



Efficiency of Public Spending in Resource-Rich Post-Soviet States

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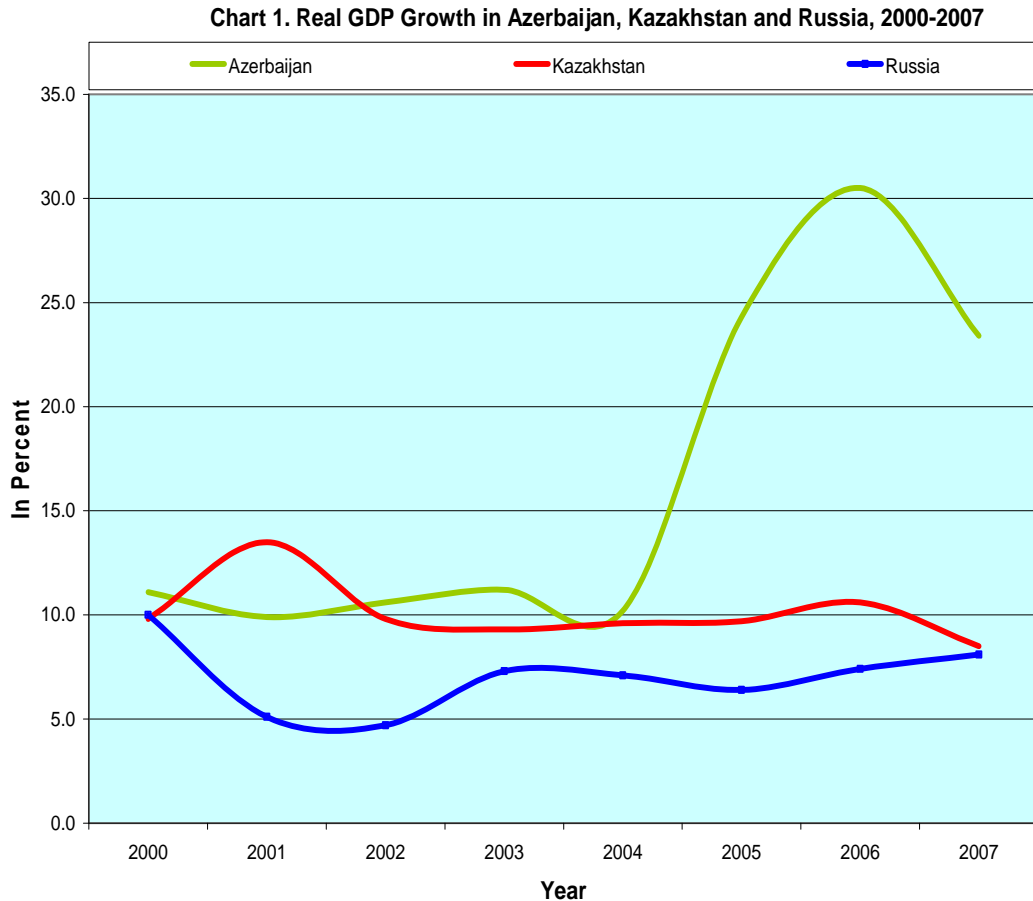
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1. Introduction

The existence of market failures and the need for distributive policies necessitate economic interventions by government. Public spending is a powerful tool in government efforts to improve the delivery of public services or create better conditions for market efficiency. Given the marked differences between social and private rates of return on investments in the education, health, social security sectors, governments often spend on these sectors of the economy where private investment falls short. There is a broad recognition that public spending is vital to sustain long-term economic growth, decrease income inequality and reduce poverty. Yet, a growing body of literature documents ineptitude in government spending decisions and inefficiency in their execution of public sector projects. This is particularly true in developing countries where lack of required capacities, and weak institutions, further aggravate the situation. In a country with poor institutions, a bigger government or a rapid surge in public spending can distort the market and breed corruption, rather than providing the public goods necessary to enhance market efficiency.

During the most recent commodity boom cycle from 2003 to 2008, rising world prices for oil and natural gas brought a spectacular economic boost to resource rich countries in transition, including Azerbaijan, Kazakhstan and Russia. Having suffered a streak of negative economic growth during the first half of the 1990s, these countries then began to record exceptionally high growth rates. As presented in chart 1, between 2000-2007 Azerbaijan's economy grew on average 16.4 percent annually, at one point registering over 30 percent GDP growth in real terms. For the same period Kazakhstan and Russia also registered a strong GDP growth of 10.1 percent and 7 percent, respectively. In addition, rising oil and gas prices generated enormous fiscal revenues, and a lion's share of these funds were spent on fixing a failing social sector badly damaged in the 1990s during the painful transition from a command system to a market economy. However, it is well documented that higher public spending alone is unlikely to produce desirable

social outcomes without substantial improvements in the efficiency of public service delivery.



Numerous attempts have been made to analyze the efficiency of government spending. This body of empirical research can be grouped into four categories: (1) inquiries that focus on certain types of government spending in a specific country; (2) papers that attempt to quantitatively measure public spending efficiency using data on inputs of government spending; (3) studies that evaluate public spending efficiency using output data only; and (4) empirical analyses that seek to assess the efficiency of public expenditures using both input and output data. This study falls into the final category.

The primary objective of this study is to examine the efficiency of public spending on health, education and social protection (or security) in the three natural resource-rich

former Soviet republics of Azerbaijan, Kazakhstan and Russia. The three social sectors merit policymaker's attention because they are central to improving living standards and sustaining economic development in the post-communist region. In most cases, observers evaluate government policies by analyzing changes in social and human development indicators over the tenure of an incumbent government. But a comparison of public spending efficiency at the national level leaves out some important factors that might be central to explaining variations in spending efficiency across countries. By closely examining differences in public spending efficiency at the sub-national level, we identify additional factors that contribute to variations in public spending efficiencies at the national level.

Benchmarking regional level spending efficiencies is particularly relevant for Kazakhstan and Russia, because regional governments in these countries play an important role in forming spending priorities. Another important direction taken in this exercise is the ranking of spending efficiency scores in Azerbaijan, Kazakhstan and Russia against a range of emerging and advanced countries. Anecdotal evidence indicates that there are detectable differences in efficiency of government spending across administrative units of Russia and Kazakhstan. The sub-national analysis is also motivated by the assumption that a better understanding of the determinants of local government expenditure efficiency might help to improve public sector performance at the national level.

In addition to the construction of efficiency scores at both the national and sub-national levels, the study examines the dynamics of expenditure efficiency over time and uncovers factors behind changes in efficiency measures. Finally, the study identifies determinants of possible inefficiencies and discusses factors that can alleviate their occurrence and facilitate better policymaking. In general, this research seeks to offer policy options for improving public spending efficiency at the national and sub-national levels in post-communist societies.

The rest of this paper is organized as follows. Section 2 takes stock of recent economic developments in Azerbaijan, Kazakhstan and Russia, with some discussion of the role of

the extractive sector in the economy. Section 3 places the present research within the context of the existing literature on public spending efficiency. Section 4 elaborates on the methodological approach employed. Section 5 discusses the sources of data and describes the variables used in the analysis. Section 6 presents the main findings from statistical analysis and offers an explanation for the observed trends. The final section summarizes the main findings and conclusions.

2. Overview of Recent Economic Developments in Azerbaijan, Kazakhstan and Russia

After the demise of the Soviet Union in 1991, its fifteen member republics emerged as independent states and made strides towards a market economy. The process of transformation has been turbulent and uneven across transition economies due to different initial conditions, rapid breakdown of regional economic ties and lack of experience and capacity in design and implementation of structural reforms, institution building and regulation of emerging market entities. During the first half of the last decade, all the former republics experienced a dramatic fall in their aggregate output, suffered high levels of unemployment and registered excessively high general price hikes that led to a steep decline in living standards. The Baltic States were the only exception; the slump in economic activity was milder and aggregate output recovered faster from the “transformational” recession¹, providing a path to EU membership.

The initial drop in GDP in the Commonwealth of Independent States was far worse than anticipated. Overall, CIS countries experienced a period of a steep decline in economic output during the first half of the 1990s, although the duration and magnitude of the slump varied from country to country. In particular, the cumulative output decline during the first decade of transition was dramatic in Azerbaijan, with a drop in GDP of about 60 percent, while Kazakhstan and Russia experienced a milder cumulative output loss of about 40 percent each. In addition, Azerbaijan and Kazakhstan reversed the trend in

¹ Janos Kornai coined the notion of the “transformational” recession(s) in 1994 to refer to the experience and development of the former Soviet bloc countries from a centrally planned to a market economy, and the accompanying huge decline in real activity.

1996, while Russia struggled for another three years to arrest the transition decline. Furthermore, Russia's level of real GDP in 2006 was still below the 1989 level, whereas Azerbaijan and Kazakhstan enjoyed a real GDP that substantially surpassed the pre-transition levels.

Since the turn of the century, the pace of economic growth has significantly accelerated in the CIS transition economies. In terms of real GDP growth rates, the CIS countries performed much better than their East European counterparts between 2000 and 2007. In particular, the economies of Azerbaijan, Kazakhstan and Russia, on average, registered strong growth rates during this period, boosted mainly by high energy prices. The economic boom allowed these three countries to generate enormous windfall revenues and to accumulate large foreign exchange reserves. This favorable trend created additional opportunities to increase government expenditures while also presenting significant challenges. Table 1 shows the main macroeconomic indicators for these three transition economies for 2000-2007.

Azerbaijan, Kazakhstan and Russia are endowed with substantial natural resources, and their economies, to varying degrees, depend upon the extractive sectors to generate economic growth, fiscal revenues and foreign exchange earnings. But in all three countries, the oil sector was critical in recording exceptional growth rates over the past several years. In 2007, for instance, the oil and gas sector in Azerbaijan accounted for about 59 percent of total GDP, up from 54 percent in 2006. The oil and gas sector represented over 90 percent of total exports and produced revenues equivalent to about 40 percent of non-oil GDP in 2007. The non-oil sector also continued to grow at around 12 percent, supported by non-tradable sectors activity.

In general, booming oil production, rising oil prices and a rapidly expanding public sector were major drivers of the exceptionally strong economic growth registered during the last couple of years in Azerbaijan. In 2007, crude oil production increased by 28 percent, while natural gas output grew by 80 percent. Oil revenues increased by 118 percent in 2006 and 60 percent in 2007, allowing the Azeri government to significantly boost public

spending: in 2000-2007, the total government expenditures increased five-fold in real terms. This trend demonstrates that during this period the government pursued an unusually lax fiscal policy while keeping the fiscal balance in the positive territory.

Table 1. Main Macroeconomic Indicators, 2000-2007

	2000	2001	2002	2003	2004	2005	2006	2007
Azerbaijan								
Real GDP growth	11.1	9.9	10.6	11.2	10.2	24.3	30.5	23.4
Consumer prices (annual average), in percent	1.8	1.5	2.8	2.2	6.7	9.6	8.3	16.7
Fiscal balance, in percent of GDP	-0.6	-0.4	-0.5	-0.8	1	2.6	-0.2	2.4
Government expenditure, in percent of GDP	20.8	18.7	27.7	28.5	25.9	22.7	27.4	27.4
General government debt, in percent of GDP	20.3	20.9	20.5	20	18.6	14.2	10.8	9.4
Exchange rate, Manat per USD	0.9	0.9	1	1	1	0.9	0.9	0.9
GDP per capita (in US dollars)	659.1	704.6	760.5	880.9	1050.9	1576.8	2497.9	3729.6
Current account/GDP (in percent)	-3.5	-0.9	-12.3	-27.8	-29.8	1.3	17.7	28.8
External debt/GDP (in percent)	19.8	20.2	41.7	37.7	40.2	32.8	23.2	18.6
Kazakhstan								
Real GDP growth	9.8	13.5	9.8	9.3	9.6	9.7	10.6	8.5
Consumer prices (annual average), in percent	13.2	8.4	5.9	6.4	6.9	7.6	8.6	10.8
Fiscal balance, in percent of GDP	-1	1.8	1	2.7	2.5	5.8	7.2	5.2
Government expenditure, in percent of GDP	23.2	23	21	22.6	22.1	22.3	20.4	24.3
General government debt, in percent of GDP	25.5	18	15.6	13.5	11.4	8.1	6.6	10.7
Exchange rate, Tenge per USD	142.1	146.7	153.3	149.6	136	132.9	126.1	122.7
GDP per capita (in US dollars)	1230.5	1491.7	1657.2	2062.3	2862.5	3758.3	5294.3	6742.9
Current account/GDP (in percent)	2	-6.3	-4.2	-0.9	1.1	-1.9	-2.2	-6.6
External debt/GDP (in percent)	69.3	68.4	74.1	74.3	76.3	76	91.4	90.4
Russia								
Real GDP growth	10	5.1	4.7	7.3	7.1	6.4	7.4	8.1
Consumer prices (annual average), in percent	20.8	21.6	15.7	13.7	10.9	12.7	9.7	9
Fiscal balance, in percent of GDP	3.2	2.7	0.6	1.4	4.9	8.1	8.4	6.8
Government expenditure, in percent of GDP	33.7	34.6	37.1	35.7	33.6	31.6	31.3	33.4
General government debt, in percent of GDP	62.5	48.2	41.4	32.4	25.9	16.5	10.6	9.5
Exchange rate, Rubles per USD	28.1	29.2	31.3	30.7	28.8	28.3	27.2	25.6
GDP per capita (in US dollars)	1788.7	2123.4	2379.8	2982.8	4058	5360.5	6941.9	9062
Current account/GDP (in percent)	18	11.1	8.4	8.2	10.2	11	9.6	5.9
External debt/GDP (in percent)	61.6	49.3	49.2	46.4	38.6	33.6	31.4	35.6

Source: EBRD Data

Kazakhstan has enjoyed strong economic growth since 2000, though the economic expansion showed signs of slowdown in 2007 due to the global liquidity crunch. In 2007, the economy grew by 8.5 percent, two percentage points lower than a year earlier, yet an

impressive growth by any account². This strong economic performance has largely been supported by expansion in construction, financial intermediation and the service sector. Economic growth in Kazakhstan slowed sharply in 2008 owing to the global financial crisis and a precipitous drop in oil prices. The banking sector has heavily borrowed from international markets in recent years and substantially expanded its domestic lending activity, mainly to the construction and real estate sectors. At present, banks have condensed their lending operations in response to funding difficulties. Although the Kazakh authorities have sufficient financial resources to prevent the banking sector from a full-blown liquidity crisis, medium-term growth prospects will increasingly depend upon measures to mitigate risks in the banking sector and on world prices for oil.

From 2000-2007, Kazakhstan doubled its crude oil production, increasing production volume by 11.5 percent per year, on average, and made genuine efforts to expand production capacity to accelerate growth in oil production. Nevertheless, oil exports accounted for 26.4 percent of GDP in 2007, a drop from 30.6 percent in 2006. This downward trend is likely to continue. High oil prices and strong growth in non-oil revenues permitted the government of Kazakhstan to increase its budget revenues, but the government registered a non-oil budget deficit equal to 4.3 percent of GDP, reflecting a rapid increase in government expenditures. However, as shown in Table 1, the government has been able to maintain a positive overall fiscal balance since 2001. Between 2000 and 2007, total government expenditures grew more than threefold in real terms due to significant increases in spending on education, health and social protection. Although such a rapid increase in government spending over a short time span is not unusual in booming economies, and though it has provided much needed financing for infrastructure improvements and social development in Kazakhstan, there is a significant risk that the quality and efficiency of the public spending might deteriorate with growing expenditures.

² In 2008, the economy of Kazakhstan grew by 3.5 percent. The global financial crisis and a sharp decline in oil prices are expected to slow economic growth further in 2009.

Russia's economy has expanded at a brisk pace since the nation's remarkable recovery from the 1998 financial crisis. Over the years immediately following the crisis, a weak Russian currency underpinned the strong growth. Even though over the last nine years annual growth in real GDP has been somewhat slower compared to Azerbaijan and Kazakhstan, the expansion has been more balanced. Moreover, recent GDP growth increased from 7.4 percent in 2006 to 8.1 in 2007, which is significantly above Russia's recent trend. The acceleration is fuelled by the thriving non-tradable sector, reflecting booming domestic demand and currency appreciation. By contrast, the key engines of economic growth in 2003-2004 were oil and some industrial sectors that grew at an average rate of almost 10 percent over that period. In 2007, construction and wholesale and retail trade grew by 16.4 and 12.9 percent, respectively, while growth in the manufacturing sector slowed to 7 percent and growth in the resource extraction industry virtually stopped, reflecting capacity constraints and a lack of development of new fields.

Though Russia depends on the extractive sectors less than its neighbors do, its budget still relies heavily on oil windfalls for revenue. The general government budget data demonstrate a considerable increase in public spending in 2007, compared to the previous two years. Russia increased its spending by about 2 percent of GDP in 2007. While revenues increased by less than one percent of GDP, the magnitude of the budget surplus was reduced by 2.3 percent of GDP. In 2007, the authorities adopted a new strategy to increase public spending further. The approved three-year budget entailed a relaxation of non-oil fiscal deficit to 2.5 percent of GDP by 2009. The international development agencies are concerned that the efficiency of the planned public spending would be much lower in the absence of strong public-sector and administrative reforms. The end of the boom cycle in mid-2008 significantly decelerated economic growth in 2008, and there is a widespread agreement among analysts that the Russian economy will shrink in 2009 for the first time since the 1998 financial crisis. The global financial liquidity crunch combined with weak oil prices have been pulling down economic growth in Russia.

This short overview of recent economic developments in Azerbaijan, Kazakhstan and Russia clearly demonstrates that all three countries have been expanding rapidly for about

eight years and the extractive sector played a major role in the development process, albeit to varying degrees. The economy of Azerbaijan relies more on hydrocarbon production to generate economic growth, while Kazakhstan and Russia are less dependent on the extractive sector. Regardless of the uneven growth experiences, these nations have shared one common trend: public spending has been on the rise in all three economies. This fiscal relaxation has led to widespread concerns that without public sector reform, increasing government expenditures will have a limited impact on development. Moreover, the economies of these countries have been hit hard by the current global downturn, since oil prices remain weak, reflecting the decline in demand for oil.

3. Definition of Spending Efficiency

For the purpose of this study, the efficiency of public spending is measured as a difference between the actual spending and the theoretically possible minimum spending that is sufficient to produce the same level of actual output. Efficiency measures are computed by comparing government expenditures for certain services with the actual outcomes. This process involves the estimation of efficiency frontiers using data envelopment analysis (DEA),³ a non-parametric method that is a first step in detecting sources of inefficiencies in allocating public funds to the social sector. The existing studies differentiate two types of efficiencies: input-oriented measures and output-oriented measures. The former indicates the movement (an increase or a decrease) along the input space for a given level of output, while the latter reflects the improvement in outputs for a given set of inputs. We focus on input-oriented efficiency scores since our interest lies in understanding public spending policies aimed at achieving certain level of outputs. In addition, we allow variable returns to scale given, in some instances, the reduction in certain outputs for higher levels of public spending. This assumption implies

³ For the nonparametric DEA estimation, we use the software package FEAR 1.11 created by P.J. Wilson (2008). FEAR is based on the statistical package R, and we duly recognize its authors: R Development Core Team (2008). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0, URL <http://www.r-project.org>.

that increase in government spending in some cases might reduce the level of output rather than increasing it.

In this paper we use Farrell's (1957) measure of efficiency, which means that our reported efficiency scores are bound between zero and one. A score of lower than one in the interior of the efficiency frontier indicates a less efficient outcome while a score of one means that within the sample of countries or regions a decision-making unit (in our case a state or province) lies on the efficiency frontier or is considered to be most efficient. Hence, relative inefficiencies of the observed input-output combination are defined as the distance away from the efficiency frontier. For example, a score of 0.64 implies that the same output could be achieved with lower level of public expenditures or inputs (64 percent of the current input levels).

We calculate and report the efficiency scores of an international sample of medium sized developed and developing European economies as well as Azerbaijan, Kazakhstan and Russia. This analysis is then augmented by a sub-national level study of efficiency scores in both Russia and Kazakhstan⁴. We also describe the evolution of the efficiency rankings over time, starting in 2003 and ending in 2006.

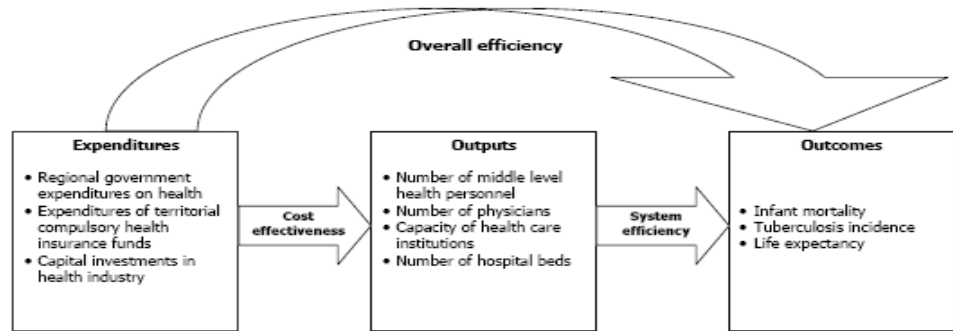
Measures of efficiency

In this study, we distinguish two types of efficiencies: cost efficiency (effectiveness) and the system efficiency (institutional efficiency). The combination of these two efficiencies allows us to assess the total or overall efficiency. Figure 1 and Figure 2 sketch out a diagram of these two different types of efficiency for Russia and Kazakhstan. These figures also present measures of inputs, outputs and outcomes, used in ranking efficiencies across regions, and provide the basis for the international comparison of the three countries. The cost efficiency measures a degree of efficiency in a country in turning inputs into outputs while the system efficiency gauges efficiency of the institutions in transforming outputs into final outcomes. Even if some countries are

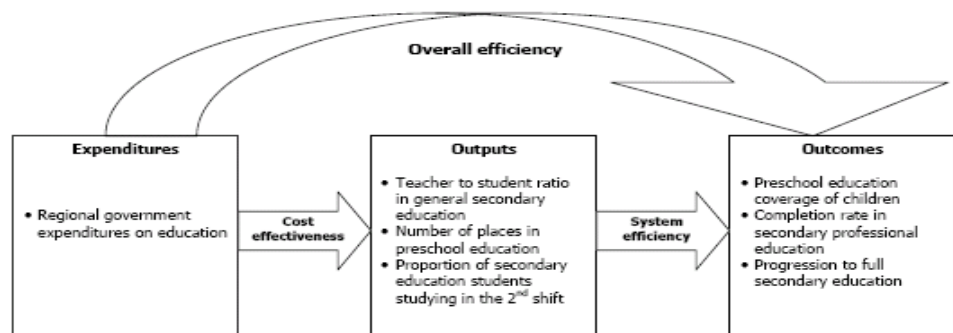
⁴ Sub-national data is not available for Azerbaijan.

relatively efficient in terms of obtaining higher output for a given level of inputs what makes the crucial difference is the total efficiency, which depends to a large degree on the system efficiency. In addition, it may take fewer resources or less time to improve cost efficiency whereas improvements in institutional quality and efficiency usually require more effort and time. One of the contributions of this study is to illustrate all three types of efficiency measures in order to glean policy recommendations that improve public spending in health, education and social security sectors in these countries.

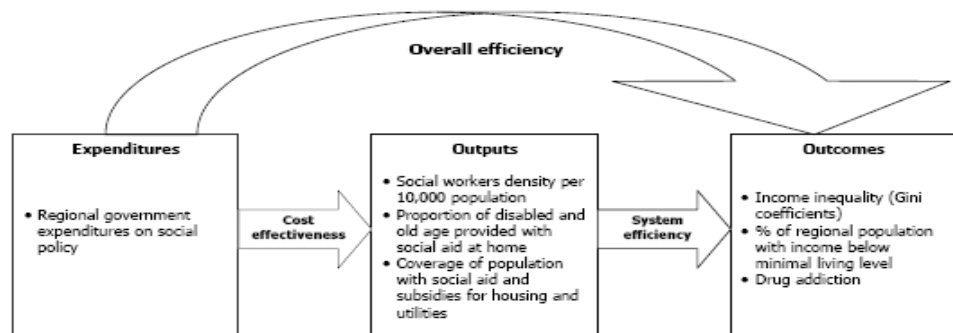
Figure 1: Efficiency relationships – Russia



(a) Health

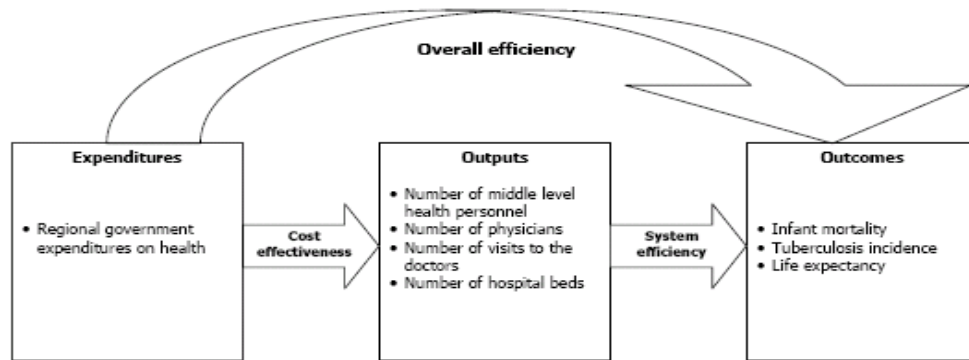


(b) Education

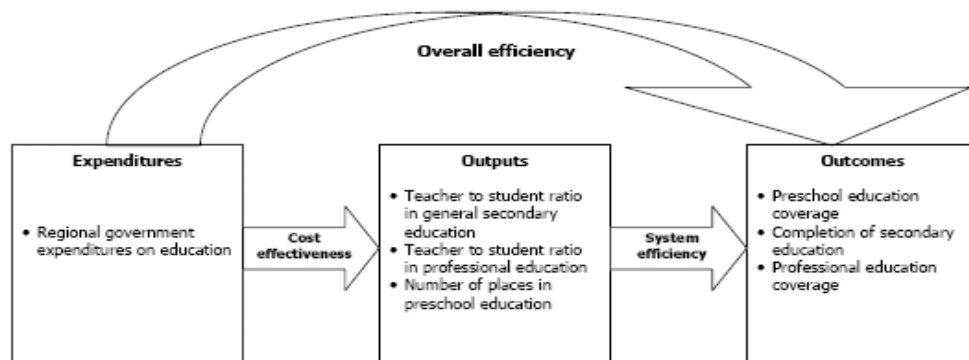


(c) Social policy

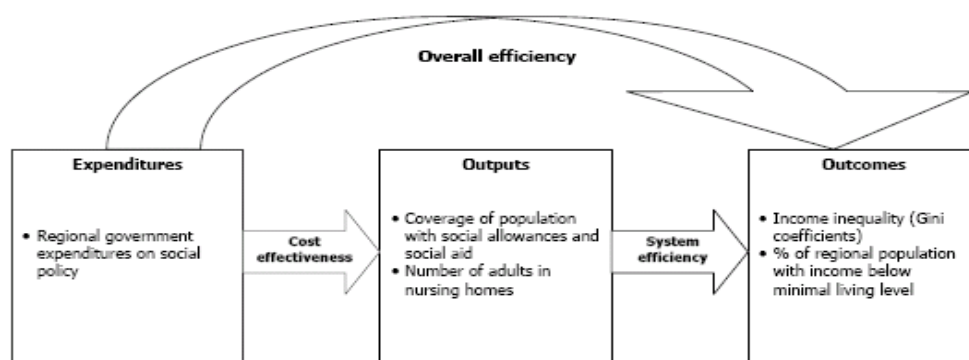
Figure 2: Efficiency relationships – Kazakhstan



(a) Health



(b) Education



(c) Social policy

In Kazakhstan and Russia, employing data from the three sectors (health, education, and social security), we analyzed the effects of public spending on main social indicators (outcomes) such as life expectancy and infant mortality (in health), progression rates or exam scores (in education) or income inequality (in social protection). Inputs that allowed this production in the public sector to occur in our study are the per capita real national and regional public expenditures across countries and regions. For intermediate outputs or resources to evaluate system efficiency, we use the number of hospital beds and doctors (in health), teacher to student ratios (in education) and social worker density or proportion of disabled or old age population with social aid, for example.

4. Evolution of Public Spending in Azerbaijan, Kazakhstan and Russia

Tables 1 and 2 in Appendix A summarize the description of indicators used in the study and provide summary statistics of inputs, outputs and outcomes for Russia and Kazakhstan. The data compiled for Russia cover the period between 2001 and 2006, while data for Kazakhstan capture the 2000-2007 period. The mean calculations for input variables indicate that, during the sample period, regional government expenditures on education, health and social protection grew in real terms in Russia. The same exercise for Kazakhstan demonstrates that regional government spending on education and health increased from 2000 to 2007 whereas expenditures on social protection slightly declined over this period. Most output and outcome indicators showed an upward trend in both countries over the sample period.

Table 3 presents the evolution of real budget expenditures on education, health, and social protection in Azerbaijan in 2000-2007. It can clearly be seen that in all three sectors, public spending dramatically increased in real terms throughout this period.

Table 3. Evolution of Real Budget Expenditures on the Social Sector in Azerbaijan, 2000-2007 (in Million AZM)

Year	Education		Health		Social Security	
	In 2000 Prices	Percent of GDP	In 2000 Prices	Percent of GDP	In 2000 Prices	Percent of GDP
2000	181.8	3.85	40.9	0.87	139.4	2.95
2001	183.4	3.5	41.4	0.79	143.9	2.75
2002	183.2	3.15	42.9	0.74	182.4	3.14
2003	220.2	3.29	51.9	0.77	200.7	2.99
2004	258.5	3.45	64.6	0.86	207.8	2.77
2005	298.7	2.97	92.5	0.92	244.5	2.43
2006	354.7	2.66	120.0	0.9	252.9	1.89
2007	458.7	2.87	163.2	1.02	377.4	2.36

Source: State Statistical Committee of Azerbaijan and author's calculations

The government funds allocated to education have grown by about two fold since 2000, while social security spending is almost three times the 2000 level, and government expenditures on the health sector quadrupled. However, as a percent of GDP, budget expenditures on education and social security have declined slightly, while public funding of the health sector marginally increased, reflecting exceptional GDP growth rates in Azerbaijan over this period. This trend differs somewhat from public spending trends recorded in both Kazakhstan and Russia during the same period.

Table 4 shows changes in public spending in real terms in the social sector in Kazakhstan over the period of 2000-2007. During this period, public spending on the education and health sectors increased about four-fold in real terms, while the social security sector saw slightly slower – about double – growth in government spending for the sector. Because of these different growth rates, government expenditures on these sectors as a share of GDP, have changed unevenly throughout this period. The public spending on the education and health sectors as a percent of GDP increased slightly in 2000-2007 while government funding of the social security sector declined by two full percentage points. This trend is also influenced by the changes in the pension system in Kazakhstan, which was privatized before the turn of the century.

Table 4. Evolution of Real Budget Expenditures on the Social Sector in Kazakhstan, 2000-2007 (in Billions of KZT)

Year	Education		Health		Social Security	
	In 2000 Prices	Percent of GDP	In 2000 Prices	Percent of GDP	In 2000 Prices	Percent of GDP
2000	71.90	2.77	44.99	1.73	153.46	5.90
2001	78.07	2.60	50.02	1.67	157.79	5.26
2002	91.49	2.78	54.22	1.65	162.59	4.94
2003	99.17	2.63	58.23	1.54	164.81	4.36
2004	114.07	2.54	68.74	1.53	183.22	4.08
2005	182.88	3.38	132.00	2.44	245.82	4.55
2006	214.51	3.20	146.40	2.19	276.86	4.14
2007	269.40	3.58	177.09	2.35	297.17	3.95

Source: Kazakhstan Ministry of Finance and author's calculations

Table 5 summarizes the evolution of real budget expenditures in Russia on the social sector in 2000-2007. Spending on education, health and social security grew steadily between 2000 and 2007. Unlike in Azerbaijan and Kazakhstan, government expenditures on these sectors as a share of GDP increased during this period. This positive trend can be partially explained by the fact that Russia's real GDP growth over this period was slower than Azerbaijan's or Kazakhstan's. In real terms, Russian public spending on education, health and social security doubled from 2000 to 2007. Since 2005, the Russian government has been funding both health and social security, and to a lesser degree education, through extra-budgetary funds. Table 5 contains the actual consolidated budget data. In an effort to make cross-country comparisons meaningful, we excluded funds allocated to these sectors by the extra-budgetary funds at the national and local levels.

Table 5. Evolution of Real Budget Expenditures on the Social Sector in Russia, 2000-2007 (in Billions of RUB)

Year	Education		Health		Social Security	
	In 2000 Prices	Percent of GDP	In 2000 Prices	Percent of GDP	In 2000 Prices	Percent of GDP
2000	214.70	2.94	153.40	2.10	127.90	1.75
2001	228.45	3.11	149.18	2.03	182.15	2.48
2002	290.99	3.78	180.32	2.35	445.30	5.79
2003	297.31	3.59	186.04	2.25	199.67	2.41
2004	334.49	3.48	208.73	2.17	227.79	2.37
2005	395.51	3.66	276.14	2.55	257.19	2.38
2006	381.37	3.11	279.08	2.28	241.74	1.97
2007	451.76	3.27	322.23	2.34	275.99	2.00

Source: Russian Statistical Agency and author's calculations

Sub-National Budget Expenditures in Kazakhstan and Russia

A careful analysis of government budget spending on the social sector at the sub-national level offers additional insights into the association between the expenditures and outcomes. We examined the correlation between real gross regional product per capita and government expenditures on education, health and social security across regions to identify whether more prosperous regions are higher spenders and more efficient in delivering public goods. The results of this exercise show that in Russia there is a strong correlation over time between real regional product per capita and budget spending, while the correlation is somewhat weaker in Kazakhstan. This implies that in Russia wealthier regions spend more, while poorer local authorities spend less. For Kazakhstan there was no clear correlation between budget expenditures and real gross regional product, indicating that the government there implements a strong equalization policy under which both rich and poor regions receive more or less equal treatment from the central government. Moreover, the striking difference in correlation is likely due to the fact that in Russia, regional governments are much more independent from the center in their spending decisions, and that a sizeable portion of government spending on the social sector stems from the regional governments.

Further analysis of regional government budget expenditure trends revealed that in both Russia and Kazakhstan expenditures started rising at the beginning of the decade and continued growing at the same pace during the rest of the sample period. This appears to be especially true for those regions at the upper end (15th percentile) of the distribution in both health and education, but not on social spending. A major finding to be taken from these exercises is that higher spending does not necessarily translate into better outcomes in Kazakhstan and Russia, which is consistent with the conclusions of other studies. In the following sections, we will be able to test this proposition more rigorously across regions within a country and over time. We will seek to determine whether high spenders (regions with relatively higher per capita public spending) are less efficient.

The comparison across the two countries of changes in health, education and social outputs over time within the distribution of per capita real expenditures averaged at a particular point in time, provides a link between inputs and outputs. In Russia, the high spenders provided more hospital beds, and a larger number of physicians per 10,000 people. They also added more capacity in health care institutions. In Kazakhstan, a similar trend appears to exist in health care, where higher regional expenditures were clearly focused on increasing the number of hospital beds and physicians. In education, however, there are some differences: For example, in Russia, higher education spending provided higher teacher to student ratios, while in Kazakhstan, regions in the upper (15th) percentile of the expenditure distribution had lower teacher to student ratios. There are no clear patterns that emerge in terms of social security spending in the two countries. While lower social spending regions in Russia seem to outperform the wealthier regions, in Kazakhstan, higher spenders had an above average number of social aid recipients at the beginning of the period, a trend that was reversed (or equalized) by the end of the period (in 2006).

When we compared indicators for health, education, and social outcomes in both countries, using a range of per capita expenditures from high-spending regions to lower-spending regions, we obtained mixed results. In Russia, we observed that higher spenders do not necessarily attain better outcomes. For example, infant mortality showed a downward trend over time, in all but the lowest-spending group, while female life

expectancy was shorter among the highest spenders than in any other group. In the highest-spending region, continuation rates for education were the highest and improved over time. However, secondary school completion rates were lower in this group than among low- and middle-spending regions.. More striking is that income inequality was relatively higher in regions with high social expenditure per capita. Similarly in Kazakhstan, the high health expenditure group had higher infant mortality than the other two groups. Higher spenders, however, appear to achieve lower poverty rates across the board.

International comparison and ranking of Azerbaijan, Russia and Kazakhstan

We analyzed the efficiency frontier for a group of countries, including some advanced, emerging and transitional economies. The results presented in Table 6 reveal, surprisingly, that Azerbaijan stands on the efficiency frontier in health spending relative to a cohort of advanced and developing European economies. While there has been some improvement in efficiency in education -- a move closer to the frontier in 2006 relative to the reference group, from 0.89 to 0.92 -- Azerbaijan has performed poorly in terms of social security spending as it moves inside and away in the interior, from 0.92 to 0.66, of the frontier between 2003 and 2006.⁵ Kazakhstan appears to be on the efficiency frontier for education, while Russia is consistently at the lower end of the distribution in all three sectors at period end. Table 6 also shows that Russia improved its efficiency on health spending within the sample, increasing its ranking from 14 in 2003 to 8 in 2006.

One explanation for Azerbaijan's high efficiency scores in the health sector may be that its health care spending is the lowest in the sample, and thus for any given level of outputs the country ranks better than the other countries. The poor quality of the data on Azerbaijan may offer another explanation for this puzzling result.

⁵ On the frontier we observed Cyprus, Malta, Sweden, and South Korea. This finding is consistent with earlier work, for a different sample and years.

Table 6: Efficiency scores – International Comparison of Efficiency Rankings

Country	Health						Education						Social policy					
	2003		2006		2003		2006		2003		2006		2003		2006			
	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank	Score	Rank		
Azerbaijan	1.0000	1	1.0000	1	0.8921	5	0.9212	3	0.9229	2	0.6572	5						
Belarus	0.2767	17	0.2755	14	1.0000	1	0.5510	14	0.3887	12	0.2199	15						
Bulgaria	0.3380	16	0.2755	14	1.0000	1	0.6786	7	0.3833	13	0.2171	16						
Cyprus	1.0000	1	1.0000	1	0.5825	13	0.3698	16	n/a		0.5368	6						
Czech Republic	0.7950	3	0.4737	6	0.9403	3	0.5693	12	0.7823	3	0.7651	2						
Estonia	0.5085	6	0.5337	3	0.6458	11	1.0000	1	0.5632	7	0.3210	9						
Hungary	0.3670	13	0.3197	11	0.6898	8	0.5548	13	1.0000	1	0.6855	3						
Kazakhstan	0.5009	7	0.4828	5	1.0000	1	1.0000	1	1.0000	1	0.6807	4						
Latvia	0.5583	5	0.4494	7	0.6979	7	0.7405	6	0.4462	11	0.3094	13						
Lithuania	0.3801	11	0.4070	9	0.7956	6	0.7409	5	0.5182	9	0.3133	12						
Malta	0.4706	9	1.0000	1	1.0000	1	0.4967	15	0.4684	10	0.5319	7						
Poland	0.4862	8	0.5974	2	0.6832	10	0.5999	11	0.2808	15	0.1578	18						
Romania	0.3484	15	0.3106	12	0.9466	2	0.7451	4	0.5228	8	0.3164	10						
Russia	0.3669	14	0.4334	8	1.0000	1	0.9776	2	0.5817	6	0.3589	8						
S Korea	0.8889	2	1.0000	1	1.0000	1	1.0000	1	n/a		1.0000	1						
Slovakia	0.4157	10	0.3559	10	0.9042	4	0.6129	9	1.0000	1	1.0000	1						
Slovenia	0.7076	4	0.5000	4	0.5968	12	0.6425	8	0.3028	14	0.3159	11						
Sweden	1.0000	1	1.0000	1	n/a		n/a		0.6000	5	1.0000	1						
Turkey	0.2056	18	0.2231	15	n/a		n/a		0.6317	4	0.3085	14						
Ukraine	0.3745	12	0.2903	13	0.6835	9	0.6025	10	0.3833	13	0.1753	17						

Regions of Russia: A Comparison of Efficiency Scores

Table 7 provides a summary of efficiency score distributions for Russia over the period from 2003 to 2006.⁶ Overall, average efficiency scores for education and social protection spending are better than for the health sector. Efficiency scores for the health sector changed significantly over the period studied. The number of the regions that meet efficiency standards with a score of one in this study has not changed, excluding a brief drop in 2005. Yet the minimum cost efficiency score estimated for the regions improved from 0.33 in 2003 to 0.52 in 2006, signifying improvements along this particular efficiency measure. However, the deterioration of the overall efficiency score over the period overshadows this positive change. The number of regions considered most efficient declined from 26 in 2003 to 19 in 2006. The minimum overall efficiency score in the regions also dropped, from 0.24 in 2003 to 0.22 in 2006. This decline is entirely due to a weakening of system efficiency which is linked to the quality of institutions.

A careful examination of the efficiency scores and their distribution across regions and over time suggests that the spending surge in the health sector is not causing a rise in the overall efficiency. However, this finding does not imply that the quality of health services is worsening. It rather indicates that each dollar of additional spending brings less benefit. Furthermore, for education spending the number of most efficient regions increased marginally, from 14 in 2003 to 16 in 2006, when ranking the regions by overall efficiency. The results also illustrate that throughout the sample period system efficiency in the education sector experienced some improvements, while cost efficiency showed a slight deterioration. But the minimum level of cost efficiency improved somewhat, and this trend has brought down cost efficiency variations across regions. Overall, the cost efficiency of education spending suffered a visible decline throughout this period.

For government spending on social protection, overall efficiency improved steadily until 2005, when measured by the number of most efficient regions. Neither cost efficiency

⁶ The number of regions used is 79, the same used in Hauner's study(2005), and comprises 21 *republics*, 50 *oblasts*, 6 *krais*, and 10 *okrugs*, including the two cities Moscow and St Petersburg.

nor system efficiency showed a clear upward trend during this period, although the efficiency scores in both categories were somewhat lower in 2006 compared to the 2005. This deterioration could be the result of a government policy that replaced in-kind benefits with cash payments to economically disadvantaged people. It is likely that this new policy came with a high price tag while offering less visible gains. This observation is broadly in line with the findings of similar studies that report that spending efficiency declines when public expenditures grow.

Table 7: Summary of efficiency score distributions -- Russia

	Health			Education			Social policy		
	Cost eff.	System eff.	Overall eff.	Cost eff.	System eff.	Overall eff.	Cost eff.	System eff.	Overall eff.
2003									
Minimum	0.338	0.388	0.241	0.206	0.763	0.357	0.212	0.635	0.415
1st Quartile	0.634	0.623	0.612	0.537	0.845	0.609	0.596	0.817	0.648
Median	0.740	0.699	0.699	0.688	0.905	0.745	0.670	0.880	0.741
Mean	0.730	0.714	0.705	0.664	0.894	0.731	0.677	0.869	0.743
3rd Quartile	0.838	0.793	0.834	0.813	0.950	0.891	0.793	0.926	0.853
Maximum	0.995	0.983	0.977	0.968	0.997	0.995	0.968	0.999	0.996
N Efficient	26	16	27	10	27	14	15	37	13
2004									
Minimum	0.368	0.421	0.163	0.226	0.733	0.258	0.109	0.691	0.408
1st Quartile	0.715	0.640	0.650	0.572	0.839	0.604	0.505	0.843	0.578
Median	0.784	0.721	0.718	0.689	0.903	0.692	0.591	0.893	0.690
Mean	0.786	0.724	0.741	0.682	0.899	0.709	0.603	0.884	0.699
3rd Quartile	0.875	0.817	0.884	0.822	0.966	0.849	0.713	0.943	0.803
Maximum	0.986	0.960	0.998	0.997	0.996	0.992	0.955	0.999	0.999
N Efficient	26	14	18	13	27	14	11	33	16
2005									
Minimum	0.429	0.438	0.174	0.206	0.768	0.281	0.171	0.767	0.372
1st Quartile	0.695	0.698	0.667	0.562	0.836	0.575	0.582	0.870	0.643
Median	0.775	0.834	0.750	0.697	0.904	0.707	0.706	0.899	0.766
Mean	0.764	0.809	0.743	0.689	0.896	0.692	0.700	0.897	0.749
3rd Quartile	0.836	0.912	0.851	0.843	0.948	0.824	0.832	0.935	0.868
Maximum	0.990	0.993	0.992	0.991	0.999	0.982	0.972	0.992	1.000
N Efficient	17	25	24	9	33	19	17	40	22
2006									
Minimum	0.528	0.394	0.222	0.228	0.777	0.244	0.315	0.808	0.395
1st Quartile	0.762	0.668	0.631	0.565	0.852	0.613	0.667	0.856	0.650
Median	0.811	0.739	0.719	0.688	0.912	0.736	0.753	0.900	0.765
Mean	0.809	0.748	0.706	0.676	0.903	0.711	0.747	0.899	0.734
3rd Quartile	0.885	0.821	0.789	0.815	0.953	0.839	0.850	0.936	0.841
Maximum	0.988	0.997	0.987	0.993	0.999	0.996	0.995	0.999	0.990
N Efficient	26	12	19	7	34	16	14	37	16

Regions of Kazakhstan: A Comparison of Efficiency Scores

Table 8 presents a summary of efficiency scores distribution for the regions of Kazakhstan in 2003-2006. Efficiency scores in all three sectors have been more evenly distributed across regions of Kazakhstan as compared to Russian regions, which can be seen in the difference between the minimum score and the maximum score. Overall the efficiency of spending in the health sector deteriorated slightly from 2005 to 2006, as the number of most efficient regions dropped from 5 to 3, while mean and median efficiency scores improved somewhat. The efficiency of spending on education visibly declined from 2004 to 2006. The number of regions with the highest overall efficiency scores collapsed, from 12 in 2004 to 6 in 2006. The distribution of the overall efficiency scores for spending on social protection improved slightly during this period, reflecting well-designed government policies to root out poverty in rural areas. Yet the cost efficiency in this sector suffered a slight decline. These findings again support the argument that increased spending did not bring about additional efficiency in most cases. These comparisons also reveal immense cross-regional variations in efficiency scores across Russian regions, while scores across Kazakh regions more evenly distributed.

Table 8: Summary of efficiency scores distributions -- Kazakhstan

	Health			Education			Social policy		
	Cost eff.	System eff.	Overall eff.	Cost eff.	System eff.	Overall eff.	Cost eff.	System eff.	Overall eff.
2003									
Minimum							0.721	0.523	0.473
1st Quartile							0.797	0.538	0.587
Median							0.870	0.653	0.714
Mean							0.858	0.660	0.722
3rd Quartile							0.920	0.729	0.880
Maximum							1.000	0.884	0.939
N Efficient							6	4	6
2004									
Minimum				0.502	0.950	0.857	0.240	0.520	0.530
1st Quartile				0.779	0.955	0.894	0.742	0.547	0.654
Median				0.854	0.960	0.935	0.777	0.617	0.769
Mean				0.815	0.960	0.928	0.734	0.612	0.772
3rd Quartile				0.897	0.965	0.969	0.804	0.678	0.918
Maximum				0.959	0.969	0.986	0.957	0.712	0.988
N Efficient				6	14	12	6	4	5
2005									
Minimum	0.674	0.744	0.516	0.570	0.905	0.803	0.267	0.491	0.510
1st Quartile	0.800	0.805	0.597	0.783	0.922	0.836	0.613	0.524	0.617
Median	0.834	0.836	0.638	0.861	0.938	0.935	0.816	0.567	0.709
Mean	0.847	0.850	0.680	0.825	0.938	0.900	0.740	0.621	0.709
3rd Quartile	0.910	0.889	0.752	0.899	0.955	0.942	0.922	0.717	0.806
Maximum	0.979	0.971	0.946	0.978	0.971	0.983	0.965	0.851	0.918
N Efficient	6	7	5	9	14	11	7	6	5
2006									
Minimum	0.723	0.668	0.538	0.519	0.838	0.550	0.336	0.539	0.545
1st Quartile	0.794	0.781	0.598	0.713	0.878	0.666	0.624	0.653	0.610
Median	0.871	0.808	0.686	0.855	0.923	0.734	0.839	0.808	0.702
Mean	0.873	0.825	0.705	0.794	0.917	0.720	0.775	0.750	0.699
3rd Quartile	0.967	0.845	0.737	0.891	0.962	0.759	0.953	0.857	0.764
Maximum	0.995	0.992	0.992	0.951	0.984	0.878	0.985	0.894	0.883
N Efficient	6	6	3	8	12	6	6	4	6

5. The origins of inefficiencies

The second stage of the analysis focuses on the possible determinants of the efficiency score distributions at the sub-national level. Due to data limitations, we performed this analysis only for Russian regions in 2006. In this exercise, the efficiency scores assigned to regions are regressed on a host of environmental variables (correlates) that might effect health, education, and social sector performances in Russia across its regions.

In our regression analysis, per capita gross regional product is used as a measure of income in Russian regions. The argument runs as follows: Higher income might be associated with better outcomes in all three sectors. As regions become richer they build better institutions and the efficiency in delivering public services improves. It is also true that income may increase the cost of public services while reducing public spending efficiency as regions (countries) get wealthier. Our empirical results confirm the first

hypothesis: that there is a positive and significant correlation between income and efficiency scores. The estimated results cannot lend support for the argument that in wealthy regions a disproportionate rise in the cost of public services erodes spending efficiency.

In addition, the regression analysis also includes some measures of the population, including age distribution and population structure, since these tend to affect health or education outcomes. Other controls in this category include population density, average temperature, and migration growth among regions, which are expected to positively affect outcomes, both in terms of health and the provision of better services. There is little evidence, however, to suggest that climate or air and water pollution or consumption of alcohol or population size adversely affected the distribution of efficiency scores across regions in all three sectors. We also observe that higher private health sector expenditure is marginally associated with lower public health expenditure efficiency. The regression analysis demonstrated no significant impact of private sector expenditures on education efficiency in Russian regions.

We used the volume of oil and gas extraction as a measure of resource dependence in the regions. The initial calculations indicated that many Russian regions can be considered resource dependent, and these regions spend a higher share of their revenues on public sector goods. The wealth of data allows us to test the hypothesis that higher oil prices, and hence revenues, may weaken incentives for efficient allocation of scarce public resources. Our analysis finds a significant negative correlation between the “oil” sector variable and the efficiency score, which confirms the hypothesis. It appears that at the sub-national level, resource abundance hurts regional development outcomes by reducing the efficiency of public spending. The degree of significance is higher in the education sector compared to the health and social sectors. The results indicate that hydrocarbon rich regions spend more than the other regions on the social sector without matching improvements in the outcome variables. This is a classic example of public resources being squandered when they are easily available and rarely subject to public scrutiny, as is the case with resource rents.

The expert rankings of investment potential for the regions are used as a measure of investment risk, which can be considered a proxy for the quality of the business environment. The shadow economy variable measures the size of the underground economy, which may adversely impact performance in the health and social sectors. We cannot find any effect of investment risk on the efficiency scores. While the shadow economy proxy does negatively affect health and education sector outcomes, the coefficients are not statistically significant. Moreover, we control for the level of modernization among regions, using urbanization rates, and the proportion of population with higher education. Our hypothesis is that these variables positively effect public sector performance and boost overall efficiency. We obtained mixed results: It seems that urbanization rates affect education outcomes negatively, while the share of population with higher education yields a positive impact on social policy outcomes. Finally, the regression results indicate that the size of bureaucracy positively impacts health sector efficiency. This finding may suggest that larger regional governments are better positioned to deliver essential health services, but we cannot find significant effects of this variable on social sector efficiency.

6. Concluding Remarks

In this paper, we have analyzed efficiency of public spending in Azerbaijan, Kazakhstan and Russia. The results indicate that these resource-rich former Soviet republics dramatically increased government spending between 2000 and 2007 because of unusually high global prices for oil and gas, which are their main export commodities. However the level of spending on the social sector in all three countries remains significantly lower than in the more advanced transitional economies. With relatively high outcomes in the education and health sectors, these three countries rank above average among the countries in the sample. The comparison of their public spending efficiency with the more advanced transitional countries, and some developed countries, also uncovered striking differences in overall spending efficiency. It is worth noting that

in the health sector, calculated efficiency scores in Azerbaijan are far better than the average efficiency score obtained for all countries in the sample.

More importantly, efficiency of public spending across regions of Russia is very uneven, and there is scarce evidence that the low-efficiency regions are catching up with the high-efficiency regions over time. Though some regions are improving their cost efficiency, in general, they have failed to make visible progress in system efficiency that could be linked to the quality of institutions. We also note that better cost effectiveness does not necessarily translate into better systemic efficiency overall. Kazakhstan appears to show a different pattern than Russia in terms of the distribution of rankings of efficiency scores. We also observe that Kazakhstan is a unitary state with a strong equalization policy, and thus the variance in the estimated distribution of efficiency scores is relatively small.

We have found that the resource curse is evident at the sub-national level as well, eroding public sector efficiency. This is a new finding among the existing literature on this topic and complements earlier work on Russia. The current level of spending efficiency in Russia's health and social protection sectors is lower than in the advanced transitional countries of Eastern Europe. Contrary to our expectations, the results demonstrate that these three countries are in the top performers' category in terms of spending efficiency in the education sector. Still, the analysis indicates that there are ample opportunities to improve efficiency of public spending in Azerbaijan, Kazakhstan, and Russia.

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Table 9. Regression Estimation Results for Russia

Dependent Variable – Rankings 2006	Health	Education	Social policy
GRP_R	0.4922	1.0427	0.6767
t-stats	1.686008	3.288371	3.441826395
OIL	-0.0368	-0.0744	-0.0131
t-stats	-1.51709	-2.8461	-0.747366247
OLD	-0.8253	-2.5068	-0.624
t-stats	-1.75355	-4.15923	-1.826614048
ACADEMIC	-0.0194	-0.4271	0.6721
t-stats	-0.04519	-0.79747	2.447712601
URBAN	0.1047	-1.6123	-0.2419
t-stats	0.258651	-2.80747	-0.74280713
POPUL	-0.0411	-0.5485	0.0218
t-stats	-0.28497	-1.25267	0.1537594
SHADOW	-0.1038	-0.0799	0.0607
t-stats	-0.38387	-0.2532	0.257125326
RISK & INV_POT	-0.0012	-0.0696	0.0764
t-stats	-0.01044	-0.60092	0.840381705
SIZE OF BUREAU	0.6582	0.7587	0.0746
t-stats	1.845992	1.601769	0.190747957
PRIVHEL	-0.4945		
t-stats	-1.64887		
PRIVEDUC		-0.1324	
t-stats		-0.60584	

Appendix A

Table 1: Data description – Russia

Code	Description	Mean (s.d.) all years	Min all years	Max all years	Mean (s.d.) 2001	Mean (s.d.) 2006
INPUT INDICATORS						
per capita values, adjusted by regional to national price level, 2000 prices, RUR						
inp_ed	Consolidated regional government expenditures on education	2,025.68 (1,189.04)	449.74	9,983.98	1,358.74 (857.61)	2764.33 (1,249.50)
inp_soc	Consolidated regional government expenditures on social policy	852.93 (386.17)	306.23	3581.56	589.47 (192.28)	1,284.88 (347.15)
inp_hl	Consolidated regional government expenditures on health	1,332.47 (717.92)	337.17	5,644.88	852.66 (431.64)	1,882.82 (789.35)
inp_hl_oms	Expenditures of territorial compulsory health insurance funds	781.01 (330.24)	175.15	2740.35	493.36 (195.40)	1,135.81 (232.39)
inp_hl_inv	Capital investments in health industry	230.35 (206.12)	6.40	1,506.68	177.56 (196.83)	330.07 (224.26)
OUTPUT INDICATORS						
Health:						
nurses	Number of middle level health personnel per 10,000 population, year end	113.67 (16.66)	43.86	160.00	111.68 (16.62)	114.67 (17.03)
physicians	Number of physicians per 10,000 population, year end	46.13 (10.83)	20.8	83.5	45 (10.13)	47.36 (11.32)
capacity	Capacity of health care institutions, number of visits in shift per 10,000 population, year end	250.18 (59.76)	73.1	614.1	242.35 (55.78)	256.46 (59.45)
hospbeds	Number of hospital beds per 10,000 population, year end	119.84 (24.96)	39.5	252.4	121.81 (24.11)	116.92 (25.16)
Education:						
teachstud	Teacher to student ratio in general secondary education	0.098 (0.015)	0.067	0.2	0.089 (0.011)	0.106 (0.015)

Continued on next page

Code	Description	Mean (s.d.) all years	Min all years	Max all years	Mean (s.d.) 2001	Mean (s.d.) 2006
presch_pl	Number of places in preschool institutions, per 1,000 children applicable age	661.11 (176.51)	31.39	1198.70	695.88 (195.18)	614.44 (151.35)
secshift	Percent of students at public secondary schools studying in the 2nd shift	16.66 (7.16)	0	45.7	19.95 (6.68)	13.58 (6.60)
Social policy:						
socwks	Number of social workers per 10,000 population	12.74 (7.26)	0.31	37.81	12.88 (7.56)	11.72 (6.25)
socsup_pc	Number of people receiving social support on housing and utilities per 100 population	3.16 (1.39)	0	16.26	3.43 (1.25)	2.85 (1.03)
subsidy_pc	Number of families receiving subsidies for housing and utilities per 10,000 population	431.63 (264.55)	0	1,500.80	287.56 (210.96)	396.15 (216.44)
socaid	Old and disabled people receiving social aid at home, % applicants	92.85 (10.6)	20.4	100	92.17 (11.82)	94.70 (7.07)
OUTCOMES						
Health:						
infant	Infant mortality, deaths during the first year of life per 1,000 born alive	13.03 (4.08)	4.7	42.1	15.71 (4.54)	11.00 (3.68)
tuberc_inc	Incidence of tuberculosis per 100,000 population	91.5 (37.19)	35.7	348.5	94.57 (41.76)	88.97 (35.61)
lifef	Female life expectancy at birth, years	71.75 (2.53)	60.22	79.84	72.01 (2.14)	72.51 (2.45)
Education:						
presch	Pre-school coverage of children, % of children applicable age, year end	59.05 (12.97)	4.3	92.3	57.69 (13.47)	59.76 (12.45)
compl_ss	Completion rate in secondary professional education	0.80	0.39	1.5	0.81	0.75

Continued on next page

Code	Description	Mean (s.d.) all years	Min all years	Max all years	Mean (s.d.) 2001	Mean (s.d.) 2006
progr_sf	Progression rate to full secondary education	0.61 (0.10)	0.41	0.88	n/a	0.59 (0.06)
Social policy:						
gini	Gini coefficient	0.337 (0.036)	0.268	0.56	0.320 (0.040)	0.350 (0.032)
drugs	Number of registered people with drug addiction, per 1,000 population	1.89 (1.42)	0.16	6.62	1.81 (1.41)	1.96 (1.38)
poverty	% regional population with income below minimal income level	28.19 (11.94)	9.7	88	37.99 (12.85)	20.38 (8.28)

Table 2: Data description – Kazakhstan

Code	Description	Mean (s.d.) all years	Min all years	Max all years	Mean (s.d.) 2001	Mean (s.d.) 2007
INPUT INDICATORS						
	real per capita values, 2000 prices, Tenge					
inp_hl	Regional government expenditures on health	6,050.89 (2,923.94)	1,387.84	16,514.80	3,470.07 (1,252.69)	10,299.35 (2,374.41)
inp_ed	Regional government expenditures on education	9,119.65 (3,756.49)	3,547.31	20,189.52	5,937.22 (1,819.72)	14,702.48 (3,035.88)
inp_soc	Regional government expenditures on social policy	1,795.42 (1,284.70)	626.22	14,024.42	2,123.15 (639.22)	1,828.92 (465.56)
OUTPUT INDICATORS						
Health:						
nurses	Number of middle level health personnel per 10,000 population, year end	80.05 (12.65)	46.84	118.26	75.90 (11.96)	87.14 (12.52)
physicians	Number of physicians per 10,000 population	36.62 (14.18)	19.81	85.50	35.03 (12.57)	39.11 (15.87)
doctvis	Number of visits to doctors per 10,000 population	767.53 (177.54)	399.95	1,512.16	715.62 (169.89)	796.09 (121.83)
hospbeds	Number of hospital beds per 10,000 population	78.32 (13.36)	48.1	101.4	76.16 (14.67)	79.99 (13.70)
Education:						
teachstud	Teacher to student ratio in general secondary education	0.096 (0.016)	0.065	0.136	0.089 (0.011)	0.107 (0.019)
presch_pl	Number of places in preschool institutions per 10,000 population	131.54 (56.19)	32.10	257.11	124.37 (60.58)	154.84 (51.88)
teachstud_pr	Teacher to student ratio in professional education	0.06 (0.01)	0.02	0.09	0.07 (0.02)	0.06 (0.01)

Continued on next page

Code	Description	Mean (s.d.) all years	Min all years	Max all years	Mean (s.d.) 2001	Mean (s.d.) 2007
Social policy:						
welfare_pc	Number of social allowances recipients per 10,000 population	530.35 (152.40)	180.03	1,681.12	532.56 (91.89)	483.00 (88.36)
socaid_pc	Number of social aid recipients per 10,000 population	447.75 (556.55)	27.38	3,562.78	n/a	186.03 (171.81)
nhomes_pc	Number of adults in nursing homes per 10,000 population	10.32 (6.14)	0	36.89	9.17 (3.32)	8.25 (5.25)
OUTCOMES						
Health:						
infant	Infant mortality, deaths during the first year of life per 1,000 born alive	16.03 (3.63)	10.1	26.56	19.63 (4.08)	n/a
tuberc_inc	Incidence of tuberculosis per 100,000 population	164.56 (50.18)	64.11	284.27.5	n/a	n/a
lifef	Female life expectancy at birth, years	72.21 (1.53)	69.92	76.86	n/a	72.54 (1.73)
Education:						
presch_pc	Number of children in preschool institutions per 10,000 population	128.62 (60.77)	25.03	245.72	109.19 (57.31)	166.58 (60.64)
schgrad_pc	Number of graduates in secondary education per 10,000 population	184.11 (155.21)	69.90	1206.31	n/a	n/a
profstud_pc	Number of students in professional education per 10,000 population	66.96 (22.32)	18.24	110.31	60.42 (22.20)	72.08 (21.15)
Social policy:						
gini	Gini coefficient	0.288 (0.031)	0.222	0.360	0.300 (0.031)	0.291 (0.033)
poverty	% regional population with income below minimal income level	31.22 (16.83)	3.2	70.7	44.28 (17.45)	13.04 (6.20)

Appendix B

Some Relevant Studies

Concern over the efficiency of government expenditures is universal. A large body of literature has examined the efficiency of public spending in advanced industrial democracies. There is also burgeoning research on the efficiency of public spending in developing countries and transitioning economies.

A cross-national study of government expenditures by Gupta *et al.* (1997) shows that African countries, on average, are less efficient in providing education and health services than Asian and Western hemisphere countries. The analysis also demonstrates that public spending efficiency in Africa has improved over the sample period, but the efficiency gap between the African states and the other countries has widened. In particular, the analysis finds a negative relationship between the input efficiency score and the level of public spending, implying diminishing returns to government expenditures after a certain threshold level. Gupta *et al.* argue that inefficiencies in public spending in African countries stem from relatively high public sector wages.

Using data from 1996 to 2002, Herrera and Pang (2005) examine public spending efficiency on the education and health sectors in 140 developing countries. The results indicate a negative association between the estimated efficiency scores and a wide array of control variables, including the size of public expenditure, the wage bill in the total budget, income inequality, and the proportion of the service that is publicly financed. The only control variable that had a positive association with the efficiency scores was the level of urbanization.

Another recent empirical study focuses on OECD countries. Afonso and Aubyn (2005) estimate efficiency of public spending on education and health using non-parametric techniques. A novel feature of their study is that it employs quantity inputs in measuring government expenditures. This approach makes international comparisons free of

exchange rate and price distortions in comparative efficiency analysis. Afonso and Aubyn find that in both the education and health sectors estimated efficiency scores vary greatly across the OECD countries, indicating scope for improvements in these two sectors without further increases in expenditures. The analysis identifies three countries – Japan, South Korea and Sweden – as efficient providers of education and health services regardless of estimation method. The results indicate that countries may have different input needs to achieve the same level of output, depending upon their population density or the level of economic development even under efficient public services.

Along similar lines, Afonso, Schuknecht and Tanzi (2006) analyze public sector efficiency in the new member states of the European Union and compare their efficiency results to the emerging market economies. The main methodological contribution of that study is the authors' construction of Public Sector Performance and Efficiency composite indicators for the ten new members of the EU, and evaluate input-output efficiency scores using a sound statistical technique. They find that countries with a small public sector and lower expenditure to GDP ratios tend to be more efficient in providing public services. The study also concludes that public sector efficiencies are positively affected by such factors as per-capita income, public sector competence, education levels and the security of property rights.

Studies that investigate public sector efficiency in transition countries are few, albeit increasing in numbers. Wilson (2005) explores public spending efficiency in education in several transition economies, and in Latin American and East Asian countries. The analysis indicates that, on average, input inefficiency appears to be higher compared to output inefficiency, suggesting that many schools probably exhibit decreasing returns to scale, with additional funding bringing fewer benefits to their operations. Similarly, Mattina and Gunnarsson (2007) find that public spending in Slovenia, compared to other EU member states, is relatively inefficient, inflexible and poorly targeted. The authors further claim that there is substantial room for reducing public spending on education, health, and social protection in Slovenia, without jeopardizing outcomes in these sectors. The results suggest that high social protection spending without due improvements in

outcomes is a waste of public resources and that this inefficiency can be eliminated or substantially reduced by launching targeted social assistance programs and by reforming institutions.

In recent years, IMF has produced a few papers on government spending efficiency in post-socialist economies. Jafarov and Gunnarsson (2008) find that the government of Croatia spends inefficiently on education and health care. Specifically, inefficiencies in the health sector are related to high levels of spending, rather than weak outcomes, while inefficiencies in the education sector arise from both poor outcomes and excessive spending. Jafarov and Gunnarsson conclude that there is substantial room for improving government spending efficiency in the education and health sectors while cutting budget expenditures. Another IMF working paper by Hunter (2007) investigates efficiency of public expenditure in Russia both at the general and local government level. Like our own analysis, Hunter's work uses efficiency scores based on input and output data from the education, health and social protection sectors. Hunter also examines public spending efficiency across Russian regions and sheds light on the variables that may be behind the efficiency differences.

This study differs from Hunter's approach in several ways. First, we extend the analysis cross-nationally and temporally by including two more countries – Azerbaijan and Kazakhstan – and calculating efficiency scores for several years. Second, we use different input and output measures in assessing spending efficiency in the Russian regions. Finally, from the methodological standpoint, we employ more robust statistical techniques to identify factors conducive to sub-national variations in efficiency scores.