It can be left unharnessed if there is no suitable institutional infrastructure, which would allow for adoption, diffusion, and productive use of information and communication technologies (ICT).

The paper constructs a *New Economy Indicator* (NEI) measuring the level of preparedness of transition economies for harnessing the potential of ICT to accelerate the long-term economic growth and catching-up with developed countries. In the NEI ranking Slovenia scored the highest, followed by the Czech Republic and Hungary. Albania, Bosnia and Herzegovina, and FR of Yugoslavia occupy the bottom of the table. Similarity of the NEI results with the Global Competitiveness Report 2001 suggests that fundamentals responsible for the development of both the ‘new’ and the ‘old’ economy are largely the same. Hence, there is no ‘new’ or ‘old’ economy: there is only one economy where old recipes for development still apply.

Keywords: post-communist transition, ‘new economy’, ICT, economic growth.

JEL classification: O1, O2, O3, O5

---

<sup>1</sup> This paper is largely based on the „Institutional Infrastructure of the ‘New Economy’ and Catching-up Potential of Transition Economies”, *TIGER Working Paper Series*, No. 16, March 2002, Warsaw, available at [www.tiger.edu.pl](http://www.tiger.edu.pl)

## 1. Introduction

The ‘new economy’ hype is over. The bursting of the stockmarket bubble instilled much needed realism into debates on the economic impact of the on-going technological revolution spurred by information and communication technologies (ICT), and most visibly embodied in the Internet. The business cycle is alive and kicking, unemployment is up, and shares prices are down. The economic nirvana of the ‘new economy’ did not materialize. The ‘new economy’ (NE) thus still needs to be taken in quotes.

The impact of the NE on the world-wide economy, despite the recent hype, has so far been quite limited, particularly in terms of its geographical reach. The ‘new economy’ has been mostly felt in developed countries, some examples to the contrary notwithstanding (Bangalore in India is a fitting and often-cited example). However, the contribution of new technologies to growth in developing and transition economies has been minimal, particularly when viewed from a macroeconomic perspective.

Despite a somewhat ambivalent start, in the longer run the ‘new economy’ offers great potential for faster economic growth and an increase in standards of living in less developed countries, transition countries included<sup>2</sup>. The acceleration in productivity and output growth could allow transition economies to shorten the process of their catching-up with developed countries. The relative low level of economic development together with technological backwardness offers them a handicap in development: thanks to absorption, imitation and application of knowledge, blueprints, ideas, technological and organizational advances, and superior technologies already developed in rich countries, post-socialist economies should now grow faster than developed economies. The CEECA countries may be thus able to ‘leapfrog’ stages of technological development and subsequently considerably increase rates of economic growth. The ‘knowledge-like’, weightless nature of the ‘new economy’, which provides for easier and faster diffusion, can further accelerate the absorption process.

Realizing the benefits of the NE is however not automatic. Its potential can be left unharnessed if there is no suitable institutional infrastructure, which would allow for adoption, diffusion, and profitable use of innovative technologies.

---

<sup>2</sup> The following terms: transition countries/economies, post-socialist countries/economies, and Central and Eastern European and Central Asia countries (CEECA) will be used interchangeably. The category of transition countries in this paper includes 27 post-socialist countries of Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Estonia, FR Yugoslavia, FYR Macedonia, Georgia, Hungary,

After more than a decade of transformation from a command economy to a market economy, the process of institution building is still far from being concluded. Like the technological revolution, the post-socialist institutional revolution is not over. The results of the latter revolution will bear upon the future prospects for development. Countries with insufficiently developed institutions are likely to find themselves in a ‘technological trap’, risking to be marginalized in a global economic community. Various speeds of adoption of the NE are also likely to add to the increasing polarization of growth rates among the post-socialist countries. Ultimately, the NE can have both its winners and losers. The existence of appropriate institutions will be one of the deciding factors.

Hence, what are the institutional preconditions for transition economies to benefit from the potential of the NE? What is the current level of institutional readiness for adoption of the NE among transition countries? Can it prosper in spite of the old problems of the poor ‘hard’ infrastructure, lack of regulations and mature institutions, scarce capital, and finally lack of English language skills? What does the future hold?

This paper constructs a *New Economy Indicator* (NEI) measuring the capacity of transition economies to exploit the potential of the innovation and technology diffusion stemming from the ‘new economy’ to accelerate the long-term economic growth and catching-up with developed countries. The NEI indicator is comprised of ten variables believed to be the most pertinent for development of the ‘new economy’ and its profitable use. These are the following:

1. Quality of regulations and contract enforcement
2. Infrastructure
3. Trade openness
4. Development of financial markets
5. R&D spending
6. Quality of human capital
7. Labor market flexibility
8. Product market flexibility
9. Entrepreneurship
10. Macroeconomic stability

The structure of the paper is as follows: Section 2 succinctly discusses the phenomenon of the ‘new economy’ in developed countries and analyze current and prospective impacts of the ICT revolution on growth in transition countries. In Section 3 the NEI indicator of the quality of institutional infrastructure is developed. Section 4 concludes the paper.

## **2. The impact of the ‘new economy’ on transition countries**

The existence of the ‘new economy’, the term itself so often put in quotes, is still open to debate. The ‘new economy’ is most often construed as a superior economic structure perpetuated by innovations in ICT, which -- while impacting all sectors of the economy – accelerates productivity and economic growth. Other definitions of the ‘new economy’ underscore the contribution of globalization (Pohjola 2001b), spillover effects of communication networks (Stiroh 1999), and permanently higher growth rate in productivity stemming from the production, adoption, and continued diffusion of ICT (De Masi *et al.* 2001).

The emergence of the concept of the ‘new economy’ largely rests on the extraordinary performance of the US economy in the second half of the 1990’s, where annual productivity as measured by GDP per hour worked in the non-farm business sector increased to 2.7% between 1996-99 from 1.6% before 1995 (Pohjola 2001b). It seems that also Finland, Ireland, Sweden, Singapore, Canada, and Australia were able to benefit from the ICT to increase their rates of output and productivity growth in the late 1990’s.

Notwithstanding the US ‘miracle’, the impact of the ‘new economy’ on the global economy has so far been negligible. The ‘new economy’ in developing and transition countries, aside from small-scale microeconomic improvements, did not seem to contribute to economic growth at all. Software industry development in Bangalore in India, fish markets in Bangladesh, eastern European information portals, or Internet coffee markets in Brazil have added much to the ‘new economy’ hype. Alas, these much-cited developments did not seem to have equally added to the economic growth of their countries.

The lack of macroeconomic impact of ICT on developing countries was confirmed by the results of a comprehensive cross-country empirical study on the returns of IT investment in developed and developing countries (Dewan and Kraemer 2000). The study shows that returns on IT investment are ‘positive and significant for developed countries, but not statistically significant for developing countries’ (as quoted in Kraemer and Dedrick 2001, p 262). The estimate of IT output elasticity is 0.057 (positive and significant) for developed

countries<sup>3</sup>, but statistically indistinguishable from 0 for developing countries'. Pohjola (2001a) shows that the relative contribution of IT to GDP growth in developing countries, to which transition countries belong, was less than 2% (China, India, Argentina, Chile, Brazil, Thailand, Venezuela) compared to more than 10% in the US, Finland, Canada, Sweden, and UK. No other studies, at least that the author is aware of, have found any sizable contribution of ICT to growth in developing countries. It seems that more research in this area is needed (however, lack of relevant data is a usual constraint).

One reason for the apparent lack of benefits from the diffusion and adoption of the NE in transition countries is still the relatively small value of IT investments – the most advanced transition countries (Poland, Czech Republic, Hungary, Slovakia) in 1999 invested in IT between 1.9% (Poland) to 4.2% (Czech Republic) of their GDPs, which compares to Sweden's 6.5%, 5.3% in the US and the overall OECD average of 4.3% (OECD 2001b). Also in absolute numbers the value of IT investments in Central and Eastern European countries were much smaller than in rich countries<sup>4</sup>. IT investments in less developed transition countries of Central Asia are not likely to exceed 1% of GDP. Thus it seems that investments are too small to bear upon growth.

Yet, why do not even small investments yield positive returns? Kraemer and Dedrick (2001) suggest that developing countries, as opposed to developed countries, have not been able to profitably use ICT products and services due to the lack of complementary investments in infrastructure, human capital, and R&D. This seems to be right. Returns on many various high-value added investments depend on complementarities. To put it into colloquial terms, a brand new high-tech factory in the middle of an underdeveloped country (or 'developing' as euphemistically we all have learned to say) will not be efficient when faced with lack of local suitable labor skills, infrastructure, regulations, taxation and so on (which together equates to institutional infrastructure as we discuss more forcefully later). In this environment, returns on investments in basic infrastructure (drinking water, primary schools, irrigation) are very likely to be more productive than high-technology investments. As a result, some transition countries could rightly decide to invest in basic infrastructure while compromising ICT investments.<sup>5</sup> Consequently, at least during the process of building

---

<sup>3</sup> A 10% increase in IT investment should result in 0.57% increase in output.

<sup>4</sup> According to IDC (2000), all transition economies spent a little more than \$10 billion on IT in 1999. This is roughly equal to IT investments of Sweden alone.

<sup>5</sup> The technological trap is analogous to the poverty trap, which is very interestingly discussed in Easterly (2001). He explains the idea of a poverty trap by taking an example of the returns on education in an underdeveloped country, where it is more profitable for parents not to spend money on education of their

basic infrastructure, a technological chasm between underdeveloped and developed countries could further widen.

The technological gap could also widen between more and less developed transition economies. The NE may thus contribute to rising growth disparities in transition economies. Different qualities of institutional infrastructure and the various speeds at which these economies espouse the Internet revolution will most likely lead to further polarization of patterns of economic growth in those countries. The least developed countries, like Tajikistan or Albania, can even find themselves in the technological trap. **Initial development conditions therefore matter for the adoption of the NE. It is because when one country is better developed than another, then it has higher chances for taking advantage of the NE.**

Despite negligible macroeconomic impact, the IT revolution seems to have contributed to productivity and output growth on a microeconomic level in certain industries (retail, financial services, transport) and specific enterprises. Anecdotal evidence abounds – management information systems together with the use of e-mail seem to have been the most appreciated for their contribution to better productivity (as recently discussed with several CEO's in Poland). Yet, these effects are seemingly too small to reflect on the macro picture.

The 'new economy' has contributed to a few success stories. Rapid development of e-banking<sup>6</sup>, e-commerce<sup>7</sup>, and Internet portals bears proof of the potential of new technologies. Yet again, far from being euphoric, the macro impact of e-business in transition countries is still insignificant. Growing penetration of the Internet (more than 10% of Poles used the Internet regularly as of the end of 2001; there are more users in Estonia, Slovenia, Hungary, Czech Republic, but much fewer in other post-socialist countries), promulgation of e-signatures (Czech Republic, Slovenia, Poland, Hungary, Bulgaria), or attempts at introducing

---

children since benefits from being educated in a poor country are likely to be lower than a value of children's lifelong work on the farm.

<sup>6</sup> The Polish Internet bank, mBank, has attracted more than 150,000 accounts in less than a year since its inception (Gazeta Finansowa 2001); the runner-up, Inteligo, boasts of more than 100,000 accounts as of the end of 2001. Coupled with other banks, it is estimated that as of the end of 2001 there were roughly 440,000 clients using Internet accounts, six times more than in December 2000 (Rzeczpospolita 2002a). Analysts project that by 2005 Poles will maintain some 2 million e-accounts (Prawo i Gospodarka 2001). Note: the number of clients is not equal to the number of internet accounts – clients can maintain more than one account.

<sup>7</sup> E-commerce is rapidly developing. International Data Corporation estimates that in 2001 the e-commerce market in four Central European countries (Czech Republic, Hungary, Poland, Slovakia) will increase 6-fold to \$650 million (Rzeczpospolita, July 20<sup>th</sup>, 2001). In Poland [www.ce-market.com](http://www.ce-market.com), a successful B2B platform for transactions in non-ferrous metals, attracted more than 450 customers in less than six months from inception. In the same period, the total value of transactions amounted to some \$6 million – see [http://www.ce-market.com/aboutus\\_what\\_press.asp](http://www.ce-market.com/aboutus_what_press.asp)

e-government (like in Slovenia, Economist 2001a) by themselves do not much contribute to economic growth, either<sup>8</sup>.

Microeconomic rapid progress in adoption of ICT innovations bears proof to the potential of the technological revolution for transition countries. As for now though it seems that **much more time is needed for microeconomic progress to make a tangible impact on people's well-being**. Productivity improvements at the firm and industry level driven by ICT are however likely in medium and long-term to contribute to acceleration in aggregate growth. Additionally, in the long run, as argued by the conditional convergence hypothesis, transition countries should also grow faster than developed countries owing to absorption of knowledge other than technology, organizational and managerial blueprints, and financial resources from rich countries. Benefits of convergence and IT will depend on the quality of national policies and the level of development of institutional infrastructure.

The NE and the times of 'punctured equilibrium' (Thurow 2001) that it induces, presents quite a few opportunities for transition economies to achieve faster development. At the same time, however, it poses substantial threats. Generally speaking, transition countries stand a chance to grow faster thanks to the low opportunity costs of switching from old to new technologies (these are higher for developed countries – no 'sunk costs' for transition economies), younger populations which generally tend to espouse innovations faster, and a relatively high level of educational attainment, the value of which is much higher in the NE environment. Additionally, the potential of the Internet revolution also stems from the weightless, knowledge-like nature of the NE (Quah 2001), which allows for its faster diffusion and adaptability of innovations, and thus higher value of international R&D spillovers. These opportunities are mitigated by threats of digital divide and technological trap.

Despite challenges, the economic potential of the technological innovations underlying the NE is significant. That is because in the long-run technical progress is everything – in his famous article Solow (1957) found that capital accumulation accounted for only 13% of economic growth in the US in the first part of the 20<sup>th</sup> century. The rest, almost 90%, was attributed to technological progress (as expressed by TFP – total factor productivity).

In the shorter run, though, it appears that traditional accumulation of physical and human capital matters more than technological progress. This is also because of the pace of

---

<sup>8</sup> Although growing Internet penetration contributes to better access to information, convenience, customer choice, and satisfaction. These factors might be captured by some kind of a Human Convenience Index, the value of which surely skyrocketed after the emergence of the Internet.

technological progress itself, still mostly embodied in equipment and machinery, largely depends on investment in physical capital as it expands and renews the existing capital stock and enables new technologies to enter the production process. Welfe *et al.* (2001) found, based on growth accounting calculations, that between 1974-90 Poland's annual TFP growth amounted to 0.73%, which represented only 26% of the period's potential annual growth rates. Physical and human capital accumulation was responsible for the remaining 74% of the potential GDP growth. The same calculations based on data for the 1990's revealed that investments in physical capital were responsible for almost half of the growth in potential GDP (1990-95) and between 80-90% of growth between 1996-2000. The effects of technical progress, driven by the increase in the quality of human capital and the absorption of foreign technical progress, were thus quite limited.

Coe and Helpman (1995) show that between 1991-95 TFP in the most developed countries of Western Europe was responsible for approximately 60% of the annual GDP growth rates<sup>9</sup>, that is substantially more than in Poland. **This suggests that for Poland, and – per proxy – other transition economies, accumulation of traditional factors of production, that is investments in physical, and – to a lesser extent - human capital, matters much more than for developed countries. Hence, traditional factors will long remain the mainstay of economic growth in transition countries.**

This may stem from the fact, as also argued by Kreamer and Dedrick (2001), that in order for developing countries to benefit from technological innovations they need to develop physical infrastructure, invest in human capital and labor skills, and establish appropriate institutions, which all strengthen the impact of the technological progress on economic growth.

One can conclude that the process of catching-up of transition economies will mostly depend on the 'old' economy. Nonetheless, the importance of the „new economy” for economic growth is likely to gradually increase – diminishing returns to investment in physical and human capital imply that with time and rising incomes the growth of TFP driven by technological progress will have to accelerate in order to sustain high growth rates.<sup>10</sup> In the long run, then, the ultimate success of catching-up will also depend on the 'new economy'.

---

<sup>9</sup>Potential TFP for Poland; actual TFP for Western European countries. See Welfe *et al.* (2001) for methodological details.

<sup>10</sup> Welfe *et al.* (2001) argue, based on their econometric model for Poland's economy, that in order for Poland to reach 6-7% annual growth of potential GDP during the next decade, and assuming that investments to GDP would equal 30% annually and the contribution of labor force would not change, the TFP would have to be responsible for at least 50% of the increase in potential GDP. Without acceleration in TFP growth, the potential GDP would only increase by 3 to 3.5% annually.



Similarly, Kolodko argues (Kolodko 2001, p. 71) that ‘the post-socialist countries – unlike developed market economies – need not aptly utilize the potential of e-business, but first raise efficiency of the ‘old economy’, since these two ‘economies’ are destined for a lengthy coexistence’. One may add that the ‘old economy’ and capital and human accumulation, as prescribed by traditional development economies, also seem to be binding for developed economies. One of the paradoxes of the American productivity miracle in 1990’s driven by ICT is the fact that the European Union, seemingly quite slow in adoption of the Internet revolution, has nonetheless recorded productivity growth in 1995-2000 of 1.5% annually, only slightly below the 1.8% recorded in the US.<sup>11</sup> The EU experience suggests, examples of Finland, Sweden, and Ireland notwithstanding, that improvements in the ‘old’ economy must have mostly contributed to this significant productivity growth. Therefore, even in developed countries the ‘new economy’ is not the only solution to faster economic growth – the „old” economy still has a great role to play. Old-style efficiency improvements in structural, organizational and institutional frameworks of economies still matter.

### 3. The ‘New Economy’ Indicator (NEI)

Neither the ‘old’ or the ‘new economy’ will develop without appropriate institutions. These, while creating particular economic incentives, decide on the allocative efficiency of an economy. The quality of institutions largely explains differences across countries in productivity and economic growth (North 1990, Hall and Jones 1996, World Bank 2002, Clague 1997). Likewise, technological progress also contributes to divergence in growth rates.

The paper develops an institutional indicator -- the *New Economy Indicator* (NEI) -- with an objective to provide a best estimate of readiness of 26 transition countries, based on the level of development of the NE institutional and economic infrastructure, for harnessing the NE in order to achieve faster long-term economic growth and catching-up<sup>12</sup>.

---

<sup>11</sup> Calculated as Net Domestic Product (NDP) per man-hour (Economist 2001b). If one takes into account GDP per hour worked in the ten years to 2000, American productivity in that period rose by an annual average of 1.6% in the ten years to 2000, but euro area productivity rose by 1.9%. Total factor productivity, which takes into account the efficiency with which capital and labour are used, also grew slightly faster in the euro zone than in America (Economist 2001c).

<sup>12</sup> As a word of caution, the NEI surely does not fully subscribe to the neo-classical model of economics, which heavily relies on hard data and mathematical models. The indicator, since it could not be falsified due to lack of reliable data, does not have any pretense to be a hard scientific proof. Nonetheless, the implications of the indicator seem to indeed add to the current stock on knowledge on the importance of institutions for adoption of new technologies. The lack of hard data should then not limit our quest for knowledge. In a telling story, Krugman (1997, pp 1-3) cites a paper on ‘the evolution of ignorance’ about Africa. The paper describes the

Motivation for the use of indicators, as argued by Zinnes, Eilat, and Sachs (2001, p. 321) is two-fold "first, (...) indicators provide an easy way to capture a concept when a single, quantitatively measured variable cannot. (...) Second, the indicator approach helps to overcome problems of scarcity and quality of data, which are major obstacles to any work on transition economies". In other words, indicators come in handy when relevant hard data is missing.

This paper's indicator, while building on the foundations of theoretical and empirical macroeconomics as well as institutional economics (North 1994, 1997), combines ten variables, which are believed to be the most relevant for the adoption and profitable use of technological progress.<sup>13</sup> The ten variables are the following:

<b>Factor</b>	<b>Proxy</b>	<b>Source</b>
1. Quality of regulations and contract enforcement	Legal system effectiveness & extensiveness	EBRD
2. Infrastructure	Number of main telephone lines per 100 persons	EBRD
3. Trade openness	Exports plus imports to GDP	EBRD
4. Development of financial markets	Broad money (M3) to GDP	EBRD
5. R&D spending	Annual R&D spending to GDP	Eurostat
6. Quality of human capital	Education Index 1999	HDI (UNDP)
7. Labor market flexibility	Unemployment rate	EBRD
8. Product market flexibility	Competition policy index	EBRD
9. Entrepreneurship	Private sector share in GDP	EBRD
10. Macroeconomic stability	Inflation	EBRD

### **Description of the variables**

First of all, a relevance of each variable for general economic growth will be established based on a selection of research results. Secondly, the relevance of each of the variables for harnessing the potential of the "new economy" will be discussed. Thirdly, the level of development of transition countries will be commented with regard to particular variables.

---

evolution of European maps of the African continent between the fifteenth and the nineteenth century. In the XV century, maps of Africa were relatively inaccurate. Yet, they described the interior of Africa often based on indications like 'six days to the south, two days east from there'. In later centuries, cartography and the quality of information improved. The development of cartography, however, enhanced the standard of what would be considered valid data. Thus, "six days to the south" did not qualify anymore. As a result, maps developed in later centuries showed a sparser area for the African interior than on maps from the XV century! As Krugman says 'there was an extended period of time in which improved technique actually led to some loss in knowledge'. He further concludes that 'doing economics ... is a kind of mapmaking'. This paper's indicator is yet another kind of a map.

<sup>13</sup> These are also based on various research projects (OECD 2001a, IMF 2001, World Bank 1998/99).

The measure of the level of development of the NE institutional infrastructure will be reflected by a weighted sum of values of all ten variables for each country. It has been assumed that the variables of quality of regulations and law enforcement, financial development, trade openness, infrastructure, R&D spending, and human capital will be given twice as large relative weight compared to other variables (which have been multiplied by 0.5) as they are believed to be the most important for adoption of the NE. Due to either lack or limited availability of relevant data, variables are proxied only by observations available for the whole sample of countries. While it would be much more appropriate, for instance, to use a number of Internet hosts or a number of PCs per capita to measure the infrastructure variable, yet data for only main line telephone penetration is available for the full sample of transition economies. Simply put, the best available sets of data were used to measure each variable.

The construction of the indicators is based on the competitiveness indicator developed by Zinnes, Eilat and Sachs (2001, p. 322) and is performed in the following way:

- variables are selected, ensuring that each of them is either entirely positively or negatively related to the main concept;
- if variables are negatively correlated (like inflation), they are multiplied by  $-1$  to insure that always ‘more is better’;
- variables are standardized<sup>14</sup>.

#### 1. *Regulations and contract enforcement*

As argued by Clague *et al* (1997) the quality of regulations and contract enforcement mechanisms largely explain why some countries prosper while others do not. He shows that the high level of contract enforcement and respect for property rights lowers the cost of market exchanges. The lower costs of transactions are especially important for transition countries, where because of the low level of development of market exchange mechanisms the transaction costs are much higher. Higher transaction costs stifle economic growth. Quite evidently then, the quality of regulations and contract enforcement is vital for long-term economic growth.

The rule of law is equally important for adoption of ICT, particularly in less developed post-socialist countries, where contract enforcement has been traditionally lacking. New

---

<sup>14</sup> The sample mean is subtracted from each number and then the result is divided by sample standard deviation. This implies a mean of zero and a standard deviation of one across countries in the sample. Hence, all results are comparable and can be aggregated.

enterprises utilizing innovations will not prosper if the legal environment is not conducive to their development. When faced with inadequate law enforcement, entrepreneurial effort tends to shift to less transparent gray and black markets. The law extensiveness and quality of contract enforcement is then prerequisite to emergence of the ‘new economy’.<sup>15</sup>

## 2. *Infrastructure*

This is quite a self-evident category for the adoption of the ‘new economy’ – there will not be any ‘new economy’ without telephone and computer networks<sup>16</sup>. It seems probable that in order to benefit from the so-called network effects one needs to exceed a critical point in development of the network. While the exact position of the critical point is not known, it seems reasonable to assume that it is close to universal penetration. Network effects may then be non-linear – after exceeding the critical point, the economic value of the network increases more than proportionately.

It is well known that communication and computer/Internet infrastructure in transition economies significantly lags behind developed countries. According to Eurostat statistics (Deiss 2001) on the EU-candidate countries for 2000, the number of PCs and Internet hosts in a covered sample of transition economies are relatively low compared to EU countries. Diversity in results is interesting – PC penetration in Slovenia almost equals the EU average of 28.6 PCs per 100 inhabitants; in Bulgaria though, the PC penetration amounts to only 4.4 per 100 inhabitants. Similarly with Internet hosts: Slovenia boasts of 1.4 hosts per 100 inhabitants compared to Bulgarian 0.2 and the EU average of 3.3. Indeed, there is much to be done to improve the ‘new economy’ infrastructure.

Persisting underdevelopment of infrastructure does not, however, change the fact that in recent years most transition economies have made big steps in up-grading their networks. Mobile telecommunications, one of the wonders of the ‘new economy’, allowed most countries to start rapid catch-up with developed countries. Mobile telephony is a perfect

---

<sup>15</sup> However, quite interestingly, software piracy, due to lack of contract/copyright enforcement, is beneficial to adoption of the ‘new economy’ in transition economies. Billions of dollars’ worth of software has been pirated and then widely distributed at a low cost. As reported by Business Software Alliance (2001), in 1999 alone \$12 billion worth of software was pirated globally. A couple of years ago, the majority of software used by local enterprises even in Poland were not licensed. In less developed countries, like Kazakhstan or Albania, almost all software is still illegal. Piracy pays: in the short run it definitely adds to faster diffusion of information technologies. **Without piracy, technological catching-up would be considerably slower as local economies could not afford to pay the full price of software products.** This Machiavellian idea does not, however, hold in the long run. In the longer perspective, the low quality of contract enforcement and regulations is inimical to growth. This is true also because countries known for piracy, risk to be isolated by the international trade community and thus lose access to knowledge spillovers.

<sup>16</sup> Other types of hard infrastructure are almost as important – the NE will not develop in a country with dilapidated transportation networks (proverbial ‘pot holes’), low quality logistics system etc.

example illustrating potential of technological ‘leap-frogging’ – from years-long waiting lists for main line telephones to plentiful access to mobile telephones at affordable prices.

### 3. *Trade openness*

There is a broad consensus among economists that liberalized exports and imports are positively correlated with productivity and output growth. Trade openness is particularly important for diffusion of knowledge and innovations – imports are their main carrier. Open borders allow for international R&D spillover effects, which may represent a very potent contribution to economic growth in developing countries (according to Mohnen 2001, a 0.5% increase in R&D spending in terms of GDP in developed countries may result in a 14% increase in output in the long run in developing countries). Coe and Helpman (1995) find a significant relationship between import propensities and the ability to benefit from R&D spillovers: *i.e.* for a given level of R&D performed abroad, countries with a higher import propensity have higher productivity growth.

### 4. *Financial markets*

Schumpeter (1912) already asserted that a developed financial sector is important to economic growth. This assertion was confirmed by King and Levine (1993), Levine (1997), and Greenwood and Smith (1997). Financial markets play an important role in collecting and aggregating savings and then redistributing it for productive purposes.

A developed financial market is evidently critical for the ‘new economy’. In particular, the value of venture capital (VC) investments is especially important as it finances start-up companies, which tend to predominantly utilize new technologies and ideas (as the experience of dot.coms suggests). Equity markets represent the second important channel for financing the ‘new economy’.

Unfortunately, neither of the two ‘new economy’ financial channels is sufficiently developed in transition economies. The total value of VC investments is negligible. According to available data (Global Entrepreneurship Monitor 2001) domestic VC capital investment to GDP in Poland, one of the most developed countries in Central and Eastern Europe, amounted to less than 0.1% in 2000 compared to 1.2% in Israel and 1.0% in the US. According to Dresdner Kleinwort Capital (2001), in the whole of Central and Eastern Europe the average ratio of private equity funds raised (raised does not mean invested, though) to GDP as of the end of 2000, amounted to 1.3% compared to the UK with more than 5.1%,

Sweden with 3.3% and France at 2.0% of GDP. In Poland alone the aggregate amount of VC capital invested was about EUR 200 million in 2000 - that is only 0.1% of GDP!

The allocative role of equity markets is equally small – the total value of equity sold through IPOs on the Warsaw Stock Exchange in 2000 amounted to some 0.6% of total annual investments in fixed capital. **Hence, the financial infrastructure of the “new economy” in transition countries is underdeveloped and undoubtedly limits prospects for realizing the economic potential of the ICT.**

### *5. R&D spending*

Thanks to the findings of inter alia the endogenous growth theory, the importance of R&D for economic growth is by now quite obvious. Stiglitz (1998, pp. 26-27) states that ‘studies in returns to R&D in industrial countries have found individual returns of 20-30 percent and social returns of 50 percent and higher’. He further argues that ‘for most countries not at the technological frontier, the returns associated with facilitating the transfer of technology are much higher than the returns from undertaking original R&D’. **Hence, it seems that an ability to absorb the technology is key to fast development.**

In transition countries R&D spending is at a very low level. It generally does not exceed 1.0% of GDP compared to more than 2.0% on average spent by the OECD countries (Laafia 2000). Low R&D spending puts post-socialist countries in a disadvantaged position since local R&D is extremely important for understanding and absorbing knowledge developed internationally, up-grading their own R&D skills, and active participation in international R&D networks. The OECD (2001a, p. 41) argues that ‘domestic R&D (...) is key in tapping into foreign knowledge; countries that invest in their own R&D appear to benefit most from foreign R&D’. **Domestic R&D seems to be essential for absorption of international R&D spillovers.**<sup>17</sup>

R&D spending is nevertheless not everything – what matters is a profitable application of the newly created knowledge. This is where the post-socialist countries seem to lag the most: the flow of knowledge between science and industry is very weak. Most R&D institutes in post-socialist countries, often quite sophisticated in the quality of their research, nonetheless are very incompetent in terms of diffusing the results of their research for business use. This is mostly due to the legacy of socialist times when all applications of R&D were controlled by the state. The

---

<sup>17</sup> It has been argued that the rapid development of Japan since 1950’s and later Korea has been mostly based on successful adoption, imitation, and up-grading of innovations developed abroad. The same path can be taken by transition economies. Yet, domestic R&D is needed in order to successfully follow this route.

state relinquished this role in the early 1990's and left it entirely to R&D institutes. However, they proved unable to disseminate this knowledge because of the lack of clear incentives, managerial competence, and often insufficient financial support.

The ability of enterprises in transition economies to adopt R&D created both locally and internationally, is equally low. It is because the level of business R&D is particularly small. According to the OECD (2001b) Main Science and Technology Indicators, business enterprise sector R&D expenditure as a percentage of the domestic product of industry in 1999 amounted to 0.42% in Poland, 0.33% in Hungary, 0.69% in Slovakia, and 0.95% in the Czech Republic. This compares to Sweden's 4.74% and the OECD average of 1.89%.

Foreign direct investment (FDI) can play a substantial role in domestic absorption of international R&D. Its role should be growing. Yet, FDI inflows depend on the attractiveness of particular countries. Here transition countries lose in the global battle for FDI: they attract less than \$30 billion annually, which is less than Brazil alone. Transition countries then have a lot to do to promote FDI and its R&D component.

## 6. *Human capital*

The role of human capital in economic growth is widely acknowledged. Various empirical studies have found that human capital is positively correlated with GDP growth rates (Benhabib and Spiegel 1994, Barro and Sala-i-Martin 1995, Bassanini and Scarpetta, 2001b).

Benefiting from the ICT requires the right skills and competencies. That involves building on the foundations of solid education and lifelong learning. Tertiary education is particularly important for the 'new economy' since this level of education prepares people for absorption of high-technology knowledge from abroad. In this context, it is also important to note that in order to benefit from ICT, tertiary education in math, computer science and engineering rather than liberal arts should be emphasized.<sup>18</sup>

The quality of human capital in transition economies is relatively high despite their low national incomes. Ukrainian human capital is better developed than Venezuelan and Tajikistani better than Nigerian is.<sup>19</sup> Human capital is one of the few positive legacies of the

---

<sup>18</sup> For instance, according to Stiglitz (1998) the high ratio of engineers in tertiary education in Korea and Taiwan (almost triple the US level) contributed to narrowing their productivity gap with developed countries.

<sup>19</sup> According to the Human Development Index 2001, the Education Index 1999 for Ukraine amounted to 0.92, while its GDP index was only 0.59. This compares to, for instance, Venezuelan GDP index of 0.67, and Education Index of only 0.83. Post-socialist countries on the whole, thanks to a high value of the Education Index, score much higher in the HDI ranking than in the GDP ranking. For Armenia, the difference amounts to 44 places in the ranking; for Tajikistan it is 36 places.

communist era. Yet, formal education is not all – especially because ICT appropriate skills matter more than broad knowledge. ICT skills are lacking in transition countries. This is due to the relatively low numbers of math, physics, and engineering graduates. More importantly though it seems that inadequate ICT skills are due to the lack of the culture of lifelong learning – it is very rare to see middle-aged people take courses in local universities. Yet, without lifelong learning people will not be able to keep abreast of ever-changing technology, whose progress – thanks to the ‘new economy’ – has recently even quickened.

Education also contributes to the driving demand for technological products. As argued by Quah (2001), the ‘new economy’ will not develop without demand for its products. Here again a lot can be done in post-socialist countries in terms of changing attitudes towards adoption of innovations. Better education surely will help. Nonetheless, current attitudes will not be changed overnight – cultural and societal changes take decades to come about. This risk is however largely mitigated by an apparent strength – since youth tend to adopt innovations faster, the relatively young populations of Eastern Europe and Central Asia should espouse technology much quicker than older and established societies in developed countries.

### *7. Labor market*

The relevance of labor market flexibility for economic growth has been known for a long time. The OECD Jobs Study launched in 1994 was the first to find evidence that flexible labor markets result in reduction in unemployment (OECD 1999). Higher employment translates into higher output. Di Tella and MacCulloch (Economist 1999) found additional powerful evidence based on a survey of 21 countries over seven years to 1990.

Flexible labor markets are particularly important for the development of the ‘new economy’: adoption of e-business and emergence of new organizational and management structures predominantly require flexibility in re-allocating people from old to new tasks and new ways of doing business. Since innovation introduces new products and industries that replace existing ones, it leads to labor re-allocation between firms and sectors. Rigid labor markets, while stifling necessary changes in employment, inhibit the adoption of the ‘new economy’. **Flexible labor markets are thus necessary for adoption and diffusion of the technological revolution** (Johnston 2001).



#### 8. *Flexible product markets and competition*

Competition, through lowering of the barriers of entry, improves incentives and thus leads to more productive use of resources. The importance of flexible product markets for economic growth has so far been plainly evidenced (Bassanini 2001a).

Competitive markets are very important for the growth of the ‘new economy’ and its contribution to increasing productivity. New, more productive enterprises using new technologies have to have a chance to compete with incumbent companies. Market regulatory framework has to push down the barriers of entry as low as possible. Telecoms companies are a case in point – in countries where the telecommunication market has been liberalized (the US, most of the EU, developed countries of the South-East Asia), the quality has risen while costs of telecommunication services have considerably dropped in a short period of time. This is mostly not the case with telecom companies in transition economies, which retain their monopolistic positions. **Market liberalization is thus extremely important for the emergence of the “new economy”.**

#### 9. *Entrepreneurship*<sup>20</sup>

It is not enough to know. It is equally important to be able to put the knowledge into profitable use. That is where entrepreneurial spirit and thus entrepreneurs come into place. There would be no commercially utilized innovations without entrepreneurs. They transform somebody else’s ideas into economic reality.

J. Schumpeter (1912) had already discovered the links between entrepreneurship and economic growth. He was the first one to assert that entrepreneurship is, next to innovations and credit, an important factor spurring economic growth (Blaug 1994). As forces of “creative destruction” replace old inefficient firms with new and innovative firms, the growth rate of productivity accelerates.

To state the obvious, entrepreneurship is at the core of the ‘new economy’. There would not be Amazon, Yahoo, eBay, and other paragons of the Internet era without the risk-takers.

---

<sup>20</sup> Private sector share in GDP based on EBRD data is used as a variable in covering a full sample of countries. It surely is a flawed measure since it reflects both entrepreneurial activity and progress in economy-wide privatization. Nonetheless, a large share of the private sector in the GDP of transition countries means that, first of all, the structural reforms that promote entrepreneurship are advanced. Second of all, grass-roots private

### *10. Macroeconomic stability*

A high level and high variability of inflation increases uncertainty and decreases the efficiency of price mechanisms in allocating resources. As a result, inflation tends to lower the value and productivity of investments. However, specific evidence on the relationship between inflation and growth is ambivalent: while the relationship is robust in cases of high inflation, it is less so in cases of moderate or low inflation (Bruno and Easterly, 1998). Nonetheless, it is generally accepted that inflation, particularly high and variable inflation, is inimical to growth.

Macroeconomic stability is equally relevant for the adoption and development of the ‘new economy’. In an unstable inflation-prone economy, no investments will flourish (not even ICT investments). Low and stable inflation rates are thus necessary for benefiting from the technological progress.

#### *Other factors*

The NEI could be complimented with additional variables of such harder-to-quantify factors like political freedom and stability (democracy, civil liberties, state support for the Internet), culture (openness to adoption of innovations), corruption, religion, ethnicity, or even command of English. Yet, due to the very qualitative nature of these variables and for the sake of the NEI’s simplicity, these variables are not included. Nonetheless, the impact of political, social, and cultural factors on economic growth, and – in the paper’s context – on the adoption of new technologies, remains a rich field for further research.

Let us finally turn to the NEI scores:

---

business has been expanding, too (in most transition countries start-up private businesses rather than privatized companies now contribute a large part of the private economy’s contribution to GDP).

Country	NEI rank	NEI score	Regulations and law enforcement	Infrastructure	Trade openness	Financial system	R&D spending	Human Capital	Labor market flexibility	Product market flexibility	Entrepreneurship	Macroeconomic stability
Slovenia	1	10,1785	1,0846	1,7629	0,4393	1,2911	3,2527	1,1878	0,5269	1,0033	0,4107	0,3792
Czech Republic	2	9,4404	0,4310	1,3205	1,0642	2,4531	2,6677	-0,2700	0,3573	1,4730	1,3349	0,3826
Hungary	3	7,3497	1,0846	1,5654	0,8087	0,8867	0,3669	0,8963	0,3361	1,4730	1,3349	0,3381
Estonia	4	7,2152	0,8232	1,1783	1,7600	0,9481	0,1329	1,1878	-0,1728	1,0033	1,0268	0,5126
Slovak Republic	5	6,6799	-0,0266	0,8228	1,2058	1,9975	1,0688	0,3132	-0,6074	1,4730	1,3349	0,3963
Poland	6	3,7016	1,0846	0,4436	-1,3954	0,6768	0,5618	1,1878	-0,3000	1,4730	0,7188	0,3929
Bulgaria	7	2,9908	1,0846	1,0914	0,0268	0,3595	0,0159	0,0216	-0,6074	0,3769	0,7188	0,2937
Latvia	8	2,3387	1,0846	0,7596	-0,5181	-0,0040	-0,5301	0,8963	-0,1092	0,3769	0,4107	0,6221
Lithuania	9	1,6368	0,8232	0,8702	-0,2410	-0,3265	-0,0621	0,8963	-0,3424	-1,6586	0,7188	0,6357
Croatia	10	1,3759	0,8232	1,2731	-0,7521	0,8765	-0,5301	-0,5615	-0,4166	0,3769	0,1027	0,4305
Russia	11	1,0092	-0,0266	-0,0541	-0,8690	-0,6643	1,3418	0,6047	0,2619	0,3769	0,7188	-0,0039
Kazakhstan	12	0,2158	1,0846	-0,7572	0,0299	-0,7258	-0,5301	0,6047	0,6541	-0,0928	0,1027	0,3552
Ukraine	13	-0,2864	-0,4842	-0,1015	0,2238	-0,5620	-0,5301	0,6047	0,8449	0,3769	0,1027	-0,1989
Moldova	14	-0,8892	0,4310	-0,6071	0,0145	-0,4698	-0,5301	0,0216	1,0570	-0,0928	-0,5134	0,0508
Kyrgyzstan	15	-1,4902	0,1695	-1,0100	-0,3519	-0,9049	-0,5301	0,6047	0,6965	-0,0928	0,1027	0,3587
Romania	16	-1,7719	0,6271	-0,2911	-0,8690	-0,3162	-0,3351	-0,5615	0,1771	0,3769	0,1027	-0,7086
Armenia	17	-2,6630	-0,2227	-0,3701	-1,0076	-0,7616	-0,5301	0,6047	0,1347	-1,6586	0,1027	0,6699
FYR Macedonia	18	-2,7710	-0,2881	0,2382	0,2977	-0,3316	-0,5301	-1,1447	-2,1127	-0,0928	-0,2054	0,3860
Turkmenistan	19	-3,3181	-2,6414	-0,9626	1,6768	-0,4698	-0,5301	0,6047	1,2902	-1,6586	-2,0536	0,4305
Belarus	20	-3,6276	-1,7916	0,4515	0,8303	-1,0022	-0,5301	0,6047	1,0676	-0,0928	-2,3617	-2,9936
Tajikistan	21	-3,7250	-1,5301	-1,3182	2,3048	-1,0585	-0,5301	-0,5615	1,0252	-0,5625	-1,1295	-1,3961
Georgia	22	-4,0096	-0,6803	-0,6940	-1,0414	-1,1199	-0,5301	-0,2700	0,1983	-0,0928	0,1027	0,4442
Azerbaijan	23	-4,5110	-0,6803	-0,8599	-0,7459	-0,9152	-0,5301	-0,5615	-0,1304	-0,0928	-0,8214	0,6084
Uzbekistan	24	-4,5665	-0,2227	-1,0811	-0,1241	-0,8998	-0,5301	-1,7278	1,2266	-0,0928	-0,8214	-0,2742
Albania	25	-5,1069	-0,6803	-1,2076	-1,6602	1,6085	-0,5301	-2,8940	-0,4908	-0,5625	1,0268	0,5400
Bosnia	26	-7,2454	-1,3340	-0,8520	-0,5335	-0,0961	-0,5301	-1,1447	-2,9608	-1,6586	-1,4375	0,5468
FR Yugoslavia	27	-8,1505	-0,0266	-1,6105	-0,5735	-0,4698	-0,5301	-1,1447	-1,6039	-1,6586	-1,1295	-3,1988

Slovenia scored the highest in the ranking, followed by Czech Republic, Hungary, Estonia, Slovak Republic and Poland. Uzbekistan, Albania, Bosnia and Herzegovina, and FR of Yugoslavia occupy the bottom of the table. The results seem to agree with a common knowledge: most advanced transition countries are ranked in the leading positions. Countries where the transition process has made the least progress (Georgia, Azerbaijan, Uzbekistan, Albania) or where war wreaked havoc on the economy, as in Bosnia and Herzegovina and FR Yugoslavia, rank at the very bottom.

The NEI results also largely square with the results of the Global Competitiveness Report published by the World Economic Forum (2001). As one might expect, the NEI indicator of readiness for harnessing the ‘new economy’ seems to be correlated with countries’ competitiveness. This suggests that fundamental forces responsible for the development of both the ‘new’ and the ‘old’ economy are largely the same. **Hence, since both ‘economies’ rely on the same foundations, then there is no ‘new’ or ‘old’ economy: there is only one economy where old recipes for development still apply.**

Table 1  
Rankings of transition countries in Global Competitiveness Report (GCR) and NEI\*

	<b>GCR</b>	<b>NEI</b>
1.	Hungary	Slovenia
2.	Estonia	Czech Republic
3.	Slovenia	Hungary
4.	Czech Republic	Estonia
5.	Slovak Republic	Slovak Republic
6.	Poland	Poland
7.	Lithuania	Bulgaria
8.	Latvia	Latvia
9.	Romania	Lithuania
10.	Bulgaria	Croatia
11.	Russia	Russia
12.	Ukraine	Kazakhstan

\* GCR lists only twelve transition economies

We have also calculated the NEI for an unweighted sum of values of all variables. The following table shows that the NEI based on the unweighted and weighted sum are largely similar:

Table 2  
Rankings for weighted and unweighted NEI\*

	<b>Weighted NEI</b>	<b>Unweighted NEI</b>
1.	Slovenia	Slovenia
2.	Czech Republic	Czech Republic
3.	Hungary	Hungary
4.	Estonia	Estonia
5.	Slovak Republic	Slovak Republic
6.	Poland	Poland
22.	Georgia	Tajikistan
23.	Azerbaijan	Uzbekistan
24.	Uzbekistan	Azerbaijan
25.	Albania	FYR Macedonia
26.	Bosnia	Bosnia
27.	FR Yugoslavia	FR Yugoslavia

\* first six and bottom six countries

Similarity of the results bears proof to the robustness of the ranking: if changes in weights of variables were to result in big corrections to the NEI, than it might imply that the rankings are arbitrary. As shown, this is not the case here.

#### **4. Summary and conclusions**

The information technology revolution, like all previous industrial revolutions, is poised to change the ways of doing business on a global scale and thus contribute to faster productivity and output growth. The ‘new economy’ has already made its impact on growth rates in developed countries. Despite the current slowdown coupled with some pessimism, the information revolution is here to stay. More time is however needed for the benefits of NE to fully feed through to the whole economy.

The ‘new economy’ has not yet, however, had any major impact on less developed countries. Nonetheless, it represents a significant potential for less developed and transition economies to attain long-term growth, sustained and fast socio-economic development, and catch-up with developed countries. However, benefitting from this potential is not automatic: it seems that sufficient institutional infrastructure must exist before these countries can tap into the benefits of the ‘new economy’.

The *New Economy Indicator* (NEI) developed in this paper has been thus designed to illustrate the level of institutional readiness of transition economies for adoption of the ‘new economy’. As could be expected, countries most advanced in the transition process have received the highest rankings. Those countries where the process of transformation from planned economy to a market economy has progressed the least, rank at the bottom of the

table. These countries risk finding themselves in the ‘technological trap’ where, due to the insufficient quality of institutional infrastructure, investments in new technologies may yield lower returns than investments in older technologies. Hence, older technologies can prevail over new ones.

Different speeds of adoption of technological innovations resulting from the different quality of institutional infrastructure are likely to contribute – along with the traditional ‘old’ economy – to diverging rates of economic growth and thus add to the growing income polarization among the post-socialist economies. The most advanced countries (front-runners like Estonia, Czech Republic, Hungary, Poland, and Slovenia) thanks to ICT are likely to speed ahead much faster, while economic growth in lagging countries (Azerbaijan, Bosnia and Herzegovina, FR Yugoslavia, and Tajikistan) may languish.

Income polarization among transition countries is likely to grow also because of the impact of the impending accession of ten transition countries to the EU. In the long-term, the accession to the EU is set to gradually increase the value of all variables in the NEI index of all new EU members. Financial assistance from the EU to new member countries worth some EUR 40 billion between 2004-06, will improve the institutional infrastructure of the ‘new economy’<sup>21</sup>.

The potential for harnessing the ‘new economy’ for faster and sustained long-term economic growth and catching-up of post-socialist countries will depend on the level of development of the institutional infrastructure. This is mostly influenced by national economic policies and strategies. The NEI index shows where much more emphasis should be placed to promote diffusion, absorption, and the productive use of innovations. All variables count for the ‘new economy’. Yet not only - they equally count for the ‘old’ economy. It is because in reality there is only one economy, which – as has been the case throughout the whole history of mankind – combines the old with the new.

Traditional recipes for development still hold: investment in physical and human capital will for long to come be the most important ingredient of fast growth. Yet, long-term growth will also depend on the speed of replacement of the old with the new. The IT revolution may accelerate the replacement process. This is particularly true for transition economies. The technological leap-frogging will not, however, materialize without appropriate institutions. Their fast build-up is the recipe for ultimate catching-up with the developed world.

---

<sup>21</sup> For instance, Poland is to receive EUR 1 billion in 2002 and 2003 and EUR 6.5 billion annually afterwards for infrastructure investments only (JPMorgan 2002).

## References

1. Barro, R.J. and X. Sala-i-Martin. 1995. 'Economic Growth', New York: McGraw-Hill.
2. Bassanini, A., Scarpetta, S., and I. Visco. 2000. 'Knowledge, Technology and Economic Growth: Recent Evidence from OECD Countries'. Paris: OECD, Economics Department Working Papers, No. 259.
3. Bassanini, A., Scarpetta, S., and P. Hemmings. 2001a. 'Economic Growth: The Role of Policies and Institutions. Panel Date Evidence from OECD Countries'. Paris: OECD, Economics Department Working Papers, No. 283.
4. Bassanini, A. and S. Scarpetta. 2001b. 'Does Human Capital Matter for Growth in OECD Countries? Evidence from Pooled Mean-group Estimates'. Paris: OECD, Economics Department Working Paper, No. 289.
5. Benhabib, J. And M.M. Spiegel. 1994. 'The Role of Human Capital in Economic Development: Evidence from Aggregate Cross-Country Data'. *Journal of Monetary Economics*, October, 34(2), pp.143-174.
6. Blaug, M. 1994. 'Teoria ekonomii. Ujęcie retrospektywne'. Warszawa: PWN, pp. 446-447.
7. Business Software Alliance. 2001. Downloaded from <http://www.bsa.org/usa/antipiracy/piracyticker.phtml>
8. Bruno, M. and W. Easterly. 1996. 'Inflation and Growth: In Search of a Stable Relationship'. *Federal Reserve Bank of St. Louis Review*; 78(3): 139-46.
9. Clague, C. (ed.). 1997. 'Institutions and Economic Development: Growth and Governance in Less-Developed and Post-Socialist Countries'. Baltimore: The Johns Hopkins University Press.
10. Clague, C., Kiefer, P., Knack, S., and M. Olson. 1997. 'Institutions and Economic Performance: Property Rights and Contract Enforcement', in C. Clague (ed.). 'Institutions and Economic Development: Growth and Governance in Less-Developed and Post-Socialist Countries'. Baltimore: The Johns Hopkins University Press. pp. 67-90.
11. Coe, D.T. and E. Helpman. 1995. 'International R&D Spillovers'. *European Economic Review*, 39, pp. 859-887.
12. Deiss, R. 2001. 'Rapid Growth of Internet and Mobile Phone Usage in Candidate Countries in 2000'. Eurostat. *Statistics in Focus*, Theme 4-37/2001.
13. De Masi, P., Estevao, M., and L. Kordes. 2001. 'Who Has A New Economy?'. *Finance & Development*, June, Volume 39, Number 2.
14. Dewan, S. and K.L. Kraemer. 2000. 'Information technology and productivity. Evidence from country level data'. *Management Science*, special issue on the Information Industries (forthcoming).
15. Dresdner Kleinwort Capital. 2001. 'Venture Capital and Private Equity Investment in Poland'. Presentation by Janusz Heath, not published, October 18<sup>th</sup>.
16. Easterly, W. 2001. 'The Elusive Quest for Growth'. Boston: MIT Press.
17. EBRD. 2001. 'Transition Report 2001'. London: European Bank for Reconstruction and Development.
18. The Economist. 2001a. 'Brave New World'. October 18<sup>th</sup>.
19. ——— 2001b. 'Statistical Illusions'. November 8<sup>th</sup>.
20. ——— 2001c. 'Irrational pessimism'. December 6<sup>th</sup>.
21. ——— 2000. 'Untangling e-economics'. September 23<sup>rd</sup>.
22. ——— 1999. 'Working man's burden'. February 4<sup>th</sup>.

23. Laafia, I. 2000. 'R&D Expenditure and Personnel in Candidate Countries and the Russian Federation in 1998'. Eurostat. *Statistics in Focus*, Theme 9-3/2000. Downloaded from <http://europa.eu.int/comm/eurostat/Public/datashop/print-product/EN?catalogue=Eurostat&product=KS-NS-00-003--I-EN&mode=download>
24. Gazeta Finansowa. 2001. 'Pierwszy rok mBanku lepszy od oczekiwań'. 01.12.2001, pp. 7.
25. Global Entrepreneurship Monitor. 2001. Executive Report. Downloaded from [www.entreworld.org](http://www.entreworld.org)
26. Gordon, R.J. 2000. 'Does the 'New Economy' Measure Up to the Great Inventions of the Past?'. NBER Working Paper, No. W7833, August. Downloaded from <http://papers.nber.org/papers/W7833>.
27. Greenwood, J. and B. Smith. 1997. 'Financial Markets in Development and the Development of Financial Markets'. *Journal of Economic Dynamics and Control*, Vol. 21, No. 1, pp. 145-81.
28. Hall, R.E. and C.I. Jones. 1999. 'Why Do Some Countries Produce So Much More Output Per Worker than Others?'. NBER Working Paper, No.W6564, June. <http://papers.nber.org/papers/W6564>.
29. \_\_\_\_\_ 1996. 'The Productivity of Nations', NBER Working Paper, No. W5812, November. Downloaded from <http://papers.nber.org/papers/W5812>
30. IDC. 2000. 'The 1999 IDC Worldwide Black Book'. New York: International Data Corporation.
31. IMF. 2001. 'World Economic Outlook. The Information Technology Revolution'. Chapter III. Washington, DC: International Monetary Fund. October.
32. J.P. Morgan. 2002. 'Central Europe Weekly'. Economics and Policy Research. London. February 8.
33. Johnston, D. 2001. 'Future Economic Challenges for the European Economy'. WSPiZ & TIGER Distinguished Lectures Series, No. 5. Downloaded from <http://www.tiger.edu.pl/publikacje/dist/Johnston.pdf>
34. King, R. and R. Levine. 1993. 'Finance and Growth: Schumpeter Might Be Right'. *Quarterly Journal of Economics*, Vol. 108, No. 3, pp. 513-42.
35. Kolodko, G.W. 2001. 'The 'New Economy' and the Old Problems. Prospects for Fast Growth in Post-Socialist Countries'. *Zagreb International Review of Economics & Business*, Vol. 4, No. 2, pp. 71-90.
36. Kraemer, K. L., and J. Dedrick. 2001. 'Information Technology and Economic Development: Results and Policy Implications of Cross-Country Studies'. In M. Pohjola (ed.). 2001. *Information Technology, Productivity, and Economic Growth*. Oxford University Press, pp. 262-263.
37. Krugman, P.R. 1997. 'Development, Geography, and Economic Theory (Ohlin Lectures)'. Boston: MIT Press, pp. 1-3.
38. Levine, R. 1997. 'Financial Development and Economic Growth: Views and Agenda'. *Journal of Economic Literature*, Vol. 35, No.2, pp. 688-726.
39. Mohnen, P. 2001. 'International R&D Spillovers and Economic Growth. In M. Pohjola (ed.) *Information Technology, Productivity, and Economic Growth*, Oxford University Press, pp. 50-72.
40. North, D.C. 1997. 'The Contribution of the New Institutional Economics to an Understanding of the Transition Problem'. WIDER Annual Lectures 1. Helsinki: UNU/WIDER. March.
41. \_\_\_\_\_ 1990. 'Institutions, Institutional Change, and Economic Performance. Cambridge, UK: Cambridge University Press.
42. \_\_\_\_\_ 1994. 'Economic Performance Through Time'. *American Economic Review*, 84, pp. 359-68.



43. OECD. 1999. 'Implementing the OECD Jobs Strategy: Assessing Performance and Policy'. Paris: Organisation for Economic Co-operation and Development. September.
44. \_\_\_\_\_ 2000. 'A New Economy? The Changing Role of Innovation and Information Technology in Growth'.
45. \_\_\_\_\_ 2001a. 'The New Economy: Beyond the Hype'.
46. \_\_\_\_\_ 2001b. 'The Science, Technology, and Industry Scoreboard 2001'. Downloaded from <http://www1.oecd.org/publications/e-book/92-2001-04-1-2987/gB-2-b.htm>
47. Oliner, S.A., Sichel, D.E. 2000. 'The Resurgence of Growth in Late 1990s: Is Information Technology The Story?'. Federal Reserve Board. February. Mimeo.
48. Pohjola, M. (ed.). 2001a. 'Information Technology, Productivity, and Economic Growth'. Oxford University Press, pp. 11-12.
49. \_\_\_\_\_ (2001b). Presentation at the conference „The 'New Economy' and Its Implications for Long-Term Growth in Post-Socialist Countries". Warsaw, March 29-30, 2001.
50. Prawo i Gospodarka. 2001. '2mln e-klientow w 2005'. October 5<sup>th</sup>.
51. Quah, D. 2001. 'Technology Dissemination and Economic Growth: Some Lessons for the New Economy'. Paper delivered in a public lecture as part of the University of Hong Kong's 90<sup>th</sup> Anniversary Celebrations, July. Downloaded from <http://econ.lse.ac.uk/staff/dquah/p/0201hku.pdf>
52. *Rzeczpospolita*. 2002. 'Tracą najwięksi gracze'. January 18<sup>th</sup>.
53. \_\_\_\_\_ 2001. 'Faktura z sieci'. Nauka i Technika. March 12<sup>th</sup>.
54. Schumpeter, J. 1912. 'The Theory of Economic Development'. Boston: Harvard University Press. Translated into English in 1934.
55. Stiglitz, J.E. 1998. 'More Instruments and Broader Goals: Moving toward the Post-Washington Consensus'. WIDER Annual Lectures, No. 2. Helsinki: UNU/WIDER. January.
56. Stiroh, K. 1999. 'Is There a New Economy?'. Challenge, July/August, pp. 82-101.
57. Solow, R. 1957. 'Technical Change and the Aggregate Production Function'. Review of Economics and Statistics, August.
58. World Bank. 2002. 'World Development Report 2002. Building Institutions for Markets'.
59. \_\_\_\_\_ 1998. 'World Development Report 1998/99: Knowledge for Development'.
60. \_\_\_\_\_ 1997. 'World Development Report 1997. The State in a Changing World'.
61. UNDP. 2001. 'Human Development Report 2001'. United Nations Development Programme. Downloaded from <http://www.undp.org/hdr2001/back.pdf>
62. Welfe, W., Florczak, W. and L. Sabanty. 2001. 'Ekonometryczne modelowanie postępu technicznego, jego efektów oraz źródeł'. In W. Welfe (ed.). 2001. 'Ekonometryczny model wzrostu gospodarczego'. Łódź: Wydawnictwo Uniwersytetu Łódzkiego, pp. 124 – 128.
63. World Economic Forum. 2001. 'Global Competitiveness Report 2001-2002', pp. 21. Downloaded from <http://www.cid.harvard.edu/cr/pdf/GCR0102%20Exec%20Summary.pdf>
64. Zinnes, C., Eilat, Y. and Jeffrey Sachs. 2001. 'Benchmarking Competitiveness in Transition Economies'. Economics of Transition, Volume 9 (2) 2001, 315-353.