*Acta Oeconomica, Vol. 53 (1) pp. 1–27 (2003)*

# THE ECONOMIC AND INSTITUTIONAL DETERMINANTS OF THE 'NEW ECONOMY' IN TRANSITION ECONOMIES

M. PIATKOWSKI

*(Received: 24 April 2002; revision received: 7 August 2002; accepted: 5 November 2002)*

The contribution of the so-called 'New Economy' to economic growth in developing countries has so far been minimal. Nonetheless, in the longer run the 'New Economy' offers great potential for faster economic growth in post-socialist economies. Realising this potential is, however, not automatic. It could be left unharnessed if there is no suitable institutional and economic infrastructure that would allow for adoption, diffusion, and productive use of information and communication technologies (ICT). The paper here will construct a *New Economy Indicator* (NEI) that measures the levels of preparedness of transition economies for harnessing the potential of ICT to accelerate long-term economic growth and a catching-up with the developed countries. In the NEI ranking Slovenia scored highest; it is followed by the Czech Republic and Hungary. Albania, Bosnia and Herzegovina, and Serbia–Montenegro (former Yugoslavia) occupy the bottom of the table.

**Keywords**: post-communist transition, new economy, ICT, economic growth

**JEL classification index**: O1, O2, O3, O5

## 1. INTRODUCTION

The 'New Economy' can be defined as a host of new economic phenomena resulting from two concurrent processes: on one hand, globalisation, i.e. ongoing deregulation, integration of global markets for capital, goods and labour, as well as increased competition; on the other hand, a technological revolution based mostly on general-purpose information and communications technologies (ICT), which, having an impact on all sectors of the economy, accelerate productivity and economic growth[1]. The extraordinary performance of the US economy,

[1] For similar definitions see Stiroh (2002b), Pohjola (2001) and De Masi et al. (2001). Broader definitions could borrow from the concept of the 'Attention Economy' already put forth by

*Correspondence*: M. Piatkowski, TIGER (Transformation, Integration, and Globalisation Economic Research), Leon Koźmiński Academy of Entrepreneurship and Management, ul. Jagiellońska 59, 03-301 Warsaw, Poland. E-mail: mpiatek@tiger.edu.pl

marked by a substantial increase in productivity and growth rates coupled with low inflation and unemployment, along with a number of other developed and developing countries in the second part of the 1990s has been considered as an evidence of this new economic phenomenon.

The technological revolution has been spurred by a fast increase in the quality and productivity of ICT products and services coupled with their rapidly decreasing prices and a convergence of information and communications technologies, this being most visibly embodied in the Internet.

The 'New Economy' miracle of the end of the 1990s did not last however. The market bubble burst, a large number of Internet companies collapsed, the business cycle was alive and kicking, unemployment increased and share prices nose-dived. The economic nirvana of the 'New Economy' did not materialise; and neither did the 'New Economics' – which proclaimed the end of the business cycle, sustained low inflation accompanied by low unemployment, and a permanent increase in productivity growth. The 'New Economy' thus still needs to be put into quotation marks.

Despite the recent hype, the impact of the 'New Economy' on the world-wide economy has so far been quite limited. The production and use of ICT has contributed to faster growth in output and productivity in the US and a few other developed (Australia, Sweden, Finland) and developing countries (Malaysia, The Philippines, Thailand, South Korea, and Taiwan, which benefited from the production of ICT). However, the contribution of ICT to growth in transition economies has been negligible, particularly in a macroeconomic perspective.

Nonetheless, the underlying forces of the 'New Economy' – that is, globalisation and the ICT revolution – have not been arrested: they are and will be proceeding at a fast rate now and in the future.[2]

Hence, it seems that in the longer run the 'New Economy', like all previous technological revolutions, offers great potential for faster economic growth and an increase in standards of living in transition countries. The acceleration in productivity and output growth could allow transition economies to shorten the process of their catching-up with developed countries. The relatively low level of

Simon (1971). This paper, however, will use a more narrow definition of the 'New Economy': of it being represented by a technological revolution spurred by ICT only. This is because the limited scope of the paper does not allow for an analysis of the process of globalisation. Nevertheless, most conclusions of the paper – along with the NEI index – could be successfully applied in an elucidation of determinants with regard to harnessing the 'New Economy' in its broad sense as defined in the text.

[2] As argued by the IMF: "The longer term benefits (of IT) for the global economy are likely to continue, or even accelerate, in the years to come" (IMF 2001, p. 103).

economic development together with technological backwardness is a handicap as regards their development: thanks to absorption, imitation and application of knowledge, blueprints, ideas, technological and organisational advances, and superior technologies already developed in rich countries, post-socialist economies should be 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 (as opposed to traditional factors of production) can be copied and transferred at negligible costs, will be able to further accelerate the absorption of technological progress.

Realising the benefits of ICT is, however, not automatic. Its potential might be left unharnessed if there is no suitable institutional and economic infrastructure that could allow for adoption, diffusion, and profitable use of such innovative technologies.

After more than a decade of transformation from a command economy to a market economy, the process of institution building in the transition countries is still not over. Countries with insufficiently developed economic and institutional foundations are likely to find it hard to be able to tap into the ICT revolution. Hence, the lagging countries could find themselves in a "technological trap", risking a situation of being marginalised within the global economic community. Various speeds of absorption of ICT are likely to add to the increasing polarisation of growth rates among post-socialist countries. Ultimately, therefore, the 'New Economy' will have both its winners and losers – and the appropriate institutions and economic policies will be deciding factors.

Consequently, what are the economic and institutional preconditions for transition economies to benefit from the potential of the 'New Economy'? What is the current level of institutional readiness for the absorption of ICT into a 'New Economy' among transition countries? Can it prosper despite old problems of a poor, "hard" infrastructure, a lack of regulations and mature institutions, a scarcity of capital, and even lack of English language skills? What does the future hold?

This paper will construct a *New Economy Indicator* (NEI) measuring the capacity of transition economies to exploit the potential of ICT – i.e. which underlies the 'New Economy' – that will lead to an acceleration of long-term economic growth and a catching-up with developed countries. The NEI includes ten variables believed to be the most appropriate ones for the development of a 'New Economy' and its profitable operations:

(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) Labour-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 analyses current and prospective effects of the ICT revolution on growth in transition countries. In Section 3 the NEI is developed. Section 4 then describes the variables, and Section 5 concludes the paper.

## 2. THE IMPACT OF THE 'NEW ECONOMY' ON TRANSITION COUNTRIES

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 1990s, where labour productivity in the non-farm business sector increased to roughly 2.5% between 1996 and 2000 from 1.5% between 1973 and 1995 (IMF 2001, p. 110). It is believed that the acceleration in productivity was linked to benefits accruing from the production and use of ICT (Jorgenson – Stiroh 2000; OECD 2001a; Stiroh 2002a). Some other developed countries, notably Finland, Ireland, Sweden, Singapore, Canada, and Australia, were also able to benefit from production and/or use of ICT to increase their rates of output and productivity growth in the late 1990s (OECD 2001a). A number of developing countries – Malaysia, Thailand, The Philippines, Taiwan, and South Korea – also benefited from ICT production in the late1990s (though not from its usage – IMF 2001).

Notwithstanding the US "miracle" and the above examples, the impact of the 'New Economy' on the global economy has so far been negligible. There is no evidence that ICT has contributed to economic growth in developing and transition countries[3]. Software industry development in Bangalore in India, electronic fish markets in Bangladesh or rising penetration of the Internet in Eastern Eu-

[3] A research project led by the author first aims to make quantitative assessments of the contribution of ICT investments to economic growth in eight transition countries (Bulgaria, the Czech Republic, Estonia, Poland, Romania, Russia, Slovakia and Slovenia), for which there are available data as regards ICT spending (based on WITSA 2002).

rope have added much to the 'New Economy' hype; nevertheless, these much-cited developments do not appear to have added a lot to the *economic growth* of their countries.

The lack of macroeconomic impact of the use of ICT on developing countries, to which transition countries belong, was confirmed by the results of a comprehensive cross-country empirical study on the returns of IT investment in developed and developing countries (Dewan – 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 – Dedrick 2001, p. 262). The estimate of IT output elasticity is 0.057 (positive and significant) for developed countries,[4] but is statistically indistinguishable from 0 for developing countries. Pohjola (2001) shows that the relative contribution of IT to GDP growth in developing countries was less than 2% (China, India, Argentina, Chile, Brazil, Thailand, Venezuela) compared to more than 10% in the US, Finland, Canada, Sweden, and the UK. No other studies have found any sizeable contribution of ICT towards growth in developing countries.

One reason for the apparent lack of benefits from the diffusion of the 'New Economy' in transition countries is still the relatively small value of IT investments – the most advanced transition countries (the Czech Republic, Estonia, Hungary, Poland, Slovakia, Slovenia) invested in IT between 1.9% (Poland) to 4.2% (Czech Republic) of their GDPs in 1999, against 6.5% in Sweden, 5.3% in the US and an overall OECD average of 4.3% (OECD 2001b).[5] Additionally, in absolute figures the value of IT investments in Central and Eastern European countries was much smaller than that for developed countries.[6] IT investments in less developed transition countries of Central Asia are not likely to exceed 1% of the GDP. Thus it seems that IT investments are too small to have an effect upon growth.

Yet why do not even small investments yield positive returns? Kraemer and Dedrick (2001) suggest that developing countries, as opposed to developed ones, 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 – and this

[4] A 10% increase in IT investment should result in 0.57% increase in output.

[5] According to other data available from the European Information Technology Observatory (EITO 2002, as quoted by Deiss 2002, p. 5), IT expenditure in 2000 in the EU candidate countries ranged from 0.9% of the GDP in Romania to 3.1% of the GDP in the Czech Republic – against the EU average of 3.4%.

[6] According to IDC (2000), all transition economies spent a little more than USD 10 billion on IT in 1999. This is roughly equal to the IT investments of Sweden alone.

would seem to be right. Returns on numerous, different, high-value-added investments depend on reciprocal occurrences. A brand new high-tech factory in the middle of an underdeveloped country (or "developing" as we have – euphemistically – learned to say) will not be efficient when faced with a lack of appropriate labour skills, infrastructure, regulations, taxation and so on (which, taken together, refers to the institutional infrastructure – as we shall discuss with more emphasis later). In this environment, returns on investments in basic infrastructure (drinking water, primary schools, hospitals) are very likely to be higher than from high-technology investments. As a result, some transition countries correctly decided to invest in basic infrastructure while compromising themselves on ICT investments.[7] Consequently, at least during the process(es) of constructing a basic infrastructure, a technological chasm between underdeveloped and developed countries has been able to further open up.

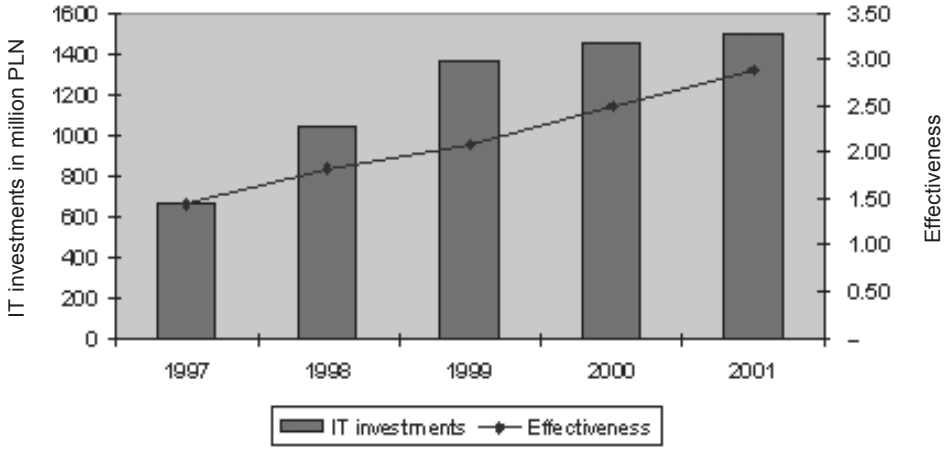
By the same token, the technological gap between more and less developed transition economies was also able to widen itself. The 'New Economy' may thus be contributing to a rising divergence in growth rates among transition economies. The least developed countries, like Tajikistan or Albania, might even find themselves in a technological trap. *Initial development conditions therefore matter for the adoption of the 'New Economy'. This is because when one country is better developed than another, it has a greater opportunity to take advantage of the 'New Economy'.*

Despite the 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 within specific enterprises. According to one of the recent studies on the transport industry in Poland (Brdulak 2002), the market share of transport companies in Poland using sophisticated software increased from 45% in 2000 to 60% in 2001, thus giving evidence of the benefits of IT use.

There also seems to exist a strong correlation between IT investment in the banking sector in Poland and its effectiveness (see the *Figure* below)[8].

[7] 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 their children's education as the benefits obtainable from being educated in a poor country are likely to be lower than the value of the children's lifelong working on the farm.

[8] Correlation coefficient –0.92: at a significance level 0.05 the observations are correlated, but at a significance level of 0.01 it cannot be ruled out that they are not. As a note of caution, an existence of correlation does not explain the direction of causality. It may either be that IT investments increase efficiency or that efficient banks invest in IT. Most likely both processes are in play at the same time.




*Note:* Effectiveness measured as assets in million PLN per employee. IT investments for 2001 had been projected.

*Source:* Author's calculations based on DiS (2001) for IT investments and NBP (2002) for effectiveness.

IT Investments and Effectiveness of the Polish Banking Sector, 1997–2001

Other anecdotal evidence abounds, particularly as reported by business press, which showcases the positive effects as regards productivity given ICT introduction; yet all such beneficial effects are seemingly too small to be able to reflect themselves in a macro picture.

The 'New Economy' has contributed to a few other success stories. The rapid development of e-banking, e-commerce,[9] and Internet portals bears proof of the potential of new technologies. Yet again, though, the macro impact of e-business in transition countries is still insignificant. The growing penetration of the Internet (more than 15% of Poles used the Internet regularly as of mid-2002; there are more users in Estonia, Slovenia, Hungary and the Czech Republic, but a lot fewer in other post-socialist countries), the promulgation of e-signatures (Czech Republic, Slovenia, Poland, Hungary, Bulgaria) or attempts at introducing e-gov-

[9] E-commerce is rapidly developing. The International Data Corporation estimates that, in 2001, the e-commerce market in four Central European countries (the Czech Republic, Hungary, Poland, Slovakia) will increase sixfold to USD 650 million (*Rzeczpospolita* 2001). In Poland 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 its inception. In the same period, the total value of transactions amounted to some USD 6 million – see http://www.ce-market.com/aboutus_what_press.asp.

ernment (like in Slovenia, *Economist* 2001a) by themselves do not contribute much to economic growth.[10]

When it comes to adoption of ICT innovations, microeconomically rapid progress provides evidence of the potential of the technological revolution for transition countries. *For now, however, it seems that much more time is needed for ICT to make a tangible impact on people's well-being*. The effects of earlier technological revolutions took decades to feed through to productivity statistics (for instance, it took the US forty years in the early 20th century to change their business practices in order to use electricity productively – David 2000). In the long-term perspective, productivity improvements at the firm and industry level driven by ICT are likely, however, to contribute to an acceleration in aggregate growth.

The 'New Economy' and the times of "punctured equilibrium" (Thurow 1997) that it induces present quite a few opportunities for transition economies to achieve faster development. At the same time, however, this poses substantial threats. Generally speaking, transition countries stand a chance of growing more quickly, thanks to the low opportunity costs of switching from old to new technologies[11], to younger populations, which generally tend to espouse innovations more rapidly, and to a relatively high level of educational attainment, the value of which is much higher in the 'New Economy' environment. Additionally, the potential of the Internet revolution also stems from the weightless, knowledge-like and non-rival nature of the 'New Economy' (Quah 2001), which allows for the quicker diffusion and adaptability of innovations – and thus the higher potential value of international R&D spillovers. Such opportunities are nonetheless mitigated by threats of a digital divide and/or the technological trap.

Despite challenges, the economic potential of the technological innovations underlying the 'New Economy' is significant. This 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 20th century. The rest, almost 90%, was attributed to technological progress (as expressed by TFP – total factor productivity).

[10] Although growing Internet penetration contributes to better access to information, convenience, customer choice, and satisfacton. These factors might be captured by some kind of a Human Convenience Index (HCI), the value of which most certainly skyrocketed after the emergence of the Internet.

[11] Switching costs are higher for developed countries – there are no 'sunk costs' for transition economies. Mosdorf (1998, p. 8), for instance, reports that in Germany "the build-up of its telecommunications infrastructure, which cost DM 500 billion in all, could be replaced by a mere DM 40 billion investment today".

In the shorter run, however, it appears that a traditional accumulation of physical and human capital may matter more than technological progress. This is also because of the pace of technological progress itself, still mostly embodied in equipment and machinery, and it 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 that, based on growth-accounting calculations, between 1974 and 1990, 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 1990s revealed that investments in physical capital were responsible for almost half of the growth in potential GDP from 1990 to 1995 and for between 80–90% of growth between 1996 and 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) showed that between 1991 and 1995 TFP in the most developed countries of Western Europe was responsible for approximately 60% of the annual GDP growth rates,[12] which is substantially more than in Poland. *This suggests that, for Poland and, by implication, in other transition economies, the accumulation of traditional factors of production, i.e. investments in physical and – to a lesser extent – human capital, matters much more than in the case of developed countries.* ICT may help to drive investment, thanks to the substitution effect spurred on by rapidly declining prices, yet its small share within total investments[13] coupled with non-extraordinary returns on ICT investments (see again Dewan – Kraemer 2000) mean that investments in non-ICT capital are likely to remain the mainstay of economic growth in transition countries.[14]

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

One can conclude from this that the process of catching-up of transition economies will mostly depend on the accumulation of traditional factors, that is, in-

[12] Potential TFP for Poland; actual TFP for Western European countries. See Welfe et al. (2001) for methodological details.

[13] The share of ITC does not exceed 4.2% of GDP (OECD 2001b) versus annual total investment rates in fixed capital, which are generally higher than 20% of GDP in transition economies (EBRD 2001).

[14] Although one must remember that a large part of non-ICT investments carry an embedded ICT technology. Thus the real ICT share in investments could be much larger.

vestment in non-ICT and human capital. Nonetheless, the importance of the 'New Economy' for economic growth is likely to gradually increase – diminishing returns on 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.[15] *In the long run, then, the ultimate success of catching-up will also depend on the 'New Economy'.*

In the same vein, Kolodko (2001, p. 71) argues that "the post-socialist countries – unlike developed market economies – need not aptly utilise the potential of e-business but should first raise the efficiency of the 'Old Economy', since these two 'economies' are destined for a lengthy coexistence". One may add here that the 'Old Economy', capital and human accumulation – as delineated by traditional development economies – would also seem to be "binding" when it comes to developed economies. One of the paradoxes of the American productivity miracle driven by ICT in the1990s is the fact that the European Union, which seemed to be quite slow in the adoption of the Internet revolution, nonetheless recorded productivity growth in 1995–2000, of 1.5% annually, this being only slightly below the 1.8% recorded in the US.[16] 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', that is, non-ICT industries and services, still has a great role to play. Old-style efficiency improvements in structural, organisational, and institutional frameworks of economies still matter, although globalisation and the absorption of ICT has certainly proved to greatly enhance the speed and sense of urgency of such changes.

[15] Welfe et al. (2001) argue, based on their econometric model for Poland's economy, that in order for Poland to reach a 6–7% annual growth of the potential GDP during the next decade – and assuming that investments in the GDP equal 30% annually, and that the contribution of the labour force does not change – the TFP would have to be responsible for at least 50% of the increase in the potential GDP. Without any acceleration in TFP growth, the potential GDP would only increase by 3 to 3.5% annually.

[16] Calculated as the 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 in the 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 the US (*Economist* 2001c).

## 3. THE 'NEW ECONOMY' INDICATOR

Neither the 'Old' nor the 'New Economy' will develop without appropriate economic and institutional foundations. These, while creating particular economic incentives, decide on the allocative efficiency of an economy. The quality of such institutions and economic policies largely explains the differences across countries in productivity and economic growth (North 1990; Hall – Jones 1996; World Bank 2002; Clague 1997). Likewise, technological progress also contributes to divergences in growth rates.

The present paper develops the *New Economy Indicator* (NEI) with the objective of providing a best estimate of the readiness of 27 transition countries, based on the level of development of their institutional and economic infrastructure, for harnessing the 'New Economy' in order to achieve faster long-term economic growth.[17]

Motivation for the use of indicators, as argued by Zinnes et al. (2001, p. 321), is twofold: "[...] 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 ones most relevant for the adoption and profitable use of technological progress.[18] The ten variables are listed in *Table 1.*

[17] As a word of caution, the NEI, since it could not be tested due to a lack of reliable data, does not purport to present hard scientific proof. Nonetheless, the implications of the indicator indeed seems to add to the current stock of knowledge regarding determinants of the adoption of new technologies. The lack of hard data should not limit our quest for knowledge therefore. In a telling story, Krugman (1997, pp. 1–3) cites a paper on "The evolution of ignorance" with reference to Africa. The paper describes the evolution of European maps of the African continent between the 15th and the 19th centuries. In the 15th century, maps of Africa were relatively inaccurate; 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 serve to qualify anymore. As a result, maps developed in later centuries depicted a sparser area for the African interior than was the case with the 15th century maps. As Krugman says "there was an extended period of time in which improved technique actually led to some loss of knowledge"; and he further concludes that "doing economics ... is a kind of mapmaking". This paper's indicator is yet another kind of a "map".

[18] These are also based on various research projects (OECD 2001a; IMF 2001; World Bank 1998).

*Table 1*

Variables

| Factor | Proxy | Source |
|---|---|---|
| 1. Quality of regulations and contract enforcement | Legal-system effectiveness and extensiveness | EBRD* |
| 2. Infrastructure | Total number of telephone lines (main and cellular) plus Internet hosts per 100 persons | ITU 2002 |
| 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 2000** |
| 6. Quality of human capital | Education Index 1999 | HDI (UNDP) 2001 |
| 7. Labour-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 |

* All EBRD data from EBRD 2001.
** Quoted from Laafia (2000).

## 4. DESCRIPTION OF THE VARIABLES

First of all, the relevance of each variable for general economic growth will be established, based on a selection of research results. Second, the relevance of each of the variables for harnessing the potential of the 'New Economy' will be discussed, and finally, the level of development of transition countries will be commented upon, with regard to these particular variables.

The measure of the level of development of the NE institutional infrastructure will be reflected by a weighted sum of the values of all ten variables for each country. It has been assumed that the variables for the quality of regulations and law enforcement, for financial development, trade openness, infrastructure, R&D spending, and for human capital will be given twice as large a relative weighting compared to the other variables (which have been multiplied by 0.5), for these are believed to be the most important factors as regards adoption of the 'New Economy'. Due to either a lack of or the limited availability of relevant data, variables are proxied only by observations that are available for the whole sample of countries.

The construction of the indicators is based on the competitiveness indicator developed by Zinnes et al. (2001, p. 322), and it performs in the following way:

- The variables are selected with an assurance 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 "more is always better".
- The variables are standardised. The sample mean is subtracted from each observation and the result is then divided by a sample standard deviation. This implies a mean of zero and a standard deviation of one across the countries in the sample. Hence, all results are comparable and can be aggregated.

### 4.1. 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 a high level of contract enforcement and respect for property rights lowers the cost of market exchanges. Lower transaction costs are especially important for transition countries – otherwise, owing to the low level of development of market exchange mechanisms, such transaction costs will be much higher, and 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 an adoption of ICT, particularly in less developed post-socialist countries, where contract enforcement has traditionally been lacking. New enterprises utilising 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 grey and black markets. The extensiveness of the law and the quality of contract enforcement then become a prerequisite to the emergence of the 'New Economy'.[19]

[19] However, quite interestingly, software piracy, due to a lack of contract/copyright enforcement, is beneficial as regards adoption of the 'New Economy' in transition economies. Billions of dollars worth of software has been pirated and then widely distributed. As reported by Business Software Alliance (2001), in 1999 alone USD 12 billion worth of software was pirated globally. A couple of years ago, the majority of software used by local enterprises in Poland was unlicensed. In less developed countries, like Kazakhstan or Albania, almost all software is still illegal. Therefore in the short run piracy pays definitely adds to the quicker diffusion of information technologies. Without piracy, technological catching-up would be considerably slower, for 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 their piracy risk become isolated by the international trade community, and will thus lose access to knowledge spillovers.

### 4.2. Infrastructure

Infrastructure is a self-evident category for the adoption of the 'New Economy', i.e. there will be no 'New Economy' without telephones or computer networks.[20] It seems probable that in order to benefit from so-called network effects, one needs to exceed a critical point in the 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 having 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 infrastructures of transition economies significantly lag behind those of developed countries. According to Eurostat statistics (Deiss 2002) on the EU-candidate countries for 2001, the number of PCs and Internet hosts in a covered sample of transition economies is relatively low, compared to EU countries. The diversity in results is interesting – PC penetration in Slovenia almost equals the EU average of 31 PCs per 100 inhabitants; in Bulgaria, however, PC penetration amounts to only 4.9 PCs per 100 inhabitants. The case is similar with Internet hosts: Slovenia boasts of 1.5 hosts per 100 inhabitants compared to Bulgaria's 0.3, and an EU average of 3.5. Indeed, there is much to be done to improve the infrastructure of the 'New Economy'.

Persisting underdevelopment of an infrastructure does not, however, change the fact that in recent years most transition economies have made big steps in upgrading their networks. Mobile telecommunications, one of the wonders of the 'New Economy', has allowed most countries to start a rapid catch-up with developed countries. Mobile telephone industry is a perfect example illustrating the potential of technological "leapfrogging" – moving from years-long waiting lists for a main line telephone to plentiful access to mobile telephones at an affordable price.

### 4.3. Trade openness

There is a broad consensus among economists that liberalised exports and imports are positively correlated with productivity and output growth. Trade openness is particularly important with regard to the diffusion of knowledge and in-

[20] Other types of hard infrastructure are almost as important – the 'New Economy' will not develop in a country with a dilapitated transportation network (the proverbial "potholes"), low quality logistics systems, etc.

novations – imports being 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 could result in a 14% increase in output in developing countries in the long run). Coe and Helpman (1995) found a significant relationship between import propensities and the ability to benefit from R&D spillovers, i.e. for a given level of R&D carried out abroad, countries with a higher import propensity can get higher productivity growth.

### 4.4. Financial markets

Schumpeter (1912) 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 in redistributing them for productive purposes.

A developed financial market is clearly critical for the 'New Economy'. In particular, the value of venture capital (VC) investments is especially important, as this finances start-up companies, which predominantly tend to utilise new technologies and ideas (as the experience of dotcoms suggests). Equity markets represent the second most 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 investment in GDP in Poland, one of the most developed countries in Central and Eastern Europe, amounted to less than 0.1% in 2000, i.e. compared to 1.2% in Israel and 1.0% in the US. According to Heath (2001), in the whole of Central and Eastern Europe the average ratio of private equity funds *raised* (and raised does not mean invested) against GDP amounted to 1.3% as of the end of 2000, compared to the UK with more than 5.1%, Sweden with 3.3% and France with 2.0% of GDP. In Poland alone the aggregate amount of VC 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 this undoubtedly limits prospects for realising the economic potential of ICT.

### 4.5. R&D spending

Thanks to the findings of endogenous growth theory, the importance of R&D for economic growth is by now quite obvious. Stiglitz (1998, pp. 26–27) states that "studies of returns to R&D in industrial countries have found individual returns of 20–30% and social returns of 50% 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". Thus it seems that an ability to absorb technology is the 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 an understanding and absorbing of knowledge developed internationally, an upgrading of one's own R&D skills and an active participation in international R&D networks. The OECD (2001a, p. 41) states that "domestic R&D [...] is the key to tapping into foreign knowledge; countries that invest in their own R&D appear to benefit most from foreign R&D". So domestic R&D seems to be essential for the absorption of international R&D spillovers.[21]

R&D spending is nevertheless not everything – what matters is profitable application of the newly created knowledge; and this is where the post-socialist countries seem to trail behind 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 – are nonetheless 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 state relinquished this role in the early 1990s and left it entirely to R&D institutes. However, these proved unable to disseminate this knowledge because of a lack of clear incentives, managerial competence, and often insufficient financial support.

The ability of enterprises in transition economies to adopt R&D that has been carried out locally and internationally is equally low. This is because the level of business R&D is particularly small. According to OECD (2001b), in 1999 the business sector's R&D expenditure as a percentage of the domestic product of

[21] It has been argued that the rapid development of Japan since the 1950s and later that of Korea have been mostly based on the successful adoption, imitation, and upgrading of innovations developed abroad. The same path can be followed by transition economies. However, domestic R&D is needed in order to successfully follow this route.

industry amounted to 0.42% in Poland, 0.33% in Hungary, 0.69% in Slovakia, and 0.95% in the Czech Republic. This is to be compared to Sweden's 4.74%, and an OECD average of 1.89%.

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

### 4.6. Human capital

The role of human capital in economic growth is widely acknowledged. Various empirical studies have found that human capital can be positively correlated with GDP growth rates (Barro – Sala-i-Martin 1995; Bassanini – Scarpetta 2001).

Benefiting from ICT requires the right skills and competencies. This involves building on the foundations of a solid education and lifelong learning. Tertiary education is particularly important for the 'New Economy', since this level of education prepares people for the absorption of high-technology knowledge from abroad. In this context, it is also important to note that, so as to be able to benefit from ICT, a tertiary education in mathematics, computer science and engineering – rather than the liberal arts – should be emphasised.[22]

The quality of human capital in transition economies is relatively high, despite the low national incomes. For example, Ukrainian human capital is better developed than Venezuelan, and the Tajikistani one is better than Nigeria's.[23] Human capital is one of the few positive legacies of the communist era. Nevertheless, formal education is not everything – for ICT-appropriate skills matter more than a broadly-developed knowledge; and ICT skills are lacking in transition countries, this being due to the relatively low numbers of mathematics, physics, and engineering graduates. More importantly, though, it seems that inadequate

[22] For instance, according to Stiglitz (1998), the high ratio of engineers in tertiary education in Korea and Taiwan (almost triple of the US level) has contributed to their narrowing the productivity gap with developed countries.

[23] According to the Human Development Index (UNDP 2001), the Education Index 1999 for Ukraine amounted to 0.92, while its GDP index was only 0.59. This is comparable with, for instance, a Venezuelan GDP index of 0.67 and an 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.

ICT skills are due to there being a lack of a lifelong learning culture, so it is very rare that one sees middle-aged people attend courses at local universities. Yet without lifelong learning people will not be able to keep abreast of an ever-changing technology, whose progress – thanks to the 'New Economy' – has recently even quickened.

Education also contributes to driving the 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 the adoption of innovations. Better education will certainly 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 young persons tend to take up innovations more quickly, and the relatively young populations of Eastern Europe and Central Asia should promote technology much more rapidly than would be the case with older, more established societies in developed countries.

### 4.7. Labour market

The relevance of labour-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 labour markets result in reductions in unemployment (OECD 1999), and higher employment translates itself into higher output. Di Tella and MacCulloch (as quoted in *Economist* 1999) found additional powerful evidence based on a survey of 21 countries over the seven years to 1990.

Flexible labour markets are particularly important for the development of the 'New Economy': the adoption of e-business and the emergence of new organisational and management structures predominantly require flexibility in being able to re-allocate people from old to new tasks, with regard to new ways of doing business. Since innovation introduces new products and industries that replace existing ones, it leads to labour re-allocation among firms and sectors. Rigid labour markets, while stifling the necessary changes in employment, inhibit adoption of the 'New Economy'. Flexible labour markets are thus necessary for the adoption and diffusion of the technological revolution (Johnston 2001).

### 4.8. Flexible product markets and competition

Competition, through lower barriers of entry, improves incentives and thus leads to a more productive use of resources. The importance of flexible product mar-

kets for economic growth has so far been plainly evidenced (Bassanini et al. 2001).

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 need to have a chance to compete with incumbent companies. A market-regulatory framework has to push down the barriers to entry to as low a level as possible. Telecom companies represent a case in point: in countries where the telecommunications market has been liberalised (the US, most of the EU, the developed countries of South-East Asia), quality has rise,– while the costs of telecommunications services have dropped considerably over a short period of time (OECD 2001a). This is, however, mostly *not* the case with telecom companies in transition economies, which retain their monopolistic positions. Market liberalisation, which generally induces a decrease in prices and a reduction of entry barriers, is extremely important, therefore, for the emergence of the 'New Economy'.

### 4.9. Entrepreneurship

It is not enough to merely *know*; it is equally important to be able to put knowledge into profitable *use*. This is the field where entrepreneurial spirit, and thus entrepreneurs find their place. There would be no commercially utilised innovations without entrepreneurs, for they are the ones who transform somebody else's ideas into economic reality.

J. Schumpeter (1912) discovered the links between entrepreneurship and economic growth. He was the first one to assert that entrepreneurship is, besides to innovations and credit provision, an important factor spurring economic growth (Blaug 1994). As the forces of "creative destruction" replace old, inefficient firms with new and innovative ones, 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.[24]

[24] The private sector share in GDP based on EBRD data is used as a variable in covering a full sample of countries. It is certainly a flawed measure as it reflects both entrepreneurial activity and progress in an economy-wide privatisation programme. Nonetheless, a large share of the private sector in the GDP figures for transition countries means that, first of all, the structural reforms that promote entrepreneurship are advanced. Secondly, grass-roots private business has been expanding, too (and in most transition countries start-up private businesses – rather than privatised companies – now contribute a large part of the private economy's contribution to GDP).

### 4.10. 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 – Easterly 1996). 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 be able to flourish (not even ICT investments). Low and stable inflation rates are thus necessary for benefiting from technological progress.

### 4.11. Other factors

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

Let us finally turn to the NEI scores, in *Table 2*.

Slovenia scored highest in the ranking, having been followed by the Czech Republic, Hungary, Estonia, the Slovak Republic and Poland. Uzbekistan, Albania, Bosnia–Herzegovina, and the FR Yugoslavia occupy the bottom of the table. The results seem to agree with what is 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 has wreaked havoc on the economy, as in Bosnia–Herzegovina and Serbia and Montenegro, rank at the very bottom.

The NEI results also largely square with the results of the Global Competitiveness Report (GCR) published by the World Economic Forum (2001). As one might expect, the NEI index illustrating the degree of readiness for harnessing the 'New Economy' seems to correlate with countries' competitiveness (*Table 3*). This suggests that fundamental forces responsible for the development

*Table 2*

Rankings of transition countries according to the NEI

| Country | NEI ranking | NEI score | Regulations and law enforcement | Infrastructure | Trade openness | Financial system | R&D spending | Human capital | Labour-market flexibility | Product-market flexibility | Entrepreneurship | Macroeconomic stability |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Slovenia | 1 | 10.8012 | 1.0846 | 2.3856 | 0.4393 | 1.2911 | 3.2527 | 1.1878 | 0.5269 | 1.0033 | 0.4107 | 0.3792 |
| Czech Republic | 2 | 10.1259 | 0.4310 | 2.0060 | 1.0642 | 2.4531 | 2.6677 | –0.2700 | 0.3573 | 1.4730 | 1.3349 | 0.3826 |
| Hungary | 3 | 7.2732 | 1.0846 | 1.4889 | 0.8087 | 0.8867 | 0.3669 | 0.8963 | 0.3361 | 1.4730 | 1.3349 | 0.3381 |
| Estonia | 4 | 7.3827 | 0.8232 | 1.3457 | 1.7600 | 0.9481 | 0.1329 | 1.1878 | –0.1728 | 1.0033 | 1.0268 | 0.5126 |
| Slovak Republic | 5 | 6.7511 | –0.0266 | 0.8940 | 1.2058 | 1.9975 | 1.0688 | 0.3132 | –0.6074 | 1.4730 | 1.3349 | 0.3963 |
| Poland | 6 | 3.7422 | 1.0846 | 0.4842 | –1.3954 | 0.6768 | 0.5618 | 1.1878 | –0.3000 | 1.4730 | 0.7188 | 0.3929 |
| Bulgaria | 7 | 2.3397 | 1.0846 | 0.4403 | 0.0268 | 0.3595 | 0.0159 | 0.0216 | –0.6074 | 0.3769 | 0.7188 | 0.2937 |
| Latvia | 8 | 2.1582 | 1.0846 | 0.5791 | –0.5181 | –0.0040 | –0.5301 | 0.8963 | –0.1092 | 0.3769 | 0.4107 | 0.6221 |
| Lithuania | 9 | 1.2747 | 0.8232 | 0.5081 | –0.2410 | –0.3265 | –0.0621 | 0.8963 | –0.3424 | –1.6586 | 0.7188 | 0.6357 |
| Croatia | 10 | 1.1471 | 0.8232 | 1.0444 | –0.7521 | 0.8765 | –0.5301 | –0.5615 | –0.4166 | 0.3769 | 0.1027 | 0.4305 |
| Russia | 11 | 0.6573 | –0.0266 | –0.4061 | –0.8690 | –0.6643 | 1.3418 | 0.6047 | 0.2619 | 0.3769 | 0.7188 | –0.0039 |
| Kazakhstan | 12 | 0.1328 | 1.0846 | –0.8403 | 0.0299 | –0.7258 | –0.5301 | 0.6047 | 0.6541 | –0.0928 | 0.1027 | 0.3552 |
| Ukraine | 13 | –0.6724 | –0.4842 | –0.4875 | 0.2238 | –0.5620 | –0.5301 | 0.6047 | 0.8449 | 0.3769 | 0.1027 | –0.1989 |
| Moldova | 14 | –0.9426 | 0.4310 | –0.6606 | 0.0145 | –0.4698 | –0.5301 | 0.0216 | 1.0570 | –0.0928 | –0.5134 | 0.0508 |
| Kyrgyzstan | 15 | –1.5160 | 0.1695 | –1.0359 | –0.3519 | –0.9049 | –0.5301 | 0.6047 | 0.6965 | –0.0928 | 0.1027 | 0.3587 |
| Romania | 16 | –1.6560 | 0.6271 | –0.1752 | –0.8690 | –0.3162 | –0.3351 | –0.5615 | 0.1771 | 0.3769 | 0.1027 | –0.7086 |
| Armenia | 17 | –3.1266 | –0.2227 | –0.8337 | –1.0076 | –0.7616 | –0.5301 | 0.6047 | 0.1347 | –1.6586 | 0.1027 | 0.6699 |
| FYR Macedonia | 18 | –3.1322 | –0.2881 | –0.1231 | 0.2977 | –0.3316 | –0.5301 | –1.1447 | –2.1127 | –0.0928 | –0.2054 | 0.3860 |
| Turkmenistan | 19 | –3.3963 | –2.6414 | –1.0408 | 1.6768 | –0.4698 | –0.5301 | 0.6047 | 1.2902 | –1.6586 | –2.0536 | 0.4305 |
| Belarus | 20 | –4.4567 | –1.7916 | –0.3776 | 0.8303 | –1.0022 | –0.5301 | 0.6047 | 1.0676 | –0.0928 | –2.3617 | –2.9936 |
| Tajikistan | 21 | –3.5857 | –1.5301 | –1.1789 | 2.3048 | –1.0585 | –0.5301 | –0.5615 | 1.0252 | –0.5625 | –1.1295 | –1.3961 |
| Georgia | 22 | –3.9427 | –0.6803 | –0.6272 | –1.0414 | –1.1199 | –0.5301 | –0.2700 | 0.1983 | –0.0928 | 0.1027 | 0.4442 |
| Azebaijan | 23 | –4.3465 | –0.6803 | –0.6954 | –0.7459 | –0.9152 | –0.5301 | –0.5615 | –0.1304 | –0.0928 | –0.8214 | 0.6084 |
| Uzbekistan | 24 | –4.5651 | –0.2227 | –1.0797 | –0.1241 | –0.8998 | –0.5301 | –1.7278 | 1.2266 | –0.0928 | –0.8214 | –0.2742 |
| Albania | 25 | –4.7612 | –0.6803 | –0.8618 | –1.6602 | 1.6085 | –0.5301 | –2.8940 | –0.4908 | –0.5625 | 1.0268 | 0.5400 |
| Bosnia–Herzegovina | 26 | –7.1586 | –1.3340 | –0.7652 | –0.5335 | –0.0961 | –0.5301 | –1.1447 | –2.9608 | –1.6586 | –1.4375 | 0.5468 |
| Serbia and Montenegro | 27 | –6.5273 | –0.0266 | 0.0127 | –0.5735 | –0.4698 | –0.5301 | –1.1447 | –1.6039 | –1.6586 | –1.1295 | –3.1988 |

of both the ‘new’ and the ‘old’ economy are largely the same. *Hence both types of economy rely on the same foundations, there is no ‘new’ or ‘old’ economy: there is only one economy, where old recipes for development still apply.*

*Table 3*

Rankings of transition countries in the GCR and NEI

| Country | GCR ranking | NEI ranking |
|---|---|---|
| Bulgaria | 10 | 7 |
| Croatia | n.d. | 10 |
| Czech Republic | 4 | 2 |
| Estonia | 2 | 4 |
| Hungary | 1 | 3 |
| Kazakhstan | n.d. | 12 |
| Latvia | 8 | 8 |
| Lithuania | 7 | 9 |
| Poland | 6 | 6 |
| Romania | 9 | 16 |
| Russia | 11 | 11 |
| Slovak Republic | 5 | 5 |
| Slovenia | 3 | 1 |
| Ukraine | 12 | 13 |

*Note*: GCR lists only twelve transition economies.

*Table 4*

Rankings for weighted and unweighted NEI

| Ranking | Weighted NEI | Unweighted NEI |
|---|---|---|
| 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–Herzegovina | Bosnia–Herzegovina |
| 27. | Serbia and Montenegro | Serbia and Montenegro |

*Note:* The table shows the first six and bottom six countries of the ranking.

We have also calculated the NEI for an unweighted sum of values of all the variables. *Table 4* shows that NEI on the basis of the unweighted/weighted sum are more or less the same, and the similarity of results bears proof to the robustness of the ranking. If changes in the weightings of variables were to lead to major corrections in the NEI, it might imply that the rankings were arbitrary. As shown, however, it is not the case here.

## 5. 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', spurred on by globalisation and rapid progress in information and communications technologies (ICT), has had its impact on growth rates in a number of developed and developing countries. Despite the current slowdown, and coupled with some pessimism, the information revolution is here to stay. More time is needed, however, for the benefits of 'New Economy' to fully feed through to the whole economy.

The 'New Economy' has not yet, however, had any major impact on less developed countries. Notwithstanding, it represents a significant potential for the less developed/transition economies to attain long-term growth, a sustained and rapid socio-economic development, enabling them to catch-up with developed countries. However, benefiting from this potential is not automatic: it seems that a satisfactory institutional and economic 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 readiness of transition economies for the adoption of the 'New Economy'. As could be expected, the countries that are most advanced in the transition process receive the highest rankings, and those countries where the process of transformation from planned economy to a market economy has progressed least, rank at the bottom of the table. The latter countries are at risk of finding themselves in a "technological trap" where, due to the insufficient quality of institutional and economic infrastructure, investments in new technologies may yield lower returns than investments in older technologies. Consequently, in these countries older technologies could prevail over new ones.

Different speeds of adoption of technological innovations emanating from the different quality of institutional infrastructures are likely to contribute – along

with the traditional 'old' economy – to diverging rates of economic growth and thus also to a growing income polarisation among post-socialist economies. The most advanced countries (front-runners like Estonia, the Czech Republic, Hungary, Poland, and Slovenia), thanks to ICT, are likely to proceed much faster, while economic growth in the countries plodding behind (Azerbaijan, Bosnia–Herzegovina, Serbia and Montenegro, and Tajikistan) may further languish.

Income polarisation 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, EU accession 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 – being worth some EUR 40 billion between 2004 and 2006 – will improve the foundations for a faster diffusion of technological progress.

The 'New Economy' will not be harnessed without a developed institutional infrastructure and appropriate economic policies. 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' and the 'Old Economy' alike – and this is because, in reality, there is only one economy, which, as has been the case throughout history, combines the old with the new.

Traditional recipes for development still hold: investment in physical and human capital is likely to be the most important ingredient within fast growth for a long time. However, long-term growth will also depend on the speed of replacement of the old with the new. The ICT revolution is likely to accelerate this replacement process. This is particularly true for transition economies. Nevertheless, the technological leapfrogging will not materialise without appropriate economic and institutional foundations; their fast build-up is the recipe for an ultimate catching-up with the developed world.

## ACKNOWLEDGEMENT

This paper is based on "The 'New Economy' and Economic Growth in Transition Economies. The Relevance of Institutional Infrastructure" WIDER Discussion Paper, No. 2002/62, July. The author gratefully acknowledges comments by Matti Pohjola, Grzegorz W. Kolodko, and other, anonymous reference providers.

## REFERENCES


Barro, R. J., Sala-i-Martin, X. (1995): *Economic Growth,* New York: McGraw-Hill.

Bassanini, A., Scarpetta, S. (2001): Does Human Capital Matter for Growth in OECD Countries? Evidence from Pooled Mean-group Estimates. Paris: OECD, Economics Department, Working Paper No. 289.

Bassanini, A., Scarpetta, S., Hemmings, P. (2001): Economic Growth: The Role of Policies and Institutions. Panel Date Evidence from OECD Countries, Paris: OECD, Economics Department, Working Paper, No. 283.

Blaug, M. (1994): *Teoria Ekonomii. Ujêcie retrospektywne* (Theory of Economics. Retrospective View). Warszawa: PWN.

Brdulak, H. (2002): Ranking Firm Transportowo-Spedycyjno-Logistycznych (TSL) 2002. (The Ranking of Transport-Spedition-Logistics Firms), Kolumna Transportowa, *Rzeczpospolita*, 27 June. From: http://www.rp.pl/dodatki/ transport_020627/transport_a_5.html

Bruno, M., Easterly, W. (1996): Inflation and Growth: In Search of a Stable Relationship. *Federal Reserve Bank of St. Louis Review*, Vol. 78, No. 3, pp. 139–146.

Business Software Alliance (2001): From http://www.bsa.org/usa/antipiracy/piracyticker.phtml

Clague, C. (ed.) (1997): *Institutions and Economic Development: Growth and Governance in Less-Developed and Post-Socialist Countries*, Baltimore MD: Johns Hopkins University Press.

Clague, C., Kiefer, P., Knack, S., Olson, M. (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 MD: Johns Hopkins University Press, pp. 67–90.

Coe, D. T., Helpman, E. (1995): International R&D Spillovers. *European Economic Review*, Vol. 39, pp. 859–887.

David, P. (2000): Understanding Digital Technology's Evolution and the Path of Measured Productivity Growth: Present and Future in the Mirror of the Past. In: E. Brynjofsson and B. Kahin (eds): *Understanding the Digital Economy*, MIT Press.

Deiss, R. (2002): Information Society Statistics. Data for Candidate Countries. Eurostat. *Statistics in Focus*, Theme 4–17/2002. From http://europa.eu.int/comm/ eurostat

De Masi, P., M. Estevao, L. Kordes (2001): Who has a New Economy? *Finance & Development*, Vol. 39, No. 2. June.

Dewan, S., Kraemer, K. L. (2000): Information Technology and Productivity. Evidence from Country Level Data. *Management Science*, Special Issue on the Information Industries, Vol. 46, pp. 548–562.

DiS (2001): Informatyczne systemy bankowe (Information Systems in Banking). Biuro Badawczo-Analityczne DiS, August. From : http://www.mastertext.com.pl/dis/raporty/isb01/isb01ip.htm

Easterly, W. (2001): *The Elusive Quest for Growth*, Boston MA: MIT Press.

EBRD (2001): *Transition Report 2001,* London: European Bank for Reconstruction and Development.

*Economist* (1999): Working Man's Burden. 4 February.

*Economist* (2000): Untangling E-conomics. 23 September.

*Economist* (2001a): Brave New World. 18 October.

*Economist* (2001b): Statistical Illusions. 8 November.

*Economist* (2001c): Irrational Pessimism. 6 December.

EITO (2002): European Information Technology Observatory 2002. Frankfurt/Main: European Information Technology Observatory. hhtp://www.eito.com

Global Entrepreneurship Monitor (2001): Executive Report. From hhtp://www.entreworld.org

Greenwood, J., Smith, B. (1997): Financial Markets in Development and the Development of Financial Markets. *Journal of Economic Dynamics and Control*, Vol. 21, No. 1, pp. 145–181.
Hall, R. E., Jones, C. I. (1996): The Productivity of Nations. NBER Working Paper, No. W5812, November. From http://papers.nber.org/papers/W5812
Heath, J. (2001): Venture Capital and Private Equity Investment in Poland. Dresdner Kleinwort Capital, Mimeo.
IDC (2000): *The 1999 IDC Worldwide Black Book*, New York: International Data Corporation.
IMF (2001): World Economic Outlook. The Information Technology Revolution. Chapter III, Washington DC: International Monetary Fund. October, pp. 103–142. From http://www.imf.org/external/pubs/ft/weo/2001/02/pdf/chapter3.pdf
ITU (2002): ITU World Telecommunication Indicators 2002. Geneva: International Telecommunication Union. http://www.itu.int
Johnston, D. (2001): Future Economic Challenges for the European Economy. *WSPiZ & TIGER Distinguished Lectures Series*, 5. From http://www.tiger.edu.pl/publikacje/ dist/Johnston.pdf
Jorgenson, D. W., Stiroh, K. J. (2000): Raising the Speed Limit: U.S. Economic Growth in the Information Age. Brookings Papers on Economic Activity, (1), pp. 125–211. From http://www.ny.frb.org/rmaghome/economist/stiroh/ks_grw.pdf
King, R., Levine, R. (1993): Finance and Growth: Schumpeter might be Right. *Quarterly Journal of Economics*, Vol. 108, No. 3, pp. 513–542.
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.
Kraemer, K. L., Dedrick, J. (2001): Information Technology and Economic Development: Results and Policy Implications of Cross-Country Studies. In M. Pohjola (ed.): *Information Technology, Productivity, and Economic Growth,* Oxford: Oxford University Press.
Krugman, P. R. (1997): *Development, Geography, and Economic Theory* (Ohlin Lectures), Boston MA: MIT Press.
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. From http://europa.eu.int/comm/eurostat
Levine, R. (1997): Financial Development and Economic Growth: Views and Agenda. *Journal of Economic Literature*, Vol. 35, No. 2, pp. 688–726.
Mohnen, P. (2001): International R&D Spillovers and Economic Growth. In M. Pohjola (ed.): *Information Technology, Productivity, and Economic Growth,* Oxford: Oxford University Press.
Mosdorf, S. (1998): quoted in Summary Report "Knowledge – The Shift in Paradigm". Berlin, Villa Borsig. From: http://www.dse.de/ef/rep1098e.htm
NBP (2002): Sytuacja finansowa banków w 2001 roku (Financial Situations of Banks in 2001). National Bank of Poland, May. From: http://www.nbp.pl/statystyka/wyniki_dwn/synteza2001.pdf
North, D. C. (1990): *Institutions, Institutional Change, and Economic Performance,* Cambridge: Cambridge University Press.
North, D. C. (1994): Economic Performance through Time. *American Economic Review*, Vol. 84, pp. 359–368.
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.
OECD (1999): *Implementing the OECD Jobs Strategy: Assessing Performance and Policy*, Paris: Organisation for Economic Co-operation and Development. September.
OECD (2001a): *The New Economy: Beyond the Hype,* Paris: Organisation for Economic Co-operation and Development.

OECD (2001b): The Science, Technology, and Industry Scoreboard 2001. From http://www1.oecd.org/publications/e-book/92-2001-04-1-2987/gB-2-b.htm

Pohjola, M. (ed.) (2001): *Information Technology, Productivity, and Economic Growth,* Oxford: Oxford University Press.

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 90th Anniversary Celebrations, July. From http://econ.lse.ac.uk/ staff/dquah/p/0201hku.pdf

*Rzeczpospolita* (2001): Faktura z sieci (An Invoice from the Net). Nauka i Technika, 12 March. Fromhttp://arch.rp.pl/a/rz/2001/12/20011203/200112030058.

Schumpeter, J. (1912): *The Theory of Economic Development*, Boston MA: Harvard University Press. Translated into English in 1934.

Simon, H. (1971): "Designing Organizations for an Information-rich World". In M. Greenberg (ed.): *Computers, Communications and the Public Interest,* Baltimore: The Johns Hopkins Press, pp. 40–41.

Solow, R. (1957): Technical Change and the Aggregate Production Function. *Review of Economics and Statistics*, Vol. 39, No. 3, pp. 312–20, August.

Stiglitz, J. E. (1998): More Instruments and Broader Goals: Moving toward the Post-Washington Consensus. *WIDER Annual Lectures* 2. Helsinki: UNU/WIDER. January.

Stiroh, K. (1999): Is there a New Economy? *Challenge*, July/August, pp. 82–101.

Stiroh, K. (2002a): Information Technology and the U.S. Productivity Revival: A Review of the Evidence. *Business Economics*, Vol. XXXVII, No. 1, January, pp. 30–37. From: http://www.ny.frb.org/rmaghome/economist/stiroh/ks_busec.pdf

Stiroh, K. (2002b): New and Old Economics in the 'New Economy'. In *Economic Policy in the New Economy,* Kiel Institute of World Economics.

Thurow, L. (1997): *The Future of Capitalism: How Today's Economic Forces Shape Tomorrow's World*, New York: Penguin Books.

UNDP (2001): Human Development Report 2001. United Nations Development Programme. From http://www.undp.org/hdr2001/back.pdf.

Welfe, W., Florczak, W., Sabanty, L. (2001): Ekonometryczne Modelowanie Postępu Technicznego, Jego Efektów Oraz Źródeł (Econometric Modeling of Technological Progress). In W. Welfe (ed.): *Ekonometryczny model wzrostu gospodarczego (Econometric Model of Economic Growth).* Łódź: Wydawnictwo Uniwersytetu Łódzkiego, pp. 124–128.

WIDER (2002): The 'New Economy' and Economic Growth in Transition Economies. The Relevance of Institutional Infrastructure. Discussion Paper 2002/62, Helsinki: United Nations University World Institute for Development Economics Research.

WITSA (2002) "Digital Planet 2002: The Global Information Economy". Vienna, World Information Technology and Services Alliance.

World Bank (1998): *World Development Report 1998/99: Knowledge for Development*, Oxford: Oxford University Press.

World Bank (2002): *World Development Report 2002: Building Institutions for Markets*, Oxford: Oxford University Press.

World Economic Forum (2001): Global Competitiveness Report 2001–2002. From http://www.cid.harvard.edu/cr/pdf/GCR0102%20Exec%20Summary.pdf

Zinnes, C., Eilat, Y., Sachs, J. (2001): Benchmarking Competitiveness in Transition Economies. *Economics of Transition*, Vol. 9, No. 2, pp. 315–353.