EFFICIENCY OF GOVERNMENT SOCIAL SPENDING IN CROATIA

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Abstract

This paper analyzes the relative efficiency of social spending and service delivery in Croatia by comparing social spending and key social (outcome) indicators in Croatia to those of comparator countries. The analysis finds evidence of significant inefficiencies in Croatia's social spending, mainly related to inadequate cost recovery for health and education services, weaknesses in the financing mechanisms and institutional arrangements, weak competition in the provision of social services, and weaknesses in targeting benefits. The paper also identifies areas for cost recovery and reform.

Keywords: Expenditure efficiency; health care spending; education spending; social protection spending

1 Introduction

The benefits of a further and significant reduction in the fiscal deficit in Croatia are well recognized. Moreover, fiscal adjustment will need to be led by rationalizing regular spending programs because the tax burden in Croatia is already one of the highest in the

region, and Croatia's aspirations toward European Union (EU) membership suggest future spending pressures.[1] Expenditure-led fiscal adjustment will help to address Croatia's large current account deficit, and maintain strong economic growth on a sustainable basis. At the same time, rationalizing spending is a key for enhancing the flexibility of fiscal policy, a necessary ingredient for coping with shocks in the context of tightly managing the exchange rate. Indeed, in its latest *Economic and Fiscal Policy Guidelines*, the Ministry of Finance (MoF) projects a decline in general government spending of almost 6 percentage points of GDP, just from 2007 to 2010.[2]

A key policy issue is how to reduce the government-spending-to-GDP ratio, including by containing the cost of social services without undue sacrifices in quality. After all, social services constitute the largest share of total general government spending (more than half in 2005, the latest year for which data is available). Moreover, while Croatia's performance on health indicators has been better than most EU-10 countries, it is well behind most EU-15 countries, as discussed later in the paper, and Croatia's education outcomes are lagging behind most EU-10 and EU-15 countries'[3]. Improving social indicators while containing costs requires greater efficiency of social spending.

With this in mind, and to help identify areas for reform, this paper analyzes the relative efficiency of social spending in Croatia. It does so by comparing social spending and key social (outcome) indicators in Croatia to those of comparator countries.[4] Relative efficiency is defined as the distance of a country's observed input-output combination from an efficiency frontier. This frontier is estimated using so-called Data Envelopment Analysis (DEA, see Annex I) and represents the maximum attainable social outcome for a given input level (spending or intermediate output such as the number of hospital beds and the density of physicians). The efficiency of social spending in Croatia is evaluated against frontiers estimated for the EU-15, the EU-10, Cyprus, Malta, and OECD countries.[5]

The analysis finds evidence of significant inefficiencies in Croatia's social spending and therefore a significant potential to reduce government expenditure. As discussed later, this potential could be realized by: (i) containing demand for social services by introducing (or increasing the existing) fees for users of these services; (ii) reforming finance mechanisms for social spending; (iii) introducing greater competition in the provi-

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[1] This pressure is related to the use of EU structural funds, contributions to the EU budget, and an upgrading of environmental standards. Funck (2003) suggested that implementing National Programs for the Adoption of the Acquis of the new member states was going to entail additional annual spending of (on average) about 3½ percent of GDP for these countries. Cucilić, Faulend, and Šošić (2004) estimated net fiscal costs (netting out transfers from the EU) of Croatia's EU accession for 2007, the year the authors expected accession to take place at the time of writing, at 1.1 percent of GDP.

[2] The projection does not include spending related to the use of EU structural funds.

[3] EU-10 countries are new EU members and comprise the Czech Republic, Estonia, Latvia, Hungary, Lithuania, Poland, Slovakia, Slovenia, Bulgaria, and Romania. EU-15 countries comprise Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden and the United Kingdom.

[4] Old-age pensions will not be a subject of this study, since this component of social spending does not lend itself to analysis of efficiency in the same way as the other components that are analyzed.

[5] The choice of comparator groups, the EU-10, EU-15, and OECD countries, is related to similarities in social infrastructure in Croatia and EU-10 countries, Croatia's EU membership aspirations, and income level, respectively. To keep the discussion focused, Cyprus and Malta were not considered as a separate comparator group.

sion of social services; (iv) improving the administration of social spending; and (v) targeting benefits better.

The rest of the paper is organized as follows. Section II compares social spending and performance indicators in Croatia with those in other countries. Section III assesses efficiency scores of key social spending categories, outlines possible explanatory factors for understanding cross-country differences in efficiency, and discusses potential reforms to enhance efficiency. Section IV concludes.

2 International Comparisons of Social Spending and Performance

The focus of this section is on three key areas, namely health care, education, and social protection (excluding pensions). As in Verhoeven et al. (2007), performance indicators are divided into desired *outcome* and intermediate *output* indicators*.* Outcomes correspond to the underlying objectives sought by policy makers. Intermediate outputs are thought to be related to desired outcomes but can be more closely associated with current spending. The following indicators are used.

Table 1 Croatia: Health Expenditure and Outcomes[a]

	Total Expenditure on Health (% of GDP)	Public Expenditure on Health (% of GDP)	Health Life Expectancy (years)	Standardized Death Rates (per 100.000 people)	Infant Mortality Rate (per 1.000 live births)	Child Mortality Rate (per 1.000 live births)	Maternal Mortality Rate (per 100.000 live births)	Incidence of Tuberculosis (per 100.000 people)
Croatia	7.9	6.6	66.6	886.9	6.0	7.0	10.0	40.6
Bulgaria	7.7	4.3	64.6	1,056.4	12.0	15.0	32.0	39.0
Czech R.	7.2	6.6	68.4	837.6	3.0	4.0	9.0	10.4
Estonia	5.2	4.0	64.1	993.6	6.0	7.0	38.0	42.7
Hungary	7.9	5.6	64.9	1,015.5	7.0	8.0	11.0	21.7
Latvia	6.5	3.4	62.8	1,107.2	9.0	11.0	61.0	62.6
Lithuania	6.5	4.8	63.3	1,081.6	7.0	9.0	19.0	62.5
Poland	6.3	4.5	65.8	872.0	6.0	7.0	10.0	26.1
Romania	5.7	3.5	63.1	1,076.4	16.0	19.0	58.0	134.2
Slovak R.	6.1	5.4	66.2	945.0	7.0	8.0	10.0	17.0
Slovenia	8.9	6.8	69.5	729.4	3.0	4.0	17.0	14.6
EU-8 average	6.8	5.1	65.6	947.7	6.0	7.3	21.9	32.2
EU-10 average	6.8	4.9	65.3	971.5	7.6	9.2	26.5	43.1
EU-15 average	8.6	6.4	71.3	628.9	4.0	4.9	9.9	12.8
OECD average	8.7	6.3	70.7	672.2	4.3	5.3	9.5	15.4

[a] *Spending data are averages for 2001-04. HALE data are for 2002. death rates are for the latest year available during 2001-05. infant and child mortality and incidence of tuberculosis are for 2005. an maternal mortality data are estimates for 2000.*

Sources: WHO; and World Bank. World Development Indicators database.

- Health care: The intermediate output indicators considered are the density of physicians, pharmacists, and healthcare workers; the number of hospital beds; and the number of immunization vaccines. The key outcome variables include infant-, child-, and maternal mortality rates; the standardized death rate from all causes per 1,000 people, as defined by the World Health Organization (WHO); incidences of tuberculosis;[6] and healthy average life expectancy (as defined by the WHO).

- Education: The key intermediate output indicators are primary pupil-teacher ratios, enrollment rates, rates of progression to secondary education, and graduation (completion) rates. The main outcome indicator is the average score on an international standardized test (PISA 2006) in mathematics (secondary education).

- Social protection: The key outcome indicator is poverty rates published by the OECD (data for Croatia are from the Croatian Central Bureau of Statistics, and may not be fully comparable to OECD data).

2.1 Health Care

Health care in Croatia is mainly financed (around 90 percent) by the Croatian Health Insurance Institute (HZZO). Only a small share of the funding comes from other sources such as co-payments, informal patient payments and payments from other insurance companies. Payroll contributions are set at 15 percent of the gross wage. In addition, enterprises pay another ½ percent of wages for work-related injury insurance.

In terms of health outcomes, Croatia has performed better than most countries with similar income levels. For example, in terms of healthy average life expectancy (HALE), Croatia has better results than all EU-10 countries (Table 1) except for Slovenia and the Czech Republic. Furthermore, Croatia's performance is better than the average for EU-10 countries in terms of all the other available indicators: standardized death rates; incidence of tuberculosis; maternal, infant and child mortality rates.[7]

Unlike many other former socialist countries, Croatia does not have an acute over-capacity problem in terms of intermediate output indicators. Croatia's ratios of hospital beds and physicians per 1,000 inhabitants and the health worker density index (6, 2, and 8, respectively) are at or lower than the averages for EU-15 countries (6, 3, and 13, respectively), and are lower than the averages for EU-10 (7, 3, and 10, respectively) and OECD countries (6, 3, 13, respectively). Moreover, Croatia's ratio of in-patient admission per 100 is also below the averages for EU-10, EU-15, and OECD countries (Table 2). However, anecdotal evidence suggests that there are underutilized capacities in suburban and rural areas.

However, significant challenges remain. First, the health care system is not financially sustainable and runs persistent deficits: at end-2006, the stock of health sector arre-

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[6] According to WHO Europe (2008), tuberculosis is a "disease of particular concern for public health in the WHO European region," and, despite progress in reducing the incidence of the disease in recent years, "the level of TB control is still inadequate" (http://www.euro.who.int/tuberculosis/publications/20071204_4).).

[7] Results for the EU-10 are heavily influenced by the results for Bulgaria and Romania, which have significantly worse results than the other new EU members. But Croatia's performance is still slightly better than the averages for the other EU-10 countries.

Table 2 Selected Real Health Resources[a]

|	Hospital Beds (per 1,000)	Physicians (per 1,000)	Health Worker Density Index (per 1,000)	Pharmacists (per 100,000)	Doctors' Consultations (per capita)	Bed Occupancy Rate, Acute Care Hospitals (percent)	In-patient Care Admissions (per 100)	Average Length of Stay (all hospitals)	Immu- nization, Measles (percent of children ages 12-23 months)
Croatia	5.6	2.4	7.7	55.8	x	88.1	16.6	10.3	96.0
Bulgaria	6.3	3.6	8.3	12.5	x	x	21.0	8.1	96.0
Czech Republic	8.8	3.5	13.4	56.3	13.0	74.6	22.1	10.8	97.0
Estonia	6.0	3.2	9.8	62.6	x	68.4	19.2	8.0	96.0
Hungary	7.8	3.2	11.9	52.7	12.1	75.7	25.5	8.1	99.0
Latvia	7.8	3.0	8.2	x	x	x	22.1	10.0	95.0
Lithuania	8.7	4.0	12.4	70.2	x	78.6	23.8	10.2	97.0
Poland	5.6	2.5	7.7	58.1	5.9	x	17.6	6.9	98.0
Romania	6.6	1.9	6.2	4.8	x	x	24.6	8.0	97.0
Slovak Republic	7.2	3.1	10.6	49.0	12.7	68.6	18.5	8.9	98.0
Slovenia	5.0	2.3	9.4	42.5	x	70.1	17.6	7.1	94.0
EU-8 average	7.1	3.1	10.4	55.9	10.9	72.7	20.8	8.7	96.8
EU-10 average	7.0	3.0	9.8	45.4	10.9	72.7	21.2	8.6	96.7
EU-15 average	5.5	3.2	13.0	82.5	5.9	74.3	17.9	8.4	90.1
OECD average	6.1	3.0	12.5	74.4	6.9	76.2	18.6	8.4	91.6

[a] *Data are for the latest year available except for data on doctors' consultations, which are averages over 2002-03, and data on immunizations, which are for 2005.*

Sources: WHO; and World Bank, World Development Indicators database.

ars exceeded 1 percent of GDP (World Bank, 2007b). While some of these arrears were repaid in 2007, reform measures have been insufficient to harden budget constraints. Second, Croatia's public spending on health care in proportion to GDP is one of the highest in the region, so Croatia's good performance in comparison to the EU-10 comes at a high cost. In particular, Croatia spends about 8 percent of its GDP on health care, which is higher than any of the EU-10 countries except Slovenia (Table 1). Moreover, about 84 percent of health care spending comes from public sources. For comparison, while EU-15 countries, on average, spend more on health care than Croatia, much larger shares of their spending are privately financed (Figure 1). Thus, in terms of public health care spending, Croatia's expenditure in percent of GDP is among the highest in Europe. Third, population aging is likely to exert further upward pressure on public finances, including through spending on health care. Fourth, compared with the averages for EU-15 countries, Croatia performed worse in terms of all the available outcome indicators. Gaps with EU-15 countries are large especially in terms of standardized mortality rates for non-communicable diseases (cardio-vascular diseases, cancer, injuries, chronic respiratory diseases, diabetes, etc.).

High and increasing public health spending reflects both strong demand and supply inefficiencies:

Figure 1 The Share of Private Funding in Total Health Care Spending in Croatia Is
*One of the Smallest In the Region, Average 2001-04*
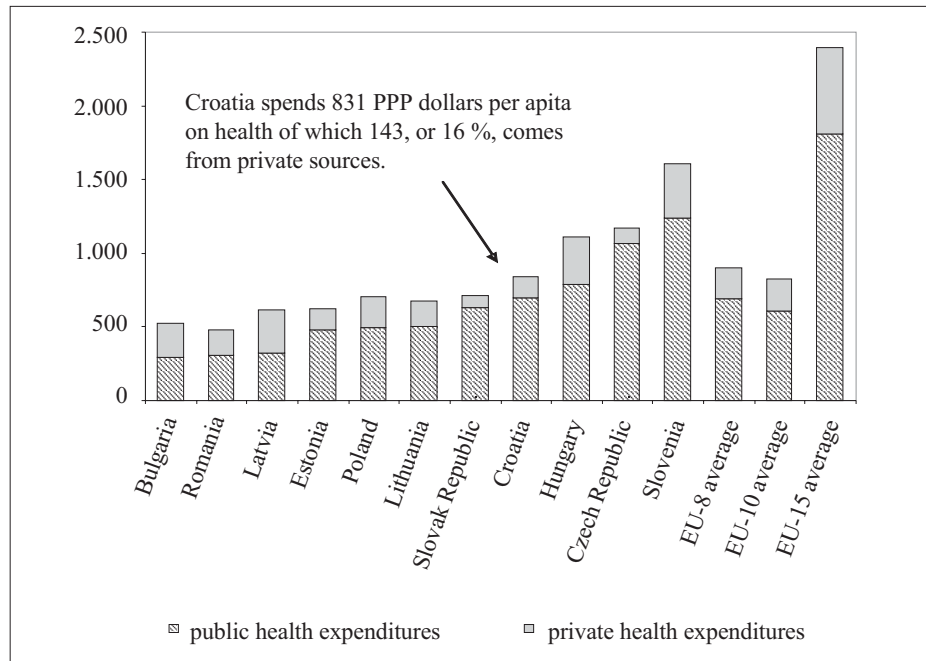
Source: WHO; and authors' estimates.

- The old-age dependency ratio (ratio of population aged 65 and older, which requires more health care than younger generations, to population aged 17-64) in Croatia is one of the highest in the region. Moreover, this ratio is projected to increase from 26 percent in 2006 to 48 percent in 2051 (Central Bureau of Statistics, 2006).

- Under the existing health insurance system, low rates of co-payments in combination with widespread exemptions from contributions have boosted the demand for health services.[8] The coverage of the basic benefit package is very broad, while medical services essentially become free for 600,000 people who have supplementary insurance offered by the HZZO, as this insurance pays for co-payments. Indeed, the share of co-payments in total health spending is less than 1 percent, compared with the 7-33 percent in Western European countries.[9] Around 1,900 types of drugs on the so-called A list are fully paid by the HZZO, while 300 types of drugs on the so-

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[8] See Mihaljek (2007), World Bank (2007a). Twenty groups of people, including pensioners, unemployed, and students, are exempt from paying contributions. Only around 35 percent of the population pays contributions (IMF, 2008).

[9] See *Funding Health Care* by Mossialos et al. (2002) for a description of cost sharing in Europe. Several countries, including Australia, Canada, and Switzerland, do not allow supplementary insurance to cover co-payments associated with services paid for by the health insurance fund.

Figure 2 Share of Population Aged 65 and Older in total Population, 2006
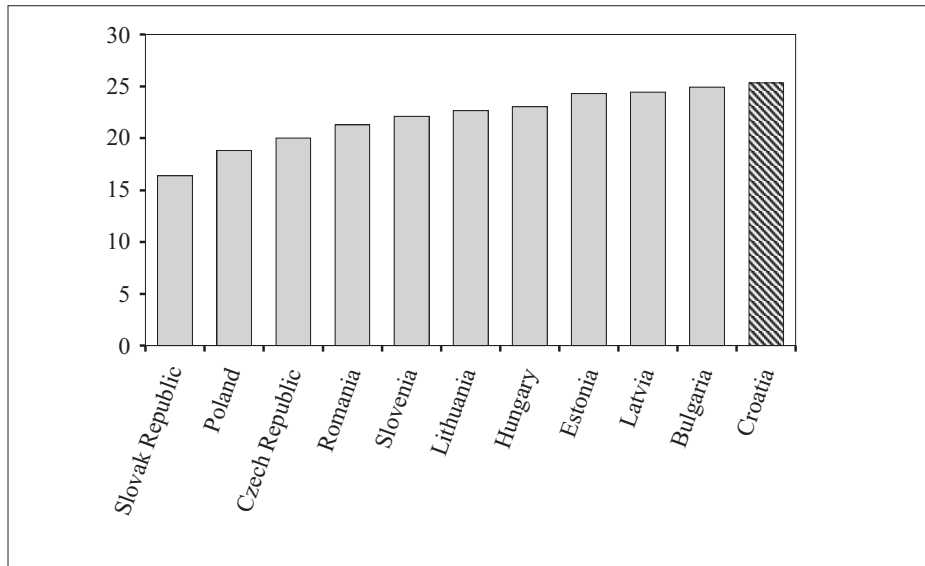
Source: Eurostat; and Central Bureau of Staistics of Croatia

called B list are partially paid by the HZZO.[10] While the government introduced a flat administrative fee of 10 kuna per person (with a cap of 30 kuna per month) in 2005, its impact on demand for health services has been weakened by exemptions from these fees. The government has decided to abolish this fee in 2008.

• The system of capacity- and input-based payments to hospitals has encouraged hospitals to keep beds full and extend the length of patients' stay (World Bank, 2007a and Mihaljek, 2007). Thus, the system does not provide needed incentives for hospital managers to cut costs, which is likely to have contributed to the long average length of stay in (all) hospitals (ALOS) in Croatia: at about 10.3 days, ALOS in Croatia was one of the longest in Europe in 2005 (compared with 8.6 days in EU-10 countries and 8.4 days in EU-15 countries). Although ALOS has recently fallen significantly, it is still high compared to other countries.[11]

• A substantial share of the care at the primary level is provided by costly specialists. This outcome is mainly due to the fact that primary-care physicians, who are supposed to play the role of "gatekeepers" of the health system, are paid on a capitation-basis (that is, physicians are paid flat fees per patient per year). This approach provides an incentive for physicians to sign up as many patients as possible and refer them to specialists instead of treating them.

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[10] These lists were introduced in 2006. For drugs on the B list, the HZZO pays a reference price for drugs on the A list and consumers pay the difference between the sale and reference prices. As a result of strong bargaining, pharmaceutical spending was reduced by about 2 percent in 2007, despite a 6 percent increase in consumption of drugs (IMF, 2008).

[11] Over a third of total health care spending in Croatia finances hospital (in-patient) care (IMF, 2008).

Figure 3 Average Length of Stays in Hospitals (days)
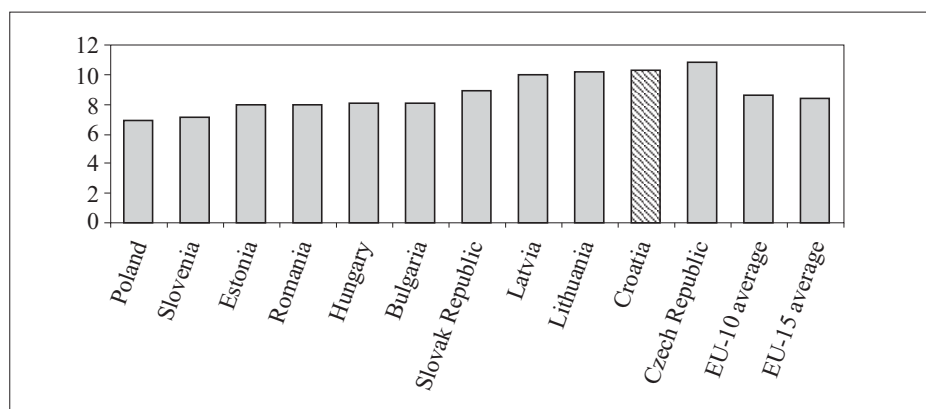
[a]*Data are from latest year available except for the data on doctors' consultations which are the average over 2002-03 and immunization from 2004.*

Sources: WHO; and the World Bank's World Development Indicators database.

- There is little competition among health care providers. Of the 66 hospitals, only 3 were privately owned in 2006. Private institutions are largely limited to the provision of specialized medical services.

In all, without reforms, health care expenditures will increase significantly. The authorities' latest Pre-accession Economic Program envisages an increase of 4 percentage points of GDP in public health spending from 2005 to 2050. This increase could be higher because of, for example, underestimating the costs of new medical technology.

2.2 Education

Croatia's education system is, like most European and transition countries, mainly financed and operated by the public sector. Recognizing discrepancies both in quality and quantity aspects, the government has since 2005 been undertaking a large reform program, detailed in the government's Strategic Development Framework 2006-13 and the Education Sector Development Plan (ESDP) 2005-10.

Croatia's total spending on education as a share of GDP is in line with EU-10 and EU-15 countries, but its educational output and outcome levels are lower. In 2005, Croatia spent around 5.6 % of GDP on education, similar to average spending by the EU-15 (Table 3). Croatia's public education spending was about 4.8 % of GDP, somewhat less than the averages for EU-10 and EU-15 countries (5 % of GDP and 5.4 % of GDP, respectively). Thus, Croatia's private spending (at about 0.75% of GDP) is higher than the averages for EU-10 and EU-15 countries (at about 0.4 % of GDP), notwithstanding Croatia's few private schools. Private spending in Croatia is mainly on pre-school and tertiary education. Regarding outcomes, Croatia's school enrollment and completion rates are lower than those in comparator countries. In tertiary education, for example, gross enrollment was about 46 percent in 2006, compared to about 53 percent in the EU-10. Furthermore,

Figure 4 2006 PISA Mathematics Scores
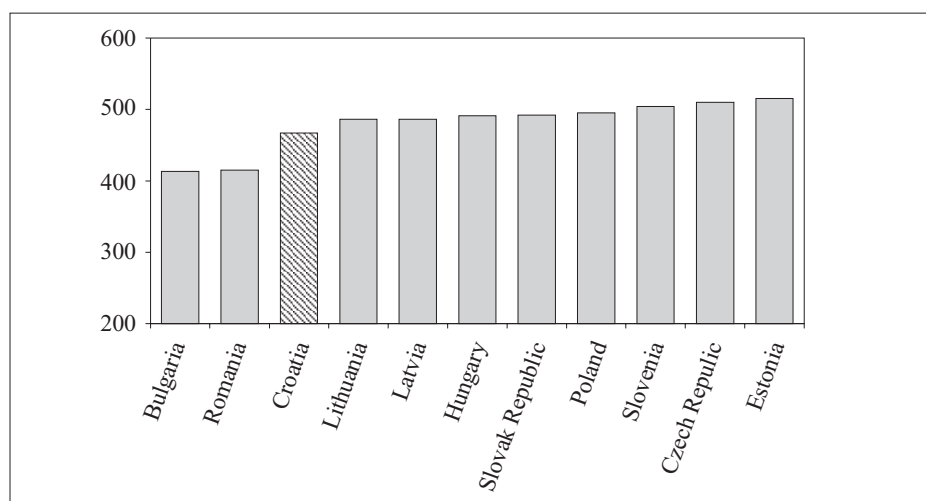
Source: The OECD Programme for International Student Assesment (PISA)

only one third of the students at the tertiary level reportedly complete their programs, with an average completion rate of 6.7 years in four-year programs (World Bank, 2007a). In the 2006 PISA standardized test in mathematics, only Bulgaria and Romania in the EU-10 scored worse than Croatia: out of 57 countries, Croatia ranked 36th.[12]

Croatia's student-teacher ratios in primary and secondary schools have been falling and are lower than those in comparator countries. Contributing to this, the number of students fell at all levels except for tertiary education from 1990 to 2005, reflecting declining fertility rates. In addition, during the same period, the number of full-time teachers increased at all levels of education except primary education, where the number remained stable.

School infrastructure is used intensively, but teaching hours are short. About 65 percent of schools have double shifts, and 8 percent of schools have triple shifts (although only 10 percent and 2 percent of students, respectively, attend these schools). The government is trying to eliminate multiple-shift schools, especially those with three shifts. Regarding teaching hours, teachers with a fulltime position are required to teach 15-21 hours per week, compared with 21-24 hours per week in OECD countries.

There are notable differences in the composition of education spending between Croatia and other countries. Wages and salaries constitute a very large share of primary education spending in Croatia (about 90 % of recurrent spending, compared with about 82 percent in the EU-15 and 73 % in the EU-10). In primary and secondary education, Croatia spends a significantly larger share on investments (22 %, compared with about 7 %

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[12] The other PISA scores (science and language) are highly correlated (at 90 percent) with the PISA mathematics scores. Including them in the analysis in this paper would not significantly change the results.

Table 3 Education Expenditure, Output, and Outcomes[a]

	Public Expenditure on Education (% of GDP)	School Enroliment, Primary (%; net)	Primary Completion Rate (% of relevant age group)	Progression to Secondary School (%)	Pupil-Teacher Ratio, Primary	School Enroliment, Secondary (%; net)	School Enroliment, Tertiary (%; gross)	Average PISA Mathematics Test Scores
Croatia	4.5	87.3	91.4	99.9	17.7	85.0	38.7	467
Bulgaria	3.8	95.1	97.6	95.9	16.7	88.5	41.1	413
Czech Republic	4.4	x	102.8	98.0	17.9	x	43.2	510
Estonia	5.6	94.1	102.4	96.2	14.1	89.7	65.1	515
Hungary	5.4	89.1	96.0	98.8	10.5	90.7	59.6	491
Latvia	5.5	87.0[b]	95.2	98.5	13.0	91.0[b]	74.3	486
Lithuania	5.6	89.4	101.5	99.2	14.7	92.9	73.2	486
Poland	5.5	97.3	100.0	98.5	12.6	90.0	61.0	495
Romania	3.5	91.9	91.5	98.0	17.5	80.8	40.2	415
Slovak Republic	4.3	x	100.3	98.2	17.7	x	36.1	492
Slovenia	6.0	97.8	108.2	99.5	15.1	94.7	73.7	504
EU-8 average	5.3	92.4	100.8	98.4	14.4	91.5	60.8	497
EU-10 average	5.0	92.7	99.5	98.1	15.0	89.8	56.8	481
EU-15 average	5.6	98.2	97.2	99.5	13.8	91.2	62.2	498
OECD average	5.5	97.5	99.2	99.3	14.7	90.9	62.2	504

[a]*Data are for the latest year available except for data on primary completion rates, which are averages over 2003-04, and data on public education spending and progression to secondary, which are averages over 2001-03.*

[b]*Fund staff estimates, based on gross enrollment rates.*

Sources: UNESCO; and World Bank, World Development Indicators database.

in the EU-15 and 8 percent in the EU-10; see World Bank, 2007a) which leaves a smaller share for spending on non-wage recurrent expenditures, including spending on books for libraries and laboratory equipment. In contrast, the share of investments in tertiary education in Croatia is smaller than the share in peer countries. Recent increases in education spending have gone mainly to overheads and to a growing pre-school subsector.

Decision making and financing of education is fragmented. For example, decisions about establishing schools are made by local governments while teachers are hired and financed by the central government. Coordination issues in decision making contributes to excess spending since local governments do not face the full costs of their decisions to build schools.

Public subsidies on education mostly benefit households with higher incomes. The Household Budget Survey suggests that students from higher-income families receive the lion's share of scholarships and rewards. In particular, the amount of scholarships and rewards going to students from households in the top-income quintile (that is the top 20 percent of the income distribution) is almost 10 times higher than the amount going to students from the bottom quintile. Two observations are relevant: (i) most scholarships and rewards go to students with better academic achievements; and (ii) students in this cate-

gory tend to come from families in the top-income quintile, which can spend more money to support education. Students from the top-income quintile also benefit from other subsidies, such as free books, dormitories, and transportation.

2.3 Social Protection

Croatia maintains a comprehensive and complex system of social protection. The system serves multiple objectives and includes support to war veterans and their families, population policy measures, social assistance to low-income groups, and a large number of other social assistance programs. The administration of social benefits is highly fragmented, with insufficient coordination among the different levels of government providing these services.

Overall, the system has been effective in reducing poverty. Croatia's poverty rate is low by international standards, but is stagnant despite strong economic growth, thus requiring attention. In 2004, about 11 % of the population was considered poor and another 10 % was at risk of poverty (World Bank, 2007a).

Spending on social protection is high by regional standards, but only a small share is spent on direct poverty alleviation. In 2007, the government spent about 4.5 % of GDP on social assistance and social benefits (other than those covered under social-security), but only about 0.6 percent of GDP of this money is used for poverty-related social assistance programs. Most programs target specific categories such as war veterans, the disabled, and parents and children. However, there is no database on recipients of various social protection benefits capable of preventing double-dipping and improving the targeting of benefits.

3 The Relative Efficiency of Social Spending

This section carries out the data envelopment analysis (DEA), discusses possible explanatory factors behind cross-country differences in efficiency, and highlights potential reforms to enhance efficiency. As noted earlier, the analysis generates a best-practice frontier of input-output combinations (e.g. social spending and outcomes) that dominate the other combinations in the sample, and countries that are not on the frontier are then ranked according to the distance from the frontier. Similarly as in Verhoeven et al. (2007), a correlation analysis is also conducted to understand reasons for variation in efficiency across countries in the health and education sectors. Finally, in highlighting potential efficiency-enhancing reforms, the section draws on the findings in the World Bank's *Public Finance Review.* [13] Data are drawn from Eurostat, OECD, WHO, UNESCO, and the World Bank's database on World Development Indicators. Spending data are adjusted to internationally comparable purchasing power parity (PPP) terms.

3.1 Health Care

The results of the DEA suggest significant inefficiencies in Croatia's public health spending and, correspondingly, significant room to rationalize public spending witho-

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[13] The sequencing of possible reforms and related political economy issues are beyond the scope of this paper.

ut sacrificing, rather, potentially improving, health outcomes. In terms of the efficiency scores for public spending of OECD and EU-10 countries (37 countries), Croatia ranks in the 63rd percentile. Reflecting low private health expenditures in Croatia, it ranks in the 48th percentile for total spending on health (Table 4). With respect to individual outcome indicators, Croatia's ranking is in the last quartile for the standardized death rates (SDR) and incidence of tuberculosis; in the third quartile for HALE, the child mortality rate, and infant mortality rate; and in the second quartile for maternal mortality rates (Table 4; Figure 2).

Inefficiencies in the Croatian health care system occur mostly in the process of transforming intermediate resources into health outcomes. In addition to estimating efficiency from health spending to outcomes (e.g. infant mortality rates) as above, we also estimate efficiency from intermediate outputs (e.g. hospital beds) to outcomes (e.g. infant mortality rates), with a view to understanding the stage at which (production) inefficiencies occur (called system efficiency hereafter; see also Appendix I). As can be seen from Table 5, system efficiency is relatively low in Croatia. This is only in part related to long stays in hospitals. As the two first columns in Table 5 suggest, there are other inefficiencies in the system: the system efficiency using ALOS-to-outcome combinations is significantly worse than in EU-15 countries.

The results of correlation analysis suggest that relative efficiency is associated with a wide range of factors (Table 6). The key correlations include adverse relationships between

Table 4 Relative Efficiency of Croatia and the EU-10 in Health (Distribution by percentile of the ranking of efficiency scores)[a,b]

| | Percentiles | | |
1 – 25	26 – 50	51 – 75	76 – 100
Public expenditures			
	Bulgaria	Croatia	Hungary
	Czech Republic	Estonia	Lithuania
	Latvia	Poland	
		Slovak Republic	
		Slovenia	
		Romania	
Public and private expenditures			
Bulgaria	Croatia	Lithuania	Hungary
Czech Republic	Estonia	Slovenia	Latvia
Poland	Romania		
	Slovak Republic		

[a] Croatia's efficiency scores for public expenditures ranked, on average, at the 63rd percentile of the overall ranking of officiency scores in the sample of OECD and EU-10 countries and Cyprus, Malta and Croatia. This places Croatia in the third (51-75) quartile of the sample ranking distribution. The rankings are based on the point estimate of the bias-corrected output-oriented efficieny scores.
[b] Based on public and overall (public and private) spending and associated outcome indicators including infant-, child-, and maternal-mortality rates; standardized death rates; the incidence of tuberculosis; and healthy life expectancy.

Sources: WHO; World Bank, World Development Indicators; and author's estimates.

Table 5 Ratio of Percentile Rank of Efficiency Scores in Health to the Average of Percentile Ranks for OECD Countries[a]

	System Efficiency[b]		Overall Efficiency[c]	
	Intermediary inputs/outputs to outcomes	Average length of stay to outcomes	Public expenditures to outcomes	Public and private expenditures to outcomes
Croatia	1.6	1.7	1.2	0.9
Bulgaria	2.0	2.2	0.5	0.5
Czech Republic	1.4	1.1	0.9	0.7
Estonia	1.9	2.1	1.5	0.7
Hungary	1.9	1.9	1.6	1.5
Latvia	2.2	2.4	1.0	1.4
Lithuania	2.1	2.2	1.7	1.2
Poland	1.7	1.8	1.1	0.5
Romania	2.2	2.4	1.4	0.6
Slovak Republic	1.8	1.8	1.2	0.5
Slovenia	1.0	1.4	1.1	1.1
EU-10 average	1.8	1.9	1.2	0.9
EU-15 average	0.9	0.9	1.0	1.1

[a]*Ratio of bias-corrected output-oriented efficiency rankings of countries to the average ranking of OECD countries. Higher numbers suggest inefficiencies compared to the OECD average. For example, high numbers for Croatia and most EU-10 countries in the first column mean that there are significant inefficiencies in these countries in the process of transforming intermediary inputs into health outcomes.*

[b]*Based on bias-corrected output-oriented efficiency rankings using, as inputs, the average of various intermediate inputs/outputs and, as production, various outcome indicators.*

[c]*Based on bias-corrected output-oriented efficiency rankings using, as inputs, the average of various intermediate inputs/outputs and, as production, various outcome indicators.*

Sources: WHO; World Bank, World Development Indicators database; and Fund staff estimates.

efficiency on the one hand, and on the other (1) exogenous and lifestyle factors such as alcohol consumption; (2) spending on collective care and administration; (3) spending on pharmaceuticals; (4) doctors' wages; (5) the number of doctor consultations, in-care admissions, and outpatient contacts; and (6) length of stays in hospitals (although only weakly).[14, 15] Moreover, out-of-pocket payment is strongly associated with increased relative efficiency in the sample. These results suggest that inefficiencies in health spending in

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[14] This analysis does not provide estimates of causality. It is possible that causality goes the other way around or both ways. The small sample size precludes regression analysis in the second-stage.

[15] Given the close relationship of spending and outcomes with income levels, correlations of efficiency scores and associated factors are conditional on GDP. GDP per capita is adversely related to efficiency since many of the factors that are associated with efficiency are also closely related to income level. In order to avoid attribution of factors whose effects on the variation in efficiency cannot be separated from the effect of GDP, only GDP per capita and factors that are correlated with efficiency independently of GDP per capita are considered in the second-stage analysis of this paper. The association with efficiency of factors that are strongly correlated with GDP is assessed by regressing the efficiency score on both GDP and the associated factor.

Croatia may in part be related to high pharmaceutical spending, long stays in hospitals, low levels of out-of-pocket spending and of private participation.[16]

The above results suggest that system efficiency can be improved by containing demand for health services and changing the mix of resources spent on health care. The following reforms, including those already underway or planned by the Croatian authorities[17], could greatly improve the efficiency of health care spending:

- increasing co-payments could help contain demand for health care spending and generate significant budgetary savings. For example, if the level of private co-financing was raised to 7 percent of total health spending (one of the lowest co-payments-to-total-health-spending ratios of the Western European countries), through increases in co-payment rates and/or eliminating exemptions from co-payments, this could generate budgetary savings of 0.5 percent of GDP. Increasing the share of the private sector in financing sick leave and reducing the replacement rates would also significantly curb demand and public spending for health services.[18] Restricting the basic benefit package provided by the HZZO would enhance the impact of this measure.[19] It should be noted, however, that co-payments could curtail access to the system for lower-income families. To prevent this possibility, means-testing could be used to grant limited exemptions (e.g. pensioners are currently exempt, but some of them may not need to be subsidized).

- phasing out public supplementary insurance provided by the HZZO would reduce demand for health care services and stimulate the provision of additional insurance by private participants. The equity impact of this measure is not likely to be significant because essential services are covered by basic insurance.

- restraining demand for pharmaceuticals by increasing the share paid by consumers and exposing producers to more competition could further reduce pharmaceutical spending. The former could be achieved through reducing the number of medicines on the A-list, while the latter could be achieved through determining the specific drugs to be subsidized for each illness by periodic competitive tenders. Strengthening incentives to prescribe/use generic substitutes would also help reduce drug spending.

- accelerating reforms to introduce performance-based payments instead of input- or capacity-based payments would help curb excess spending. While the government has introduced case-based payments on a pilot basis, the effectiveness of this initiative has been weakened by options provided to hospitals to opt out of the new

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[16] Data from the World Bank *World Development Indicators* database suggest that in 2005 out-of-pocket spending in percent of total (private and public) health care spending in Croatia (at 17.6 %) was lower than in both the EU-10 (25.2 %) and the EU-15 (19.4 %). Using data from the HZZO, HANFA, and WHO, Mihaljek (2007) estimates out-of-pocket expenditure as a percentage of total health care in Croatia, the EU-10, and the EU-15 in 2003 at 16 percent, 23 %, and 18 %, respectively.

[17] The Croatian government adopted the National Health Care Development Strategy 2006-11 to enhance and secure better-quality health care for citizens. The strategy includes both system reforms and financing reforms.

[18] About 6 percent of the labor force was on sick leave in 2005; anecdotal evidence suggests that sick leave is used to deal with excess employment at the business level.

[19] Moreover, restricting the basic benefit package would stimulate private participation in the provision of additional insurance.

Figure 5 Efficiency Frontiers for Selected Health Outcome Indicators - Croatia's efficiency scores for HALE, the child mortality rate, infant mortality rate, and incidence of tuberculosis are among the lowest in the sample
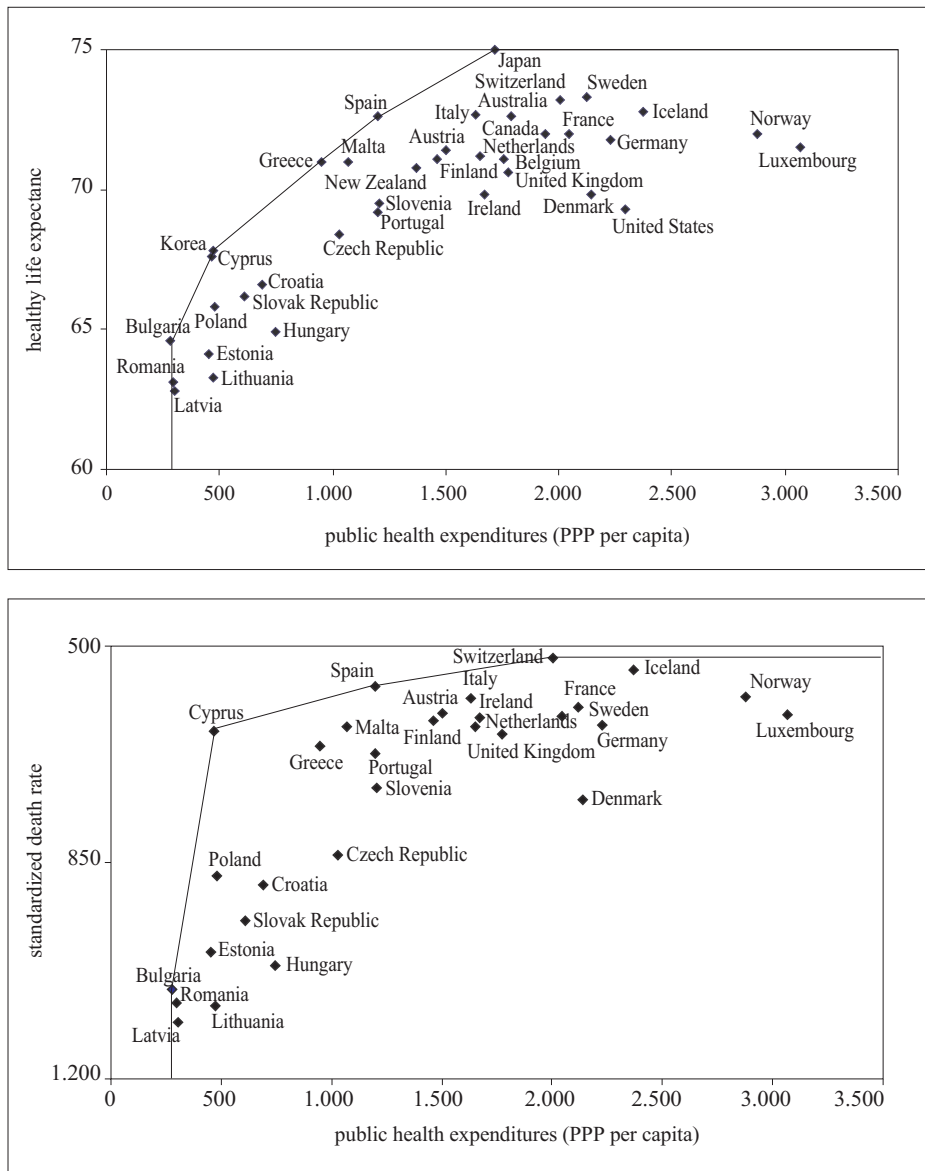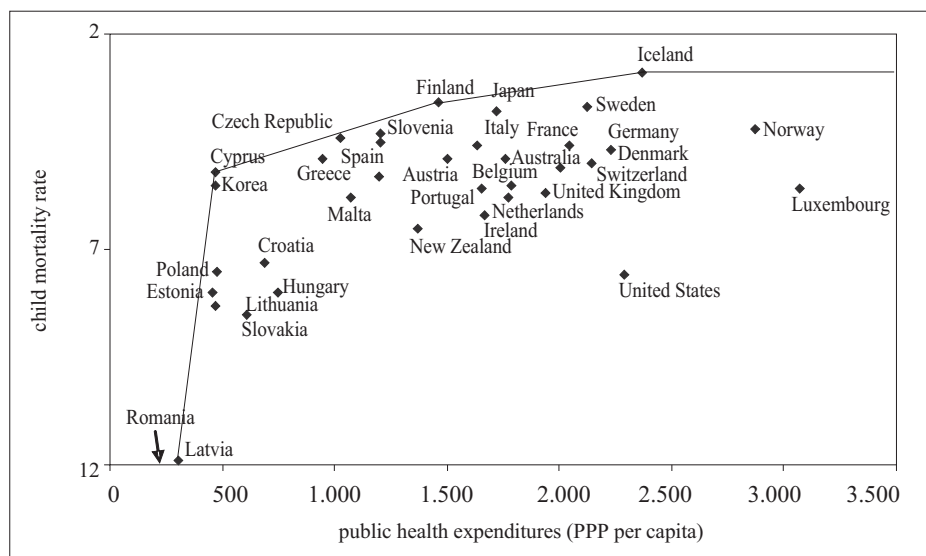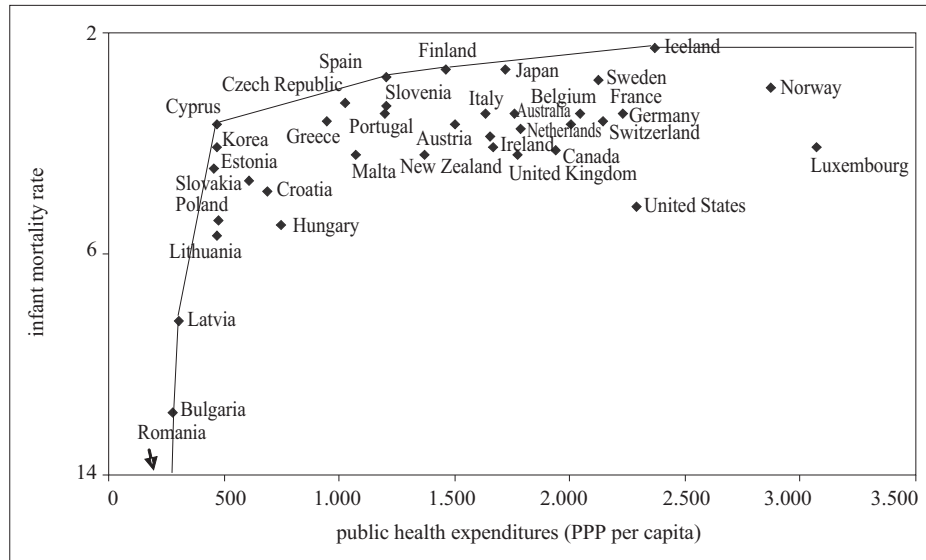
payment system that essentially guarantees highest prices for services of hospitals. The authorities intend to introduce the so-called Diagnosis Related Groups (DRG) payment method in all hospitals treating acute diseases in late 2008. These measures would facilitate reducing the length of stays in hospitals and could generate significant budgetary savings over the medium term.

• Restructuring the system by moving more resources to more affordable outpatient care could also generate significant savings. Reforms to the payment system to str-
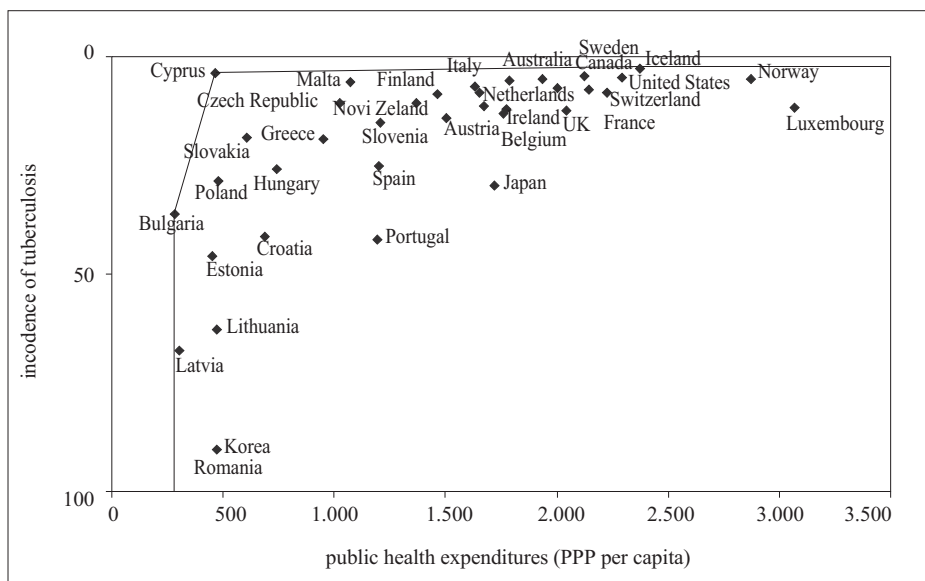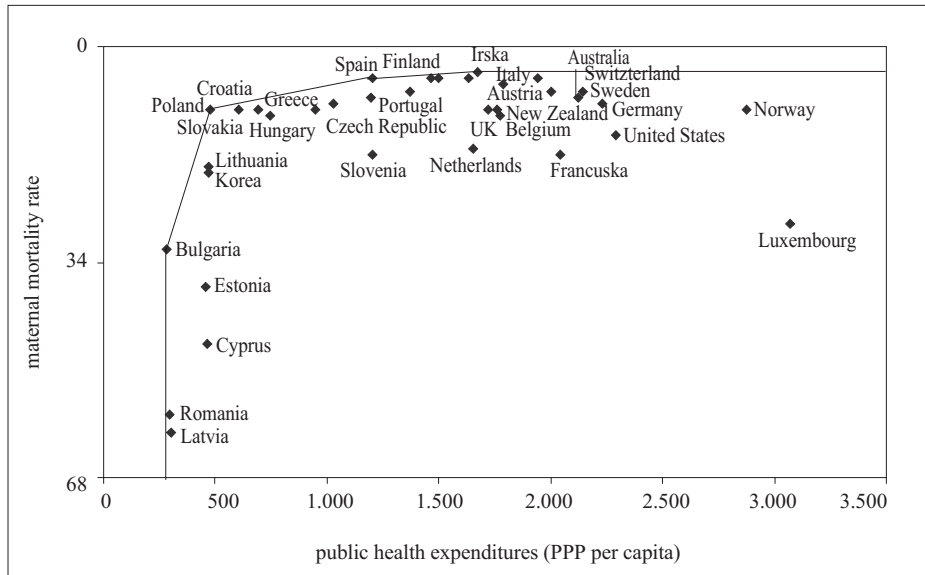
Sources: WHO; World Bank; authors' estimate

engthen incentives of general practitioners to treat patients rather than to refer them to specialists, as well as increases in co-payments for inpatient care, would serve this purpose. Administrative measures such as requesting general practitioners to explain the reasons for their referrals could also help reduce referrals to specialists.

Table 6 Correlations of Relative Efficiency in Health with Associated Factors[a]

	Healthy Life Expectancy	Standar-dized Death Rate	Infant Mortality Rate	Child Mortality Rate	Maternal Mortality Rate	Incidence of Tuber-culosis
Overall efficiency: public expenditures to outcomes						
Exogenous factors						
Alcohol intake (liters per capita per year)	NN	NN			N	
Average schooling years in the population			NN	NN		
GINI Index			N	N		
Expenditure composition						
Collective care expenditure (percent of public health exp.)[c]			NN	NN		
Collective care expenditure (PPP per capita)[c]			NN	NN		
Out-of-pocket expenditure (percent of private health exp.)	P		PP	PP		
Doctors' wages (percent of GDP)			NN	NN		
Health resources						
MRIs per million capita	P		P	P		
Overall efficiency: public and private expenditures to outcomes						
Exogenous factors						
GDP per capita (PPP dollars)	NN		NN	NN	NN	
GINI Index			NN	NN		
Average schooling years in the population			NN	N		
Expenditure composition						
Pharmaceutical expenditure (PPP per capita)[c]			NN	NN		
Collective care expenditure (percent of total health exp.)[c]			NN	NN		
Collective care expenditure (PPP per capita)[c]			NN	NN		
Personal care expenditure (PPP per capita)[c]			NN	NN		
Administration and insurance (percent of total health exp.)[c]			NN	NN	N	
Administration and insurance (PPP per capita)[c]			NN	NN		
Out-of-pocket expenditure (percent of private health exp.)	PP		PP	PP		
Doctors' wages (percent of GDP)			NN	NN	N	
System efficiency: intermediate resources/services to outcomes						
Exogenous factors						
GDP per capita (PPP dollars)	PP	PP	PP	PP	P	PP
Population over 65 years (percent of total population)	P			P		
Expenditure composition						
Pharmaceutical expenditure (percent of total health exp.)[c]	NN	NN	NN	NN		NN
Administration and insurance (percent of public health exp.)[c]	NN	NN	NN	NN		NN
Health resources[b]						
Doctors' consultations per capita per year	NN	NN		N		NN
In-patient care admissions per 100 capita[d]	NN	NN	NN	NN	N	
Outpatient contacts per capita per year[d]	N	N				
Average length of stay at hospital					N	N

[a] *Correlations are run on bias-corrected output-oriented efficiency scores. This table summarizes the results of correlations of associated factors with the level of efficiency. PP (P) indicates that the associated factor is positively correlated with level of efficiency (negatively correlated with output-oriented efficiency scores) at the 5 (10) percent significance level. NN (N) indicates that the associated factor is negatively correlated with level of efficiency (positively correlated with output-oriented efficiency scores) at the 5 (10) percent significance level. Several of the associated factors are highly correlated with GDP. Only correlations that are significant after conditioning on GDP are considered (see Appendix I).*

[b] *Only real health resources/services not included in the DEA (hospital beds, number of physicians, health workers, pharmacists, and measles immunization rate are included in the DEA) are considered.*

[c] *Excludes non-OECD countries due to missing data.*

[d] *Excludes non-European OECD countries due to missing data.*

Sources: WHO; World Bank; OECD; and authors' estimates.

Rationalizing the network of hospitals would allow Croatia significantly to improve the efficiency of health care spending and generate budgetary savings in the medium to long term. This would require developing a master plan by assessing the needs of the population by type of service and geographic location and identifying potential areas for efficiency gains. The master plan should also include closing some facilities, reorienting some facilities for alternative uses such as long-term care and private sector practice, and improving the infrastructure and upgrading equipment in the remaining facilities.

The efficiency of health spending could be significantly increased by improving the management of health institutions and introducing more competition into healthcare markets. Mihaljek (2007) notes that "virtually the entire secondary and tertiary health care sectors are managed by physicians, who often lack the adequate training in strategic management, financial planning, and other skills necessary for hospital management in a competitive market environment." Furthermore, there are coordination issues among different government agencies, leading to inefficiencies. For example, while hospitals are managed by local governments, staff hiring is done at the central government level. Accordingly, giving more independence to hospitals, imposing hard budget constraints on them, bringing in professional management expertise, and exposing them to competition could help significantly reduce inefficiencies in the health care sector. In this regard, a privatization program of hospitals should be considered in the context of the master plan.

Finally, stepping up efforts to prevent diseases (beyond immunizations covered in the above DEA analysis) would also help enhance efficiency and contain costs. For example, the share of overweight people in Croatia is among the highest in the Europe, which may be one of the factors of high incidences of death from circulatory system and heart diseases.[20] Smoking-related death incidences are also significantly higher than in EU-15 countries, as well as in Slovenia and the Czech Republic (Table 7), suggesting that increasing people's awareness of a healthy lifestyle could help reduce health care spending.

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[20] The share of obese people in Croatia is almost double the average of the EU-15. Mihaljek (2007) mentions an unhealthy lifestyle (high alcohol and tobacco consumption, and prevalence of physical inactivity) as the likely reason for the difference in mortality rates for non-communicable diseases between Croatia and EU-15 countries.

Table 7 Standardized Death Rates, all ages, 2005 (per 100,00)

	All Causes	Circulatory System	Ischemic Heart Diseases	Alcohol-Related Causes	Smoking-Related Causes	Cancer of the Cervix
Czech Republic	886.9	435.8	167.9	90.5	380.9	3.5
Estonia	837.6	419.0	177.5	81.0	359.3	5.3
Hungary	993.6	498.2	264.2	158.3	448.6	6.8
Latvia	1,015.5	502.4	261.3	129.5	490.5	6.5
Lithuania	1,107.2	578.7	287.0	157.2	532.2	6.6
Poland	1,081.6	562.8	355.0	190.8	548.1	9.8
Slovak Republic	862.4	384.2	114.4	89.5	293.1	7.8
Slovenia	945.0	508.7	268.3	90.6	414.1	6.8
Croatia	729.4	288.0	80.2	93.8	215.7	2.7
EU-8 average	946.5	467.8	226.0	123.8	412.7	6.5
EU-15 average	606.2	213.7	82.3	57.9	200.3	2.2

Soruce: WHO, European Health for All database.

3.2 Education

The analysis suggests significant inefficiencies in the education sector (Table 8). In terms of the efficiency scores, Croatia ranks in the third quartile for primary education and secondary education (as well as in terms of PISA test scores);[21] and in the last quartile for tertiary education. For tertiary education, this inefficiency is related to low enrollment and graduation rates. For secondary education, this low ranking reflects mainly low enrollment rates and relatively low PISA scores (in mathematics), and in primary education the inefficiencies stem from low enrollment, low completion rates, and high overhead costs related to the excess number of schoolteachers, which has not matched the declining school-age population.

As in the health care sector, the main inefficiencies in the Croatian education sector lie in transforming intermediate education outputs into real outcomes. As can be seen from Table 9, Croatia's system efficiency from secondary enrollment to PISA scores was worse than the EU-10 average and significantly worse than the OECD average.[22] These results suggest that there is significant scope for streamlining education expenditures in Croatia and that the education system could be improved by relevant policy reform.

Correlation analysis of efficiency of education spending is revealing (Table 10). The key findings include a positive relationship between overall efficiency on the one hand, and on the other (1) the share of current expenditure in total education; (2) classroom size; (3) parent's education; and (4) school quality and autonomy indicators such as student

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[21] Efficiency in secondary education is estimated using both a combined set of secondary intermediary outputs and outcomes, and PISA scores only.

[22] System efficiency was estimated only for the secondary education level, where PISA test scores were used as education outcome. The overall public sector efficiency (quartile) rankings in the primary and secondary levels presented in Table 7 are for the first stage of the production process (spending to intermediary outputs), since no education outcomes such as test scores are available at these levels.

Table 8 Relative Efficiency of Croatia and the EU-10 in Education (distribution by percentiles of the ranking of efficiency scores)[a]

	Percentiles			
	1-25	**26-50**	**51-75**	**76-100**
Primary education[b]				
	Romania	Bulgaria	Croatia	
		Czech Republic	Estonia	
		Lithuania	Hungary	
		Slovak Republic	Latvia	
			Poland	
			Slovenia	
Secondary education[c]				
	Bulgaria	Estonia	Croatia	
	Lithuania	Hungary	Czech R.	
	Poland	Latvia		
	Romania	Slovak Republic		
		Slovenia		
PISA test scores				
	Estonia	Czech Republic	Bulgaria	
	Poland	Latvia	Croatia	
	Romania	Lithuania	Hungary	
	Slovak Republic			
	Slovenia			
Tertiary education[d]				
	Latvia	Estonia	Hungary	Bulgaria
		Lithuania		Croatia
		Poland		Czech Republic
		Slovenia		Romania
				Slovak Republic

[a]*Croatia's efficiency scores for primary education ranked, on average, at the 70th percentile of the overall ranking of efficiency scores in the sample of OECD and EU-10 countries and Cyprus, malta and Croatia. This places Croatia in the third (51-75) quartile of the sample ranking distribution. The rankings are based on the point estimate of the output-oriented efficiency scores.*

[b]*Based on primary expenditure efficiency in producing primary enrollment, primar pupil-teacher ratio, primary completion rates and progression to secondary education.*

[c]*Based on secondary expenditure efficiency in producing secondary enrollment, upper secondary graduation rates, and averages PISA mathematics scores.*

[d]*Based on tertiary expenditure effieincy in producing tertiary enrollment.*

Sources: UNESCO; World Bank; and author's estimates.

admission prerequisites, student discipline and principal responsibility for hiring. Also, note that the coefficient of correlation between GDP per capita and overall efficiency has a minus sign while the coefficient of correlation between system efficiency and GDP per capita has a plus sign. This perhaps reflects the fact that rich countries spend more money on education and health – due mainly to high costs for intermediary output – but causing only marginal improvements in outcomes. However, these countries are more efficient in transforming intermediate output into outcome. There are two implications for Croatia. First, more spending, especially capital spending, will not automatically improve educa-

Table 9 Ratio of Percentile Rank of Efficiency Scores in Education to the percentile
Rank of the Average Efficiency Score of the OECD[a]

	System Efficiency	**Overall Efficiency[b]**
	Secondary enrollment rate to PISA scores	**Total education expenditures to PISA scores**
Croatia	1.9	1.3
Bulgaria	2.3	1.0
Czech Republic	x	0.8
Hungary	1.4	1.0
Latvia	1.7	0.5
Lithuania	1.7	0.7
Poland	2.2	0.1
Romania	2.2	0.1
Slovak Republic	x	0.4
Slovenia	1.1	0.3
EU-8 average	1.6	0.5
EU-10 average	1.8	0.5
EU-15 average	1.1	1.2

[a]Ratio of output-oriented efficiency rankings of EU-10 and EU-15 countries to the average ranking of OECD countries. Higher numbers suggest inefficiencies, compared to OECD countries.
[b]Based on output-oriented efficiency rankings from Table 8.

Sources: UNESCO; World Bank; and Fund staff estimates.

tion outcomes. Second, the costs of having an excess number of teachers will rise significantly as teachers' wages grow in line with income levels.

The following reforms, which are largely consistent with many reform measures included in the ESDP, could help improve the efficiency of education spending:

- Rationalizing the teaching force would help contain declines in the student-teacher ratio, as well as related fiscal costs and rigidities that limit the scope for discretionary cuts in short-term education spending. This could be achieved through natural attrition and a selective hiring freeze for new teachers. If Croatia's student-teacher ratios could be increased to the levels of OECD countries, it would allow the country to reduce the number of teaching staff by around 11 percent at the primary level and by around 17 percent at the secondary level. In this regard, World Bank (2007a) suggests that the number of students 7-29 years of age will decline by another 358,000 or about 25 percent from 2005 to 2030. This implies a significant potential for savings, if the number of teachers and overall education spending can be reduced in line. Also, as the number of students decline, schools could consider pooling resources by sharing teachers. Otherwise, further declines in the student-teacher ratio would lead to significant inefficiencies and aggravate the fiscal burden.
- Rationalizing the school network would also help realize potential benefits from expected declines in the number of students. This could be facilitated by increases in spending on transportation and the usage of multi-grade teaching in small scho-

Table 10 Correlations of Relative Efficiency in Education with Associated Factors[a]

	Primary			Secondary			Tertiary
	Enroll-ment rate	Comple-tion rate	Pupil-teacher ratio	Enrol-ment rate	Gradua-tion rate	PISA math scores	Enroll-ment rate
Overall efficiency: public expenditures to outputs/outcomes							
Exogenous factors							
GDP per capita (PPP dollars)		NN		NN		NN	
Healthy life expectancy (years)	PP	PP					
Mother's education ICED 3 or higher (percent students)[b]	...	...	...	PP	P	P	...
Father's education ICED 3 or higher (percent students)[b]	...	...	...	PP		P	...
Expenditure composition							
Private education expenditure (as a share of public educ. exp.)			NN				
Total current expenditure (percent of non-tertiary educ. exp.)		P	PP	PP			...
Total capital expenditure (percent of non-tertiary educ. exp.)		N	N	N			...
Education resources							
Pupil-teacher ratio in secondary[c]	...	...	...			PP	...
Student admission record is prerequisite (percent schools)[b]	...	...	...			PP	...
Principal is responsible for hiring teachers (percent schools)[b]	...	...	...	P		PP	...
Student absenteeism hinders learning (percent schools)[b]	...	...	...			NN	...
Student skipping classes hinders learning (percent schools)[b]	...	...	...			NN	...
Student lack ofrespect hinders learning (percent schools)[b]	...	...	...			N	...
Student bullying hinders learning (percent schools) [b]	...	...	...	NN			...
System efficiency: secondary enrollment/PISA math scores							
Exogenous factors							
GDP per capita (PPP dollars)	...	...	...	...	...	PP	...
Infant mortality rate (per 1,000 live births)	...	...	...	...	...	NN	...
Education resources[b]							
Student admission record is prerequisite (percent schools)[b]	...	...	...	...	...	P	...
Student absenteeism hinders learning (percent schools)[b]	...	...	...	...	...	NN	...
Student skipping classes hinders learning (percent schools)[b]	...	...	...	...	...	NN	...
Student lack of respect hinders learning (percent schools)[b]	...	...	...	...	...	N	...

[a] Correlations were run on output-oriented efficiency scores. This table summarizes the results of correlations of associated factors with the level of efficiency. PP (P) indicates that the associated factor is positively correlated with level of efficiency (negatively correlated with output-oriented efficiency scores) at the 5 (10) percent significance level. NN (N) indicates that the associated factor is negatively correlated with level of efficiency (positively correlated with output-oriented efficiency scores) at the 5 (10) percent level. Several of the associated factors are highly correlated with GDP. Only correlations that are significant after conditioning on GDP are considered (see Appendix I).

[b] Only covers countries that participated in the 2003 PISA test.

[c] Excludes non-OECD countries due to missing data.

Sources: UNESCO; World Bank, World Development Indicators; OECD; and authors' estimates.

ols. The government's efforts to eliminate triple shifts are welcome, but attempts to eliminate double shifts need to be well planned to avoid unnecessary spending.

• Increasing teaching hours may allow for better education outcomes while containing education spending. This would provide room to contain the decline in the student-teacher ratio in the event that enrollments increase.

• Moving toward performance- and per-capita based budgeting could significantly reduce inefficiencies in the education sector. The authorities have already made good progress toward these ends by introducing a transparent system of performance evaluation of students' achievements as well as the quality of teachers. More could be done, however, to take into account the number of students, as well as selected output and outcome indicators such as graduation and drop-out rates, student-teacher ratios, scores on international standardized tests.

• Reducing rigidities related to institutional and funding mechanisms could generate savings. In particular, gradually raising local governments' control over and responsibility in delivering educational services, in line with their capacity, would allow them to internalize the full cost of their decisions and could increase the efficiency of education spending.

• Greater cost recovery should be considered in pre-school education and university tuition. In pre-school education, which is under the control of local governments, unit costs have risen faster than the other levels of education, which may reflect inefficiencies in the provision of services by local governments. Regarding university tuition, education is free for about 48 per cent of students, but a study at the University of Rijeka suggests that those who pay fees complete with better grades and earlier than other students (World Bank, 2007a). Introducing means-testing for programs providing free textbooks, transportation, and dormitories would help to better target the vulnerable groups and curb education spending without sacrificing education outcomes.

More generally, improving the skills base to match that demanded by the labor market will be important for ensuring that the Croatian economy competes successfully in Europe and globally. The Lisbon Council's European Human Capital Index ranked Croatia last among 12 central and eastern European countries, mainly due to low scores on utilization of human capital, although this study ranked Croatia in the middle of the 12 countries for human capital endowment (i.e., education and training) and human capital productivity (Ederer, Schuller, and Willms, 2007). This suggests that the impact of education spending on economic growth in Croatia could be enhanced by shifting resources to meet demands in the labor market better.

3.3 Social Protection Transfers

Croatia is on the efficiency frontier line, but this is because of low levels of social protection spending (in PPP terms) rather than large changes in poverty reduction due to social protection transfers. This suggests problems in the future, unless the system is reformed (Figure 3). In particular, unless efficiency of social spending is improved significantly, further increases in social spending may not lead to less poverty.

The following reforms could help improve the efficiency of social protection spending:

- Improving the targeting of benefits by significantly expanding the use of means testing in providing benefits would improve the efficiency of social protection spending. The intended introduction of taxpayer identification numbers – and, more importantly, to quantify the benefits received by individuals – would facilitate the introduction of this measure.

- Consolidating supervisory responsibility under a single agency would improve the coordination of policies and their implementation. Unifying the administration of benefits to a single office at the local level with a view to eliminating possibilities for double-dipping could generate fiscal savings and improve efficiency.

- Changing the overall mix of total social spending by reducing the share of categorical benefits and increasing the share of well-targeted programs could help achieve better results.

Finally, any new initiatives on social spending should be designed with a view to enhancing incentives to work. Croatia's labor market participation rate is one of the lowest in Europe, and the existing social benefits may have contributed to this outcome. Active labor market measures (employment subsidies, training, measures to promote jobs for the disabled, etc.) and easing hiring (and firing) procedures could be considered to re-connect the unemployed to the labor market.

Figure 6 Social Spending and Poverty Rate Reduction in Selected Countries
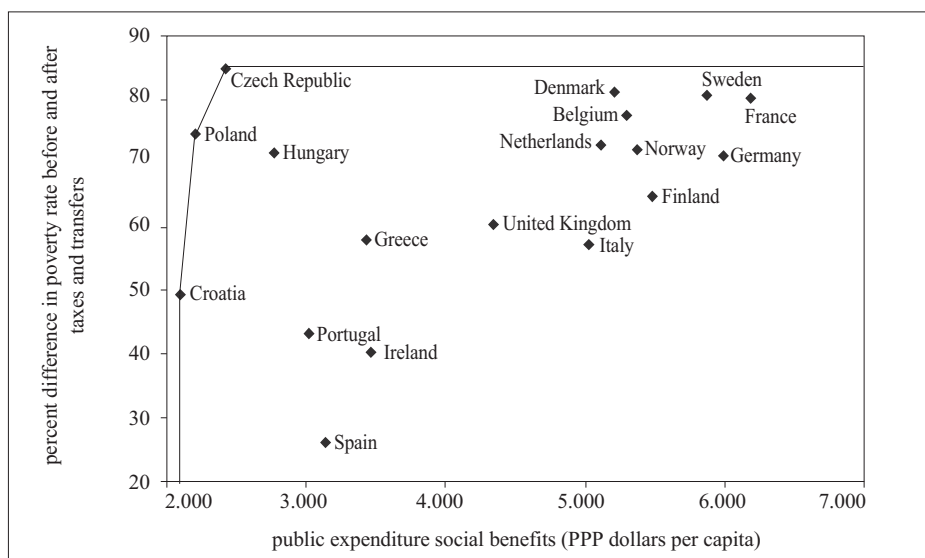
Sources: Croatian Central Bureau of Statistics; Eurostat; OECD; and authors' estimates.

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4 Concluding Remarks

The previous sections demonstrated that there are significant inefficiencies in social spending in Croatia. In the health sector, inefficiencies are mainly related to high spending, rather than weak outcomes. In the education sector, inefficiencies are related to both poor outcomes and increasing overhead costs. Regarding social protection spending, inefficiencies are related to weaknesses in targeting. While there are caveats to the analysis, the main findings, taken together with the findings of other studies, seem quite robust. In particular, the findings of this paper, derived from simple cross-country comparisons, simple correlation analyses, and DEA,[23] are supported by studies at sectoral levels by the IMF, the World Bank, and Mihaljek (2007).

These inefficiencies suggest that there is room to improve key social indicators while containing public spending. The paper has suggested a number of measures that can be taken to reduce inefficiencies in public spending and generate budgetary savings. These measures are summarized in the following frame. Some of the above reforms could have disproportionate effects on the poor and other vulnerable groups. Therefore, to make sure that vulnerable groups are not deprived of necessary services, targeted transfers to them may be needed.

Menu of Reform Measures to Increase Efficiency of Social Spending in Croatia

Health Care
- Increase co-payments while minimizing exemptions.
- Further reduce subsidization of pharmaceuticals.
- Accelerate the introduction of the Diagnosis Related Groups (DRG) payment method.
- Restrict the basic benefits package covered by HZZO.
- Shift resources to more affordable outpatient care.
- Increase the role of the private sector in the provision of health care services.
- Strengthen incentives for general practitioners to reduce referrals.
- Rationalize the hospital network.

Education Sector

- Rationalize the teaching and non-teaching work force and wage bill.
- Consider greater cost recovery in tertiary education by reducing budget financing to universities and means testing scholarships.
- Increase teaching hours to international norms.
- Target free textbooks, transportation, and dormitories programs only to the vulnerable.

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[23] See Annex I for description of caveats of DEA.

- Rationalize the school network and expand multi-grade teaching in small schools.
- Move towards per-student or performance-based budgeting.
- Shift resources to meet demands in the labor market better.

Social Protection
- Improve targeting of benefits.
- Streamline benefits by consolidating them and reducing their number.
- Consolidate the administration of social benefits.

Annex I Data Envelopment Analysis (DEA)[24]

The DEA technique is a non-parametric method of estimating production possibility sets, which can be used to evaluate the efficiency in the use of inputs in producing outcomes for a sample of production units.[25] It is mostly used for estimating relative efficiency in business applications, but it has recently also been used to assess the relative efficiency of public expenditure. In the context of government expenditure efficiency, indicators of public production are typically used to measure outcomes, for example, life expectancy and infant mortality rates (in health care), youth literacy rates and test scores (in education), and the number of roads and telephone lines (in infrastructure). Inputs used to produce these outcomes are public and private expenditure on health, education, and infrastructure, as well as intermediate outputs and resources such as the number of doctors and hospital beds (in health care) and enrollment rates and student-teacher ratio (in education). The production units in this case are often countries, but could also be sub-national regions.[26]

Figure A1 illustrates a stylized example of DEA based on a single input and outcome indicator across countries. The efficient frontier connects countries A to D as these units dominate countries E and G in the interior. The convexity assumption allows an inefficient country (point E) to be assessed relative to a hypothetical position on the frontier (point Z) by taking a linear combination of efficient unit pairs (points A and B). In this manner, an *input-based technical efficiency* score that is bounded between zero and one can be calculated as the ratio of YZ to YE. The score corresponds to the proportional reduction in inputs that is consistent with relatively efficient production of a given output, and can be interpreted as an indicator of the cost savings that could be achieved from efficiency enhancement. Similarly, an *output-based technical efficiency* score can be calculated as the ratio of FX to EX, which reflects the improvement in outputs for given inputs that could be achieved from efficiency enhancement. This paper focuses on output-based efficiency scores, since Croatia will need to improve outcomes without increasing expenditures.[27] [28]

DEA is a powerful tool to assess the relative efficiency of spending, but also has important caveats. For example, it does not require an assumption about unknown functio-

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[24] This Appendix is based on Zhu (2003), Mattina and Gunnarsson (2006), and Verhoeven et al. (2007).

[25] It was developed by Farrell (1959) and popularized by Charnes, Cooper and Rhodes (1978). See Zhu (2003) for more detailed discussion of DEA.

[26] There is well-established literature using DEA to assess the relative efficiency of public expenditure. Gupta and Verhoeven (2001) studied the relative efficiency of education spending in a broad sample of African countries during the 1984-95 period. Afonso and St. Aubyn (2004) applied DEA and a related frontier-based approach on health and education spending in a sample of OECD countries. Herrera and Pang (2005) studied the relative efficiency of spending in 140 countries using DEA. Afonso, Schuknecht and Tanzi (2006) applied DEA in a sample of EU and emerging market countries. An important contribution of their work was to apply truncated regression models based on procedures developed by Simar and Wilson (2007) to control for exogenous factors that impact efficiency but that are not directly controlled by policy makers. Coelli, Lefebvre, and Pestieau (2007) applied DEA to study social protection performance in the EU.

[27] An output-based efficiency score of one corresponds to a relatively efficient country operating on the frontier. Scores exceeding one imply that spending could achieve better output performance. This differs from input-based efficiency scores that range between zero and one.

[28] The input- and output-based efficiency scores are equal assuming constant returns to scale. However, the DEA models considered in this paper permit variable returns to scale.

*Figure A1 Illustrative Example of Applying DEA*
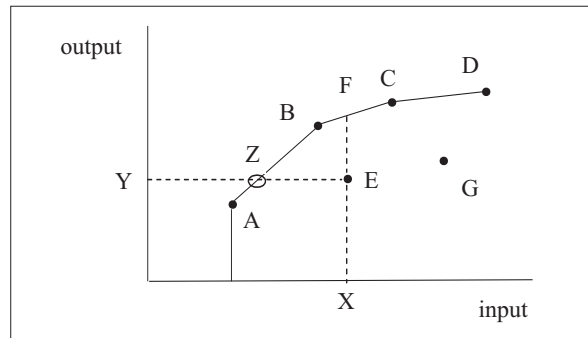
nal forms for the efficiency frontier or complex distributional properties for econometric analysis. However, it is also subject to the following caveats:

- Results are highly sensitive to sample selection and measurement error. As a result, outliers exert large effects on the efficiency scores and the shape of the frontier. For this reason, proper sample selection is the key to ensuring that cross-country input-output combinations are comparable.
- Spending attributes that are difficult to quantify are not easily incorporated in the analysis, such as the quality of spending.
- The outcome indicators against which inputs are evaluated may not actually be targeted by policy makers.
- Large differences across countries in private health care or education spending could bias the efficiency scores of public spending, as the outcomes targeted by policy makers are also impacted by private spending.
- Factors beyond the direct control of policy makers can also affect relative efficiency scores. For instance, a high incidence of AIDS would reduce the measured efficiency of health spending in African compared to other countries.

Moreover, simple DEA estimation produces biased estimates of the efficiency scores that need to be corrected. In particular, the best-practice frontier can move *outward,* if efficient pairs/countries are added in the sample, but cannot move inward. This one-sided error means that estimating the best-practice frontier with a finite sample is subject to bias. Since output–oriented efficiency scores are measured in relation to the frontier, the estimated scores are subject to the same finite sample downward bias (i.e., the level of efficiency is overestimated unless a correction is made for the bias). This bias stems from the fact that since we only observe a sub-sample of the possible outcomes representing all feasible combinations of spending and outcomes, we do not know the exact position of the best-practice frontier. Where appropriate, corrections are made for the estima-

Figure A2 The Efficiency Relationship between Health Expenditures, Resources, and Outcomes
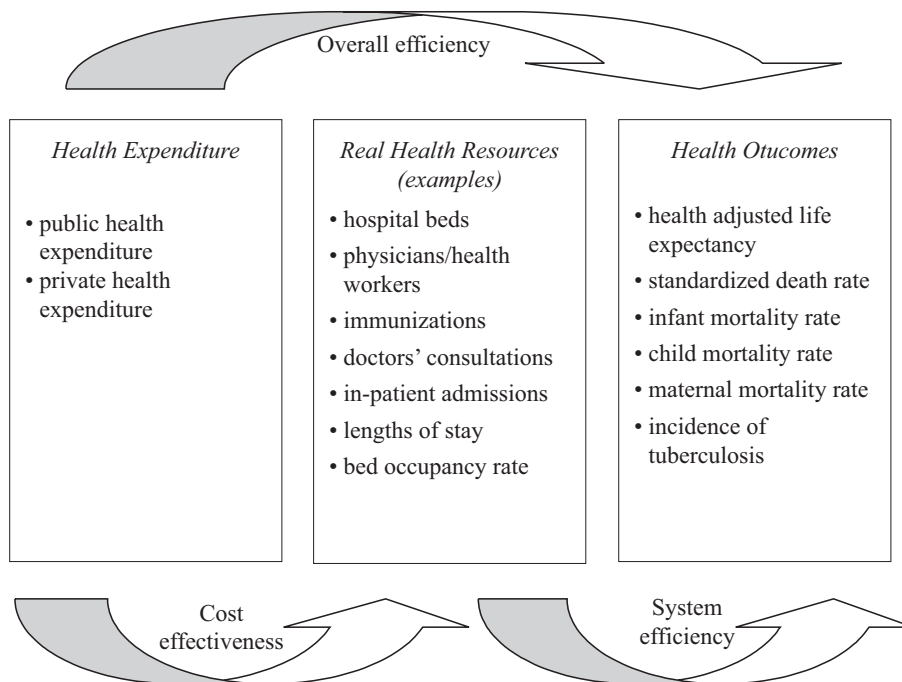
tion bias in the best-practice frontier and efficiency scores through bootstrapping, as suggested by Simar and Wilson (2000).[29]

DEA results can be disaggregated to assess at what stage of the spending process inefficiencies arise. This is done as by comparing *spending efficiency* (the overall measure of efficiency from spending to outcomes as discussed above) and *system efficiency* (the measure of efficiency from intermediate outputs to outcomes; Tables 5 and 9). Figure A2 illustrates how it is done in the analysis of efficiency of health care spending. First, cost efficiency is assessed using health care spending and intermediate output indicators such as hospital beds, immunizations, physicians, health care workers and pharmacists

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[29] A key issue is how quickly the estimated efficiency scores converge to their unbiased true values if the sample of observations is expanded. This convergence speed is $n^{-2/(p+q+1)}$, where p is the number of inputs and q is the number of production items. In the 1 input / 1 product examples of this Annex, the convergence speed is $n^{-2/3}$. This is faster than the convergence speed for a standard parametric regression of $n^{-1/2}$, suggesting that reasonable estimates of efficiency scores and confidence intervals can be reached with a lower number of observations than would be needed for standard regression analysis. However, the convergence speed declines exponentially as the number of inputs and production items is increased, and already at two inputs and production items, the speed of convergence is markedly slower than for a parametric regression. This implies that an expansion in the numbers of inputs and production items comes at a significant cost in terms of the ability to draw conclusions on efficiency from a limited number of observations.

per capita. Second, efficiency scores are calculated, using the intermediate output index as an input and associated outcomes (infant, child, and maternal mortality rates, as well as HALE, standardized death rates and the incidence of tuberculosis). Third, the resulting system efficiency rankings are averaged and expressed as a ratio of the average OECD ranking, and compared with similar ratios for spending efficiency.

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