Re-thinking the measurement of Economic Development: Application of a Revised Development Index to Central Asia

Kristopher D. White
Kazakhstan Institute of Management, Economics, and Strategic Research

Abstract

Economic development, once viewed as a synonymous concept with economic growth, is now widely recognized as connoting societal progress. While such notions as progress and quality of life may be difficult to quantify, one empirical measure of development has received ample attention in both the academic literature and popular press. Since the early 1990s the United Nations has released its annual Human Development Index (HDI), which provides a quantitative measure of development using state-level income (output), health, and education variables. If intra-regional variations in economic development within Central Asia are of concern, however, the HDI seems inadequate. A new economic development index is constructed here, adding to the HDI the measures of corruption, income inequality, infant mortality, and undernourishment. Applying this new index to Central Asia reveals little change in the results of the HDI, while still exposing stark variations in intra-regional economic development levels. Such disparities may prove problematic for the widely discussed economic integration efforts within the region.

Keywords: Central Asia, economic development, empirical measurement, corruption, income inequality, infant mortality.

Introduction

The breakup of the Soviet Union in 1991 propelled 15 newly independent states into the existing global political and economic arena. Sixteen years later, these 'new' states exhibit variations in development levels, as well as differences in influence (however defined) within the globalized new world order. While treating the former Soviet Union as a monolithic entity has contemporary merit, a recognition and analysis of the regional constituencies of former Soviet space (the Baltic States, the Caucasus, or Central Asia for example) illuminates important regional distinctions. Central Asia, defined here as the former Soviet republics of Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan, is indeed a region facing a number of contemporary challenges. While the current 'war on terror' and significant oil and natural gas reserves seem to have brought the region into the Western consciousness, environmental

---

A paper presented at the Tenth Conference of the European Society for Central Asian Studies (ESCAS) forms the basis of this working paper.

The author would like to acknowledge the helpful comments received from Dr. Bruce Taylor.

The author also wishes to express heartfelt gratitude to Richard Kendrick (1930-2008) whom he first met on the campus of Clark University in 1988, and whose wisdom continues to resonate following his passing on March 4, 2008.

---

degradation, privatization, political reform, disparities in well-being, and a current discourse on regionalism remain pressing issues. How the region deals with these challenges will, of course, impact its future. In the current era of globalization's interconnectedness of regions and states, the response to these issues will also have an unmistakable global impact.

Given this contextual background and the region's resurgent geopolitical importance, this paper sets out to address the current state of economic development within Central Asia. The concept of economic development is treated here as a multi-dimensional snapshot of overall levels of citizens' well-being within the region. A geographical treatment, particular attention will be paid to the intra-regional variation in development levels as expressed by the dimensions of income, health, education, and government. Academic literature (e.g. Åslund, 2003) and empirical evidence (UNDP, 2006) suggest that significant disparities in economic development continue to afflict the region. Using the United Nations' Human Development Index (HDI) as a departure point, a revised development index is presented, featuring a revised set of variables and a slightly modified weighting scheme. In addition to the income, health, and education variables reflected in the HDI, additional measures of income inequality, health, and corruption are used to create a new economic development index sensitive to a number of particular development challenges faced by Central Asia. While index values are calculated for 122 of the world's states, particular emphasis is paid to Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, and Uzbekistan. The results presented here reaffirm the significant regional disparities with respect to development levels within Central Asia. Such disparities may prove problematic for the success of future regional integration efforts, particularly those emulating the European Union brand of regionalism based on commonalities.

Economic Development

As this paper seeks to empirically re-asses the current state of development in Central Asia, a necessary starting point is a brief discussion on what exactly is meant by the term *economic development*. Somewhat surprisingly, this term, as known today, has only fairly recently gained wide exposure in the academic literature. As Arndt (1981) articulates, economic *development* and economic *growth* were largely viewed as

synonymous terms in the years following the Second World War. Even earlier colonial-era references to economic development referred simply to the exploitation of a colonial possession's natural resources. By the 1960s, most attempts at measuring economic development focused solely on *per capita* income and output (GNP or GDP) *per capita* (Stockwell, 1960). Those states with the highest levels of income or output were assumed to have the highest levels of economic development, and those states with low levels of income were assumed to have the lowest levels of economic development. By the early 1970s, Seers (1972) strongly questioned the confusion between economic growth and development and proposed that a measurement of economic development be a measure of decreases in poverty, unemployment, and inequality. He also offers a much broader definition of development, calling the main goal of economic development "the realization of the potential of human personality" (Seers, 1971, p. 22). As late as the late 1970s, Flamming (1979) describes the significant confusion and overlap existing between the concepts of economic development and economic growth.

Today, of course, the notion of economic development extends well beyond a state's economic growth rate or a population's average income. What confusion may exist seems to be based on the choice of term to use, be it economic development, development, socio-economic development, or human development. Regardless of the term used, the concept denotes progress or improvement in the quality of life of a state's population (UNDP, 2006). As Fik (2000) defines it, economic development refers to "positive changes and progress in the human condition through economic means" (p. 22). While economic development, by definition, is a dynamic process, a given state's level of economic development can be measured at a given time using empirical data reflecting income, health, education, physical infrastructure, government, or overall quality of life. Measuring development requires decisions on the geographical scale of analysis (from international to intra-state), the variables to measure, the data sources to utilize, and the relative importance of the included variables. Perhaps the most influential development measure available today is the Human Development Index (HDI) published annually by the United Nations. The HDI will be described in more detail in a subsequent section of this paper.

Geography and Economic Development

The academic discipline of geography is concerned with such concepts as location, regions, spatial variation, and place characteristics (to name but four). Economic geographers study the locations, distributions, and interactions among/between economic phenomena. As the world's economic development levels exhibit marked variation between states, within states, between regions, and within regions, geographers have made valuable contributions to the economic development literature (Fik, 2000; Halloway and Pandit, 1992). A state's location, of course, can impact its economic development. A landlocked location has historically impeded its involvement in global oceanic trade. A location along a major trading route (the ancient Silk Road network for example) can stimulate trade, economic growth, and economic development. The world's most profitable natural resources occupy highly localized and distinct points in the Earth's crust. If a given state's political boundaries happen, by chance, to bound such a location, revenue (and ideally development) accrues to the state.

Location aside, geography is also multi-disciplinary in nature, drawing on theories and concepts from economics, demography, and political science to name just three. Economic development itself is a multi-dimensional concept, itself encompassing economic, demographic, and political variables. A shared multi-dimensionality and a concern with regional/locational variations combine to make geography (and hence economic geography) an ideal vantage point from which to approach economic development research.

Quantifying Development: The Human Development Index

Since 1990, the United Nations Development Program (UNDP) has produced its annual Human Development Report (HDR). In addition to focusing on pressing economic development issues (e.g. access to clean water in 2006, human rights in 2000, and alleviating poverty in 1999), these reports have also included a standardized development measure called the Human Development Index (HDI). The HDI "looks beyond GDP to a broader definition of well-being" (UNDP, 2006) to also include measures of health and education. More specifically, the most recent versions of the HDI have incorporated state-level data on life expectancy at birth (in years), adult literacy rate (% age 15 and above), combined primary, secondary, and tertiary gross enrollment ratio

(%), and *per capita* GDP (purchasing power parity in $US). For each of the world's states (data permitting), three separate income, health, and education indices are calculated using the above variables. The final HDI value is calculated by averaging these three indices, forming the basis of the final development rankings. Results of the most recent HDI (2006 report using 2004 data) show that the world's highest levels of human development are found in Norway, Iceland, Australia, Ireland, and Sweden. Conversely, the lowest levels of human development are found in Ginea-Bissau, Burkina Faso, Mali, Sierra Leone, and Niger (UNDP, 2006).

As with other world regions, HDI results can be used to highlight intra-regional development variations within Central Asia. In addition, comparing HDI results from the 1996 and 2006 reports allows for a cursory comparison of regional development changes during the past decade (Tables 1a and 1b). As a cautionary note, time series analysis comparing HDI results from different reports is not recommended as computational methods have changed slightly over the past ten years. As a result, index values take on slightly different meanings, although HDI rankings can be compared to illuminate relative improvement or decline in a state's level of development. It should also be noted here that the 1997 HDI (using data from 1994) ranked 175 of the world's states, while the 2006 HDI (using 2004 data) ranked 177 states.

In both 1994 and 2004 Tajikistan is shown to exhibit the region's lowest development levels, and its world HDI ranking has dropped seven places (from 115 to 122). It appears that a nearly three-year drop in life expectancy (original data used in the 1997 and 2006 HDRs have been examined to analyze HDI value/rank changes) has offset gains in adult literacy and gross enrollment ratio. It seems logical that Tajikistan's civil war, which raged through much of the 1990s, at least partly explains its drop in life expectancy and, hence, its final HDI value and rank. Turkmenistan, the region's development leader in 1994, witnessed a precipitous drop in world HDI rank (from 85 to105), though retained the region's second-highest development score in 2004. A drop in life expectancy by 2.2 years and a comparatively sharp drop (15 percentage points) in gross enrollment ratio appears responsible for this dramatic HDI ranking drop. Kyrgyzstan's HDI ranking dropped slightly, from 107 to 110. This dip is most likely a result of a nearly one-year drop in life expectancy, which (like Tajikistan) offset gains in

Table 1a: Human Development Index (HDI): 1994

HDI Rank		HDI value
1	Canada	0.960
85	**Turkmenistan**	**0.723**
93	**Kazakhstan**	**0.709**
100	**Uzbekistan**	**0.662**
107	**Kyrgyzstan**	**0.635**
115	**Tajikistan**	**0.580**
175	Sierra Leone	0.176

Source: Human Development Report 1997, *Human Development to Eradicate Poverty*

Table 1b: Human Development Index (HDI): 2004

HDI Rank		HDI value
1	Norway	0.965
79	**Kazakhstan**	**0.774**
105	**Turkmenistan**	**0.724**
110	**Kyrgyzstan**	**0.705**
113	**Uzbekistan**	**0.696**
122	**Tajikistan**	**0.652**
177	Niger	0.311

Source: Human Development Report 2006, *Beyond scarcity: Power, poverty and the global water crisis.*

adult literacy rate and gross enrollment ratio. After Turkmenistan, Uzbekistan experienced Central Asia's second-greatest drop in HDI world ranking (from 100 to 113) between 1994 and 2004. While Uzbekistan's nearly one-year drop in life expectancy may explain some of this decrease, a larger contributing factor may be its poor *per capita* output performance. According to UNDP data, Uzbekistan suffered a nearly $800 nominal decrease in *per capita* GDP between 1994 and 2004. Central Asia's greatest development gains have occurred in Kazakhstan, seeing its HDI rank jump 14 places (from 93 to 79). Currently Central Asia's development leader, Kazakhstan also holds the distinction of the only Central Asian republic (CAR) to increase its HDI ranking during the decade in question. Kazakhstan's development gains seem to be a result of a sharp increase (18 percentage points from 73 to 81) in gross enrollment ratio and a more than doubling (increase of $4,156) of its nominal *per capita* GDP. While Kazakhstan's endowment of petroleum resources (coupled with current high oil prices) has conspired to fuel tremendous economic growth, Kazakhstan has also been a regional leader in economic reform (Åslund, 2003). In addition, economic gains have filtered down into Kazakhstan's population to a much greater degree than within any other of Central Asia's states (Rywkin, 2005).

Moving beyond the HDI: a development index for Central Asia

As specified earlier, the purpose of this paper is to construct a new economic development index that captures some of the salient development challenges faced by the Central Asian region. While the HDI remains the world's prominent quantitative measure of development, it has met with a number of calls for improvement, both in terms of methodology (Foster et al., 2005) and choice of included dimensions (Sagar and Jajam, 1998). This paper seeks to reaffirm the benefits of the HDI – namely a quantitative development measure that is applied across the world's states and which extends the notion of development beyond income or output. As such, the methodological techniques used here to derive a Central Asian development index will largely mirror those used by the HDI. The alternate index presented here differs from the HDI in its breadth and inclusion of additional dimensions. In addition to the *per capita* GDP, gross enrollment ratio, adult literacy, and life expectancy variables used in the HDI, this index will expand to include measures of income inequality, undernourishment,

infant mortality, and corruption. As rationale for the HDI variables has been addressed elsewhere (UNDP, 1990), this paper will seek to substantiate the inclusion of those variables that differ from the HDI.

Corruption

Government corruption can be generally defined as "the sale of public goods or services for private benefit" (Åslund, 2003, p. 80). The list of publicly provided goods and services is, of course, a lengthy one. Some of those that appear to be more prone to corruption, however, include police protection and law enforcement, health care, education, and taxation. For individual citizens, corruption can take the form of a payment (bribe) to obtain these 'public' services. Bribes can be paid to doctors for treatment, to school officials for an educational opportunity, to judges for leniency, or to police officers to ward off harassment. Corruption can also impact small businesses, making profitability more difficult in the face of corrupt licensing and permit officials demanding bribes in exchange for allowance to remain in operation. Large corporations may also face corruption taking the form of much larger bribes (or perhaps 'campaign contributions') in exchange for entry into a particular market.

Regardless of its level of operation (individual, small firm, large corporation; low-level bureaucrat, high ranking government official), public sector corruption greatly retards economic development (Azfar *et al.*, 2001). Some of the impacts of corruption on economic development include a negative impact on private business investment, a negative impact on foreign direct investment (FDI), a negative impact on economic growth, and an increase in public investment – although with diversion from such important sectors as health, education, and infrastructure maintenance (Wei, 1999). In sum, corruption erodes a given state's wealth (Transparency International, 2007).

The negative impacts of corruption on economic development hit the Central Asian region particularly hard. In fact, Central Asia is often considered one of the world's most corrupt regions (Åslund, 2003; Eshanova, 2002). Corruption in Central Asia may involve the payment of bribes to ensure a safe childbirth, to obtain a job, to send children to better schools, or to obtain a familial burial plot (Eshanova, 2002). Beyond these areas, regional corruption is perceived to be particularly egregious within law enforcement, including police, judges, tax police, and customs agents (Åslund,

2003). As a market distortion, corruption effectively increases the operating costs of each of the region's afflicted businesses (Tully, 2004). Given the multitude of negative impacts of corruption on economic development, and the fact that corruption is particularly pervasive in Central Asia, it seems logical to include some measure of corruption into a development index with this region in mind. One such quantitative measure is the Corruption Perceptions Index (CPI), published annually since 1995 by Transparency International, an organization dedicated to the eradication of corruption. The CPI will be discussed in greater detail later with the other data variables used in this paper.

Income inequality

Income inequality can generally be considered the divide or 'gap' between rich and poor in a given population. Income inequality (or the correlate notions of consumption or wealth inequality) has received much attention recently, both in the academic literature (e.g. Wilkinson, 2006) and the popular press (Abramowitz and Montgomery, 2007). Much of this recent attention seems to have been stimulated by the wider debate on globalization, and whether the increasingly integrated world economy has heightened the inequality in global levels of income, development, or overall well-being. Income inequality can be examined at the global scale investigating average income disparities between the world's independent states, or at the national scale investigating inequality *within* a particular state. Global income inequality as a whole is the sum of these two income inequality components (Goesling, 2001). The global pattern of income inequality within states reveals the greatest disparities in Latin America and sub-Saharan Africa, followed by South and East Asia, and the least inequality found in the regions of northern, and eastern Europe (Deininger and Squire, 1997).

The relationship between a state's income inequality and its economic growth and development was first investigated by economist Simon Kuznets (see, for example, (Kuznets, 1955)), who pioneered the 'inverted U' hypothesis, the graphic expression of which became known as the 'Kuznets curve.' In this context, income inequality rises dramatically in the early stages of a state's economic development, reaches a peak somewhere in the middle stages of development, and declines with further development. Empirical evidence from studies investigating the Kuznets hypothesis leads to a range of

conclusions in the academic literature. Weede and Tiefenbach (1981) find that economic development significantly determines a state's level of income inequality, fully supporting the Kuznets hypothesis. The authors also cite numerous works that also substantiate the Kuznets 'inverted U.' Conversely, Deininger and Squire (1997) are unable to support Kuznets, finding little relationship between growth and inequality. In what might be considered a middle position, Ram (1997) examines income inequality in developed countries and finds that the Kuznets pattern holds through the 1960s, but the 1970s brought an increase in inequality, effectively 'uninverting' the Kuznets U.

Regardless of the precise causal relationship between economic development and intra-state income inequality, such inequality has a negative impact on the state's level of development. Higher levels of income inequality can worsen absolute levels of poverty, will adversely affect overall human welfare, and can aggravate political and social tensions (Ogwang, 1995). In addition to having lower life expectancies and poorer overall health, societies with higher income inequality also tend to exhibit lower levels of social capital, trust, and higher rates of homicide (Wilkinson, 2006). The negative impacts of income inequality seem particularly acute in Central Asia. Income inequality remains, by international standards, quite high in the region, having increased dramatically since independence (Falkingham, 2005). Furthermore, these increases in income inequality have also contributed to higher regional levels of poverty (UNDP, 2005). Recognizing the negative developmental aspects of income inequality, as well as the prevailing income disparities within Central Asia, it would seem appropriate to include a measure of income inequality in this paper's revised economic development index. While a number of quantitative methods and measures exist to reflect a given society's income inequality level, the measure to be incorporated into this research will be the Gini coefficient, described in greater detail in the next section elaborating on data definitions and sources.

Infant mortality and undernourishment

Health-related dimensions remain important components of a state's level of economic development. Favorable health conditions can lead to higher rates of economic growth while poor health conditions serve to trap citizens in poverty (WHO, 1999). Two important measures of health conditions within a particular state are infant mortality and

undernourishment. Infant mortality rates generally refer to the number of infant (aged between birth and one year) deaths per one thousand live births. Infant mortality has been shown to be the supreme indirect measure of a given state's level of economic development (Stockwell, 1960). While correlating strongly with income, infant mortality is not exaggerated by extremes of income, can affect all segments of society, and reducing its occurrence remains a universal goal worldwide (Berentsen, 1987).

While infant mortality applies to a specific age cohort within a society, undernourishment applies to an entire population. Undernourishment has often been used in the context of global hunger, although the term 'hunger' as applied to poverty and underdevelopment has been derided as being overly emotional and inaccurate (Blyn, 1961). The constituent components of 'hunger' in this context can generally be said to include both *under*nourishment and *mal*nourishment. Undernourishment applies to a paucity of total calories (caloric intake of food) per day, while malnourishment refers to deprivation of certain essential vitamins and minerals necessary for healthy life. Put simply, undernourishment resides below some minimum threshold of caloric quantity, while malnourishment applies to caloric quality.

As previously mentioned, the HDI incorporates a lone health-related variable (life expectancy) to measure development. The revised development index presented here will also incorporate life expectancy while also utilizing measures of infant mortality and undernourishment. The main objective in this case is to try to uncover a bit more intra-regional variation along the health dimension within Central Asia. As with corruption and income inequality, specific data definitions for the infant mortality and undernourishment variables will be discussed in the next section.

Data

For calculating a revised economic development index sensitive to the development challenges faced by Central Asia, data were collected along the income, health, education, and governmental quality dimensions for as many of the world's independent states as possible given the availability of data. These data, presented for the five Central Asian republics and summarized for all states (Table 2), were generally the most recent available. In all, a total of eight variables, whose data values are described below, were utilized in calculating this paper's economic development index.

Per capita gross domestic product (pcGDP) refers to a state's total value of goods and services produced within its borders and standardized by dividing by its population. The value of all goods and services produced are in U.S. dollars, standardized using the purchasing power parity (PPP) methodology that values goods at prevailing prices in the U.S. (CIA, 2007). Data values refer to 2006, and were collected for 200 geographic entities.

The Gini coefficient (GNI), or Gini index, measures the extent of inequality in a given state's distribution of family income. While theoretically ranging from 0 (perfect equality) to 100 (perfect inequality), global Gini coefficients tend to be highest in sub-Saharan Africa (values in the 50s) and lowest in Scandinavia (values in the 20s) (CIA,2007). Representing income inequality in 2006, Gini coefficient data were collected for 122 geographic units.

Life expectancy (LEX) refers to the number of years a newborn is expected to live given the prevailing age cohort-specific mortality rates – assuming these mortality rates remain constant throughout the newborn's life (UNDP, 2006). Life expectancy data are for the year 2004, and were collected for 174 geographic entities.

Infant mortality rate (IMR) refers to the number of deaths of infants under the age of one year per 1,000 live births. These data values are rates for the year 2007 and were collected for 197 geographic units (US Census Bureau, 2007).

Prevalence of undernourishment (UNR) represents the percentage of a given population considered undernourished as defined by the World Bank. Undernourishment data refer to the year 2004, and were collected for 170 geographic units (World Bank Group, 2007).

Gross Enrollment Ratio (GER) is the combined ratio of total students enrolled in primary, secondary, and tertiary levels of education to total individuals of official school age for the three levels (UNDP, 2006). Expressed in percentage terms and pertaining to enrollment conditions in 2004, GER data were collected for 177 geographic units.

Adult literacy rate (ALR) refers to the percentage of the population, aged 15 years and older, who can read and write (UNDP, 2006). ALR data reflect literacy conditions in 2004, and were collected for 175 geographic entities.

Table 2: Data values used in calculating revised development index

	pcGDP[1]	GNI[2]	LEX[3]	IMR[4]	UNR[5]	GER[6]	ALR[7]	CPI[8]
Kazakhstan	9,400	31.5	63.4	27.41	6	91	99.5	2.6
Kyrgyzstan	2,100	29.0	67.1	33.38	4	78	98.7	2.2
Tajikistan	1,300	34.7	63.7	43.64	56	71	99.5	2.2
Turkmenistan	8,500	40.8	62.5	72.04	7	75	98.8	2.2
Uzbekistan	2,000	26.8	66.6	68.89	25	74	99.0	2.1
Max	71,400	70.7	82.2	184.44	75	113	99.8	9.6
Min	600	23.2	31.3	2.30	2.5	21	19.0	1.8
Median	6,200	38.2	70.6	21.88	8	73	89.9	3.2
N=	200	122	174	197	170	177	175	161

[1]*per capita* GDP ($US) in terms of purchasing power parity, 2006. source: CIA, 2007.
[2]Ginni coefficient (measure of income inequality) 2006. Source: CIA, 2007.
[3]Life expectancy at birth (years) 2004. Source: UNDP, 2006.
[4]Infant mortality rate (per 1,000 live births) 2007. Source: US Census Bureau, 2007.
[5]Prevalence of undernourishment (% of population) 2004. Source: World Bank, 2007.
[6]Gross enrollment ratio (%) 2004. Source: UNDP, 2006.
[7]Adult literacy rate (%) 2004. Source: UNDP, 2006.
[8]Corruption perception index, 2006. Source: Transparency International, 2006.

Corruption Perceptions Index (CPI) data values represent indexed levels of perceived corruption in 2006 (Transparency International, 2007). Theoretically ranging from one to ten (although actual range is from 1.8 to 9.6), CPI data were collected for 161 geographic units.

Methodology

In general, the indexing methodology implemented by the United Nations in its Human Development Index (HDI) was used to calculate the revised development index for this paper. Following the general formula (equation 1), the index value for, say, Turkmenistan adult literacy would be that state's literacy data value minus the minimum literacy value in the data set, divided by the difference between the maximum and minimum adult literacy data values.

$$(1) \qquad \text{Index}_i = \frac{\text{Actual value}_i - \text{minimum value}}{\text{Maximum value} - \text{minimum value}}$$

The formulation above was used to calculate the individual index values for the gross enrollment ratio, adult literacy, and life expectancy data items. In the case of infant mortality, Gini coefficient, and undernourishment, higher data values indicated higher levels of infant mortality, income inequality, and undernourishment in the population. The general indexing method was used for each of these three variables, although yielding highest index values for those states with the highest infant mortality, income inequality, or undernourishment. As all index values ranged between 0 and 1, the simple correction of subtracting these three indices from one resulted in an appropriate transformation.

Corruption perception index data were already in index form, with data values potentially ranging from 0 to 10. Once again, the general indexing calculation was used, yielding a simple movement of the decimal place left one position. The resulting corruption index transformed the original data into the zero to one format used in this paper. Index values for *per capita* GDP were calculated using the same method for such

calculation presented in the most recent (2006) version of the Human Development Index. The natural logarithm was used for the actual, minimum, and maximum data values for this index only. Variation in world *per capita* GDP is striking, ranging from $600 (Somalia and Malawi) to $71,400 (Luxembourg). Using the logged data values in the indexing calculation yields the necessary data compression.

For the final index value calculation, four separate index values were calculated for the health, education, government, and income variables. The health index was the arithmetic mean of the life expectancy, infant mortality, and undernourishment index values. The education index was the arithmetic average of the gross enrollment and adult literacy rate index values. The government index was simply the transformed index value from the Corruption Perception Index. The income index was calculated using the sum of the indices for *per capita* GDP and income inequality, with *per capita* GDP assigned a weight of 9, and income inequality assigned a weight of 1. This particular weighting scheme, while admittedly highly subjective, was chosen to impart a slight (10 percent) inequality adjustment to *per capita* GDP. The final index values for this paper (Appendix A) represent the average of the health, education, government, and income indices.

Results and discussion

Using the above methodology, final index values were calculated for those states with data values across all eight development variables; a total of 122 geographic entities (Appendix A). The general geographical pattern emerging from these economic development index results is fairly consistent with both conventional wisdom and the latest version of the Human Development Index. In general, the states with highest levels of economic development tend to be concentrated in northern and western Europe, North America (particularly Canada), and the Austral region. As expected, states of the sub-Saharan region dominate the least economically developed states.

With respect to Central Asia, results of the revised index can be used to illustrate intra-regional variation on dimensions pertinent to regional development challenges. In addition, these results can be examined against the results of the most recent Human Development Index (2006) to see if different patterns or magnitudes of variation exist between the two indices (Table 3).

Table 3: Central Asian comparison of revised development index and 2006 HDI [1]

	Revised development index		Human Development Index	
	rank	index value	rank	index value
Kazakhstan	45	.679	79	.774
Turkmenistan	72	.612	105	.724
Kyrgyzstan	75	.603	110	.705
Uzbekistan	83	.554	113	.696
Tajikistan	87	.505	122	.652

[1] Revised development index ranked 122 geographical entities (from 1. Finland to 122. Guinea-Bissau), while the 2006 Human Development Index ranked 177 geographical entities (from 1. Norway to 177 Niger).

At first glance at the rankings, it appears that the revised development index presented here simply replicated the HDI. Kazakhstan is, and remains, the region's economic development leader by far. The Central Asian states that follow are, in descending order, Turkmenistan, Kyrgyzstan, Uzbekistan, and Tajikistan. This order holds true for both the HDI and the revised development index. In this case the addition of more variables, chosen specifically to tease out more regional variation, did not change the development rank order of Central Asian states. The values between the two indices are different, with the revised index's values being lower, primarily a result of the inclusion of the corruption values that all tended to be quite low for the Central Asian republics.

The magnitude of difference in index rank between republics can give an indication of the degree of separation or gap in economic development levels. Comparing those gaps from the HDI and those from the revised development index may yield a fuller picture of the degree of disparities within the region. The rank gap between Kazakhstan (ranked 1) and Turkmenistan (2) increased just one place (from 26 to 27) from the HDI to the revised development index. As for the gap between Turkmenistan

and Kyrgyzstan (3) the gap narrowed from five in the HDI to 3 in the revised development index. The gap between Kyrgyzstan and Uzbekistan (4), however, widened fairly sizably from three ranking places to eight. Perhaps illustrating Uzbekistan's relative development decline, the ranking gap between it and Tajikistan (5) narrowed from nine to four. If one examines the development index ranking gap between the region's top and bottom states (Kazakhstan and Tajikistan), this gap is one place narrower (42 places) in the revised development index than in the HDI (43 places). It must be noted here that this paper's revised development index ranked 122 world states, compared to the 177 ranked by the HDI, so rank differences are proportionally greater in the former than in the latter. While the rank gap between Kazakhstan and Tajikistan is one less place for the revised development index, the proportional gap is ten percent greater (34 percent compared to 24 percent in the HDI). Add to this the one rank jump in separation between Kazakhstan and Turkmenistan, and it would appear (albeit marginally) that there might be slightly more intra-regional economic development variation within Central Asia than uncovered by the HDI.

Conclusion

A revised economic development index, designed to be applicable to the Central Asian region, has been constructed using the traditional measures of the HDI, augmented by the additional items of income inequality, corruption, infant mortality, and undernourishment. Applied to 122 of the world's states, this revised index's results generally coincide with the overall pattern of global economic development as shown by the HDI. As this paper's focus is on the geography of economic development within Central Asia, the resultant pattern of intra-regional economic development variation has been described and compared to the HDI. Results show an identical ranking of Central Asian states, with Kazakhstan emerging as the region's economic development leader followed by Turkmenistan, Kyrgyzstan, Uzbekistan, and Tajikistan. While regional rankings replicate those presented in the HDI, it appears that this paper's revised development index may have uncovered a marginally greater level of intra-regional economic development variation than previously shown. These results reaffirm the existence of significant variations in economic development levels within Central Asia. Continued divergence in inter-state economic development levels may prove problematic

for future efforts aimed at regional economic integration, particularly if such efforts seek to replicate a European Union-style arrangement.

References Cited

Abramowitz, M. and Montgomery, L. 2007. Bush addresses income inequality. *Washington Post*. Thursday, February 1, p. A04.

Arndt, H.W. 1981. Economic development: a semantic history. *Economic Development and Cultural Change*. 29(3): 457-466.

Åslund, A. 2003. Sizing up the Central Asian economies. *Journal of International Affairs*. 36(2): 75-87.

Azfar, O., Lee, Y., and Swamy, A. 2001. The causes and consequences of corruption. *Annals of the American Academy of Political and Social Science*. 573: 42-56.

Bardhan, Pranab. 1997. Corruption and development: A review of issues. *Journal of Economic Literature*. 35(3): 1320-1346.

Berentsen, William H. 1987. German infant mortality 1960-1980. *Geographical Review*. 77(2): 157-170.

Bloch, H. and Hak Kan Tang, S. 2004. Deep determinants of economic growth: institutions, geography, and openness to trade. *Progress in Development Studies*. 4(3): 245-255.

Blyn, George. 1961. Controversial views on the geography of nutrition. *Economic Geography*. 37(1): 72-74.

Central Intelligence Agency. 2007. The World Factbook. Last accessed September 1, 2007 via https://www.cia.gov/library/publications/the-world-factbook/.

Deininger, Klaus and Squire, Lyn. 1997. Economic growth and income inequality: reexamining the links. *Finance and Development*. 34(1): 38-41.

Eshanova, Zamira. 2002. Central Asia: corruption a common feature of daily routine. Radio Free Europe/Radio Liberty, July 17. Last accessed July 20, 2007 via Http://archive.muslimuzbekistan.com/eng/ennews/2002/07/ennews22072002_8.html.

Falkingham, Jane. 2005. The end of the rollercoaster? Growth, inequality and poverty in Central Asia and the Caucasus. *Social Policy and Administration*. 39(4): 340-360.

Fik, Timothy J. 2000. *The Geography of Economic Development: Regional Changes, Global Challenges*. Boston: McGraw Hill Higher Education.

Flammang, R.A. 1979. Economic growth and economic development: counterparts or competitors? *Economic Development and Cultural Change*. 28(1): 47-61.

Foster, J.E., Lopez-Calva, L.F., and Szekely, M. 2005. Measuring the distribution of Human Development: methodology and an application to Mexico. *Journal of Human Development*. 6(1): 5-29.

Goesling, Brian. 2001. Changing income inequalities within and between nations: new evidence. *American Sociological Review*. 66(5): 745-761.

Halloway, S.R., and Pandit, K. 1992. The disparity between economic development and human welfare. *The Professional Geographer*. 44(1): 57-71.

Kuznets, Simon. 1955. Economic growth and income inequality. *The American Economic Review*. 45(1): 1-28.

Ogwang, Tomson. 1995. The economic development-income inequality nexus: Further evidence on Kuznets' U-curve hypothesis. *American Journal of Economics and Sociology. 54(2): 217-229.*

Ram, Rati. 1997. Level of economic development and income inequality: evidence from the postwar developed world. *Southern Economic Journal*. 64(2): 576-583.

Rywkin, Michael. 2005. Stability in Central Asia: engaging Kazakhstan. *American Foreign Policy Interests.* 27: 439-449.

Sagar, Ambuj D. and Najam, Adil. 1998. The human development index: a critical review. *Ecological Economics*, 23: 249-264.

Seers, Dudley. 1972. What are we trying to measure? *Journal of Development Studies.* 8(3): 21-36.

Stockwell, E.G. 1960. The measurement of economic development. *Economic Development and Cultural Change*. 8(4): 419-432.

Transparency International. 2007. Global corruption report 2007: corruption in judicial systems. Cambridge: Cambridge University Press.

Tully, Andrew. 2004. Central Asia: corruption, lack of vision seen as stunting economic growth. Radio Free Europe/Radio Liberty, October 10. Last accessed July 19, 2007 via http://www. Eurasianet.org/departments/civilsociety/articles/pp101004_pr.shtml.

UNDP. 1990. Human Development Report 1990. New York: Oxford University Press.

UNDP. 2006. Human Development Report 2006: beyond scarcity: power, poverty, and the global water crisis. New York: United Nations Development Programme.

U.S. Census Bureau. 2007. International Data Base (IDB). Last accessed August 1, 2007 via http://www.census.gov/ipc/www/idb/.

Wade, Robert H. 2001. The rising inequality of world income distribution. *Finance and Development.* 38(4):

Weede, Erich, and Tiefenbach, Horst. 1981. Some recent explanations of income inequality: an evaluation and critique. *International Studies Quarterly*. 25(2): 255-282.

Wei, Shang-Jin. 1999. Corruption in economic development: beneficial grease, minor annoyance, or major obstacle? World Bank Policy Research Working Paper No. 2048.

Wilber, Charles K. 1966. A Non-monetary index of economic development. *Soviet Studies*, 17(4): 408-416.

Wilkinson, Richard G. 2006. The impact of inequality. *Social Research.* 73(2): 711-732.

World Bank. 2007. Health, Nutrition, and Population Statistic Database. Last accessed Septermber 9, 2007 via http://devdata.worldbank.org/hnpstats/.

World Health Organization. 1999. WHO on health and economic activity. *Population and Development Review*. 25(2): 396-401.

Kristopher White is an Associate Professor at the Kazakhstan Institute of Management, Economics, and Strategic Research in Almaty, Kazakhstan. Correspondence is welcome via kwhite@kimep.kz.

Appendix A: Final revised economic development index values and rankings[1]

Rank		Index value
1	Finland	0.95425
2	Denmark	0.95418
3	Norway	0.94712
4	New Zealand	0.94073
5	Sweden	0.94033
6	Australia	0.92944
7	Netherlands	0.92386
8	Switzerland	0.91956
9	Canada	0.91623
10	Austria	0.91410
11	United Kingdom	0.90996
12	Ireland	0.90036
13	Germany	0.89430
14	Belgium	0.88930
15	France	0.88670
16	United States	0.88201
17	Japan	0.87987
18	Spain	0.86761
19	Slovenia	0.84867
20	Estonia	0.83627
21	Portugal	0.83492
22	Israel	0.82963
23	Korea, South	0.81324
24	Italy	0.81132
25	Chile	0.80909
26	Uruguay	0.79839
27	Greece	0.79110
28	Hungary	0.78996
29	Czech Republic	0.78415
30	Lithuania	0.78093
31	Latvia	0.77279
32	Slovakia	0.76209
33	Poland	0.74312
34	Mauritius	0.72386
35	Malaysia	0.72236
36	Bulgaria	0.71744
37	Argentina	0.71582
38	Costa Rica	0.71560
39	Croatia	0.71017
40	Jordan	0.70838

41	Russia	0.69031
42	Ukraine	0.68550
43	Romania	0.68230
44	Tunisia	0.68121
45	**Kazakhstan**	**0.67966**
46	Belarus	0.67770
47	Mexico	0.67516
48	Colombia	0.66913
49	Brazil	0.66775
50	Macedonia	0.66766
51	Turkey	0.65655
52	Thailand	0.65299
53	Bosnia and Herzegovina	0.65249
54	Peru	0.65237
55	Panama	0.65004
56	Albania	0.64800
57	China	0.64671
58	South Africa	0.64080
59	Jamaica	0.64062
60	Georgia	0.63834
61	Armenia	0.63348
62	El Salvador	0.62651
63	Philippines	0.62362
64	Ecuador	0.62355
65	Algeria	0.62337
66	Venezuela	0.62182
67	Iran	0.61793
68	Azerbaijan	0.61744
69	Moldova	0.61403
70	Sri Lanka	0.61374
71	Egypt	0.61303
72	**Turkmenistan**	**0.61189**
73	Dominican Republic	0.60642
74	Paraguay	0.60414
75	**Kyrgyzstan**	**0.60346**
76	Indonesia	0.59639
77	Botswana	0.59516
78	Vietnam	0.58281
79	Bolivia	0.57443
80	Namibia	0.57271
81	Mongolia	0.56925
82	Honduras	0.55429
83	**Uzbekistan**	**0.55355**
84	Nicaragua	0.54771
85	Morocco	0.54606

86	India	0.54123
87	**Tajikistan**	**0.50458**
88	Ghana	0.49311
89	Lesotho	0.48673
90	Laos	0.47718
91	East Timor	0.47520
92	Uganda	0.47361
93	Cambodia	0.47074
94	Mauritania	0.45825
95	Cameroon	0.45436
96	Nepal	0.44725
97	Madagascar	0.44221
98	Kenya	0.43491
99	Zimbabwe	0.43209
100	Bangladesh	0.42993
101	Nigeria	0.42220
102	Pakistan	0.42070
103	Senegal	0.41534
104	Rwanda	0.41394
105	Yemen	0.41244
106	Tanzania	0.38195
107	Malawi	0.37923
108	Cote d'Ivoire	0.37594
109	Zambia	0.36328
110	Guinea	0.35746
111	Mozambique	0.35151
112	Burkina Faso	0.33089
113	Ethiopia	0.32203
114	Burundi	0.31951
115	Solomon Islands	0.31839
116	Mali	0.30668
117	Central African Republic	0.30419
118	Sierra Leone	0.28412
119	Niger	0.26378
120	Angola	0.19933
121	Antigua and Barbuda	0.17929
122	Guinea-Bissau	0.15813

[1] decimal places extended out five places for ranking purposes only.