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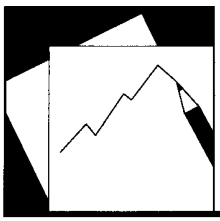

IMF Working Paper

The Health Sector in the Slovak Republic: Efficiency and Reform

Marijn Verhoeven, Victoria Gunnarsson, and Sergio Lugaresi

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The Health Sector in the Slovak Republic: Efficiency and Reform[1]

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Abstract

The paper assesses the financial situation of the health sector in the Slovak Republic. It also evaluates the efficiency of health expenditures and service delivery in comparison to the OECD and other new EU member states and suggests avenues for cost recovery and reform. The health sector of the Slovak Republic is plagued by financial problems. To turn around health system finances and achieve larger gains in health outcomes, the efficiency of health spending needs to increase and the mix and quality of real health resources need to be improved. Although Slovak's overall health spending efficiency is on par with that of the OECD, substantial inefficiencies occur in the process of transforming intermediate health inputs into health outcomes. Efficiency may be enhanced by containing the cost of drugs and reducing reliance on hospital care. Also, although cost-effectiveness may be relatively high at present, its sustainability in the future is an issue.

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Keywords: Expenditure efficiency; health sector reform

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I. Introduction

The Slovak Republic finds itself at a crossroads in health care reform. The current government has rolled back the main measures of the reform package put in place during 2003–04 in the face of public disenchantment with the results of those reforms. But further change is needed to raise the efficiency of health spending, so that the health system can be put on financially sound footing and health outcomes can be improved. The current government has formulated some initiatives, but is still in the process of developing a comprehensive strategy for the health sector.

This paper provides an analysis of key issues in the health sector and recommendations for a health reform strategy. Section II focuses on recent reforms and the fiscal challenges in the health care system. The conclusion of this analysis is that a well-defined strategy is needed to control the fiscal cost of health care over the medium term. In Section III, we turn to the question of the efficiency of health spending—a key issue for controlling health care cost and improving health outcomes. The main finding is that an immediate challenge for the Slovak health care system is to improve the mix of health care resources (e.g., doctors, hospital beds, and pharmaceuticals). The analysis also suggests that more attention should be paid to pharmaceutical costs, doctors' consultations, bed utilization, and outpatient contacts. Finally, in Section IV, we present some recommendations on measures that could be part of a health reform strategy. This includes strengthening of central oversight over public hospital finances; enhancing the role of the private sector; and reforming financial arrangements.

II. Recent Health Reforms and the Fiscal Challenge of Health Care

Reforms instituted during 2003–04 were successful in achieving a temporary improvement in the health system's financial condition. The reform measures were aimed at increasing the role of the private sector in health care and included: (1) the introduction of co-payments by patients; (2) the creation of voluntary health insurance; (3) the establishment of state-owned health insurance companies as joint-stock companies; and (4) changing the status of several hospitals from self-managed government institutions to non-profit semi-independent entities. In addition, the government took over hospital debts, which had been accumulating at an annual rate of 0.7 percent of GDP during 2000–02. As a result of these measures, health spending declined in 2004 (Table 1) while debt and arrears of the health institutions fell substantially (Table 2).

Table 1. Slovak Republic: Total and Public Health Expenditures, 2000–07
(Percent of GDP)

	2000	2001	2002	2003	2004	2005	2006	2007
Public expenditure on health	4.9	5.0	5.1	5.2	5.1	5.2	5.2	5.3
Total expenditure on health	5.5	5.6	5.7	5.9	5.8	n/a	n/a	n/a

Source: WHO Europe, IMF staff estimates after 2004.

Table 2. Slovak Republic: Health System Outstanding Debt and Arrears, 2004–06

	Debt (including arrears)			Arrears	
	2004	2005	2006	2005	2006
			(billion Sk)		
Total	19.3	6.4	7.5	5.6	6.8
Health institutions	17.1	5.2	7.4	4.4	6.7
Ministry of Health	13.9	2.8	5.1	2.0	4.4
Regional and local governments	3.2	2.4	2.3	2.4	2.3
Insurance companies	2.2	1.2	0.1	1.2	0.1
			(percent of GDP)		
Total	1.4	0.4	0.4	0.4	0.4
Health institutions	1.3	0.4	0.4	0.3	0.4
Ministry of Health	1.0	0.2	0.3	0.1	0.2
Regional and local governments	0.2	0.2	0.1	0.2	0.1
Insurance companies	0.2	0.1	0.0	0.1	0.0

Sources: Ministry of finance and ministry of health.

The reform measures were not sufficiently strong to resolve the financial problems of the health sector. The co-payments were relatively small (Sk20 for doctor visits and Sk50 per day of hospital stay). Because the coverage of the mandatory health insurance was left at very high levels, the demand for the newly introduced supplementary voluntary health insurance was low. The change in the legal status of hospitals fell short of efforts to privatize hospitals. Thus, public health spending started to rise again in 2005, and large state-owned and regional hospitals continued to accumulate new arrears with their suppliers, particularly pharmaceutical companies. The reforms also were very unpopular. Public opinion polls revealed widespread disapproval with the health reforms,[2] and health care policy was an important issue during the 2006 electoral campaign.

The new government that assumed office in June 2006 reversed key elements of the 2003–04 health care reform. Co-payments for doctor visits and hospital stays were abolished and co-payments for drugs were lowered significantly; profits and administrative spending of health insurance companies were limited to 4 percent of their total expenditure; and legislation was submitted to parliament to change the legal status of the state-owned insurance companies from joint stock companies to public agencies.

The government also undertook measures aimed at bolstering the finances of health insurers and health care institutions, but a comprehensive reform strategy remains to be formulated. With the aim of reducing the cost of medical services, the Value-Added Tax (VAT) rate for most pharmaceuticals was reduced from 19 percent to 10 percent. In addition, the government increased the transfers to health insurance companies for health insurance contributions to cover the non-working population (e.g., pensioners and the unemployed). For the first quarter of 2007, these transfers were raised from 4 percent to

[2] An opinion poll found that 74 percent of respondents disagreed with the introduction of the health care reforms, compared with 35 percent of the respondents opposing pension reform (Jevčák, 2006).

5 percent of the minimum wage per insured person. This rate would revert back to 4 percent thereafter, unless the health ministry formulates a plan for lowering the fiscal burden of health care. The health ministry has identified some 6,200 hospital beds (about 16 percent of the total number of beds) that it deems redundant and that should be eliminated. However, the implementation of the targeted reductions depends on the collaboration of subnational governments (SNG), which control most of the hospitals with the identified beds.

Further reforms will be needed to enable the health care system to remain within the financial envelope specified in the 2007–09 budget framework. At current rates,[3] health insurance contributions and other public resources available for spending in the health sector are projected to decline from 5.3 percent of GDP in 2007 to 5.1 percent during 2008–10 (Table 3). There is a risk that wage increases and the rising cost of pharmaceuticals[4] will crowd out other health spending. This would jeopardize the quality of health services and likely result in additional arrears accumulation. Managing these pressures will require the implementation of reforms aimed at raising the efficiency of health spending.

III. Comparative Analysis of Efficiency in the Health Sector

A strategy for enhancing efficiency in the health sector should be based on an understanding of the sources of current inefficiencies. In this section, we try to identify some of these sources by comparing health spending and outcomes in the Slovak Republic with those in the 10 Central and Eastern European new EU-member states (NMS–10) and OECD countries.[5]

A. International Comparison of Health Care Expenditure and Outcomes

Total health spending in the Slovak Republic is less than one-third of the EU–15 and OECD averages and above the median for the NMS–10. This partly reflects the higher cost of health services and increased health care demand in countries with higher income levels. The share of the private sector in total health care spending in the Slovak Republic is among the lowest in the EU (Figure 1). Average annual per capita expenditure on health care in the Slovak Republic during 2000–04 in purchasing power parity (PPP) dollars was PPP$712, of which only 11 percent came from private sources.[6]

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[3] See Health Policy Institute (2007) which is consistent with government forecasts.

[4] After declining slightly in 2007, owing to the reduction in the VAT rate for most pharmaceuticals, the cost of pharmaceuticals is likely to resume its upward trend from 2008 onward, in line with envisaged trends of international pharmaceutical prices. Moreover, the recent increase in drug costs is due in part to a trend toward using a larger volume of more effective, but more expensive medicines (Nemec and Ochrana, 2005).

[5] The sample of countries also include the new EU-member states Cyprus and Malta.

[6] Spending is measured in PPP terms in order to be able to compare expenditure levels across countries. More conventional measures of spending would bias such a comparison. For example, spending measured as a percent of GDP underestimates the purchasing power of spending in richer countries relative to poorer countries (because a comparable package of health services will cost less as a percent of GDP in the richer country). At the same time, richer countries should be expected to spend more on health care in PPP terms;

This reflects the high coverage of the mandatory public health insurance which leaves little space for private supplementary insurance. Only the Czech Republic has lower private health spending, at 9 percent of total health expenditure.

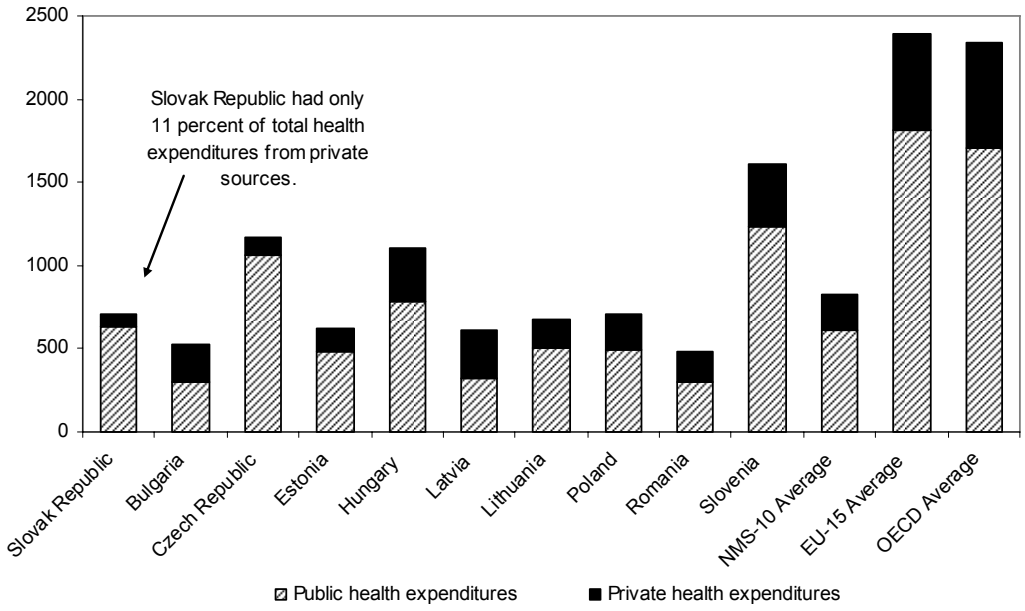
Table 3. Slovak Republic: Public Spending on Health Care, 2005–10
(In percent of GDP)

	Estimate		Projection			
	2005	2006	2007	2008	2009	2010
Health insurance companies						
Revenues	5.0	5.0	5.0	4.9	4.9	4.9
Insurance contributions from budget	1.5	1.4	1.5	1.4	1.3	1.3
Other insurance contributions	3.4	3.5	3.5	3.5	3.5	3.5
Other revenues	0.1	0.1	0.1	0.1	0.0	0.0
Expenditure 1/	5.0	5.0	5.0	4.9	4.9	4.9
Health care spending	4.5	4.6	4.7	...	...	...
Pharmaceuticals	1.8	1.9	1.8	...	...	...
In-patient care	1.1	1.1	1.3	...	...	...
Out-patient care	0.8	0.8	0.8	...	...	...
Other	0.7	0.7	0.7	...	...	...
Non-health care spending	0.5	0.3	0.4	...	...	...
Administrative expenses and profit	0.3	0.3	0.3	...	...	...
Other	0.2	0.0	0.0	...	...	...
State budget (excluding transfers to insurance companies)						
Expenditure	0.2	0.2	0.2	0.1	0.1	0.1
Current spending (administration, medical education, etc.)	0.1	0.1	0.1	0.1	0.1	0.1
Capital spending	0.1	0.0	0.0	0.0	0.0	0.0
Subnational governments and EU funds						
Expenditure	0.0	0.0	0.0	0.1	0.1	0.1
Public expenditure on health 2/	5.2	5.2	5.3	5.1	5.1	5.1

Source: Health Policy Institute (2007) and IMF staff estimates.
1/ Includes profits.
2/ Public expenditure is estimated as the sum of insurance contributions and spending by the state, subnational governments (SNG), and EU funds. This excludes spending from co-payments and other nonpublic financial sources.

as populations grow wealthier, they are likely to consume a larger and more varied package of social services, leading to increased spending (the Wagner effect).

Figure 1. Health Expenditure in the OECD and NMS-10, 2000–04
(Period average in PPP dollars)



Sources: OECD and WHO Europe

Compared to other countries, public health care expenditures and resources are tilted toward hospital care, pharmaceuticals, and wages. Hospital bed availability is in line with the NMS-10 average, but higher than the averages of the EU-15 and OECD. However, the hospital bed occupancy rate and the rate of inpatient care admission are lower in the Slovak Republic than in comparable countries (Table 4). On the other hand, the use of outpatient and doctors' services is high compared to other countries. Spending on pharmaceuticals is also higher in the Slovak Republic than in the other NMS-10 countries (Table 5). Spending is also biased toward compensation of employees, which amounted to 44.6 percent of total spending by health facilities in 2004, as compared to an average of 27.7 percent in the EU-15 (Institute for Health Information and Statistics, 2005, and Eurostat Task Force on COFOG, 2006). Overstaffing of physicians and accompanying health staff in relation to EU-15 appears to be a key issue (OECD, 2006). While wage levels are low, pressure from unions for wage increases is rising and there is anecdotal evidence of health staff emigration to EU-15 countries.

Table 4. Selected Real Health Resources 1/

	Resources				Utilization rates					
	Hospital beds (per 1,000)	Physicians (per 1,000)	Health worker index (per 1000)	Pharmacists (per 100,000)	Doctors' consultations (per capita)	Bed occupancy (percent)	In patient care admissions (per 100)	Average length of stay (days)	Outpatient contacts (per capita)	Measles immunization (percent)
Slovak Republic	7.2	3.1	10.6	49.0	12.7	68.6	18.5	8.9	13.0	98.0
Bulgaria	6.3	3.6	8.3	12.5	…	…	21.0	8.1	…	81.0
Czech Republic	8.8	3.5	13.4	56.3	13.0	74.6	22.1	10.8	15.2	97.0
Estonia	6.0	3.2	9.8	62.6	…	68.4	19.2	8.0	6.8	96.0
Hungary	7.8	3.2	11.9	52.7	12.1	75.7	25.5	8.1	12.9	99.0
Latvia	7.8	3.0	8.2	…	…	…	22.1	10.0	5.2	99.0
Lithuania	8.7	4.0	12.4	70.2	…	78.6	23.8	10.2	6.8	98.0
Poland	5.6	2.5	7.7	58.1	5.9	…	17.6	6.9	6.0	97.0
Romania	6.6	1.9	6.2	4.8	…	…	24.6	8.0	5.9	95.6
Slovenia	5.0	2.3	9.4	42.5	…	70.1	17.6	7.1	7.2	94.0
NMS-10 average	7.0	3.0	9.8	45.4	10.9	72.7	21.2	8.6	8.8	97.0
EU-15 average	5.5	3.2	13.0	82.5	5.9	74.3	17.9	8.4	5.4	89.7
OECD average	6.1	3.0	12.5	74.4	6.9	76.2	18.6	8.4	7.0	91.8

Sources: WHO and the World Bank's World Development Indicators database.
1/ Data are from latest year available except for the data on doctors' consultations, which are the average over 2002–03, and immunization, which are from 2004.

Table 5. Expenditure on Pharmaceuticals, 1999–2002 1/
(Period averages)

	Public pharmaceutical expenditure (as a percent of public health expenditure)	Public and private pharmaceutical expenditure (as a percent of public and private health expenditure)	Public pharmaceutical expenditure (PPP$ per capita)	Public and private pharmaceutical expenditure (PPP$ per capita)
Slovak Republic	31.8	34.8	180.8	220.8
Czech Republic	19.0	22.2	178.5	232.0
Estonia	…	23.3	…	…
Hungary	24.9	28.1	165.3	293.0
Poland	15.0	28.4	67.5	208.0
Slovenia	…	19.8	…	…
NMS-10 average	22.7	26.1	148.0	238.4
EU-15 average	13.4	15.4	200.4	334.6
OECD average	14.1	17.4	184.9	330.9

Sources: OECD and WHO.
1/ Includes other medical non-durables. Data on pharmaceutical expenditure in Bulgaria, Latvia, Lithuania, and Romania are not available.

Health outcomes in the Slovak Republic are close to the average for the NMS-10 but significantly worse than the average for the EU-15 and OECD. According to the latest available data, health adjusted life expectancy (HALE) in the Slovak Republic is 66 years, five years less than the EU-15 and OECD averages (Table 6). Death rates (standardized by population demographics), infant and child mortality rates, and the incidence of tuberculosis are also worse. However, maternal mortality rates are relatively low in the Slovak Republic compared to other NMS-10 countries and comparable to EU-15 and OECD averages.

B. Relative Spending Efficiency Analysis

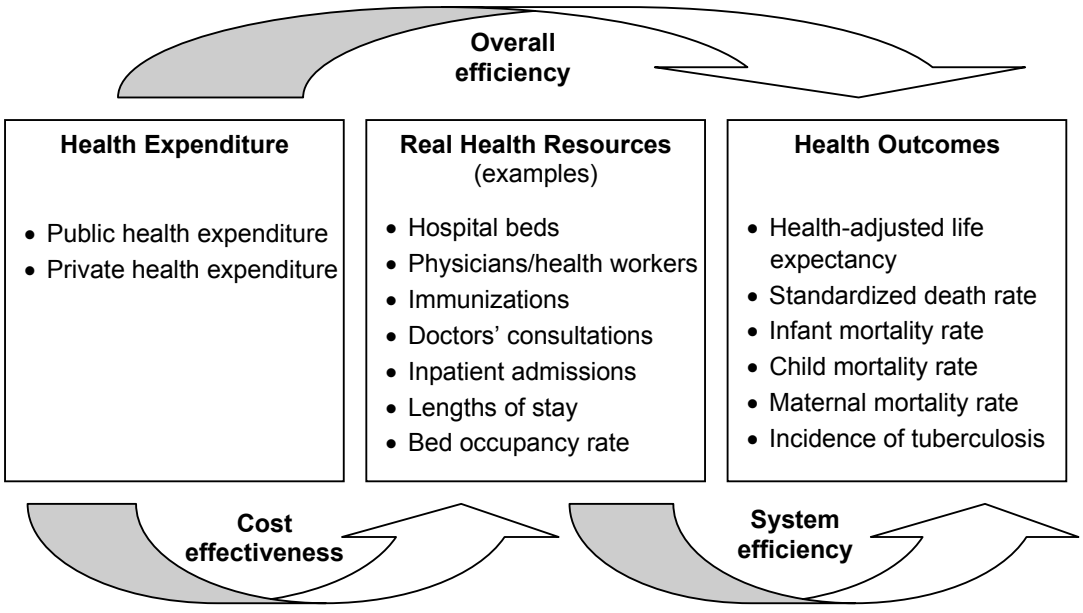
Efficiency analysis assesses whether expenditures are higher than needed to achieve prevailing health outcomes. Like other NMS-10 countries, the Slovak Republic combines relatively low health spending with relatively poor health outcomes. However, by increasing expenditure efficiency, it may be possible to raise health outcomes without increasing spending or, vice versa, to reduce spending without compromising outcomes. Figure 2 illustrates the concept of spending efficiency. *Overall spending efficiency* links health expenditure with health outcomes. The link between spending and health outcomes can be broken down into two stages. The first stage measures *cost effectiveness*—i.e., the efficiency of spending on intermediate outputs or real health resources, such as hospital beds, number of health workers, etc. The second stage measures *system efficiency*—i.e., how well the intermediate outputs or real resources are used to achieve health outcomes such as improved life expectancy and lower mortality rates.

Table 6. Health Outcomes in the OECD and NMS-10 1/

	HALE (years)	Standardized death rates (per 100,000)	Infant mortality rate (per 1,000)	Child mortality rate (per 1,000)	Maternal mortality rate (per 100,000)	Incidence of tuberculosis (per 100,000)
Slovak Republic	66.2	945.0	6.0	8.5	10.0	18.8
Bulgaria	64.6	1056.4	12.3	15.0	32.0	36.1
Czech Republic	68.4	837.6	3.9	4.4	9.0	10.8
Estonia	64.1	993.6	5.7	8.0	38.0	45.9
Hungary	64.9	1015.5	7.2	8.0	11.0	26.0
Latvia	62.8	1107.2	9.8	11.9	61.0	67.7
Lithuania	63.3	1081.6	7.5	8.3	19.0	62.7
Poland	65.8	872.0	7.1	7.5	10.0	28.5
Romania	63.1	1076.4	17.3	19.9	58.0	146.0
Slovenia	69.5	729.4	4.0	4.3	17.0	15.2
NMS-10 average	65.3	971.5	8.1	9.6	26.5	45.8
EU-15 average	71.3	628.9	4.3	4.9	9.9	13.6
OECD average	70.7	672.2	4.6	5.3	9.5	16.1

Sources: WHO and the World Bank's World Development Indicators database.
1/ HALE data are from 2002, death rates are the latest year available between 2001–05, infant and child mortality and incidence of tuberculosis are from 2004, and maternal mortality data are an estimate from 2000.

Figure 2. The Efficiency Relationship Between Health Expenditure, Resources, and Outcomes



An international comparison of efficiency is carried out using Data Envelope Analysis (DEA). DEA estimates overall spending efficiency of the use of inputs (i.e., health expenditure) in "producing" outputs (i.e., health outcomes).[7] The countries which provide the best combination (i.e., the maximum outputs for a given level of inputs or, alternatively, the minimum inputs for the level of outputs) define the best-practice frontier. The countries that are not on the frontier are then ranked according to their distance from the frontier, which is a measure of relative efficiency (see Figure 3 for an example).[8] [9]

The Slovak Republic's overall spending efficiency is on par with that of OECD countries and other NMS-10 countries. On average, the Slovak Republic ranks in the 54th percentile of the efficiency score ranking of OECD and NMS countries for public health expenditure (Table 7). If private health expenditures, which are relatively low in the Slovak Republic, are taken into account, the Slovak Republic ranks higher, at the 22nd percentile, in the efficiency score ranking for total spending on health. The Slovak Republic's ranking indicates that there is scope for improving outcomes without increasing spending.

Inefficiencies in the Slovak health system occur mostly in the process of transforming intermediate health resources into health outcomes (Table 8). In other words, system efficiency is relatively low in the Slovak Republic (see Figure 2 and Appendix I).[10] This reflects a general feature of NMS-10 countries, which achieve relatively low health outcomes with high real resource combinations. In part, this is due to inertia—for instance, hospital structures may still reflect old standards and a significant number of current health workers were educated in the pre- and early transition period. On the other hand, higher levels of cost effectiveness (see Appendix I) in the Slovak Republic and NMS-10 countries reflect relatively low prices for labor and other inputs for health services. As a result, despite spending levels, real resources in the health sector are relatively high.

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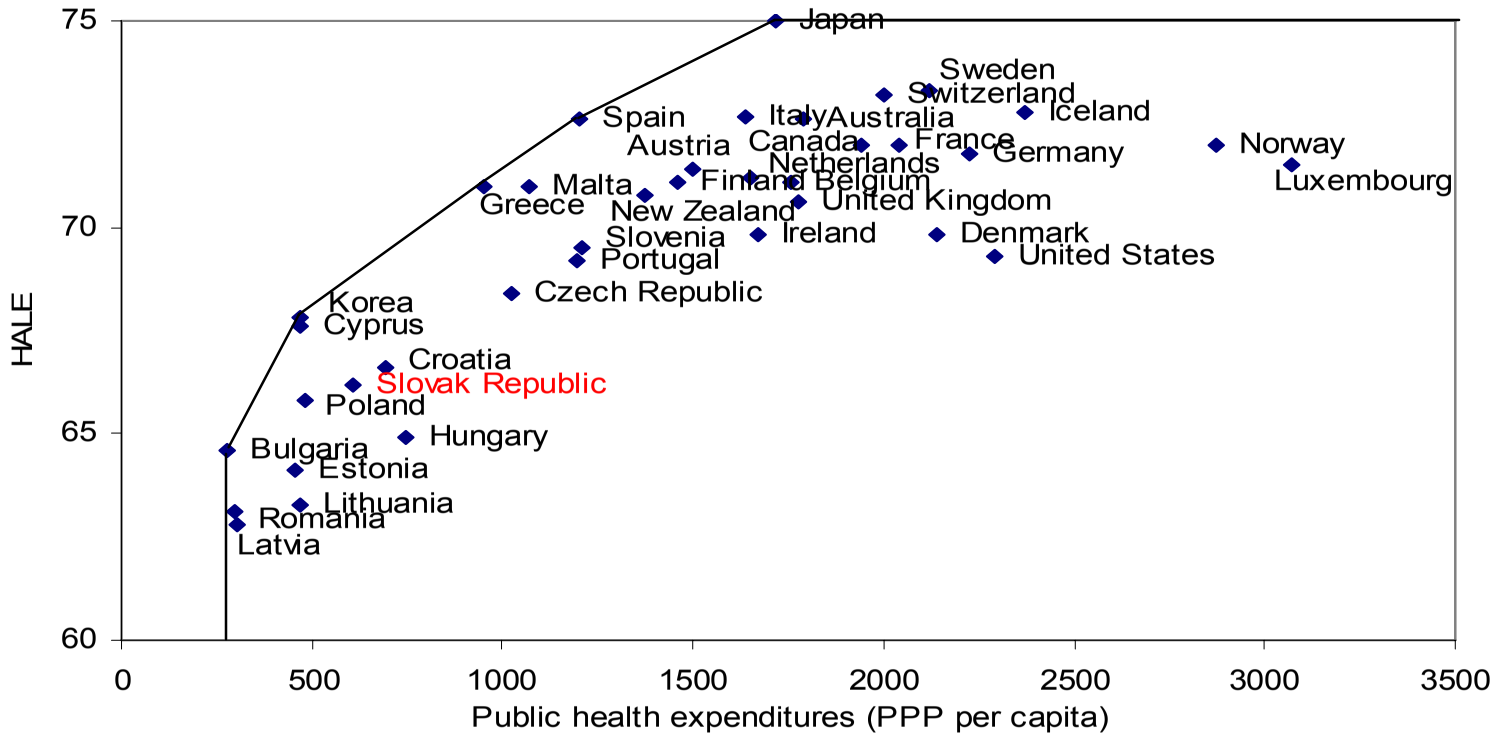
[7] The sample of countries included in the analysis are OECD countries (except Mexico and Turkey, as their levels of health outcomes and spending make them outliers) and the EU new-member states of Bulgaria, Cyprus, Estonia, Latvia, Lithuania, Malta, Romania, and Slovenia. Croatia was also included in the analysis, although some data were not available.

[8] The methodology derives from the literature on the estimation of production functions. DEA has the advantage of being sparse in its assumptions about the characteristics of the production technology. This is particularly important for assessing spending efficiency, because little is known about the nature of the relationship between spending, intermediate outputs, and outcomes.

[9] By using average health expenditures over 2000–03 and health outcomes in 2002 and 2004 in the DEA, we allow for a time lag between when spending takes place and when health outcomes are measured. The exceptions are maternal mortality, where the latest outcome data available are for 2000, and standardized death rates, where two countries have data available only for 2001.

[10] To assess at what stage in the process inefficiencies arise, the individual countries' average rankings of overall expenditure efficiency were compared with the average rankings of their efficiency in transforming intermediate resources into outcomes.

Figure 3. Spending to Outcome Frontier HALE



Source: World Development Indicators.

Table 7. Output-Oriented Efficiency
(Distribution by quartiles of the ranking of OECD and NMS countries' bias-corrected output-oriented efficiency scores) 1/

	Percentile			
	1-25	26-50	51-75	76-100
Public expenditure	Bulgaria	Czech Republic Latvia	Estonia Poland **Slovak Republic** Slovenia	Hungary Lithuania Romania
Public and private expenditure	Bulgaria Czech Republic **Slovak Republic**	Estonia Romania Poland	Lithuania Slovenia	Hungary Latvia

Source: IMF staff calculations.
1/ The Slovak Republic's output-oriented efficiency scores for public expenditures ranked, on average, at the 54th percentile of the overall ranking of efficiency scores in the sample of OECD and NMS countries. This places the Slovak Republic in the third (51-75) quartile of the ranking distribution. The rankings are based on each country's average of the individual point estimates of the bias-corrected output-oriented efficiency scores for various outcome indicators, including infant, child, and maternal mortality, the incidence of tuberculosis, and HALE (see Appendix I).

Table 8. Rank of Health Efficiency Scores Relative to the OECD 1/

	System Efficiency 2/	Overall Efficiency 3/	
	Intermediate resources to outcomes	Public expenditures to outcomes	Public and private expenditures to outcomes
Slovak Republic	1.7	1.1	0.4
Bulgaria	2.0	0.5	0.5
Czech Republic	1.4	0.7	0.5
Estonia	1.9	1.4	0.7
Hungary	1.9	1.5	1.4
Latvia	2.2	1.0	1.5
Lithuania	2.0	1.6	1.1
Poland	1.6	1.0	0.5
Romania	2.0	1.5	0.6
Slovenia	0.7	1.1	1.0
NMS-10 average	1.7	1.1	0.8
EU-15 average	0.9	1.0	1.1

Source: IMF staff calculations.
1/ Ratio of output-oriented efficiency rankings of NMS-10 and EU-15 countries and the average ranking in the sample of OECD countries. The ratio is 1 if the country is as efficient as the average for the OECD, and is higher if the country is less efficient (see Appendix I).
2/ Based on output-oriented efficiency rankings using as inputs, the average ranking of various real resources (Table 3), and as outputs, various outcome indicators, including infant, child, and maternal mortality, the incidence of tuberculosis, and HALE.
3/ Reflecting the output-oriented efficiency rankings of Table 7.

Although cost-effectiveness may currently be high, sustainability is an issue. Over the longer term, producing the mix of intermediate resources that is compatible with a

modernized system of health care would likely require substantially higher spending levels, for example for reorganizing hospital care and employing high-quality health workers.

These results are broadly consistent with the findings of other studies, although methodologies and data differ. A study of public sector efficiency in Czech Republic ranks the Slovak Republic around the average of NMS-10 countries for overall input-oriented health efficiency but substantially lower in converting real health resources into outcomes (IMF, 2007). Furthermore, similar work for Slovenia ranks the Slovak Republic among the worst of the sample of 22 OECD and other NMS countries, although this study uses public-only health spending in percent of GDP as the input (Mattina and Gunnarsson, 2007). Afonso and St. Aubyn (2007) rank the Slovak Republic and other NMS countries in the bottom third of the efficiency distribution of a wide sample of countries using output-oriented overall health efficiency scores, and second-to-last when assessing system efficiency.

C. Correlation Analysis

It is important to understand the reasons for differences in relative efficiency between the Slovak Republic and comparable countries. Many policy-related factors and factors out of the direct control of policy makers (environmental variables) affect the relationship between health expenditures and health outcomes. We examine what factors determine the variation in the link between health spending and outcomes across countries by simultaneous multi-correlation analysis.[11] Lessons are drawn about which policy factors are important to consider for improving health sector efficiency in the Slovak Republic.

Efficiency is associated with a wide range of factors. This is summarized in Table 9. GDP per capita is highly and negatively correlated with overall relative efficiency, reflecting changes in relative prices of health care as income increase (see footnote 4).[12] Because of the pervasive impact of GDP, all reported correlations in the table are independent of GDP per capita differences between countries.[13] The key correlations include:

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[11] It should be noted that simultaneous correlation analysis does not provide an estimate of causality. Policy and environmental variables may drive efficiency, but the reverse may also be true, and unobserved variables may drive policy and environmental variables as well as efficiency.

[12] Afonso and St. Aubyn (2007), using bootstrap procedures to assess the impact of exogenous factors on the variation of health efficiency across countries, also find that higher GDP levels are associated with higher system efficiency. Additionally, they find that a high level of education attainment in a country improves health system efficiency, while the prevalence of obesity and tobacco consumption lower health system efficiency.

[13] Several of the factors that are correlated with relative efficiency are also significantly correlated with GDP. For instance, countries with higher income levels spend more on pharmaceuticals, have higher out-of-pocket expenditures, and have better access to medical technology such as MRI equipment. Simultaneous correlations between these factors and relative efficiency levels may thus simply reflect the strong association between GDP and the efficiency level. Thus, in order to isolate the effects of the associated factor on efficiency from its relationship with GDP, in cases where the associated factor is significantly correlated with GDP, we ran simple regressions of relative efficiency on the associated factor and GDP per

- Countries with relatively high out-of-pocket health spending by patients appear more efficient. Out-of-pocket expenditure as a share of private health expenditures is highly associated with higher overall health expenditure efficiency. But out-of-pocket spending is not related to the size of private health expenditures (i.e., out-of-pocket spending does not seem to drive the level of private spending). In the Slovak Republic, where private health expenditures are extremely low, virtually all private health expenditures are out-of-pocket payments. Higher co-payments for health services in the Slovak Republic may thus help to reduce inefficiencies between health care utilization and outcomes.[14]

- Expenditures on collective care and on administration are associated with lower efficiency. These expenditures (e.g., for research activities, community campaigns, and preventative health care) contribute less to improving health outcomes than other types of spending.

- Spending on pharmaceuticals is associated with lower system efficiency. High pharmaceutical expenditure tends to crowd out other health resources and reduces the efficient use of real health resources.

- System efficiency is negatively correlated with the number of doctors' consultations and both in-care admissions and outpatient contacts. A likely reason for this association is that a large number of doctor and hospital visits drives up the number of prescriptions for pharmaceuticals and medical tests. As the number of doctors' consultations, especially outpatient contacts, is very high in the Slovak Republic, containing these may help reduce some inefficient spending and resource use.

These results suggest that changing the mix of real resources is key for improving the system efficiency of health spending in the Slovak Republic. System efficiency may be raised from current low levels by containing pharmaceutical costs, doctors' consultations, bed utilization, and outpatient contacts, as well as the number of hospital beds.

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capita. In those cases, the reported correlations are the regression coefficient of the associated factor, and are only reported when the coefficient is statistically significant.

[14] A World Bank and USAID (2000) study and a report by International Business Strategies (2006) show that the Slovak health system suffers from corruption and that individuals may be willing to pay for better health services. However, this is unlikely without an improvement in the quality of health services.

Table 9. Correlations of Relative Efficiency with Associated Factors 1/

	HALE	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)	– –	– –			–	
Average years of schooling of the population			– –	– –		
Gini Index			–	–		
Expenditure composition						
Collective care expenditure (percent of public health exp.) 3/			– –	– –		
Collective care expenditure (PPP per capita) 3/			– –	– –		
Out-of-pocket expenditure (percent of private health exp.)	+		++	++		
Health resource composition						
MRIs per million capita	+		+	+		
	Overall efficiency: public and private expenditures to outcomes					
Exogenous factors						
GDP per capita (PPP dollars)	– –		– –	– –	– –	
Gini Index			– –	– –		
Average years of schooling of the population			– –	–		
Expenditure						
Pharmaceutical expenditure (PPP per capita) 3/			– –	– –		
Collective care expenditure (percent of total health exp.) 3/			– –	– –		
Collective care expenditure (PPP per capita) 3/			– –	– –		
Personal care expenditure (PPP per capita) 3/			– –	– –		
Administration and insurance (percent of total health exp.) 3/			– –	– –	–	
Administration and insurance (PPP per capita) 3/			– –	– –		
Out-patient expenditures (PPP per capita) 3/			– –	– –		
Out-of-pocket expenditure (percent of private health exp.)	++		++	++		
	System efficiency: intermediate resources/services to outcomes					
Exogenous factors						
GDP per capita (PPP dollars)	++	++	++	++	+	++
Population over 65 years (percent of total population)	+			+		
Expenditure composition						
Pharmaceutical expenditure (% of total health exp.) 3/	– –	– –	– –	– –		– –
Administration and insurance (% of public health exp.) 3/	– –	– –	– –	– –		– –
Health resources 2/						
Doctors' consultations per capita per year	– –	– –		–		– –
Inpatient care admissions per 100 capita 4/	– –	– –	– –	– –	–	
Outpatient contacts per capita per year 4/	–	–				

Sources: WHO Europe, World Bank World Development Indicators, and the OECD.

1/ Correlations were run on bias-corrected output-oriented efficiency scores. This table summarizes the results of the correlations of associated factors with the level of efficiency. ++ (+) 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. – – (–) 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 in the table are highly correlated with GDP. When a factor is correlated with GDP, only correlations that are significant after conditioning on GDP are considered. (See Appendix I).

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

3/ Excludes non-OECD countries due to missing data.

4/ Excludes the non-European countries Australia, Canada, Japan, Korea, New Zealand, and the U.S. due to missing data.

IV. Conclusions and Recommendations

The immediate challenge for the health care system in the Slovak Republic is to improve health sector outcomes while containing public health spending. Medium-term fiscal consolidation objectives imply limited room for increasing health spending. At the same time, health spending may come under pressure from demands for wage increases and rising prices for pharmaceuticals. Therefore, in order to prevent a deterioration in the financial condition of health care institutions and achieve further gains in health outcomes, the efficiency of spending will need to be increased.

In order to meet this challenge and raise the efficiency of health spending, the mix and quality of real resources needs to be improved. Like other NMS-10 countries, the Slovak Republic has relatively high cost effectiveness, but low system efficiency. System efficiency may be enhanced by containing the cost of pharmaceuticals and reducing the reliance on hospital care. In addition, spending efficiency can be raised through higher out-of-pocket expenditure and more cost-effective administrative arrangements.

Introduction of the right incentives will be critical for improving health care spending efficiency. The Slovak health care system is decentralized, and the central government has limited control over decisions by insurance companies and health care institutions.[15] Therefore, a successful framework for health reform needs to include incentives for implementation, together with enhanced transparency and improved accountability.

The following measures could contribute to raising efficiency and containing health costs:

- Restrain pharmaceutical spending. This could involve: (1) introducing a national procurement system for pharmaceuticals in order to enhance the bargaining power of public hospitals against pharmaceutical companies; (2) introducing incentives for generic substitutes—for example, by allowing pharmacies to share the spread between the discounted price on generic substitutes and the full price of branded pharmaceuticals; and (3) improving the pharmaceutical pricing and reimbursement policy of the ministry of health and making it more transparent. For instance, the Pharmaceutical Reimbursement Commission could be made more independent.

- Reduce the reliance on hospitals and contain the cost of hospital care. This could involve various actions:

    - Eliminate excess hospital beds. Government plans to eliminate 6,200 beds are an important step in the right direction.

    - Impose hard budget constraints on public hospitals. The ministry of health and the regional governments should be made responsible for taking

[15] Large hospitals connected to universities are still under central government control and are the main exception.

immediate measures to reduce hospital deficits. Measures would include changing the hospital management (this would often mean replacing doctors in management positions with professional managers), the adoption of time-bound action plans for improved financial management, closing down inefficient units, and comprehensive and regular reporting by hospitals on their debts and arrears. Hospitals could share resources obtained by cost reduction, and penalties for inaction should be taken. In the medium term, health care providers and insurance companies should be encouraged to define Diagnostic Related Group protocols to ensure adequate compensation for expensive treatments.

- Restart hospital privatization. The majority of hospitals are still controlled either by the ministry of health or by regional governments. They are poorly managed and lack incentives to enhance efficiency as well as resources for needed investments. Private investors may bring managerial competence and resources. It may be necessary to introduce subsidies for hospitals located in the poorest regions and retain government control over a limited number of "hospitals of last resort," which would ensure that treatments which are critical but unprofitable (for local governments or private health providers) remain available.

- Reintroduce co-payments for doctors' visits and hospital care. Containing the number of doctors' visits and prescriptions would help contain the consumption of pharmaceuticals. The co-payments for hospital stays may help to optimize the utilization of hospital beds, which are an abundant resource. They may also reduce the in-care admissions rate, which may also help increase health system efficiency.

- Enhance incentives for competition and more cost-effective administrative arrangements. This could include the following:

  - Introduce incentives for practitioners to be cost-effective. General practitioners could be reimbursed a lump-sum amount per patient to cover all health care that the patient requires (capitation) rather than a fee-for-service or salary system. This would reduce incentives for health practitioners to oversubscribe. Alternatively, practitioners could become virtual purchasers from the insurance companies which would allocate a budget to each of them according to the number of patients and their characteristics. In this case, sharing resources obtained by cost reduction and penalties on over-prescribing could provide the right incentives.

  - Define a stricter basic health care package, allowing some variations in basic insurance premiums. This measure would also create more room for private insurance companies to provide supplementary insurance, which in turn would increase private expenditures on health care and increase competition.

- Increase the power of the antitrust authority and enhance the autonomy and independence of the Health Care Supervisory Board. Tight supply and information asymmetries often hinder effective competition in health service provision (OECD, 2003). Partly because both insurance companies and hospitals are still largely government-owned, and partly because of the special relationship between patient and doctor (based on information asymmetries and trust), competition in the health sector is structurally lower than in other sectors of the economy. The authorities should closely monitor the sector (including the Pharmaceutical Reimbursement Commission), sanction anticompetitive and unethical behavior (such as collusion among public sector agencies or in the relationship between pharmaceutical companies and health care providers), and enhance transparency. The Health Care Supervisory Board should become independent from the ministry of health (which is directly or indirectly a supervised institution), and appointment to the Board should be shifted from government to parliament or to the president.

- Refrain from introducing new limitations on the profits of private insurance companies. The government has introduced limits on the administrative costs of insurance companies and submitted proposals to regulate their profits with the aim of diverting resources to health care providers. However, forcing more expenditure on direct health care providers through regulations is unlikely to achieve enduring cost savings. Instead, it is likely to reduce private sector involvement and provide disincentives for efficiency enhancement. By allowing profit-making (both for insurance companies and health care providers) in an appropriate regulatory environment, incentives for providing better health care at lower costs would increase.

Appendix I. Technical Methodology

This annex discusses the cross-country empirical methodology used to investigate the relationship between spending and outcomes in the health sector. A second-stage statistical analysis is used to assess whether differences between countries can be accounted for by factors out of the control of policy makers, or whether changes in expenditure and sectoral policies may impact the link between health inputs and outcomes.

A. Estimation of Efficiency Scores Using Data Envelopment Analysis

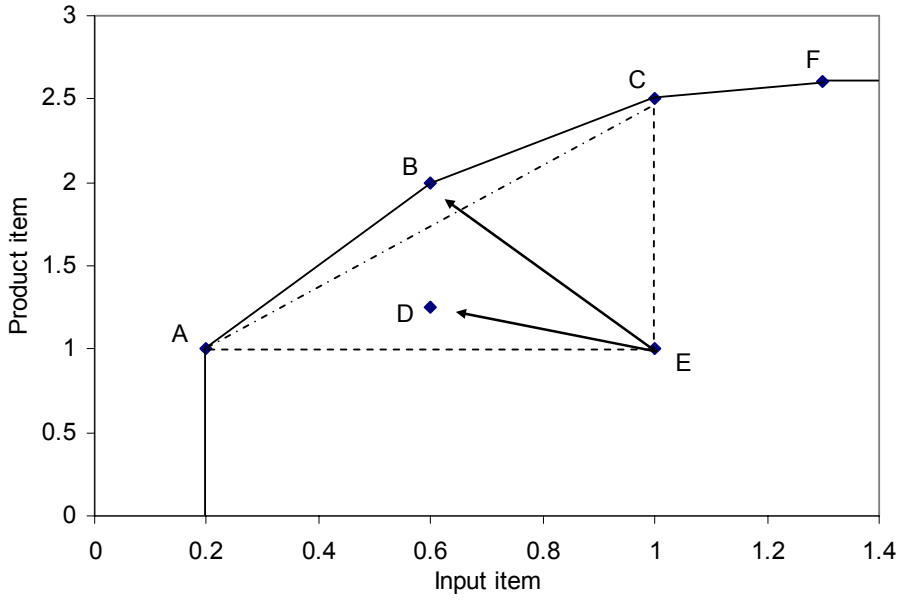
Relative efficiency of health spending is assessed by comparing expenditure levels and health outcomes in the Slovak Republic, the ten Central and Eastern European new EU-member states, and other OECD countries. This is done using DEA, which was developed for estimating best-practice frontiers and relative efficiency in business applications. In this case, DEA is used to assess the relationship between spending (inputs) and outcomes (production) across countries.

The framework of production efficiency can be used to assess the relative efficiency with which production units convert input items into production items (i.e., technical efficiency). In Figure 4, as production unit A achieves the same or more product items as production unit E with fewer input items, unit A is more efficient[16] than unit E. Similarly, unit E is less efficient than units B, C, and D. The difference between the input items used by units A and E can be used to measure the inefficiency of unit E relative to unit A. (Alternatively, this could be measured by the difference in production items.)

The most efficient units in a sample provide the parameters for an initial estimate of the best-practice frontier. One of the most common ways for determining the best-practice (or production possibility) frontier is DEA (a more detailed discussion of DEA can be found in Zhu, 2003). The best-practice frontier is illustrated in Figure 4 by the solid line that connects the best-practice units A, B, C, and F. Because these are the most efficient units in the sample, they are assigned an efficiency score of 1. The efficiency scores of the less efficient units (D and E) depend on their distance to the best-practice frontier. Several measures of the distance to the frontier can be used. Here we adopt the Farrell input efficiency score.

[16] We use the terms (in)efficient and (in)efficiency to describe the link between input items and production (outcome) items, as the link not only captures strengths or weaknesses in the production or system process, but is also influenced by uncontrollable/non-discretionary associated factors.

Figure 4. Efficiency and the Best-Practice Frontier



In this paper, we only assess cases with one input and one production item and focus on output-oriented efficiency. In this simple case, it is straightforward to calculate the efficiency score for unit E as the ratio of the number of inputs needed at a minimum (i.e., at the frontier) to achieve its level of production and the number of inputs actually used by unit E. The score, called the *input-oriented efficiency score*, can be interpreted as an indicator of the cost savings that could be achieved from efficiency enhancement. Alternatively, the *output-oriented efficiency score* for unit E can be calculated as the ratio of the number of outputs achieved at a maximum (i.e., at the frontier) to the number of input items actually used by unit E. The output-oriented efficiency score reflects the improvement in outputs that could be achieved from efficiency enhancement. As the Slovak Republic in the immediate term will need to improve health outcomes without increasing expenditures, we focus only on output-oriented efficiency scores.

Simple DEA estimation produces biased estimates of the efficiency scores which need to be corrected. Estimating the best-practice frontier for the sample of countries from the observations of health spending and outcomes is subject to bias, for which a correction needs to be made. This bias stems from the fact that since we only observe a subsample of the possible outcomes representing all feasible combinations of spending and outcomes, we do not know the exact position of the best-practice frontier. Suppose, for example, that the inputs in Figure 4 represent health spending and the production years of health-adjusted life expectancy. Also, suppose that health spending or years of health-adjusted life expectancy were initially not observed for country B. Then the best-practice frontier would be drawn through the countries A, C, and F, following the dashed line between the observations for countries A and C. However, suppose the observation for country B becomes available. Then the best-practice frontier would shift outward to the line that connects countries A, B, C, and F. It is straightforward to see that, as a general principle,

as more information becomes available about the feasible production combinations, the best-practice frontier may shift *outward* 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).

Corrections are made for the estimation bias in the best-practice frontier and efficiency scores through bootstrapping. This paper uses a method proposed by Simar and Wilson (2000), and is based on the assumption that the frontier that envelops all possible production combinations of input and product items is smooth. A key issue is how quickly the estimated efficiency scores converge to their unbiased true values if the sample of observations is expanded.[17] In the case of one input and one production item, the convergence rate is fast enough to yield acceptable estimates of efficiency scores and build confidence intervals. The bootstrapping routine was run in FEAR, a software package developed by Paul W. Wilson (Wilson, 2006). Table 7 in the main text presents rankings for the NMS-10 countries relative to the OECD and EU sample based on the point estimates of the bias-corrected efficiency scores.

The analysis of the link between spending and outcomes in health is complicated by the fact that this relationship is indirect. Spending has no direct impact on outcomes. Rather, spending translates into real resources (e.g., hospital beds and service delivery contracts with physicians) which are combined to produce intermediate outputs (e.g., immunizations rate and patient-doctor consultations). These real resources in turn are used to promote better outcomes.

The DEA results can be disaggregated to assess at what stage of the spending process inefficiencies arise. In particular, as shown in Figure 2, the analysis attempts to disaggregate what happens in the stage from spending to intermediate outputs (cost efficiency) and from intermediate outputs to outcomes (system efficiency). This is done by comparing spending efficiency (the overall measure of efficiency from spending to outcomes as discussed above) and system efficiency (see Table 8). First, an index of intermediate inputs (by level) is created. The intermediate output indicator is the index of the countries' average ranks for number of hospital beds, immunizations, physicians, health workers, and pharmacists per capita. Second, efficiency scores are calculated, using the intermediate output index as an input and various associated outcomes (infant, child, and maternal mortality rates, as well as HALE, standardized death rates and the

[17] 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 cases of this paper, 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 parametric regression. This implies that such an expansion in numbers of inputs and production items comes at great cost in terms of the ability to draw conclusions about efficiency from a limited number of observations.

incidence of tuberculosis). Third, the resulting system efficiency rankings are averaged, expressed as a ratio of the average OECD ranking, and compared with similar ratios for spending efficiency.

B. Second-Stage Analysis with Efficiency Scores

The second-stage analysis attempts to explain observed differences in the relationship between spending and outcomes. This will allow us to answer the question of how the Slovak Republic can strengthen the link between spending and outcomes. The second stage uses correlations and regressions of efficiency scores and associated factors to explain observed differences in the relationship between spending and outcomes.

Simple pair-wise correlations are used to determine which policy factors and other factors outside of the immediate control of policymakers influence the link between health expenditures and outcomes. Due to the small sample size, we refrain from using regression analysis in the second stage. With larger sample sizes, regression analysis provides insight into the relative importance of factors that are associated with efficiency. The standard approach for the second stage is to regress the DEA efficiency scores on a set of explanatory variables. However, direct estimation yields biased coefficient estimates due to serial correlation between the observations (the source of this is the same as the bias in the estimation of efficiency scores discussed above) which can be corrected by another set of bootstrap procedures proposed and developed by Simar and Wilson (2007) and applied by Afonso and St. Aubyn (2006).

Given the close relationships of spending and outcomes with income levels, correlations of efficiency scores and associated factors are conditional on GDP. GDP per capita has a very strong negative impact on efficiency. 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.

REFERENCES

Afonso, António, and Miguel St. Aubyn, 2006, "Cross-Country Efficiency of Secondary Education Provision: A Semi-Parametric Analysis with Non-Discretionary Inputs," *Economic Modelling*, Vol. 23 (May), No. 3, pp. 476–91.

———, 2007, "Assessing Health Efficiency Across Countries with a Two-step and Bootstrap Analysis," mimeo.

Eurostat, Task Force on COFOG, 2006, "Item 4 Assessment of COFOG Statistics Provided to Eurostat," Luxembourg, March 6-7, 2006. Available via the Internet: epp.eurostat.ec.europa.eu/portal/page?_pageid=1090,1&_dad=portal&_schema=PORTAL.

Health Policy Institute, 2007, "Basic Health Policy Framework for 2007–2010." Available via the Internet: www.hpi.sk.

Institute for Health Information and Statistics, 2005, "Health Statistics Yearbook of the Slovak Republic 2004," Bratislava. Available via the Internet: www.uzis.sk.

International Business Strategies, 2006, "Health Care Services in Slovakia." Available via the Internet: www.internationalbusinessstrategies.com.

International Monetary Fund, 2007, *Czech Republic—Selected Issues,* SM/07/54 (Washington).

Jevčák, Anton, 2006, "Healthcare Reform—Unpopular Even in Slovakia," Directorate-General for Economic and Financial Affairs of the European Commission, *ECFIN Country Focus*, Vol. 3, No. 2.

Mattina, Todd, and Victoria Gunnarsson, 2007, "Budget Rigidity and Expenditure Efficiency in Slovenia," IMF Working Paper 07/131 (Washington: International Monetary Fund).

Nemec, Juraj, and František Ochrana, 2005, "Slovak Health Care Reform and its Impact on Public Finance," In *Macro-Fiscal Policies: New Perspectives and Challenges: Congress of the IIPF,* Korea, 2005, S: 94.

OECD, 2003, "Health-Care Systems: Lessons from the Reform Experience," Economics Department Working Paper No. 374. Available via the Internet: http://www.oecd.org/dataoecd/5/53/22364122.pdf

———, 2006, "The Supply of Physician Services in OECD Countries," Directorate for Employment, Labour and Social Affairs Group on Health, OECD Health Working Papers No. 21 (DELSA/HEA/WD/HWP(2006)1. Available via the Internet: http://www.oecd.org/dataoecd/27/22/35987490.pdf

Simar, Léopold, and Paul W. Wilson, 2000, "A General Methodology for Bootstrapping in Non-Parametric Frontier Models," *Journal of Applied Statistics*, Vol. 27, No. 6, pp. 779–802.

———, 2007, "Estimation and Inference in Two-Stage, Semi-Parametric Models of Production Processes," *Journal of Econometrics*, Vol. 136, No. 1, pp. 31–64.

Wilson, Paul, W., 2006, "FEAR: A Software Package for Frontier Efficiency Analysis with R. Available via the Internet: www.clemson.edu/economics/faculty/wilson/courses/bcn/papers/fear.pdf.

World Bank, and USAID, 2000, "Corruption in Slovakia—Results of Diagnostic Surveys." Available via the Internet: www.worldbank.org/wbi/governance/pdf/guide_pdfs/slovrep44.pdf.

Zhu, Joe, 2003, *Quantitative Models for Performance Evaluation and Benchmarking* (Boston: Kluwer Academic Publishers, Vol. 51).