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Abstract

This paper addresses the poor economic performance of Eastern Europe in the 1990s and the future development potential of the region in the light of the theories of economic growth and human capital and their empirical tests. It concludes that Eastern Europe is likely to have fallen into a 'poverty trap' and that the way out of this trap involves tapping the growth potential derived from the region's favourable endowment with human capital and implementing growth-enhancing economic reforms.

JEL code: I 2, J 24, O 15, O4

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1. Introduction

One of the big economic puzzles of the 1990s is the economic performance of the Central and Eastern European countries. The latter seem to have had great difficulties in undergoing systemic change and, at the same time, finding a path of sustainable growth in order to catch up with western countries. The puzzle arises from the fact that the countries of Eastern Europe are generally well equipped for growth: many of them are endowed with a highly educated labour force. Thus for economists and policymakers familiar with the details of the long-run process of economic growth and particularly with the role of education in this process the expectation is that these countries should, sooner or later, show a performance similar to the one experienced by Germany and Japan after World War II.

The future development potential of Eastern Europe in a time that can be characterised as the age of human capital is also related to this puzzle. Recent shifts in the economic structure of many advanced economies reveal an expansion of the service sector, especially of knowledge-intensive activities, and a relative decline of the manufacturing and primary sectors. The changing face of modern economies is accompanied by an increase in the demand for educated labour and by small increases or even stagnation in

the demand for raw (or uneducated) labour. The emergence of information technologies, the rapid international diffusion of these technologies and the communications revolution that is taking place following the opening of the internet for a broad array of uses have very much enhanced the productivity of educated labour. What consequences does this have for economic policy in Eastern Europe? What challenges can be expected for Eastern Europe from the international specialisation of Europe in the 21st Century?

The purpose of this paper is twofold: first, to try to find a plausible answer to the puzzle of the 1990s mentioned above. For this purpose it will briefly enquire into the theories of human capital and growth, into the available empirical tests of these theories and into some unsolved problems in this area of research which might be of particular relevance for Eastern Europe. Second, the paper will derive some hypotheses concerning the future development potential of Eastern Europe.

II. Knowledge and Economic Development

1. The Contribution of Economic Theory

The traditional account of economic growth is due, among others, to Solow (1956). His neoclassical theory of exogenous growth focuses on the impact of capital accumulation and population growth on the level and the rate of

growth of GDP per capita, under the assumption of diminishing marginal products of inputs and constant returns to scale. One of the most interesting features of the neoclassical model of exogenous growth is its transitional dynamics, i. e. the path from a lower level of GDP per capita to its steady state level. Specific policies and unexpected shocks may affect the rate of capital accumulation and therefore have an impact on the rate of economic growth during the transition period. Such policies, as, for example, the creation of incentives for saving might not only increase the distance between the initial level of GDP per capita and its steady state value, but also increase the rate of economic growth needed to converge to the steady state (an increase in savings would show in an upward shift of the savings curve in figure 1A in the Appendix). This, unfortunately, does not imply that the time it takes a country to reach its steady state level of GDP per capita will shorten due to higher savings. To the contrary, since the distance between the initial level of GDP per capita and the (new) steady state level becomes larger too, the time it takes to overcome this distance is likely to be longer than the time needed to reach the older, lower steady state goal. In the case of Eastern Europe, systemic change per se can be interpreted as a process that pushed the countries of Eastern Europe into a disequilibrium position with respect to their old path and their old steady state. The theory

of exogenous growth can contribute to explain this phenomenon and, in addition, possibly be of help when it comes to find a way out of this situation.

According to the central proposition of neoclassical growth theory - the convergence hypothesis -, if two or more economies show similar propensities to save, the economy with the lower initial level of GDP per capita will tend to grow faster than the others. There are, though, a number of risks that can be associated with convergence. Exogenous shocks like, for example, financial crises or political instability, on a national and/or regional level, could readily interfere with the transmission mechanism from savings to growth and thus interrupt or delay the process of convergence. Similar results can be obtained in the context of models of endogenous growth, to the extent that the property of diminishing returns can be retained in some way or another and transitional dynamics are allowed to take place (Barro and Sala-i-Martin 1995).

Where is the link between growth and education? In an article published long ago (in 1961), Stigler complained that information (or knowledge) occupied 'a slum dwelling in the town of economics'(Stigler 1971, p.61). Although it is not at all sure whether information or knowledge has

definitely moved from the slum dwellings or the inner cities, as one would put it today, to a residential home, there is some indication that in the 1980s and 1990s there has been a change in the understanding of the role of learning, information and knowledge in economic development. Influenced by the work of economists like Lucas (1988) who stress the importance of human capital for economic development, the concept of capital used in theories of economic growth has been extended to include both kinds of capital, physical and human. This has happened in models of exogenous as well as in those of endogenous growth. In doing so, it is possible to take advantage of the similarities that exist between physical and human capital and to treat human capital like any other capital input. Like physical capital, human capital can be accumulated over time, suffers from depreciation and earns a rate of return. Yet both kinds of capital differ with respect to their ability to be accepted as collateral in case their accumulation has to be financed raising debt: while physical capital is eligible for this purpose, human capital is not. This is tantamount to say that physical capital can be financed from either own savings or debt, whereas human capital must always be financed from own savings.

Fortunately, we know from the microeconomic theory of human capital that a substantial part of the total cost of accumulating human capital has nothing to do with the expenditure of governments and private agents for education found in official statistics: this part of the cost is incurred directly by the persons seeking education in form of foregone earnings. On the one hand, this means that the total savings necessary to finance education amount to much less than the total cost of education. On the other, it means that incentives to increase the propensity of individuals to learn and voluntarily forego income during the period of education have a role in determining the supply of human capital.

The incorporation of both kinds of capital into models of economic growth gave birth to a strand of research on the relationship between human and physical capital during the process of economic growth. In fact the ratio of physical to human capital turns out to have an important influence on the growth rate. In some models (one-sector models in which the production function of human capital does not differ from the one used to produce other goods) on either side of the steady state the growth rate increases with the size of the gap between the actual value of the ratio between the two capital stocks and that ratio's steady state value. An imbalance effect can be

established in the sense that the larger the distance of the ratio from its steady state value the larger the growth rate. In other models (two-sector models in which the production of human capital is human capital intensive) this effect applies only as long as the actual value of the ratio is smaller than its steady state value. Such imbalances can be observed in the real world after a war that destroys a part of the stock of physical capital without affecting the stock of human capital. This seems to have been the case in Germany and Japan after World War II. The opposite situation arises whenever a disease kills an important share of a country's population. In the early 1990s some African countries feared that people under 30 years would be killed by the aids virus and that those countries would, within a decade, find themselves in a situation with a severely reduced stock of human capital, a resource that has always been scarce in the region. In Eastern Europe the indication is that the stock of physical capital is largely obsolete, while, at the same time, the stock of human capital compares very well to the one existing in western countries. Thus, the potential for the stock of physical capital to grow by exploiting the imbalance effect, given the good endowment with human capital, should be quite large in Eastern Europe.

While the neoclassical theory originally assumed a closed economy, recent developments in growth theory (Barro, Mankiw and Sala-i-Martin 1994) established that the process of economic growth with both kinds of capital is very similar in open economies under the assumption that capital is internationally mobile. Restricting international borrowing to finance the accumulation of physical as opposed to human capital, these models conform to the convergence hypothesis. Although the speed of convergence appears to be somewhat higher in open than in closed economies, this ultimately depends on the fraction of capital that is mobile.

Furthermore, human capital (possibly the ratio of human to physical capital) also plays a role in the international diffusion of technology. Generally, follower economies have to incur high costs if they wish to imitate and adapt the technologies developed in the leading economies. In addition, imitation takes a long time. Foreign investment by firms from the leading countries can contribute to speed the diffusion of new technologies from the leading economies to the followers. The international mobility of technical knowledge is supported by policies aiming at the protection of intellectual property rights. The latter offer incentives for the international dissemination

of additions to the stock of knowledge in those follower countries in which an upgraded stock of human capital is able to absorb the new technologies.

As can be seen from the brief survey of the relevant parts of growth theory in this section, growth theory offers some explanations for the puzzle of the 1990s. In the light of this theory, Eastern Europe's growth performance could be interpreted as reflecting a low propensity to save (possibly due to exogenous shocks in the form of macroeconomic and political instability). Also, rather small flows of foreign investment to Eastern Europe can be associated with the same reasons. The impression is that in many countries of the region systemic change per se did not bring about the big push expected to unleash productive forces. This appears to have continued to be the case even after the economies achieved a certain degree of macroeconomic stabilisation and managed to improve their political structures. Why did not the existing human capital endowment help to put the countries on a path of sustainable economic growth, as the theory of economic growth would have predicted? The puzzle of the 1990s seems to fit into what has been called the 'poverty trap' (Barro and Sala-i-Martin 1995). The supply of (domestic and foreign) savings was so low that, as shown in figure 1B in the Appendix, not even the depreciated part of the

stock of physical capital was replaced; GDP per head always bounced back to a very low value and remained there.

2. The Empirical Record

What does the empirical evidence reveal with respect to the role of human capital in economic development? It is fair to say that, generally speaking, the empirical record turned out to be clearly in favour of human capital, in spite of the many measurement problems involved. Since there is a vast literature that deals with alternative ways of measuring human capital, there is no need to summarise the state of the art here. Nevertheless, it should be helpful to point out that statistics that are available for a number of countries, particularly those pertaining to school attainment or years of schooling, do not always perform well in econometric estimates and that the debate whether a stock or a flow measure constitutes the correct choice has not yet come to an end.

In my view, measurement problems are important but should not be overestimated. They abound in many areas of economics and we have learned to live with them. It should be much more promising to focus on such issues as the test of the human capital hypothesis and the particular specification of the equation used in the literature for that purpose.

Following the lead of Mankiw, Romer and Weil (1992), there is at least one equation that can directly be derived from the neoclassical model of growth (for alternative approaches see, for example, Gundlach (1995) and Benhabib and Spiegel (1997)). Basically, it boils down to

$$(1)\ \ln(y(t))-\ln(y(0)) = a + b\ln(sk) - b\ln(n + g + \delta) - c\ln(y(0)) + c\ln(sh) + \varepsilon$$

where the log difference of GDP per worker is explained by the fraction of output allocated to increase the capital stock (investment), sk, the rate of population growth, n, augmented by the exogenous rate of technical progress, g, and the rate of depreciation of physical and human capital, δ, the initial level of GDP per worker, y(0), and the fraction of output devoted to increase the stock of human capital, sh. As concerns human capital, Mankiw, Romer and Weil (1992) show that the equation can be specified using the level of human capital instead of a GDP ratio. Other authors (Barro and Sala-i-Martin 1995) tend to add ancillary variables to the equation, which can not be derived directly from neoclassical growth theory but which can be hypothesised to have an impact on growth. The results from estimating equation (1) using the data bank prepared by Barro and Lee (human capital) and Summers and Heston's Penn World Tables version 5.6 (from which the rest of the data has been taken, namely, GDP at purchasing

power parities, investment share of GDP and population), both of which are available in the internet from the National Bureau of Economic Research (NBER) and the World Bank, respectively, and setting $g + \delta$ equal to 0.05 (as Mankiw, Romer and Weil did) are presented in table 1. By contrast to Mankiw, Romer and Weil (1992), the estimation has been carried out resorting to a panel procedure, i. e. pooling cross-section and time-series data, in order to exploit as much as possible the information available for a sample of 92 countries over a period of three decades (1960-70, 1970-80 and 1980-90). The sample includes only those countries for which both data banks overlap, in an attempt to minimise the number of missing values, and thus differs from the samples used by other authors.

As expected, the coefficients corresponding to the investment share in GDP and to human capital show positive signs, whereas population growth and the initial level of GDP per worker carry a negative sign. All variables are statistically significant at the 1 % level with the exception of population growth, which, in many cases, is significant at the 5 % level. The independent variables explain over half of the whole equation's variance when OLS are applied and between 0.83 and 0.92 percent of that variance

Table 1 Growth and Human Capital: Empirical Results

Equation	Variables				
	Physical Capital	Population	Initial GDP per worker	Human Capital	Adj.R-squared
	Common Intercept				
Primary Ed.	0.3978* (6.3279)	-0.0064 (-2.0090)	-0.0507* (-16.1075)	0.2746* (5.8544)	0.51
Secondary Ed.	0.3941* (6.9491)	-0.0090 (-2.9593)	-0.0591* (-17.6115)	0.2337* (7.7757)	0.55
Higher Ed.	0.4677* (8.2961)	-0.0082 (-2.6120)	-0.0579* (-16.1885)	0.1991* (6.0879)	0.52
	Random Effects				
Primary Ed.	0.4734* (7.4810)	-0.0024 (-1.0774)	-0.0711* (-30.6741)	0.2636* (5.3989)	0.83 (GLS) 0.89 (Unw.)
Secondary Ed.	0.4561* (7.9433)	-0.0030 (-1.4521)	-0.0802* (-31.7557)	0.2528* (8.0437)	0.84 (GLS) 0.91 (Unw.)
Higher Ed.	0.5444* (9.9490)	-0.0020 (-0.9518)	-0.0803* (-32.5774)	0.1854* (7.2317)	0.85 (GLS) 0.92 (Unw.)

* significant at the 1 % level (t-Statistics in parentheses)

Dependent Variable: log change of GDP per worker.

Total number of panel observations: 276 (includes 92 countries and three decades: 1960-70, 1970-80, 1980-90).

Human capital proxies: primary education (share of pop. over 25 years with primary school completed), secondary education (share of pop. over 25 years with secondary school completed), higher education (share of pop. over 25 years with higher education completed).

Methods of estimation: OLS with a common intercept for all countries and GLS with random effects.

Software: EViews 2.

Source: Own calculations.

when GLS are applied with random effects (table 1). The results can be interpreted as confirming the hypothesis that countries tend to converge to their steady state levels of GDP per worker in a conditional way. In other words, convergence obtains to the extent that certain levels of investment in physical and human capital support the transition to the steady state. Using the coefficient of the initial GDP per worker in the equations estimated for primary education in table 1 to derive the implied convergence parameter from the formula included in either Mankiw, Romer and Weil (1992) or Barro and Sala-i-Martin (1995), we obtain a value of 1.7 from the OLS estimation and one of 2.5 from the GLS estimation with random effects. This implies that conditional convergence, the speed with which countries approach their steady state, takes place at a speed of 1.7 and 2.5 percent per year, respectively. These results are quite similar to those presented by Mankiw, Romer and Weil (1992) and Barro and Sala-i-Martin (1995), who estimated an average speed of convergence of about 2 percent per annum. Actually, convergence towards the steady state at 2 percent per annum is not very fast: at this speed it takes a country 35 years to overcome half of the distance between the initial level of GDP per capita and its steady state value and 70 years to reach ¾ of the steady state level of GDP per worker. The assumption here is that the aggregate capital share (physical *and* human

capital) in income is close to 80 percent, with the share of physical capital accounting for 30 to 40 percent. With respect to the imbalance effect between physical and human capital, Barro (1997) includes a corresponding term in his equation and finds evidence pointing towards a positive impact of a good initial endowment with human capital on the speed of convergence to the steady state.

Thus the process of long-run growth is not an overnight phenomenon; it might take a country several generations to come near its steady state level of GDP per capita. Moreover, this process is not only conditional on the factors mentioned above (aggregate capital endowment). There are other factors that also appear to have an influence on long-run economic activity. Time-series and cross-section analyses carried out by Barro (1997), Benhabib and Spiegel (1997), Fischer (1993), Foders and Glismann (1987, 1992) and Heitger (1985, 1993), who investigated formal and informal relationships between growth and economic policies, indicate that variables representing the national institutional framework, openness and macroeconomic stability can have a considerable explanatory power, in addition to the traditional variables. Especially institutional aspects, such as the rule of law, the protection of private property rights, the development of

financial markets and small government seem to be positively related to growth. The same occurs to macroeconomic stability in the sense of a low rate of annual inflation, which generally obtains from appropriate monetary, fiscal and exchange rate policies accompanied by a productivity-lead wage policy. Furthermore, open economies with a negligible level of protection seem to perform well in the field of economic growth.

3. Issues in Human Capital Research

Although the theory of economic growth and the evidence supporting it may give the impression that we are quite knowledgeable about human capital, the truth is that we still do not know much about issues such as (i) the optimal quantity and quality of human capital necessary for sustainable growth, (ii) who should pay for education? or (iii) does education always pay off in terms of economic growth? For example, the empirical results presented above pertain to a sample of 92 countries representing a wide array of growth experiences. The evidence available in the literature for a subsample, namely for the core OECD countries, tends to point out that human capital might not be as important for rich countries as it seems to be for relative poor ones (Mankiw, Romer and Weil 1992). Thus there could be a range of the level of income per capita in which the impact of human

capital on growth is largest. Unfortunately, we have not yet been able to identify this range empirically. Moreover, if education is considered to be important for growth, how much should countries spend on it? Is there such a thing as an 'optimal' level of spending on education? Or are there 'natural' limits for spending on education? Can we expect the government to spend all its tax income for this purpose? Can we expect the government to raise taxes to the point of interfering with growth (see figure 1C in the Appendix) just to be able to increase education expenditure? What should the contribution of the private sector to the total cost of education be?

Furthermore, economists have the choice of looking at education in three different ways: as a consumer good, as an investment or as a screening device. If people get educated for fun and do not take into account other motives, the relation between education and growth breaks down. Something similar happens whenever educational achievement is seen as a mere signal, i. e. as a device used to help identify bright and capable people and not primarily to increase the skills and productivity of the labour force. Only if we adhere to the investment hypothesis do the macro and microeconomic theories of human capital survive. One of the problems that arises from the existence of alternative views of education is that it should

be extremely difficult to design an empirical test to discriminate between them in a satisfactory manner. In fact, an empirical test of the screening hypothesis, the formal statement of which is still pending, might be unfeasible.

III: The Potential of Eastern European Countries to Catch Up with the West

How far is Eastern Europe from the West? Not very far if we look at data on education. Educational attainment expressed as the share of the population of a specific age enrolled in primary, secondary and/or higher education puts Eastern Europe very close to the West (World Bank 1997). The same applies when other indicators are used. For example, the Third International Mathematics and Science Study (TIMSS) for pupils of the 8th and 12th grades clearly revealed that many countries of Eastern Europe meet world-class standards in mathematics and science and that they occupy higher ranking positions than the US and Germany (U.S.Department of Education 1996 and 1998).

While there are similarities between Eastern Europe and the West with respect to input and output measures of education, three differences should be noted. First, the process of systemic change has reduced the absolute

expenditure for education as well as the share of education expenditure in GDP in Eastern Europe. Second, the excellent performance of students from Eastern Europe in the TIMSS is in stark contrast with this region's per capita income. The latter can be taken as an indicator of potential productivity growth or convergence gap. And third, the science and technology system of Eastern European countries has not yet developed links to firms of the emerging private sector (Foders 1997b).

Moreover, the similarities that exist between Eastern Europe and the West can be interpreted as revealing not only similar strengths but also similar weaknesses. Particularly, many western countries are not very well prepared for guaranteeing a life-long learning for their populations. The same can be said with respect to the skills needed to meet the challenges of the knowledge society. In fact it is not at all sure, to what extent the adult population is in possession of the basic skills demanded today (OECD, Human Resources Development Canada 1997). Also, the drive with which economic agents and whole regions adopt new approaches to education and transform themselves into 'learning organisations' and 'learning regions' is not yet satisfactory (Foders 1997a, 1998). The deficits that exist affect areas that range from curricula and teaching methods in primary and secondary

schools to the need to expand tertiary (postsecondary, nonuniversity) educational opportunities in order to close the mounting gap between the human capital of recently educated young people and the skills of older people with work experience in an ageing society. Most of the deficiencies of western countries are shared by Eastern Europe.

Another aspect that tends to put pressure on the educational system are labour market imperfections. Rigid institutional structures in the labour markets preclude a flexible adjustment of wages in response to changes in the level and composition of the demand for and the supply of labour. They are often said to contribute to structural unemployment in the European Union, a region in which currently (1997/98) more than 18 million persons are out of work. A regime featuring high minimum wages and virtually no wage differentiation in the lower part of the wage spectrum creates no incentives for training. Besides, relatively high unemployment benefits also have an influence on the demand for training. The experience in western Europe with such a labour market regime shows that institutional rigidities tend to shift the demand for labour towards higher skilled labour: uneducated labour is substituted for educated labour because uneducated labour is too expensive. As a consequence, the probability that uneducated

persons find a job is further reduced and the demand for skilled labour is increased, although the supply of sophisticated jobs does not expand accordingly. Thus, in several countries of western Europe an unknown share of the higher demand for skilled labour largely derives from labour market imperfections and does not respond to higher labour productivity needs in the wake of technical progress.

IV. Turning Education into High Levels of Labour Productivity

Eastern Europe's great potential can be seen in its outstanding endowment with human capital. For this endowment to become productive, to contribute to economic growth and employment and to help Eastern Europe find a way out of the poverty trap a number of policies are necessary. First, domestic savings should be encouraged and channelled to physical capital accumulation through strengthened domestic financial markets. This should be complemented by policies aimed at attracting foreign direct investment as a vehicle for technology transfer and at continuously upgrading the stock of human capital. Second, labour markets should be organised in a flexible way, avoiding institutional rigidities and maintaining incentives to learn and to train. Third, the rule of law and the protection of private property rights (including intellectual property) should be guaranteed in order to support the

expansion of the private sector and technology transfer from abroad. Fourth, macroeconomic and political stability should prevail.

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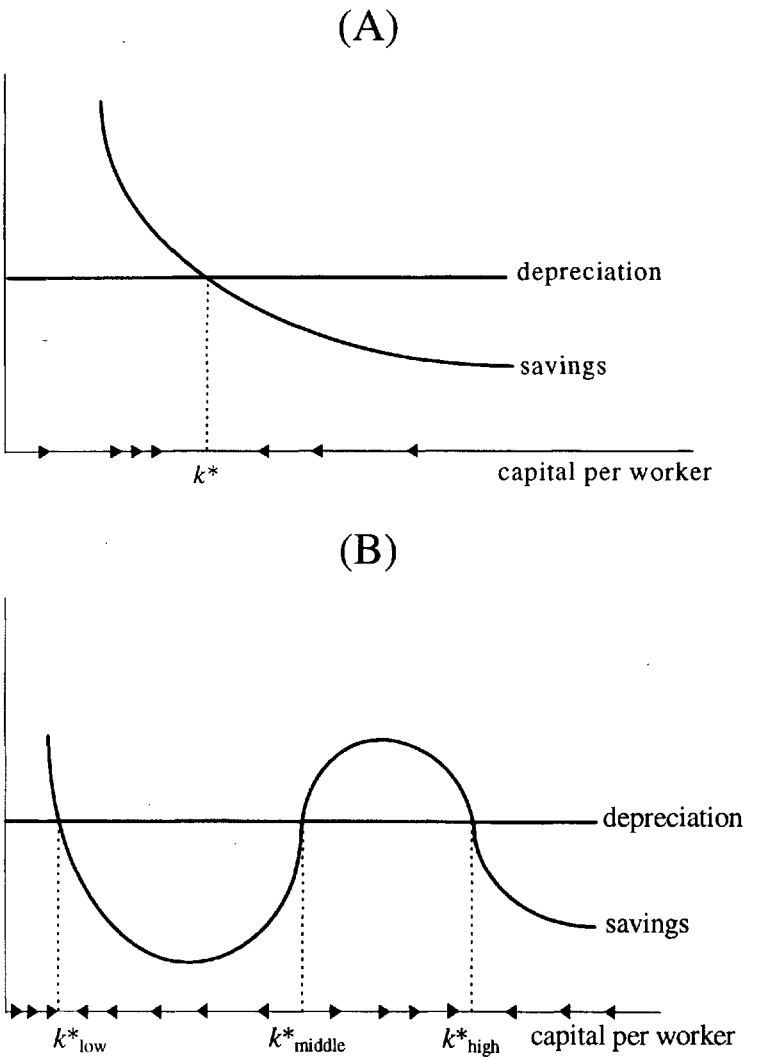
Appendix: Figure 1

Figure 1


(A)
depreciation
savings
k*
capital per worker
(B)
depreciation
savings
k*low
k*middle
k*high
capital per worker

(C)