

Market-Oriented Structural Reforms and Human Development: Evidence from Transition Economies

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Abstract

Market based reforms are expected to result in both higher economic growth and development. This paper studies the impact of reform of economic institutions and infrastructure sectors on the economic, educational and health dimension of human well-being among 25 transition economies. We use a panel data for the 1992-2007 periods and the LSDVC technique to analyse the effects of market-driven reforms on the Human Development Index (HDI) and reform packages using EBRD transition indicators. The results show that institutional economic reforms led to positive economic effect and significant impacts on other dimensions of human development. On the other hand, we find limited positive impact from infrastructure sectors reforms. However, not every aspect of reforms appear to generate positive impacts as the transition process is rather complex. For example, large scale privatizations seem to have had negative effects in health and economic outcomes. The results point towards the importance of the interaction among and the combined effect of different reform measures.

Keywords: human development, transition economies, institutions, market reforms

JEL Classification: C33, P28, O27

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1. Introduction

This paper assesses the impact of market-oriented institutional and infrastructure reforms on the economic, health and educational dimensions of the 'human development index' (HDI) across the popularly termed 'transition countries'. The transition countries comprise twenty-nine economies of Central and Eastern Europe and the Former Soviet Union (FSU)¹. The end of central planning implied that many of these countries implemented broad market-driven reforms as a part of thorough going economic and political changes in the early 1990s.

As such, the Soviet Union fragmented into 16 independent states in 1991. The new independent states had limited experience of independence and sovereignty. For example, Czechoslovakia, which experienced the “velvet revolution” in 1989, separated into the independent states of Czech Republic and Slovakia under a peaceful process in 1993. Yugoslavia followed similar path as Czechoslovakia with the independence of Slovenia, Bosnia, Croatia and Macedonia though the independence process in Yugoslavia was plagued by conflict and war (Lukic and Lynch, 1996). Nonetheless, the overwhelming majority of the newly independent states transited to a peaceful and democratic market driven framework for governance by 1992. Hence, the end of central planning paved the way towards implementing economy wide market-oriented reforms in the transition countries while allowing them to diverge politically and economically from each other (Nepal and Jamasb, 2012).

However, the transition countries that emerged from the collapse of communist regimes in the early 1990s experienced sharp economic decline as the output of the state sector shrank while the private sector was not developed enough to quickly close the output-gap (Fan and Fan, 1998). The early transition process was marked by dramatic economic and social issues resembling those observed in the central planning models in the 1980s. Some countries such as Lithuania and Slovak Republic in Eastern Europe

¹ The countries included can be divided into three groups: Central Eastern Europe and Baltic States (CEB) comprising Croatia, Estonia, Hungary, Latvia, Lithuania, Poland, Slovak Republic and Slovenia; South-Eastern Europe (SEE) comprising Albania, Bosnia and Herzegovina, Bulgaria, FYR Macedonia, Serbia, Romania and Montenegro; Commonwealth of Independent States (CIS) comprising Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia, Tajikistan, Turkmenistan, Ukraine and Uzbekistan. Besides these countries, Turkey and Mongolia are included in the transition economies as per European Bank of Reconstruction and Development (EBRD) areas of operation.

adopted a “shock therapy” approach to fully open and liberalize their economies as quickly as possible. In other countries, reforms were implemented more slowly, such as in the Commonwealth of Independent States (CIS). “Market fundamentalists” argued for quick and broad reforms as the solution for countries attacked by crisis. In contrary, “gradualists”, defended that the timing and sequencing of reforms was crucial to make the reforms work (Staehr, 2005). This led to complex and large scale experiences with economic reforms leading to diverse outcomes in the transition countries.

However, the complex set of the effects engendered in the transition towards a market economy from central planning necessitates studying the socio-economic aspects that spans well-beyond economic growth. As such, the effect of market driven economic and institutional reforms on the HDI remain to be examined in the aftermath of more than two decades of the remarkable market driven reform experiences in the transition countries. This paper attempts to fill this gap, as its purpose is broader than the literatures focused on conventional growth analysis. This is especially relevant from a policymaking perspective as the communist regimes in Europe (including the U.S.S.R.) presided over 17% of the world’s area and 9% of the world’s population under the central planning model while state employment accounted for 90% of the labour force in 1988 (Milanovic, 1998). Likewise, the education and health systems were widely available in these countries unlike other economies with similar levels of income although the quality of public services was often ignored to achieve quantitative goals (Federal Research Division, 1991).

The remainder of the paper is structured as follows. Section two briefly describes the constituents of the HDI. Section three provides a theoretical exposition based on a detailed literature review and sets a conceptual framework for the formation of hypotheses. The hypotheses to be tested by using advanced panel-data econometrics are presented in Section four of the paper. The data and econometric methodology is discussed in Section five. Section six presents the results. The results are further discussed results with relevant policy recommendations in Section seven. Section eight concludes the paper.

2. The Human Development Index (HDI)

The Human Development Index (HDI) is a composite index based on three distinct indicators: (i) longevity, (ii) educational attainment and (iii) standard of living (UNDP, 1999)². The underlying conceptual framework of the HDI stems from the capabilities and functioning approach where quality of life is translated into the capability to function in society, in terms of a set of beings and doings (Sen, 1989). Hence, the HDI had the explicit purpose "to shift the focus of development economics from national income accounting to people centred policies"(ulHaq, 1996).

The three indicators are scaled from 0 to 1 and have equal weights on the formulaic derivation of the HDI. A combination of these reflects different aspects of overall human well-being that go beyond a simple measure of economic welfare. The first Human Development Report (HDR) and the first HDI were in response to the "excessive preoccupation with GNP growth and national income accounts" that was based on a 'means' estimate and not in the 'ends' of well-being of the population (UNDP, 1990, p.9). It provided a tractable approach for analysis even if the procedure was subject to criticism and several concerns by researchers³. For example, the HDI indicators do not reflect factors such as rule of law, political freedom, etc. However, this can be the only feasible approach to overcoming the problem of measuring the capabilities framework of human development, as the set of human functioning is by definition almost unobservable (Ranis, 2004). As such, the HDI, even as a rough proxy, can serve as a diagnostic tool for opportunities in a society and implies a much richer and diverse set of human aspects than just income.

In the case of socialist countries, private initiative was limited or nearly non-existent in general and education and health services were widely present and provided for free, although there were critics about their quality, such as lack of medical items and a rigid educational system. Literacy levels were close to 100% before the transition process started (Murrell, 1991). There was also a functioning social security system with variable levels of protection across countries, but mostly satisfactory and with a flat

² An explanation on how the HDI is calculated is presented in Appendix A.2.

³ For a complete review of critiques to the HDI, see Kovacevic (2010).

distribution of social transfers⁴. However, the fact that the wage distribution was quite flat before the transition period was not necessarily positive, due to the extreme differences in income between socialist and capitalist countries throughout history (Matthews, 1986). Thus, the transition economies had some distinctive characteristics at the start of the process: low levels of income, but good standards of access to education and health, due to “previous investments made in social dimensions by previous regimes” (Tridico, 2006, p.25). This translates to more capabilities, which were mostly limited by a lack of social and political freedom.

3. The Literature and Evidence

Previous studies have not directly examined the impact of market-based reforms on the overall level of human well-being in the transition countries although some studies have analysed the effectiveness of the reforms on individual dimensions of the HDI. These dimensions include economic growth, returns to education and healthcare. The impacts of reforms on economic growth in transition economies have been studied extensively and there is a sizeable literature on the subject. Fischer et al. (1996) pioneered the literature with data for the period between 1992 and 1994 and using transition indicators as cumulative indexes, finding a positive relationship between cumulative reforms and growth. Havrylyshyn (2001) conducted an extensive survey on the existing literature after the effort of Fischer et al. about economic growth in transition economies, stating that there is a wide consensus about the determinants of growth. Similarly, Black et al. (2000) attributed the shrink in national output to the flaws in the privatization efforts in the transition countries. Staehr (2005) suggested alternative methodologies and insights into growth and reforms using “market fundamentalism” versus “gradualist” arguments in concluding that reform sequencing also appears to be important when fast reforms seem beneficial.

Most of the above studies have used the transition indicators from the European Bank for Reconstruction and Development (EBRD) as the primary source of data. However, Raimbaev (2011) used the governance indicators from the World Bank available from

⁴ For a discussion of income, poverty and social transfers in communist regimes, see Milanovic (1998).

1996 and found a crucial role for governance in generating economic growth. Likewise, most of the studies using the reform indexes of the EBRD focussed on the institutional indexes and their performance, instead of a combined analysis or interactions of economic and infrastructure reform. However, Aghion and Schankerman (1999) presented a model showing that investment in physical and institutional infrastructure, besides reducing direct costs, allows lower transaction costs and a higher level of competition, through indirect effects or “transition impacts”. De Macedo and Martins (2008) found the interaction between governance and infrastructure reforms to increase efficiency of investments while the interaction among the liberalization and financial reforms enhanced the profitability of investments.

Likewise, the transition period had important implications in the life of the citizens of the ex-USSR as economic and political changes were triggered. For example, factors crucial to human development such as the nature of labour relationships and the role of women in society changed with the transition from central planning towards market. Tridico (2006) studied the relationship between human development and economic growth during transition concluding that investing in human development is a sufficient but not necessary condition for economic growth. The author argued that “institutions and institutional policies are crucial for a development process” in the context of transition economies. Tridico (2006) also notes that death rates have risen and life expectancy had declined, especially in the Baltic States and the CIS, while privatisation often generated second class health systems, and that after 1989 public spending in education has fallen as a consequence of a decrease in GDP⁵.

However, in planned economies wages did not clearly reflect the level of education and returns to schooling were low. Therefore, opening the economy and transforming it into a market economy could have increased returns to schooling. This claim is often studied, with mixed results. Flabbi et al. (2007) found weak evidence of rising returns to education, except in Russia and Hungary where that rise was noticeable. This claim is not consensual as it can be argued that economic reforms could have created the conditions for better educational attainment statistics (through growth and accessibility

⁵ Data on public expenditure is scarce for transition economies, especially for education. The gap between spending and efficiency is also a reason why spending amounts should not be taken into account.

improvements), even if spending on education was reduced and the quality of the system decreased. It is difficult to measure the latter, and it is clear that being enrolled in a school is not the same as acquiring more capabilities by being enrolled. However, enrolment is easily measurable and is valuable information by itself. Other issues tackle the educational system in transition: the staffs were trained to teach in the old and rigid framework of central planning where skills were not developed or encouraged, while the required skills in a market economy are different (Berryman, 2000). As the economy and the system changed, workers trained under the central planning model were not qualified to work in a market economy. This implies that returns to education can be much higher for those who have already studied in the transition period.

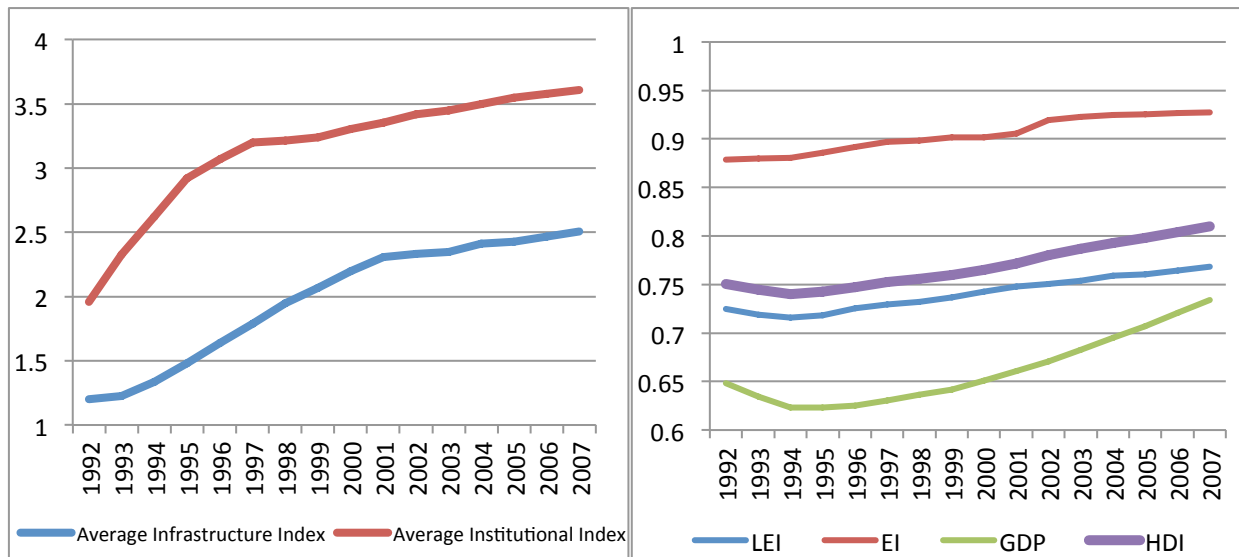
The literature suggests that large scale privatizations led to the deterioration of health conditions. King et al. (2009) attributed the increase in mortality in ex-communist countries to mass privatization leading to the increase of alcohol-related deaths, suicides and cardiac problems. These factors had a negative impact on life expectancy. The rapid changes in the economy and society generated stress with the above mentioned consequences. These arguments are also supported by the findings in (Tridico, 2006, p.26) who argued that “people with low income, and in general the losers of transition, could not afford the more expensive and more advanced private health care services”. However, the problems in the Russian healthcare system which is the largest of all in the transition economies and underwent mass privatization were not caused by the state of the economic system (Tompson, 2007). Rather, factors such as alcohol consumption and traffic crashes played a role. Nonetheless, it is not realistic to assume that all aspects of the fundamental components of HDI such as education and health outcomes can be objectively and explicitly quantified and modelled. Therefore, there is a need for more simplified approaches to be adopted as shown in Section five of this paper.

4. Hypotheses and Conceptual Framework

The aim of this paper is to assess the relationship between market-driven economic reforms and the HDI in the transition countries. When studying economy-wide reforms it is necessary to consider the interaction between reforms and their effect on the HDI as

a whole as well as on individual components of the Index. The changes in these components followed different patterns as reforms triggered ambiguous impacts across the transition countries. While education and health systems suffered the serious consequences of under-investment, the collapse of the centrally planned economies caused a sharp decline in GDP (Tridico, 2006). Thus, the transition economies adopted different strategies considering these initial conditions in the early 1990s. This led to different paces for implementation of reforms and different packages of reforms, which might have been simply institutional or also accompanied by advances in infrastructure and the regulation framework associated to it. Figure 1 shows the evolution of reforms and economic and social outcomes over the transition period.

Figure 1. Evolution of reform indices and Human Development Index (1992-2007)⁶



Source: EBRD (left) and World Bank/UNDP/UNESCO (right)

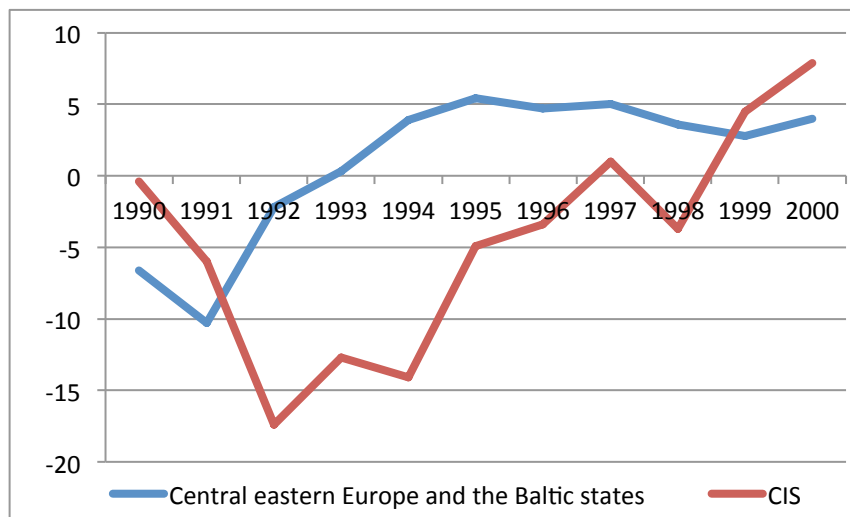
As shown in Figure 1, the HDI and its components rose steadily since 1995 despite a sharp decline in the GDP index and a decrease in life expectancy in the first few years of the process. This was likely to be possible because a reasonable institutional framework was already in place, and the indexes arose during the following years, as institutions approach the characteristics of those of a market economy. Infrastructure sector reform and changes could also be important, though perhaps less so than

⁶ LEI, EI, GDP and HDI refer to Life Expectancy Index, Education Index, GDP Index and Human Development Index respectively, with data from the UNDP.

institutional advances, as the latter ones fundamentally changed the structure of the economy and its activity.

Countries with modest or low reform efforts were struggling economically. Generally, the “shock therapy” approach adopted in Eastern Europe was not followed by other regions, such as in the CIS or Asian countries, where slower approaches were adopted. Differences between their growth patterns are clear in early periods of transition, where the blocks that applied quicker reforms came out of recession earlier and achieved consistent growth throughout the 1990s (Figure 2).

Figure 2. Real GDP growth in economic blocks (1990-2000)



Source: EBRD Transition Report 2002

Thus, the following two hypotheses are formulated as a link between reforms and changes in dimensions of human development based on the arguments of market fundamentalists and policy linkages between infrastructure and institutional reforms respectively. The market proponents argue for quick reforms in all fronts. This implied that the level and quality of institutional and infrastructural endowments changes across the transition countries as quickly as possible post-reforms. Likewise, policy linkages between infrastructure and institution reforms coupled with the gains from combining both types of policies can impact different dimensions of human development though to differing extent.

Hypothesis 1

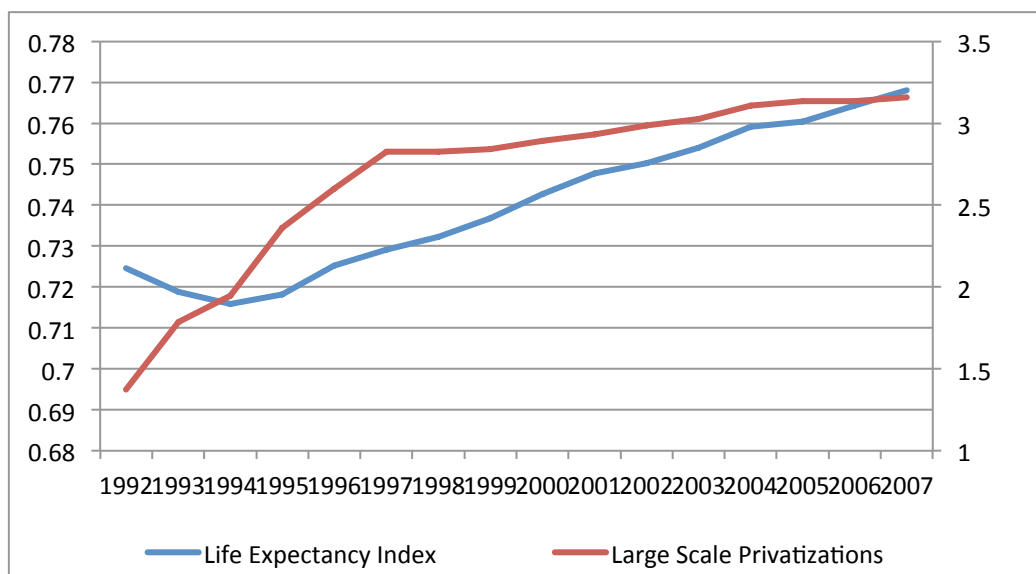
“A comprehensive set of reforms is beneficial for all dimensions of human development as the economy progresses into a market economy.”

Hypothesis 2

“Infrastructure sector reforms contributed to human development, on their own or when combined with institutional reforms”

However, other issues arise when the possibility of a negative impact of reforms is considered. In many transition economies, mass privatizations were done quickly without appropriate institutional and legal frameworks (Stiglitz, 1999; Nepal and Jamasb, 2012). Hence, it is possible that the privatisation process created negative effects, at least in the short run. The stress caused by sudden social and economic changes increased health risks. As such, large scale privatizations should have a negative effect on life expectancy, even if they have different impacts on other dimensions of human development. A combination of large scale privatizations with insufficient governance reforms should worsen the problem. Figure 3 shows how life expectancy was declining as the privatization process was advancing. It then recovered to pre-transition values in the late 1990s across the transition countries indicating a possible causality link between life expectancy and reforms. This leads us to formulate the following hypothesis:

Figure 3. Evolution of large scale privatizations and life expectancy (1992-2007)



Source: EBRD/World Bank.

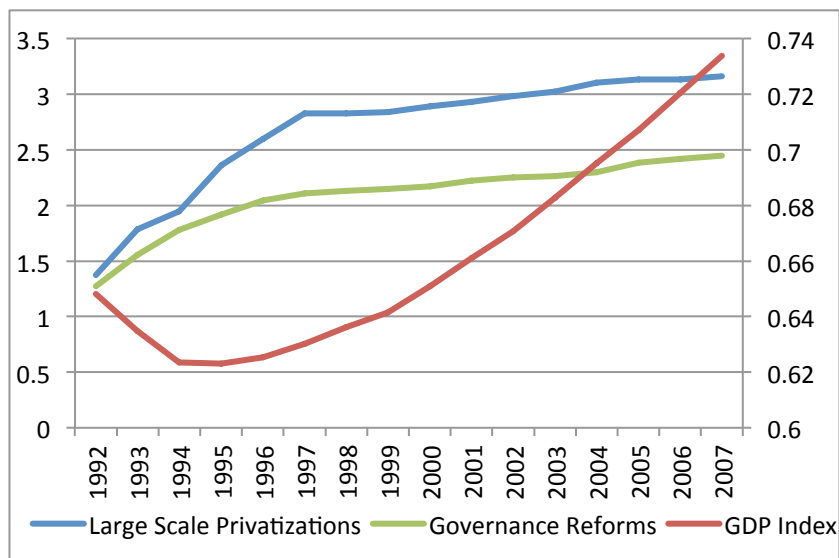
Hypothesis 3

“Large scale privatizations helped creating “second class” health systems, where the poor don’t have access to appropriate healthcare”.

The privatization efforts were also criticized due to poor selling processes and occurred under the 'velvet gloves' such as wide-spread corruption, lack of rules and transparency and lack of planning of the process (Stiglitz, 1999). This also largely affected the privatization of the infrastructure sectors and utilities such as electricity and telecom. Thus, it is likely that the mass privatization process could have had a negative effect on GDP primarily because it was not preceded or properly accompanied by extensive governance and regulation reforms. Figure 4 shows that the privatization efforts were carried out quickly, faster than the average of all other reforms, while countries were struggling with sharp falls in GDP.

This might imply policy failure due to lack of reform complementarity. As countries were selling assets as a matter of urgency to tackle their budget and debt problems, it can be argued that the process was not timed and prepared properly. Therefore, we formulate our fourth hypothesis.

Figure 4. Evolution of GDP, large scale privatizations and governance (1992-2007)



Source: EBRD / World Bank. .

Hypothesis 4

“Large scale privatizations had a negative effect on GDP due to the “dirty privatization” phenomenon” as explained by Black et al. (2000).

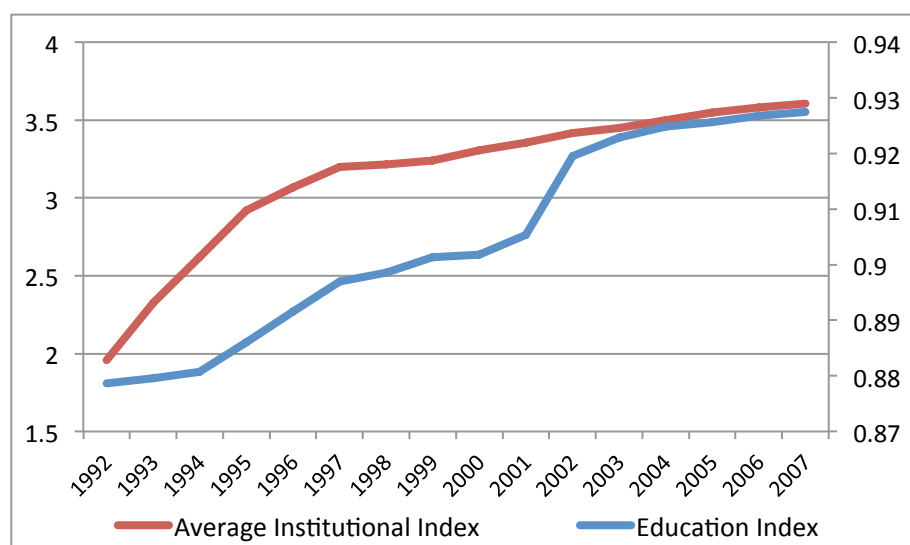
The impact of reforms in education is also important issue in the context of transition countries. Communist regimes kept returns to education very low by applying a wage grid (Munich et al., 2000), implying that transition towards a market economy should increase such returns. Increasing returns to education could have an impact on enrolment ratios by creating further incentive to pursue higher levels of education and achieve a better job with a high wage.

Figure 5 shows the behaviour of institutional advances and the education index which involves school enrolment and literacy ratios. Since literacy was already very high before transition (close to 100% in most countries), changes in this index are fundamentally explained by changes in enrolment ratios. Thus, the previously exposed argument leads us to formulate our fifth hypothesis.

Hypothesis 5.

"The overall reform effort should bring positive effects to enrolment in higher levels of education as returns to higher education increase, affecting the Education Index positively".

Figure 5. Evolution of institutions and the Education Index (1992-2007)



Source: EBRD/UNDP/UNESCO.

However, a further note on reform complementarity is required to understand the framework of transition economies. A specific reform category can have different impacts on each component, sometimes with the opposite effect. Table 1 summarizes the expected effects after the exposition about all dimensions of human development and their links with institutions.

Table 1: Reforms and effects in HDI components

	GDP		EI		LEI	
	+	-	+	-	+	-
Large Scale Privatizations	Improves efficiency and stimulates investment	“Dirty privatization” without governance reforms	Market economy increases returns to education Positive effects of growth and infrastructure	“Shock” therapy causes social problems in short-run (e.g. unemployment, school dropouts)	Can create more efficient health services	“Second class” health systems Degradation of life conditions / Quick social changes
Small Scale Privatizations	New firms					
	More competition					
Governance Reforms	Better regulation				Improves quality and management of services	
	“Smarter” investments					
Liberalization Reforms	Reduces price distortions	Short-run negative effects of “shock therapy”				“Shock therapy” causes social problems (e.g. unemployment, higher alcohol consumption, etc.)
Financial Reforms	Capital markets	No governance reforms imply inadequate bankruptcy and lending procedures			Macro-economic stabilization avoids economic problems causing social problems	
	Easier credit					
	Macro-economic stabilization					
Electric/Water Infrastructure Reforms	Higher investment profitability	Possible negative effects from lack of institutions				Improves living conditions if the starting infrastructure was very poor
Telecommunication/Road Infrastructure Reforms	Investment profitability	Possible negative effects from lack of institutions	Makes education services more accessible		Makes health services more accessible	
	Tears down distance barriers					

Source: Authors own collection

5. Data and Methodology

This paper examines the impacts of market-based structural reforms on the HDI in the transition countries. We use the HDI data available from UNDP as dependent variables from the year 1992 to 2007. UNDP has been publishing Human Development Reports with HDI scores for many countries since 1990. Ensuring data compatibility is important and the Human Development Report Office advises against constructing trend analyses based on data from different editions (UNDP, 2005, p.212). Therefore, an extensive rebuild of the HDI data was undertaken in order to ensure consistency in the dataset across all the years.

The new HDI data were constructed based on the methodology introduced by the 1999 Human Development Report although the UNDP changed the HDI methodology since 2010. The change included using the Gross National Income (GNI) instead of GDP and measures of years of schooling for the Education Index which may lead to a loss of many observations due to lack of data on those new variables. We constructed the income index based on per capita GDP⁷ (with 2005 constant PPP\$ values) and the life expectancy index based on life expectancy at birth.

The lack of a consistent single dataset for the education index implied that the index was retrieved from the respective Human Development Reports for the years 1992-1995 and 1997-2007. The value for the year 1996 was based on an average of the 1995 and 1997 index values. The limited UNESCO data for education shows that there is a reasonable approximation of the data behaviour. We use the same values from the first available year for two countries that started to appear on the reports after 1992 in order to avoid the problems of missing data⁸. We use the UNESCO data on education in order to construct an Education Index for Mongolia and Uzbekistan due to inconsistencies between reports. This implies that the HDI retrieved for each country in a given year in our study is not directly comparable to values in the UNDP reports. However, this was

⁷ It is common to take logarithms of GDP to proceed with analysis. However, the GDP index bounded between 0 and 1 already includes a form of logarithmic income discounting.

⁸ This specific issue affects Croatia and Macedonia in 1992 and 1993 (affecting a residual 2% share of the dataset). Limited UNESCO data for 1993 does not lead us to reject the assumption of constancy.

necessary to improve the quality of data and make them suitable for the purpose of this study.

The data for the independent variables was obtained from the transition indicators scores published by the EBRD. The indicators are bounded between 1 and 4+ and are mainly separated in two main sections: institutional reforms and infrastructure reforms. A score of 1 or close to 1 in these indicators implies an overall lack of appropriate institutions and framework to manage the economy with a considerable distance from the mechanisms of a market economy. A score of 4+ implies that the country has the same standards and performance as an advanced, industrialized economy, with fully working institutions and regulated/decentralised infrastructure networks⁹. Table 2 lists the dependent and independent variables used in this study.

Table 2: Dependent and independent variables and their sources

Variable	Components	Source
Human Development Index (HDI)	Life Expectancy Index – LEI	World Bank World Development Indicators
	GDP Index – GDP	
	Education Index – EI	UNDP Human Development Reports / UNESCO
LSP	Large Scale Privatization	EBRD
SSP	Small Scale Privatization	
ER	Enterprise Restructuring	
CP	Competition Policy	
TDF	Trade and Forex System	
PL	Price Liberalization	
BANKLIB	Banking Reforms and Interest Rate Liberalization	

⁹ There is also a railway infrastructure reform index, which is not included in our analysis due to lack of sufficient data.

SECFIN	Securities Markets and Non-Bank Financial Institutions	
Infrastructure Reform Indexes	Telecommunications (TELREF)	
	Electric Power (ELECREF)	
	Roads (ROADREF)	
	Water and Water Waste (WATEREF)	

Source: Authors own collection

The dataset used is, therefore, a balanced panel where the number of cross-sections (number of countries) is 25 ($N=25$) for the key reform time period between 1992 and 2007 ($T=16$), with a total of 400 observations. Table 3 below presents the properties of the data used in this study. Most of the variability in the HDI originates from changes in income. This is expected because life expectancy and education levels tend to be fairly persistent. The Education Index is high across transition economies due to the priority given to the educational system in these centrally planned economies. The correlation between human development dimensions such as the correlation between GDP and the HDI is high and the correlation of the Education Index with other dimensions or reforms is generally low. All variables appear to be stationary, avoiding the pitfalls of spurious regression results. We infer from the descriptive statistics that multicollinearity might lead to confusing inference justifying the use of a dimension reduction methods in our secondary analysis¹⁰.

¹⁰ Results of multi-collinearity tests are present in Table A.2. Allison (1999) points that a VIF value above 2.5 is problematic, although different authors give different rules of thumb. Belsley (1980) points that a condition index above 30 represent a serious problem.

Table 3: Descriptive statistics

Variable	Mean	Std. Dev	Min	Max
HDI	0.769	0.066	0.624	0.931
GDP	0.662	0.136	0.357	0.930
EI	0.904	0.037	0.760	0.980
LEI	0.740	0.060	0.597	0.893
LSP	2.683	0.913	1	4
SSP	3.472	0.904	1	4.33
ER	2.122	0.719	1	3.67
PL	3.83	0.625	1	4.33
TDF	3.459	1.103	1	4.33
COMPOL	2.057	0.621	1	3.67
BANKLIB	2.370	0.872	1	4
SECFIN	2.018	0.732	1	4
ELECREF	2.273	0.923	1	4
WATEREF	1.931	0.906	1	4
ROADREF	1.939	0.708	1	3.67
TELREF	2.271	0.950	1	4

Source: Authors own collection

However, the relationship between human development and reforms is complex. This is because the existing level of human development can depend on country-specific unobserved characteristics (e.g. culture, socio-economic factors and political systems) as well as the past levels of human development. As such, the complexity justifies the need for a dynamic model that accounts for unobserved heterogeneity. Fixed effects and Random effects panel data models can account for unobserved heterogeneity. Although it is common to use a Hausman test to find the most adequate method, in this case it is likely that reforms are correlated with the unobserved heterogeneity that is fixed over time (Nepal and Jamasb, 2012). This violates the assumption of no correlation between the composite error term and the explanatory variables of the Random Effects model, justifying the use of a Fixed Effects model.

Thus, we use a dynamic panel data framework. However, when the time dimension (T) and the number of countries in the sample (N) are both small, the Least Square Dummy Variable (LSDV) estimator is not consistent for a finite T. Bruno (2005) developed a bias-corrected LSDV estimator (hereafter called LSDVC), under the conditions of

having the error term as an unobserved white noise disturbance and having a strictly exogenous selection rule. In Monte Carlo experiments, the study confirms that LSDVC outperforms other estimators. Standard errors are retrieved through a bootstrapping method with 100 repetitions. A second order bias approximation was performed using the Blundell-Bond estimator as a consistent estimator for bias correction procedure¹¹. This implies that reforms are uncorrelated with past, present and future shocks. Likewise, the assumption is stronger than the classic weak exogeneity assumption on growth regression analysis but allows for more precise estimations in a small-sample framework as long as the assumption holds. The testing procedures broadly support this hypothesis on the assumption that policymakers ultimately decide which reforms to implement (see Berg et al., 1999)¹².

Another possible issue with the estimation procedure is the presence of cross-section dependence across the economic, educational and health among the transition economies. There can be bias in estimates under the presence of such a problem in dynamic panels with fixed-effects (Phillips and Sul, 2007). Hence, we test for cross-section dependence using the Cross-section Dependence (CD) test which has good power in small samples (Pesaran, 2004).. The null of cross-section independence is not rejected for any of the regressions at 1% significance level, giving no clear evidence of the presence of such an issue in our data (see table A.3 in the appendix). Given that the exogeneity assumption holds and there is no evidence of cross-section dependence, Thus, we validate LSDVC as preferred method for estimation given that the exogeneity assumption holds and there is no evidence of cross-section dependence.

The tests are carried out using two models. First, the basic model without reform interactions is presented which allows identification of the main reforms to human development and its components, but this is potentially exposed to the multicollinearity problem. However, reform interaction is an important issue and should be approached

¹¹ Arellano-Bond and Anderson-Hsiao estimators can also perform this task. However, results are very similar between estimators, as Bruno (2005) points in Monte-Carlo studies, therefore only Blundell-Bond is presented.

¹² A test for strict exogeneity is discussed in Wooldridge (2002, pp.284-285). Leads of regressors are added to the original regressions and a joint test of their significant is conducted. Failure to reject the null implies strict exogeneity holds.

in such a way that treats the above mentioned problems. Thus, as a second approach, a Treelet transform of the data (Lee et al., 2008) is applied in order to generate “reform clusters”. The Treelet transform is a technique for dimension reduction that generates components that are typically sparse. While this is an unsupervised dimension reduction technique¹³, the resulting components have two major advantages. First, the components that involve more than one variable have an economic interpretation related to the transition context. Second, the components that result from only one variable will not be affected by multicollinearity in estimations, providing more precise inference about these variables individually. This is particularly useful for large scale privatizations, as a part of the hypothesis testing process, and variables where significance was occasionally a borderline case (e.g., COMPOL). Those components or reform clusters are then used as regressors, to gain insight into the significance of reform packages. This allows us to assess the significance of interaction terms between reforms without multicollinearity.

The chosen specification is represented by Equation 1 below:

$$Y_{it} = \gamma Y_{it-1} + \beta X_{it} + \varphi_i + \mu_{it} \quad (1)$$

where γ is the coefficient of the lagged dependent variable, β is the vector of coefficients of the explanatory variables and φ_i is a set of fixed effects. Although Staehr (2005) uses a linear time trend and Falcetti et al. (2006) use a non-linear trend capturing patterns across countries, yearly time dummies are also included to capture non-linearities more appropriately. The inclusion of contemporary reforms instead of lagged ones does not significantly change the results¹⁴. Two models are tested where Model (1) has X_t as the set of individual reforms (the EBRD indicators with the mentioned aggregation) and Model (2) has X_t as the set of Components of the Treelet method as a representation of reform packages.

¹³ Supervised dimension reduction methods are in theory superior. The Sliced Inverse Regression (SIR) method (Li, 1991) was attempted; however the problems with the interpretation of PCA were not greatly improved, leading to the choice of an unsupervised technique that generates sparse components.

¹⁴ Staehr (2005) points that the EBRD indexes are scored in the middle of the year, which already implies some distance in time to the determination of the dependent variables.

6. Results

This section presents the results specified by the two models described to assess both individual reform impact (with results possibly affected by multicollinearity), with reform packages and with the inclusion of interaction terms to account for relationships between reform packages. The first model accounts for effects of reforms “on their own” while the second model aims to assess which reform packages have been important for the HDI outcomes by using a method of dimension reduction, followed by the addition of interaction terms. Table 4 presents the estimations for Model (1) and Tables 5 and 6 present component weights and regressions using those weights respectively. The lagged dependent variable is significant in all estimations as expected, showing the persistent of such economic and social outcomes. Standard errors are reported in brackets.

Table 4: Regression results for Model (1)

	HDI	EI	LEI	GDP
Dep.Var (-1)	0.9422 (0.0286)***	0.7689 (0.0517)***	0.9232 (0.0271)***	0.9688 (0.0212)***
LSP	-0.0007 (0.0011)	0.0072 (0.0024)***	-0.0030 (0.0012)**	-0.0047 (0.0018)***
SSP	0.0013 (0.0014)	-0.0040 (0.0032)	0.0017 (0.0016)	0.0067 (0.0024)***
ER	0.0005 (0.0015)	-0.0031 (0.0033)	0.0015 (0.0017)	0.0019 (0.0024)
PL	-0.0013 (0.0011)	0.0001 (0.0025)	0.0003 (0.0017)	-0.0011 (0.0019)
TDF	0.0029 (0.001)***	0.0009 (0.0023)	0.0007 (0.0011)	0.0059 (0.0016)***
COMPOL	-0.0016 (0.0013)	0.0001 (0.0029)	-0.0032 (0.0015)**	-0.0014 (0.0022)
BANKLIB	0.0009 (0.0013)	0.0034 (0.0029)	0.0015 (0.0014)	-0.0006 (0.0021)
SECFIN	-0.0009 (0.0012)	0.0012 (0.0026)	0.0019 (0.0013)	-0.0046 (0.0019)**
TELREF	-0.0005 (0.0009)	0.0034 (0.0020)*	0.0015 (0.0010)	-0.0046 (0.0015)***
ELECREP	-0.0004 (0.001)	-0.0023 (0.0023)	0.0009 (0.0011)	-0.0009 (0.0016)
ROADREF	-0.0004 (0.001)	0.0007 (0.0029)	-0.0005 (0.0015)	-0.0026 (0.0021)
WATEREF	-0.0008	0.0009	0.00005	-0.0015

	(0.001)	(0.0023)	(0.0011)	(0.0016)
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***, ** and * denote significance at 1, 5 and 10% levels respectively.

It is common to use LSDVC theoretically assuming strict exogeneity of the used variables. However, in many cases, the assumption is not tested. Staehr (2005) stated, in the context of growth analysis, that “the marginal effect of reforms on growth is broadly similar whether or not one seeks to correct for the endogeneity bias” (pp.182). In this case, at 5% significance level, it can be said that the exogeneity assumption holds, which is important for the validity of the LSDVC results.

Next, the estimated weights of the components from the Treelet transformation are estimated. The seven components that explain most of the variation are selected, with the optimal cut-level of the cluster tree selected accordingly. This represents an improvement in interpretation from classic Principal Component Analysis, as components are more sparse and do not present conflicting weights.

The retrieved component weights are shown in Table 5. The regression results using the component weights are then presented in Table 6.

- C1 is a component with a broad mix of policies, based mostly on infrastructure (excluding electricity and roads), banking and enterprise restructuring reforms. This is an “overall reform package” that does not include opening the market or privatizing companies, but only significant advances in the way banking, governance processes and infrastructure and utilities are managed. In other words, this represents an economic reform without opening the market and attracting private and foreign investors.
- C2 is a mix of trade and foreign exchange reforms and small scale privatization policies. This is an “early reform variable”, as these two reforms were usually early steps in reform efforts in transition economies, and are associated with market opening and attracting private sector initiative to the economy.

- C3 to C7 consist entirely of one variable each, large scale privatization, road infrastructure reforms, trade and foreign exchange systems and competitive policy measures respectively.

Table 5: Components weights from Treelet transformation

Variable	C1	C2	C3	C4	C5	C6	C7
LSP				1			
SSP		0.71					
ER	0.46						
PL			1				
TDF		0.71					
COMPOL							1
BANKLIB	0.46						
SECFIN	0.44						
TELREF	0.44						
ELECREF						1	
ROADREF					1		
WATEREF	0.44						

Table 6: Regression results from the component weights (Model 2)

	HDI	EI	LEI	GDP
Dep.Var (-1)	0.9439 (0.0265)***	0.7761 (0.0476)***	0.9255 (0.026)***	0.9622 (0.020)***
C1	-0.0003 (0.0007)	0.0029 (0.0017)*	0.0023 (0.0008)***	-0.004 (0.0011)***
C2	0.0037 (0.0008)***	-0.002 (0.0018)	0.0019 (0.0009)**	0.0098 (0.0013)***
C3	-0.0005 (0.0007)	0.0003 (0.0015)	0.0001 (0.0008)	-0.0004 (0.0011)
C4	-0.0007 (0.0009)	0.0061 (0.0022)***	-0.0028 (0.0011)**	-0.0038 (0.0016)**
C5	-0.0005 (0.0009)	0.0007 (0.0020)	-0.0005 (0.0010)	-0.0023 (0.0015)

C6	-0.0005 (0.0009)	-0.0019 (0.0019)	0.0007 (0.0009)	-0.001 (0.0014)
C7	-0.0011 (0.0008)	-0.0002 (0.0018)	-0.0021 (0.0009)**	-0.001 (0.0013)

***, ** and * denote significance at 1, 5 and 10% levels respectively.

Regarding the components with a single variable, there is no change in results from the previous regression in terms of significance, meaning that multicollinearity does not appear to be affecting the results. One of the effects of multicollinearity is that the standard errors might be too high, leading to the lack of significance of variables that are significant.

We also test for interaction between the components by adding multiplicative terms. Thus, we avoid using the original EBRD indexes due to the “dimensionality curse” and multicollinearity as the test for significance has low power for that. When such terms are included, inference on the lower-order coefficients becomes irrelevant and only the inference on the multiplicative term is legitimate (Braumoeller, 2004). Staehr (2005) mentioned that the tests for significance of the multiplicative terms have low powers, especially when variables exhibit low variations (as in the case of EBRD indexes).

We consider a set of possible interactions: the interaction of C1/C2, C1/4, C2/C4 and C4/C7, to assess the impacts of interactions between the most important economic reform packages and their relationship to large scale privatizations and finally, the interaction of privatizations with governance reforms in the context of disorderly privatization process). This provides us with additional information related to the hypothesis outlined previously.

In order to assess the importance of the macroeconomic reforms to trigger effects of electricity reforms, the interaction terms C1/C6 and C2/C6 are also considered. This inclusion is motivated by the findings in Nepal and Jamasb (2012) that implementing reforms is not the same as delivering results in the context of transition countries. The inclusion of these terms is to reflect the importance of the energy sector in transition and the changes it went through, in terms of efficiency and pricing. Table7 shows the signs and significance of interaction terms for each regression.

As shown in Table 7, the results from the interaction terms add explanatory power to our analysis, particularly to the GDP and EI regressions. The effects on the aggregated HDI itself are less clear. It should be noted that the Variance Inflation Factor (VIF) after the inclusion of such terms increases sharply and the inclusion of more interaction terms would eventually bring back the problems associated with multicollinearity. This justifies the limited number of interaction terms that were chosen with a view to the research questions in discussion.

Table 7: The results of selected reform interactions (Model 3)

	HDI	GDP	LEI	EI
C1*C2	-	- (***)	+	+
C1*C4	+	+ (***)	+	- (**)
C2*C4	+	- (***)	+	+ (***)
C4*C7	- (**)	-	-	-
C1*C6	-	-	- (***)	+ (**)
C2*C6	+	+ (**)	+	-
P-value of F-test (joint significance of interaction terms)	0.3565	0.0004	0.0175	0.0055

***, ** and * denote significance at 1, 5 and 10% levels respectively.

7. Discussion of results

A first result that emerges from our analysis is that the impact on the HDI is not uniform across reforms and human development dimensions. Specific reforms cause impacts in different dimensions and not always with an expected positive outcome. Although there is no explicit way to test for Hypothesis 1 in this context, many reforms appear to be insignificant, as the HDI appears to be positively influenced by reforms. In component analysis, only the component referring to an “early market opening” is positively significant. As such, hypothesis 1 is not confirmed, in the sense that *specific reforms*

matter. The interaction of the two largest sets of reforms (Components 1 and 2) even had negative effects in GDP. Banking and governance reforms without market opening do not seem to make a positive impact.

Regarding the impact of infrastructure reform, it should be noted that the explanatory variables used relate to the reform standards of such infrastructure, and as such, it is not surprising that only telecommunication reforms seem to have any effects. In fact, increases in EBRD indexes of infrastructure can be caused by increases in prices that are closer to efficient levels. This makes it impossible to consistently support hypothesis 2. This might happen because the standards of electricity and water supply were already reasonable and the reform measure used ultimately implies that reforms will mostly lead to higher prices. In fact, the increase in prices can increase the share of household income spent on them to very high levels. This can explain the negative significance of the interaction term between electricity reforms and the reform package without sale of state assets in health outcomes. The consistently low levels of competition policy reforms can keep a power sector reform from producing positive effects since market reforms bring extra responsibility to the competition authorities (Pollitt, 2009). This argument can be extended to the telecommunications sector. Another explanation for the lack of evidence for the positive effect of infrastructure can be related to an inverted threshold argument. In this case, it is possible that changes in infrastructure play a crucial role when its starting levels are very low (i.e. there are still parts of the population with no electricity, water or roads). In the case of the Soviet Union, this was no major problem as basic infrastructures were available to the population.

Regarding the impact of large scale privatizations, hypothesis 3 is supported by results; as such reforms have a negative impact on the life expectancy index. The negative impact of competition policy reforms on the life expectancy index is a striking result. Also, components 1 and 2 are positively related to health expectancy, meaning that both policies of market opening and banking/infrastructure reforms produce positive results. Reform interactions do not seem to be as important for health outcomes as it is for other human development dimensions.

The “dirty privatization” argument of Black et al. (2000) finds support in the data (hypothesis 4), as large scale privatizations negatively affect GDP, although small scale privatizations appear to have a positive effect. Governance indexes are low across the sample and the interaction term between large scale privatizations and competition policy is not significant for GDP, meaning that higher levels of the competition policy index are not triggering improved results in privatization efforts.

The impact of reforms on education is mostly related to large scale privatization and telecommunication reforms. Our composite analysis also points that component C1 (a broader reform effort) can have a positive effect, even if only at a 10% significance level. In that sense, hypothesis 5 finds limited evidence that some reforms positively influenced educational outcomes, by creating incentives, reducing communication and knowledge barriers and possibly giving better access to funding. Some specific interactions of reforms appear to be positive, such as a mix of sale of state assets and trade/exchange rate reforms.

Besides the testing of our hypothesis, further comments can be made. The complexity of the effects and the possibility of a specific reform having different impacts across different dimensions are largely confirmed, justifying a component-specific analysis as well as the analysis to the impacts on the composite HDI. While many reforms and policy packages are significant across individual development dimensions, the combination of such dimensions as a representation of human capabilities shows that opening the market was the crucial factor for success.

As a final note, the results reject the claim that the HDI is only a measurement of the GDP in an apparently complex and richer framework. There is a correlation of 96% between the HDI and the GDP Index in this sample. However, the diversity of impacts and results that mostly follows economic theory shows that, as the UNDP points out, GDP is not everything.

8. Conclusions and future work

The aim of this paper was to explore the significance of institutional and infrastructure reforms in economic and social changes, as measured by the composite Human Development Index and its constituents. While GDP and growth regression analysis has been extensive, the main contribution of this work is the extension of such analysis to health and education, considering Sen's (1989) capabilities approach as the end of analysis, instead of a classic growth analysis. Our empirical findings are based on the LSDVC technique which is considered as appropriate in this context, while trying to tackle a large set of problems in the data and gain insight into reform complementarity. While the HDI construction implies some arbitrary weightings, it reveals important information about the whole set of changes that the transition economies underwent as they attempted to move towards a market economy.

Our results show that the reform process in transition economies has been complex and sparked a diverse set of impacts across different dimensions of human development, as the countries went through quick and drastic changes. The most important result is that although, in general, reforms generated positive impacts, policy matters and policy packages are important. The negative impact of mass privatizations is an important lesson for the future.

The impact of infrastructure is generally unclear as no strong evidence could be found in that sense. A possible "threshold" where reforms start generating strong effects is worth analysing, since the areas of reform where countries are closer to a market economy are the ones that appear to generate important impacts. The role of governance is not clarified in our results, which is a paradigm in need of an answer in future research. Results also point that sometimes higher levels of reform indexes do not directly lead to improved outcomes for human development dimensions.

Since research in this specific field is very limited, other expansions are easy to number and there is significant future work to be done. For example, some extensions include creating indexes that include more information such as child mortality and the spread of diseases in the Health Index. Similarly, the inclusion of inequality considering

opportunities in access to education and health besides an income inequality analysis can be incorporated in the analysis.

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Appendix

A.1: Multicollinearity Tests

Variable	VIF
LSP	5.42
SSP	4.75
ER	7.46
PL	3.24
TDF	5.40
COMPOL	3.67
BANKLIB	8.80
SECFIN	4.93
ELECREF	4.16
WATEREF	4.50
ROADREF	3.29
TELREF	3.89
Mean VIF: 5.04	
Condition Index: 48.89	

Notes: Condition Index retrieved through “coldiag2” command on STATA.

All other information retrieved through command “collin”.

A.2: Methodology of the Human Development Index
(According to the 1999 Human Development Report)

$$HDI = \frac{(Life\ Expectancy\ Index + GDP\ Index + Educational\ Attainment\ Index)}{3}$$

$$Educational\ Attainment\ Index = (2 * (Adult\ Literacy\ Index) + Combined\ Gross\ Enrollment\ Index)$$

$$Adult\ Literacy\ Index = \frac{Adult\ Literacy\ Ratio}{100}$$

$$Combined\ Gross\ Enrollment\ Index = \frac{Combined\ Gross\ Enrollment\ Ratio}{100}$$

$$GDP\ Index = \frac{\log(GDP) - 100}{40000 - 100}$$

$$Life\ Expectancy\ Index = \frac{Life\ Expectancy\ at\ Birth - 25}{85 - 25}$$

Source: http://hdr.undp.org/en/media/hdr_1999_en_technote.pdf

A.3.: Cross-section dependence CD test

Model (1)

Dependent Variable	Test Score	P-Value
HDI	-2.29	0.022
GDP	-2.35	0.019
LEI	2.49	0.013
EI	-1.92	0.054

Model (2)

Dependent Variable	Test Score	P-Value
HDI	-2.21	0.027
GDP	-2.40	0.016
LEI	2.45	0.014
EI	-1.89	0.059

Model (3)

Dependent Variable	Test Score	P-Value
HDI	-2.16	0.031
GDP	-2.27	0.023
LEI	0.57	0.572
EI	-1.84	0.065