

HUMAN CAPITAL AND THE FUTURE OF TRANSITION ECONOMIES*

By

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Abstract

Transition economies have an initial condition of high human capital relative to GDP per capita. But they will not necessarily realize their latent high growth potential. In the model, at a good equilibrium a large number of children of well-educated parents take advantage of their family backgrounds and invest substantially in their own human capital. At a bad equilibrium, past educational achievements are wasted as children fail to build upon their parents' achievements. I argue that this sort of multiple equilibria provides a basis for distinguishing development economics from transition economics.

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1. Introduction

What is special about countries in transition from communism? They are unusual in many ways, but a vital fact is that educational achievements in transition economies are out of all proportion per capita GDP. Educational levels are as high or even higher than in many rich countries yet the typical transition economies has a per capita GDP similar to that of a middle income developing country.¹

The empirical growth literature [e.g., Barro and Sala-i-Martin (1995)] indicates that education is very important for economic growth so one might suppose transition economies are in great shape. This is an important insight but not decisive. I argue that human capital in some transition economies may fall to meet current living standards rather than living standards rising to meet human capital levels. In particular, the model below will exhibit multiple equilibria; a good equilibrium can be associated with rapid growth while a bad equilibrium portends deterioration.

There is some support for this idea in a recent EBRD report. Based on a survey of foreign investors and domestic enterprises it concludes that:

“...firms in transition economies lag behind advanced industrialised countries in terms of the quality of their workforce. Such quality gaps are larger in the CIS than in CEE. This finding qualifies the view that the region has abundant human capital resources, despite considerable achievements in formal education. Moreover, the lack of restructuring in the less reformed economies of the region means that many skilled workers are performing jobs that do not reflect their levels of education. Over time, there will be a continuing loss of skills, leading to an even greater gap in quality.” (EBRD, 2000, p. vi)

The multiple equilibria of this model are natural for transition economies but not for typical developing economies. This is because the results rely strongly on an initial

¹ Gros and Suhrcke (2000) systematically investigate this question using cross-section regressions on 148 countries including transition countries and find that these countries have much higher secondary and tertiary enrollment rates than their per capita GDP would predict.

condition of high human capital relative to living standards. So, while transition economics and development economics surely have much to learn from each other, this paper provides one plausible basis of separation between the two fields.

Alexeev and Kaganovich (1998) is one of the few theoretical papers on human capital and transition.² It uses an adverse selection argument to show how uncertainty over whether or not a major reform will be implemented can lead more able people, the “good guys”, to prepare relatively little for the possible change compared to less able people. This is because the good guys do better in the unreformed system than the bad guys. If reform is actually implemented, good guys finish last due to their lack of preparation. In the present paper good guys will not finish last but the two papers share a general concern about underinvestment in human capital.

Fan, Overland and Spagat (1999) (FOS) argues that educational restructuring should have high priority early in Russia’s transition process, emphasizing the potential for loss of human capital without such a policy. Like the present paper, FOS studies the dependence of children’s human capital acquisition decisions on the human capital of their parents. However, FOS focuses on Russia rather than transition economies in general and it does not allow for multiple equilibria.

On the empirical side, Münich, Svejnar and Terrell (1999) is a good recent paper showing that the transition to communism has brought a significant increase in the returns to human capital in the Czech Republic. It also summarizes most of the earlier empirical work for a variety of transition countries that tends to draw similar conclusions. The present paper relies on the existence of such a premium in transition economies and

² Roland (2000) is an excellent general survey of theoretical work on transition.

studies the microeconomics of converting it plus high initial human capital into high human capital for a new generation.

Labán and Wolf (1993) and Roland and Verdier (1994) stress critical mass effects in privatization to argue for the possibility of multiple equilibria. The latter paper suggests that giving away a substantial amount of property can coordinate agents on the good equilibrium. Johnson, Kaufmann and Shleifer (1998) has multiple equilibria with transition economy firms deciding either to pay taxes and benefit from public goods or to pay for mafia protection and operate unofficially. There must be a sufficient number of firms operating officially for the state to attain the necessary scale to induce firms to reject mafia protection. Roland and Verdier (2000) has multiple equilibria in a transition economics setting based on coordination problems in law enforcement. They argue that their bad equilibrium can be broken by the prospect of early entry into the European Union. Certainty that the law will be enforced after entry causes agents to prepare themselves by becoming producers rather than predators even before the entry date. The multiple equilibria in the present paper operate through very different channels, but there is still complementarity between the different approaches since various factors can all reinforce a bad equilibrium simultaneously. Finally, there is now a large modern literature on development traps starting with Azariadis and Drazen (1990). The present paper contributes to that literature by identifying a specific type of development trap that applies broadly to typical transition economies but not to typical developing economies.

2. The Model

There are N families indexed by i , consisting of a parent and a child. The human capital of parent i is denoted h_{i0} while his child's human capital is h_{i1} . There is

intergenerational intellectual continuity, i.e., children of well-educated parents have a better chance of becoming well educated than children of poorly educated parents have.³ We take a particularly simple formulation. Each child will either chose education or not chose education.⁴ The human capital of child i is:

$$h_{i1} = \begin{cases} (h_{i0})^a & \text{if } i \text{ chooses education} \\ \underline{h} & \text{otherwise} \end{cases} \quad (1)$$

where $0 < a, \underline{h} < 1$. The main notion is that the better is the education of the parents the easier it will be for children to invest in human capital. There can be many reasons for this to be true. Well-educated parents might have more money to invest in their children than poorly educated ones. Parents with good education might value education more than parents with poor education do. The former group might also know better how to transfer education to children than the latter group does. Those who do not make a special investment get \underline{h} , the basic level of education that is prevalent in the society.

There are two sectors: a skilled sector and an unskilled sector. Children who do not invest in education earn a wage of 1 in period 0 and a wage of $1 + \frac{k^u N^s}{N}$ in period 2 for a lifetime income of $2 + \frac{k^u N^s}{N}$ where k^u is a constant and N^s is the number of children who choose education. Thus, the work of educated people in the skilled sector spills over to create technological and organizational improvements that increase the productivity of the unskilled sector. Educated people earn nothing in period 0 when they

³ Many papers have demonstrated this for a wide range of countries (Heyneman, 1995).

⁴ Of course, dividing the population into those who do and those who do not invest in education is a drastic but useful simplification.

are studying. Educated individual i earns $\left(w + \frac{k^s N^s}{N}\right) h_{i1}$ in period 1 where w and k^s are constants. Note that skilled workers are directly productive as well as creating spillovers in both sectors.⁵ The income of individual i is:

$$I_i = \begin{cases} \left(w + \frac{k^s N^s}{N}\right) h_{i0}^a & \text{if } i \text{ chooses education} \\ 2 + \frac{k^u N^s}{N} & \text{otherwise} \end{cases} \quad (2)$$

This human capital externality is very similar to that in Perotti (1993) and similar in spirit to the human capital spillover in Saint-Paul and Verdier (1993). These papers, however, focus on redistribution and political equilibrium.

Individuals make their educational choices to maximize their incomes, therefore individual i chooses education if and only if:

$$h_{i0} \geq \left(\frac{2 + \frac{k^u N^s}{N}}{w + \frac{k^s N^s}{N}} \right)^{\frac{1}{a}} \equiv h^c(N^s) \quad (3)$$

that is, a child's human capital investment decision will depend on whether or not parental human is above a cut-off level that depends on the relative wages of skilled and unskilled workers and the parameter a .

⁵ I can make wages depend on the total quantity of skills rather than the number of skilled agents and reproduce all the results with only a slight modification in Proposition 4.

We assume $wk^u < 2k^s$. This assumption implies that the skill premium is increasing in the number of skilled workers implying, in turn, that the cut-off level of parental human capital, $h^c(N^s)$, is decreasing in the number of skilled workers. This effect is likely to be large in transition economies because the potential for technological and organizational catch-up with the advanced nations of the world is very large and highly dependent on the availability of skilled workers.

Suppose further that: $\underline{h} < \left(\frac{2+k^u}{w+k^s} \right)^{\frac{1}{a}} < \left(\frac{2}{w} \right)^{\frac{1}{a}} < 1$. This implies that children of

parents with basic education will always choose basic education, because even with the maximum possible skill premium their family background is too weak to make it worthwhile for them to invest. It also implies that children of parents with one unit of human capital will always choose to invest in human capital, because their family background is so good that they will invest even with the worst possible skill premium. We also assume that the skill premium is necessarily positive, i.e., $w > 2$

Finally, we define an equilibrium in the model using the standard Nash concept. This set-up can be viewed as a game in which every player has two strategies; “invest” or “do not invest”. An equilibrium is a profile of strategies, one for each of the N children, such that each child is maximizing his own income taking as given what all the other children are doing. Note that for convenience we will assume that any agent who is indifferent between investing and not investing will choose to invest.

3. Analysis

3.1. An Example

In this section I compare a stylized transition economy with a stylized developing economy and argue that multiple equilibria are plausible for the former but not for the latter. An interpretation is that the typical transition economy has the potential, but not a guarantee, for rapid growth based on high human capital while the typical developing economy must rise gradually over a long period of time.

Consider the following illustrative example. At time zero there are three groups labeled “High”, “Medium” and “Low”. Each individual in the high group has parental human capital of 1, while those in the Medium and Low groups have parental human capital of $2/3$ and $1/3$ respectively. The sizes of the groups are 20, 60 and 20 respectively. Table 1 summarizes the initial conditions in this transition economy. This

Table 1. Human Capital Distribution for a Typical Transition Economy

	High	Medium	Low
Number	20	60	20
Human Capital	1	$2/3$	$1/3$

distribution is meant to reflect the idea that in a typical transition economy there are many people who have attained a good educational standard.

We contrast the transition economy with a developing economy at a similar per capita GDP. The latter stochastically dominates the former.⁶

Table 2. Human Capital Distribution for a comparable non-Transition Economy

	High	Medium	Low
Number	20	30	50
Human Capital	1	$2/3$	$1/3$

⁶ It is reasonable to consider these economies as experiencing similar per capita GDP. Much of the human capital in the transition economy would have low market value, having been acquired under communism when priorities (the military above all else) were very different from what they are now. However, it is crucial to note that while a Russian rocket scientist might earn very low wages, he still can do much to facilitate his children’s human capital acquisition.

Fix the parameter values as in table 3.

Table 3. Parameter Values for the Transition and Developing Economies

a	w	k^s	k^u
.5	2.3	1.5	1

The transition economy has two equilibria, a good one and a bad one. In the bad equilibrium only the High group invests in human capital. In the good equilibrium both the High group and the Medium group invest. There is no equilibrium in which the low group invests.⁷ There is only one equilibrium in the non-transition economy. In it, only the High group invests.⁸ The example suggests that in the transition economy case, in contrast with the developing economy case, there is much at stake. If expectations can be coordinated on a positive vision of the future, many people will invest in human capital and the economy will take off. Pessimism can be lethal.

3.2. General Results

Now consider the general case, beginning with the following observations.

Proposition 1. At least one equilibrium always exists.

⁷ When only the High group invests we have $h^c = \left(\frac{2.2}{2.6}\right)^2 = .72$ so only the High group will want to invest.

When both High and Medium groups invest then $h^c = \left(\frac{2.8}{3.5}\right)^2 = .64$ both of these groups but not the low group will want to invest. If all three groups invest then $h^c = \left(\frac{3}{3.8}\right)^2 = .62$ so investment by the low group will not be sustainable.

⁸ When only the High group invests we have $h^c = \left(\frac{2.2}{2.6}\right)^2 = .72$ so only the High group will want to invest.

When both High and Medium groups invest then $h^c = \left(\frac{2.5}{3.05}\right)^2 = .67$ so investment by the Medium group will not be sustainable. If all three groups invest then $h^c = \left(\frac{3}{3.8}\right)^2 = .62$ so investment by the low group will not be sustainable.

Proof. Consider the strategy profile in which no agent invests. If this is an equilibrium, the proof is finished. If not, there is at least one agent who wishes to invest even when no one else is investing. Consider now the profile in which all such agents invest. If this is an equilibrium, again the proof is finished. If not, at least one agent now wishes to invest. Continue this procedure until every agent is satisfied. (This might only occur when everyone is investing.)

Proposition 2. Every equilibrium can be characterized by a human capital level, h^e , with the property that every child with parental human capital weakly above h^e will invest and every child with parental human capital strictly below h^e will not invest.

Proof. Take any equilibrium and take the child with the lowest parental human capital who is still investing. Suppose there is another child with higher parental human capital who is not investing. That child must be able to earn at least as much income by investing as she currently earns by not investing so she must be investing.

The next result indicates that when there are multiple equilibria only the one with the lowest h^e is efficient.

Proposition 3. When there are multiple equilibria they are Pareto ranked. More children investing always means more efficiency.

Proof. Consider two equilibria with cut-off levels $h_1^e > h_2^e$ and strictly more children investing in the second equilibrium compared to the first.⁹ Then in the second equilibrium both skilled and unskilled workers earn higher wages than their counterparts in the first equilibrium. Moreover, some children who are unskilled in the first equilibrium are skilled in the second equilibrium so they also earn higher wages in the latter case than they do in the former case.

⁹ We would not consider there to be multiple equilibria since each child is making the same decision in both cases.

The last proposition shows there is wide scope for increasing human capital in the middle range while maintaining multiple equilibria in the model. Intuitively, increasing the human capital of individuals will not upset an equilibrium unless they move from one side to the other side of the cut-off point.

Proposition 4. Consider an economy with two equilibria characterized by $h_1^e > h_2^e$.

Transform this economy into another one by increasing the human capital of all parents, i , such that $h_2^e \leq h_0^i < h_1^e$ while maintaining the inequalities $h_2^e \leq h_0^i < h_1^e$. Then in the new economy there will still exist equilibria characterized by the same $h_1^e > h_2^e$.

Proof. Consider the equilibrium in the original economy characterized by h_1^e . In this equilibrium all the children who have different parental human capital in the new economy are not investing. If they still choose not to invest in the new economy, wages of both skilled and unskilled workers will be the same in the new economy as they are at the equilibrium characterized by h_1^e in the old economy. Therefore, the choices at this equilibrium will also be equilibrium choices in the new economy. A similar argument shows that the equilibrium characterized by h_2^e also survives the transformation from the old economy into the new one.

Proposition 4 indicates that the example of section 3.1 is rather robust. In particular, there is wide latitude to vary the parental human capital of the middle group, including dropping its homogeneity, while maintaining both the good equilibrium and the bad equilibrium. This suggests that whether a one transition economy does better than another might have little to do with differences in initial human capital distributions. Two economies can both have the potential for both good outcomes and bad outcomes with other factors determining which path is followed.

Proposition 4 does not show that increasing the bulk of middle range human capital cannot add new equilibria. The above example has already shown that, starting from an economy with a single equilibrium, increasing the number of children with moderate parental human capital can add a new Pareto-superior equilibrium.

3.3. Extensions

One easy extension makes an important policy point. A temporary inability of an educational system to support large-scale human capital investment can have a large negative effect on the economy's equilibrium. Consider again the above example and suppose the educational system cannot allow human capital investment beyond the basic level for more than 50% of the population. Then the transition economy becomes effectively equivalent to the non-transition economy. The education constraint breaks the high-investment equilibrium, causing a large loss of human potential. This constraint is leveraged so its impact is much greater than might be expected. Reducing the investing population to 50% decreases the wage premium sufficiently so that another 30% of the population does not invest, despite the presence of sufficient capacity. In other words, if half the middle group is forced out of educational investment, the other half drops out voluntarily. In this situation there will seem to be insufficient demand for education while potentially there is excess demand. This is important because one often encounters the view that returns to education are generally high in transition economies and therefore there is no problem with human capital accumulation. But people must have both the incentive and the opportunity to accumulate human capital if they are to do so.

Another obvious extension is to introduce financing constraints. Then children who would maximize their lifetime income by investing might still not invest due to

insufficient resources in the short run. The effect would be similar to that of a constraint on educational capacity.

Finally, the model can be imbedded in a full overlapping generations model (see Spagat, 2001 for details). The main result is that the population separates into two classes of dynasties. For one class, human capital converges to 1. For the other class it converges to \underline{h} . The initial time period is vital because then it is determined which dynasties rise and which fall

4. **Conclusion**

This paper is about the long-run future of countries in transition from communism. Unfortunately, there has been very little analytical economic work along these lines. These countries are undergoing major structural transformations while creating a large array of new institutions from scratch. Making mistakes at the beginning of the transition process can cause problems a long time. More positively, getting things right now can pay large dividends for decades. Rich countries have already established workable if not always optimal institutions and can survive an overemphasis on the short run. Transition economies must think about the future.

The communist world stressed education, mainly in pursuit of military goals. At the beginning of the transition, human capital stocks were highly distorted from the perspective of the world market economy. Nevertheless, this legacy is something positive that can underpin a long period of rapid economic growth. At the same time, the great human potential of transition economies can easily be lost.

The model suggests the importance of coordinating agents' beliefs on a high-investment equilibrium. Roland and Verdier (2000) suggest that a key element might be

to give many countries a decent prospect of joining the EU within a reasonable period of time. But this would not guarantee success. In addition, people with a willingness to invest must have sufficient financial resources to do so and education systems must provide good opportunities for people to acquire marketable human capital. With these elements in place, the future could be bright in transition economies.

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