



# ICELAND

## 2013 ARTICLE IV CONSULTATION AND THIRD POST-PROGRAM MONITORING DISCUSSIONS

August 2013

### Selected Issues

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# ICELAND

## SELECTED ISSUES

July 16, 2013

Approved By  
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# LIFTING CAPITAL CONTROLS: THE EFFECT OF A POTENTIAL REBALANCING OF RESIDENTS' INVESTMENT PORTFOLIOS<sup>1</sup>

*This Selected Issues Paper analyses the impact of a potential rebalancing of Icelandic residents' investment portfolios as capital controls are lifted. The paper applies optimal portfolio theory to calculate the potential rebalancing towards foreign assets, and then makes an estimate of the cumulative impact on the balance of payments and international reserves. The paper draws conclusions for the authorities' capital account liberalization strategy.*

## A. Introduction

### 1. The orderly lifting of capital controls is a major outstanding challenge for Iceland.

Capital controls were introduced in 2008 in order to stabilize the exchange rate and halt a devaluation-inflation spiral with potentially devastating impact on balance sheets and growth. The controls succeeded in doing this. The challenge now is to dismantle them without triggering large and disorderly capital outflows—the very outcome that the controls were designed to prevent.

**2. The authorities have implemented a two-phase liberalization strategy.**<sup>2</sup> In the current phase—phase one—exit channels are open for offshore kronas in order to reduce or eliminate the overhang. The strategy emphasizes the importance of reducing non-residents' positions in krona and other highly liquid assets before attention is turned to residents positions. Phase two—the gradual elimination of restrictions on capital account transactions—can only begin when this and other prerequisites are in place.

### 3. The potential for liberalization to trigger capital outflows has three main sources.

Good estimates exist of the scale of two of these—liquid offshore krona and the estates of the old banks—but there is currently no reliable estimate of the impact of potential resident outflows. Liquid offshore kronas consist mainly of assets held by foreigners which were locked in when the capital controls were imposed. They are held as Treasury and Housing Financing Fund bonds and bank deposits and amount to 23 percent of GDP. The second category is the estates of the old banks, and these assets are estimated to total about 40–50 percent of GDP, with part of them liquid.

### 4. This paper estimates the potential drain from the third category—resident outflows.

The amount exiting from residents will depend in large degree on the credibility of the capital account liberalization strategy, including its handling of the first two categories. However, it is very

<sup>1</sup> Prepared by Ran Bi and Robert Gregory with research assistance provided by Vizhdan Boranova.

<sup>2</sup> For a detailed explanation of the authorities' strategy, see "Capital Account Liberalization Strategy: Report to the Minister of Economic Affairs," Central Bank of Iceland, March 25<sup>th</sup> 2011.

likely that there will be outflows related to portfolio rebalancing when the controls are lifted—not least because the controls have been in place for many years, and some institutions have been induced to sell already underweighted non-krona assets.

## B. Estimation of Rebalancing of Investment Portfolios

**5. Icelandic residents have made a remarkable shift from foreign to domestic assets since the introduction of capital controls.** Figure 1 illustrates that Icelandic pension funds, which make up 40 percent of all private sector assets, have kept their foreign security holdings relatively flat, while they have continued to invest heavily in domestic securities. Between end-2008 and end-2011, pension fund holdings of domestic securities increased by nearly 30 percent, while holdings of foreign securities increased by just 2 percent. Across the rest of the financial sector,<sup>3</sup> holdings of foreign assets have declined significantly since 2007. Banks account for the biggest decline in holdings of portfolio foreign assets since 2007, reflecting the restructuring of the system in 2008, but these declines are also seen in other categories, notably in households and nonfinancial companies. The banks undergoing winding up show an increase in 2011, but these are assets that will subsequently be paid out to foreign creditors.

**6. Icelandic residents' portfolio holdings are also out-of-line when compared to other countries.** Most countries have steadily increased their holdings of foreign portfolio investment assets since 2004. The comparator countries highlighted in Figure 1 doubled their holdings of foreign portfolio investment assets (measured in dollars) between 2004 and 2011, whereas Icelandic residents only increased their holdings by around 25 percent over the same period. Icelandic residents' holdings of foreign portfolio investments stood at 53 percent of GDP at end-2011, while the average for other Nordic countries was 107 percent of GDP.

**7. Icelandic residents' holdings of foreign portfolio investment assets are now \$23.5 billion (60 percent of GDP) less than that seen in 2007.** If capital controls were removed, and Icelandic residents used the opportunity to rebalance their portfolios to contain the same amount of foreign portfolio investment assets as they had in 2007, there would be a krona outflow of over 170 percent of 2011 GDP.<sup>4</sup> Given the rapid buildup of foreign assets in the pre-crisis period in Iceland, it is arguably more realistic to instead take an average of the growth of Nordic countries' foreign portfolio investment asset positions between 2004 and 2011, and apply those increases to Iceland's holdings. In that case the outflow would be around \$6.2 billion, or 35 percent of 2011 GDP. Looked at another way, if Icelandic residents replicated the foreign portfolio investment asset holdings of other Nordic countries at end-2011 there would be a krona outflow of 54 percent of 2011 GDP.

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<sup>3</sup> The two main sources of data for this paper are the IMF's Coordinated Portfolio Investment Survey (CPIS) and the Central Bank of Iceland's pension system [data](#).

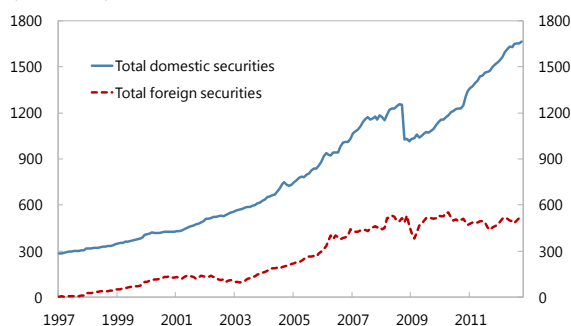
<sup>4</sup> Such a large outflow stems not only from portfolio rebalancing, but also an increase in residents' total investments in financial assets (domestic and foreign). Residents' total investments in portfolio assets in 2007 were twice of the 2011 amount.

**Figure 1. Portfolio Investment in Iceland and Comparator Countries**

*Pension funds have shifted to domestic securities...*

#### Pension Fund Holdings of Foreign and Domestic Securities

(Billions of ISK)

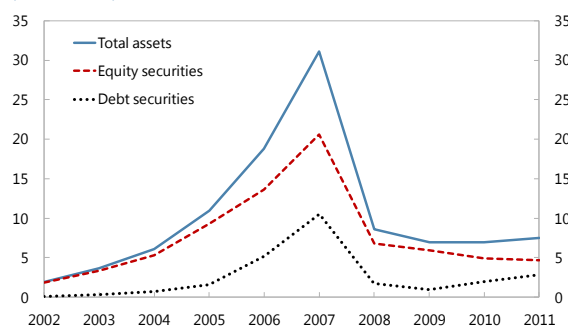


Source: Central Bank of Iceland.

*... and overall foreign asset holdings are below 2007 peaks.*

#### Breakdown of Foreign Assets Holdings

(Billions of USD)

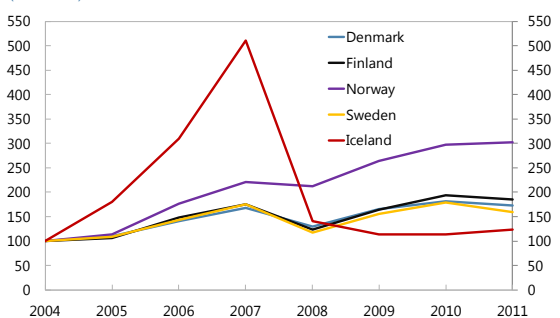


Source: Coordinated Investment Portfolio Survey.

*Iceland's decline in foreign asset holdings is unusual...*

#### Cross-country Comparison of Total Foreign Assets Held

(2004=100)

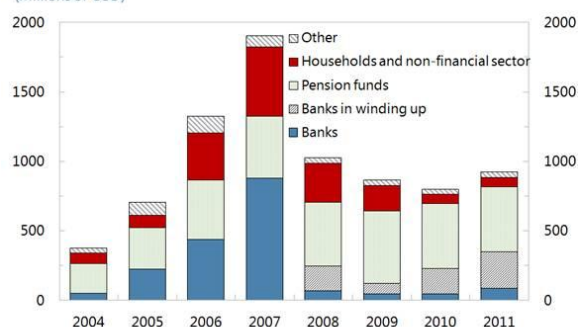


Source: Coordinated Investment Portfolio Survey.

*...driven by the banking sector, but also seen more broadly.*

#### Sectoral Breakdown of Portfolio Investment

(Millions of USD)

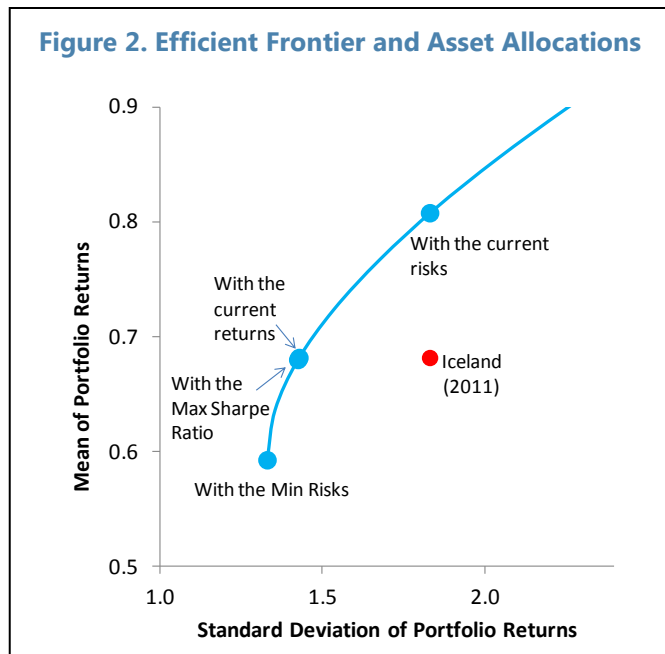


Source: CPIS.

**8. A preliminary examination of the cross country and time-series data therefore suggests that there is a significant potential drain from resident outflows.** Estimates range from 35 to 170 percent of GDP, and more likely to be around the lower end. To obtain a more rigorous calculation of potential portfolio rebalancing, a mean-variance optimization model can be used to estimate efficient asset allocations (i.e., the “efficient frontier”). The model determines the extent of the rebalancing from domestic to foreign assets that would need to take place to achieve the efficient allocations along the frontier. Using the model, an upper bound of capital outflows resulting from the rebalancing can be estimated by the difference between the current asset allocation with the allocation that minimizes risks.

**9. For this analysis a portfolio consisting of four asset classes is constructed and efficient asset allocations are estimated using the expected mean and standard deviation of portfolio returns.** It is assumed that Icelandic residents can choose among four assets: Icelandic equities, Icelandic government bonds, foreign equities, and foreign bonds. The efficient asset allocations are those that yield the highest returns given a target risk level, or the lowest risks given a target return level. All such allocations constitute the efficient frontier. Among these efficient allocations, one yields the highest return to risk ratio (i.e., this allocation maximizes the Sharpe Ratio)—this allocation is termed the “optimal portfolio” below.

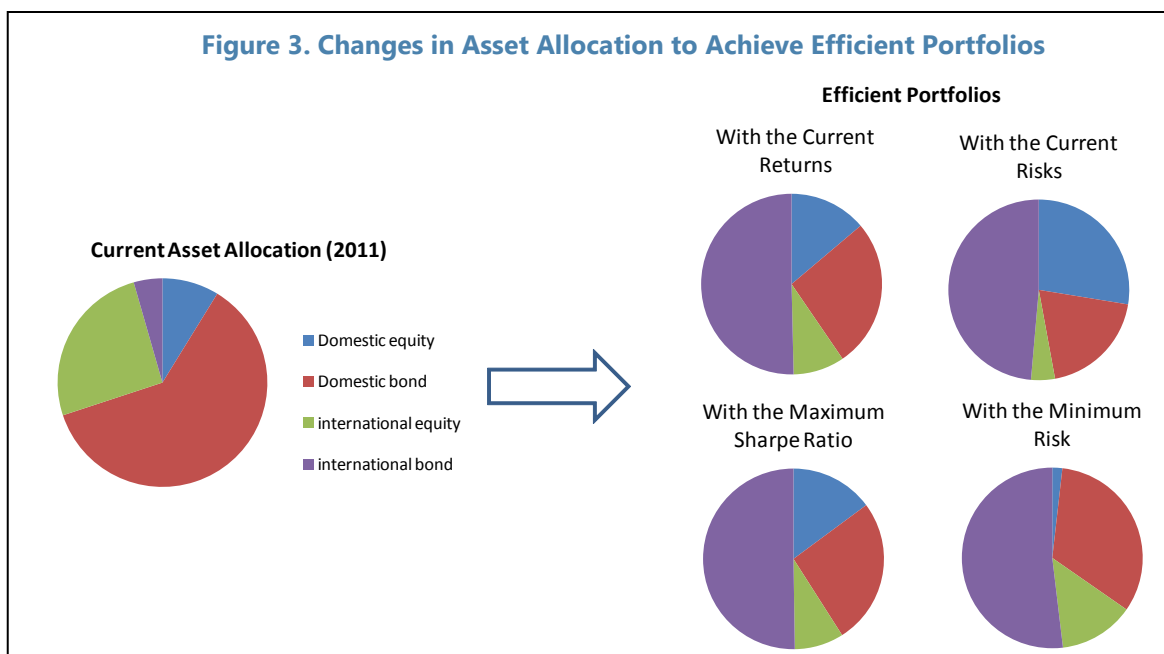
**10. To reach an efficient portfolio allocation, the model suggests that Icelandic residents would seek to move between 30 and 45 percent of 2011 GDP from domestic to foreign portfolio investment assets.** Figure 2 below shows that Icelandic residents' current (2011) asset allocation lies below the efficient frontier.<sup>5</sup> As the capital controls are lifted in the future, the allocation is likely to move towards a point on the frontier to achieve higher efficiency. A few points on the frontier can be used as targeted portfolio allocation: the point that maintains the current risk level but yields a higher return, the point that provides the current return with a lower risk level, the point that maximizes the Sharpe Ratio (the "optimal portfolio"), and the point that minimizes risks. Achieving any of these targets would require a shift from domestic assets (mainly domestic bonds) to international assets (Figure 3), and hence capital outflows, which are estimated to range from about 30 to 45 percent of 2011 GDP (Table 1).



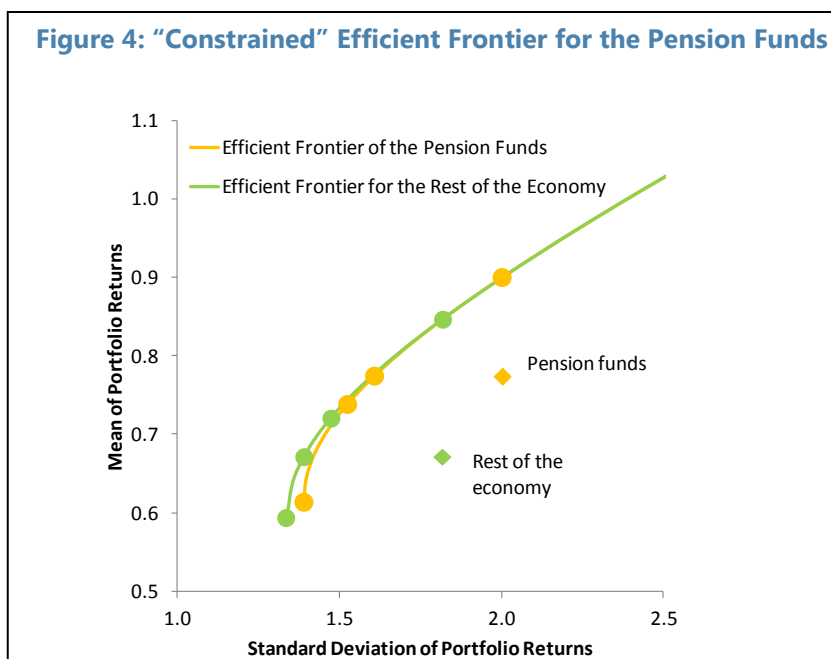
**Table 1. Capital Outflows from Residents' Portfolio Rebalancing (in percent of 2011 GDP)**

Capital Outflows from Residents' Portfolio Rebalancing (in percent of 2011 GDP)				
	To the Efficient Portfolio...			
	With the Min. Risks	With the Current Returns	With the Current Risks	With the Max. Sharpe Ratio
<b>Total</b>	<b>44.03</b>	<b>36.79</b>	<b>28.49</b>	<b>36.15</b>

<sup>5</sup> For the purpose of this analysis, the old banks under the winding up process are excluded because they will not rebalance their portfolios.



**11. In reality, however, some residents face regulatory or other constraints and may not be able to achieve the unconstrained optimal allocation even in the longer term.** For example, the Icelandic pension funds are required to hold a maximum of 60 percent of their net assets in equities and limit their foreign exchange exposure to 50 percent of total assets. To examine the effect of such constraints in limiting capital outflows from the pension funds, we extend the above analysis by estimating a “constrained” efficient frontier for the pension funds, while keeping the unconstrained efficient frontier for the rest of the economy (Figure 4). As expected, the constrained efficient frontier is slightly below the unconstrained one. The aggregate capital outflows, with the pension funds constrained, are now estimated to be at around 30 to 40 percent, with the pension funds accounting for more than half of the total outflows (Table 2).





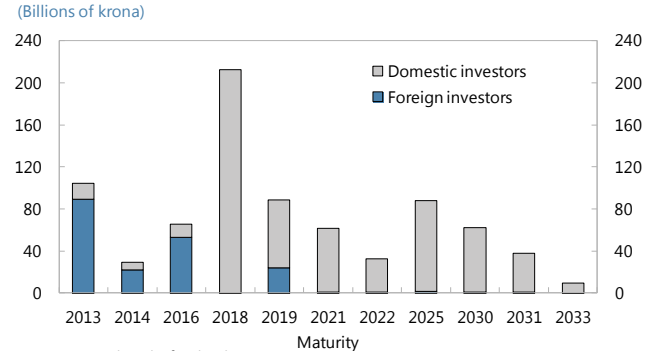
**Table 2. Resident Capital Outflows with Constraints on the Pension Funds  
(in percent of 2011 GDP)**

	To the Efficient Portfolio...			
	With the Min. Risks	With the Current Returns	With the Current Risks	With the Max. Sharpe Ratio
Pension Funds	18.38	18.38	18.38	18.38
Rest of the Economy	18.39	15.39	8.68	13.50
<b>Total</b>	<b>36.77</b>	<b>33.77</b>	<b>27.05</b>	<b>31.88</b>

## C. Effect on the Balance of Payments

**12. The analysis above can be used to estimate the potential impact on the balance of payments (BoP) and reserves.** The range of potential resident outflows from the analysis above is cumulative over a number of years, while the impact on the BoP and the exchange rate depends on the speed of the rebalancing. Although it is difficult to gauge how long the rebalancing takes, it is unlikely to occur all in one year, because not all residents' investments are liquid. Looking at the maturity structure of residents' holdings of domestic securities—as shown in the chart—domestic investors hold the majority of long-dated paper in Iceland. This would argue for a longer transition from domestic to foreign investments, as residents may not be able to liquidate their holdings immediately.

**Holdings of Government Securities by Residency and Maturity as of December 2012 1/**  
(Billions of krona)



Source: Central Bank of Iceland.

1/ Includes bonds and bills as well as securities lending from the issuer to the primary dealers.

**13. Without “speed limits” on resident outflows, there could be severe pressures on the BoP and the exchange rate.** The gross international reserves by end-2012 stand at around 30 percent of 2011 GDP—if a large chunk of the estimated resident outflows occur in one year, reserves could be easily depleted. To ensure adequate reserves, “speed limits” on resident outflows are essential. While speed limits on pension fund outflows are being contemplated by the authorities, broader restrictions on resident outflows have not been considered.

**14. Our analysis points to the potential need for speed limits not only for pension funds, but also for the broader economy, at least in the first few years following the easing of controls.** As estimated above, the potential capital outflows from residents' portfolio rebalancing could range from 30 to 45 percent of 2011 GDP (110), with non-pension-fund residents contributing to slightly below half of the outflows. The implication from this analysis is that even with the most stringent speed limits on the pension funds (i.e., allowing zero outflows), outflows from the rest of the economy could still potentially put pressures on the BoP. Therefore, it would be prudent to also have speed limits on non-pension funds resident outflows. If the capital account liberalization is managed well and confidence is maintained, such speed limits would not have to be binding ex post and they could be eased accordingly.

**15. There are numerous ways to design the speed limits, and our framework provides a tool to assess the BoP impact of each option.** One way is to apply the same speed limits on all residents. Based on the current BoP projections, if the annual outflows from residents could be limited to 7–8 percent of 2011 GDP (about \$0.9–\$1.0 billion) for eight years following the easing of capital controls, then the reserve coverage of short-term debt would remain above 100 percent (assuming that resident outflows would be financed by running down reserves) and the exchange rate would remain stable. Alternatively, tighter speed limits could be imposed on the pension funds for longer, so that the rest of the economy would be free of restrictions sooner. No matter what the ultimate design is, every effort should be made to ensure external sustainability. In this context, our analytical framework provides a useful tool to assess the BoP impact of each design.

## D. Conclusions

**16. The results of this analysis suggest that liberalization of resident’s portfolios could, at present, lead to a destabilizing impact on the BoP.** Even after the offshore krona overhang has been fully unwound, our analysis suggests that residents could reallocate 30 to 45 percent of 2011 GDP from domestic to foreign investments in the near term, causing a fall in the currency and reserves.

**17. These results should however be interpreted with caution, taking into account the limitation of the analysis and the large uncertainty surrounding the liberalization process:**

- First, given the data limitations, the analysis is conducted at a very aggregate level with only a small number of assets in the portfolio, which limits the precision of the estimates. In particular, we focus on the choice among different risky assets, rather than between the risk-free (i.e., deposits) and risky assets, given the uncertainty surrounding a “sustainable” deposit interest rate going forward and how the residents’ risk aversion would change following the lifting of controls.<sup>6</sup>
- Second, our analysis relies on backward-looking data to inform forward-looking policy making, but circumstances going forward could be different from the pre-crisis era. For example, during the time period of our analysis, there was more frequent appreciation of the krona than depreciation, but during the capital account liberalization process, depreciation pressures are more likely, at least temporarily. To reflect such a change in perception of the exchange rate risks, our analysis calculates asset returns in terms of USD so that domestic assets bear the exchange rate risks.
- Third, purchases of foreign assets in the pre-crisis period were mainly financed by extensive leveraging—a situation unlikely to be replicated in the present climate.

<sup>6</sup> By not including deposits in our analysis, we implicitly assume that deposits would remain unchanged. But in all likelihood the deposit rate before the crisis was unsustainably high, while the rate prevailing now is likely too low to support the amount of deposits that is held captive by the controls.

- Fourth, cross-country comparisons are a useful guide, but those countries have witnessed different underlying macroeconomic conditions, which would affect their portfolio allocations.
- Finally, the analysis does not take into account the likely capital inflows that will result from a successful liberalization—including those arising from an upgrade from the ratings agencies and the subsequent demand from non-residents to diversify into Icelandic assets.

**18. The results should therefore be used as an indication of the potential “worst-case” magnitude of resident outflows rather than as precise estimates.** For the reasons given above, the outflows could be much less, or there could be capital inflows that offset any rebalancing. This would mean that the speed limits would be there as a safety net and could be removed soon after liberalization. Nevertheless, given the potentially large magnitude, even if a rebalancing of residents’ portfolios would not necessarily be undertaken immediately, there could be significant implications—not only for the BoP, but also for the government’s financing cost. As shown in Figure 3, as residents rebalance their portfolios toward more efficient allocations, they would reduce their holdings of domestic bonds significantly.

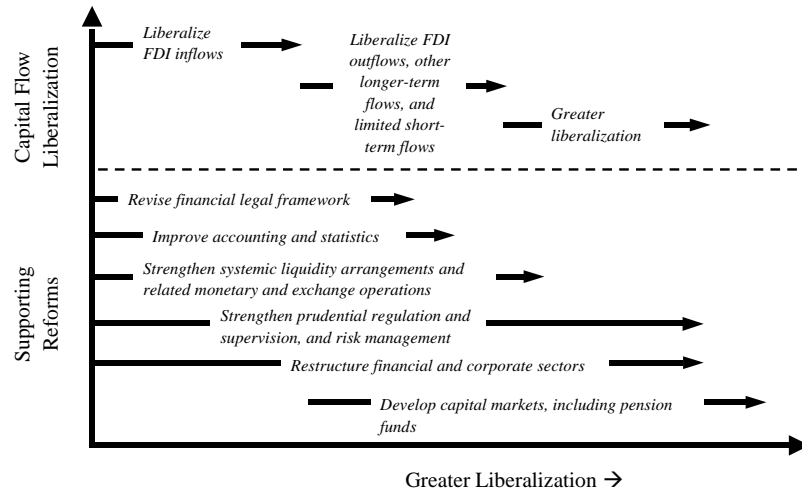
**19. These findings strongly reinforce the importance of adhering to a conditions-based liberalization strategy.** They also highlight the need for an integrated approach to capital account liberalization as set out in IMF’s institutional view.<sup>7</sup> This approach (Figure 4) emphasizes the importance of additional reforms to support the liberalization process. In phase two for Iceland this would mean maintaining adequate macroeconomic policies and strengthening institutional frameworks—including by bolstering financial markets’ ability to deal with capital flows and ensuring adequate risk management through strong prudential regulations and supervision.

**20. The Icelandic authorities have started to elaborate on how prudential measures might be defined.**<sup>8</sup> Of particular importance are their proposals to place temporary restrictions on increases in pension funds’ foreign assets. Given the size of these assets in Iceland (around 140 percent of GDP), temporarily limiting their investments in foreign assets once the controls are lifted would be a necessary measure to help mitigate the likely residents’ capital outflow and maintain external stability. With the potential for significant outflows, these “speed limits” will have to be strict at the outset, and then relaxed over time. Our analysis also points to the need to implement “speed limits” on other investments given the potentially sizeable outflows from the non-pension funds sectors. In this context, our analytical framework provides a useful tool to assess the BoP impact of different designs of speed limits. Finally, the authorities could also consider whether the liberalization process should also distinguish between different maturities of outflows.

<sup>7</sup> [“The Liberalization and Management of Capital Flows: An Institutional View”](#). International Monetary Fund, 2012.

<sup>8</sup> “Prudential Rules Following Capital Controls: Report to the Minister of Economic Affairs,” Central Bank of Iceland, August 2012.

Figure 5. Stylized Representation of a Broad Liberalization Plan<sup>1</sup>



1/ Reproduced from International Monetary Fund (2012) "The Liberalization and Management of Capital Flows: An Institutional View".

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Central Bank of Iceland, 2012. "Prudential Rules Following Capital Controls: Report to the Minister of Economic Affairs".

Central Bank of Iceland, 2011. "Capital Account Liberalization Strategy: Report to the Minister of Economic Affairs".

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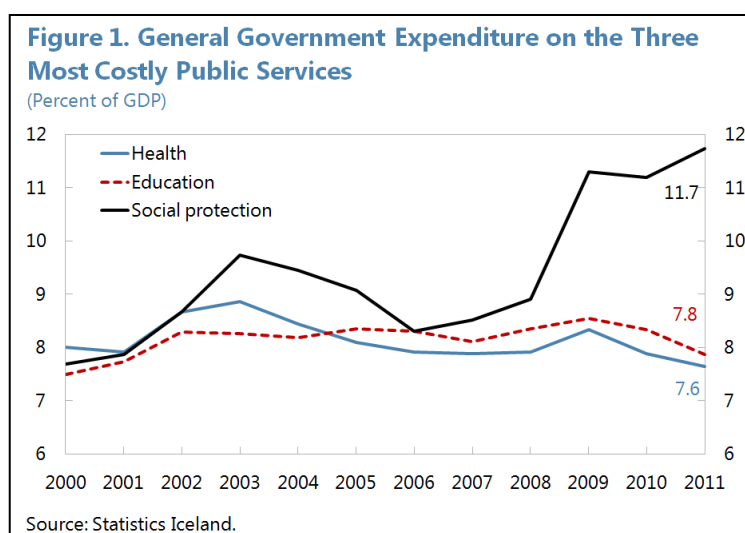
International Monetary Fund, 2012. "The Liberalization and Management of Capital Flows: An Institutional View".

# ASSESSING EFFICIENCY OF PUBLIC SPENDING ON HEALTH AND EDUCATION IN ICELAND<sup>1</sup>

*This paper measures the potential budgetary savings from improving the efficiency of public spending in health and education in Iceland. It uses a Data Envelopment Analysis to estimate an efficiency frontier by comparing across OECD countries the transformation rates of public spending into valuable social outcomes. It finds that bridging half of the gap in the efficiency of health and education spending between Iceland and countries on the efficiency frontier could generate as much as 3.2 percent of GDP in expenditure savings. The paper concludes with a discussion of the policies that could be implemented to achieve these savings.*

## A. Introduction

**1. Fiscal consolidation needs to proceed to bring down debt.** Following the 2008 financial crisis, the Icelandic authorities implemented a sizeable fiscal consolidation program. By end-2012, the overall structural balance had narrowed by 5 percentage points of GDP from its end-2009 peak of 7.5 percent. While this helped arrest the crisis-induced deterioration in public finances, further fiscal consolidation efforts will be required to bring down gross public debt, estimated at 99 percent of GDP at the end of 2012. This paper explores whether efficiency gains can be obtained in health and education, the two most costly public services outside of social protection (Figure 1), which would translate into expenditure savings that can be used as durable sources of fiscal consolidation.



<sup>1</sup> Prepared by Nazim Belhocine, with research assistance provided by Vizhdan Boranova. The author is grateful to Francesco Grigoli for providing Stata codes and some of the data used in this paper.

**2. There are potentially large savings in health and education.** Iceland's health outcomes are some of the best among OECD countries while education performance has been about average. Nonetheless, both these services are delivered at a high price compared to other countries. Over the last decade, several reports and studies have underlined the need for reforms in these areas without systematically and comprehensively estimating the accompanying potential savings. This paper is a first attempt towards this goal. The analysis suggests that the potential savings in health and education without compromising outcomes could reach up to 6.5 percent of GDP annually.

**3. The rest of the paper is organized as follows.** Section 2 provides a brief overview of the main features of the health and education systems in Iceland, and their relative performance compared to other OECD countries. Using a data envelopment analysis methodology, Section 3 estimates the potential gains from a more efficient provision of these services. Section 4 concludes with a discussion of the policies that can be pursued to achieve these savings.

## B. Performance of the Health and Education Systems in Iceland

### *Overview of the Healthcare System and its Performance*

**4. Healthcare in Iceland is predominantly managed and run by the central government.** The state absorbs 85 percent of health expenditures and healthcare services are financed either directly from the budget or indirectly through the State Social Security Institute (SSSI). Coverage is universal and private health insurance hardly exists, while health services provided by employers are very limited. Since January 2011, the Ministry of Welfare has been in charge of overseeing health policy.

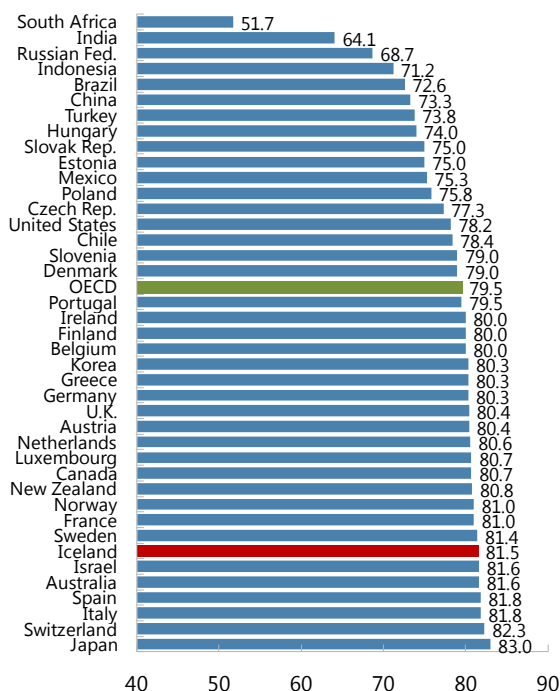
**5. Health outcomes and the quality of health care in Iceland are excellent by international standards.** Life expectancy is the highest in the world and infant mortality among the lowest (Figure 2), while maternal mortality is virtually non-existent (OECD, 2008). Eighty percent of Icelandic adults report that they are in good health, about 10 percentage points more than the average OECD (OECD, 2011). In addition, income-related health inequality appears to be smaller than in most other countries (Asgeirsdottir, 2007).

**6. Nevertheless, the healthcare system is relatively costly.** At about 9.7 percent of GDP in 2009, Iceland's healthcare expenditure is above the OECD average, whereas its spending on health per capita is also somewhat above the OECD average (Figure 3). At the same time, public per-capita expenditure on health care exceeds the OECD benchmark by around 40 percent while Iceland's GDP per capita is above the OECD average only by about 25 percent (OECD, 2008b). In addition, although the geography and population distribution of the country probably gives reasons for an above average share of health-care workers, given the need to maintain and staff hospitals in rural areas while incurring low economies of scale, staffing ratios seem excessive by international comparison (OECD, 2008). Finally, the health system faces also a looming demographic challenge with public expenditure on health projected to increase by half to reach 15.2 percent of GDP by 2050 under unchanged policies (Table 1).

Figure 2. Health Performance Indicators

Life Expectancy at Birth, 2009

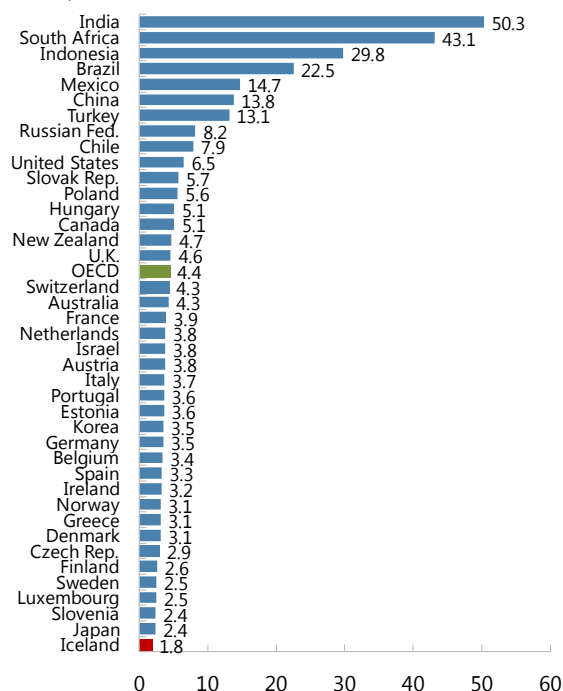
(Years)



Source: OECD Health at a Glance, 2011.

Infant Mortality Rates, 2009

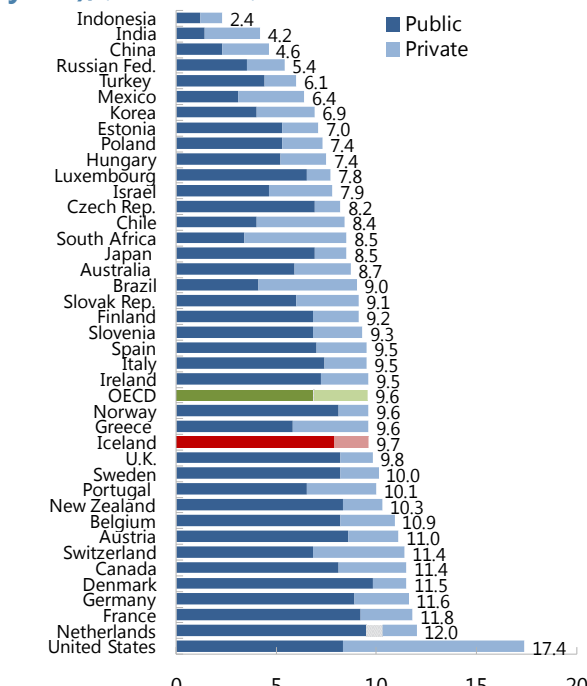
(Deaths per 1000 live births)



Source: OECD Health at a Glance, 2011.

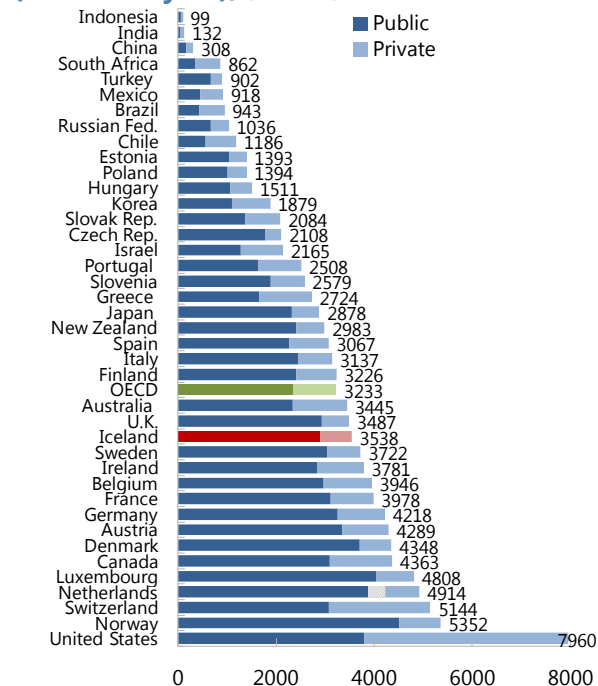
Figure 3. Expenditures on Health

Total Health Expenditure, 2009 (or nearest years), (Percent of GDP)



Source: OECD Health at a Glance, 2011.

Total Health Expenditure per Capita, 2009 (or nearest year), (USD PPP)



Source: OECD Health at a Glance, 2011.



**Table 1. Public Health Spending, 2010–50  
(Percent of GDP)**

Country	Baseline Projections									Change 2010-2030
	2010	2015	2020	2025	2030	2035	2040	2045	2050	
Australia	6.0	6.4	6.9	7.5	8.1	8.7	9.3	9.8	10.3	2.1
Canada	7.4	7.9	8.4	8.9	9.4	9.9	10.4	10.8	11.1	2.0
Denmark	8.6	8.8	9.0	9.2	9.4	9.5	9.6	9.6	9.6	0.8
Finland	6.4	7.0	7.6	8.3	8.9	9.5	10.1	10.7	11.2	2.5
France 1/	9.0	9.4	9.7	10.1	10.5	10.8	11.1	11.4	11.6	1.5
Germany 1/	8.1	8.4	8.6	8.8	9.0	9.3	9.4	9.6	9.6	0.9
Iceland	7.8	8.4	9.1	9.9	10.9	12.0	13.0	14.1	15.2	3.2
Ireland 1/	6.8	6.9	7.0	7.2	7.5	7.7	7.9	8.1	8.3	0.7
Italy 1/	6.9	7.0	7.2	7.3	7.5	7.7	7.8	7.9	8.0	0.6
Japan	6.8	7.1	7.3	7.6	7.8	7.9	8.0	8.1	8.2	1.0
Netherlands	7.6	8.2	8.9	9.5	10.2	10.8	11.4	12.0	12.5	2.6
Norway	7.2	7.5	7.9	8.4	8.8	9.3	9.7	10.1	10.5	1.7
Portugal 1/	7.6	8.4	9.2	10.1	11.1	12.2	13.4	14.7	15.9	3.5
Spain 1/	6.6	6.9	7.3	7.7	8.2	8.7	9.3	9.7	10.1	1.6
Sweden	7.8	7.9	8.0	8.1	8.2	8.3	8.3	8.3	8.3	0.4
Switzerland	6.6	7.4	8.4	9.4	10.5	11.7	13.0	14.3	15.6	3.9
United Kingdom 1/	7.3	8.0	8.7	9.6	10.6	11.7	12.9	14.2	15.5	3.3
United States	7.6	8.6	9.8	11.2	12.7	14.2	15.7	17.3	18.9	5.1

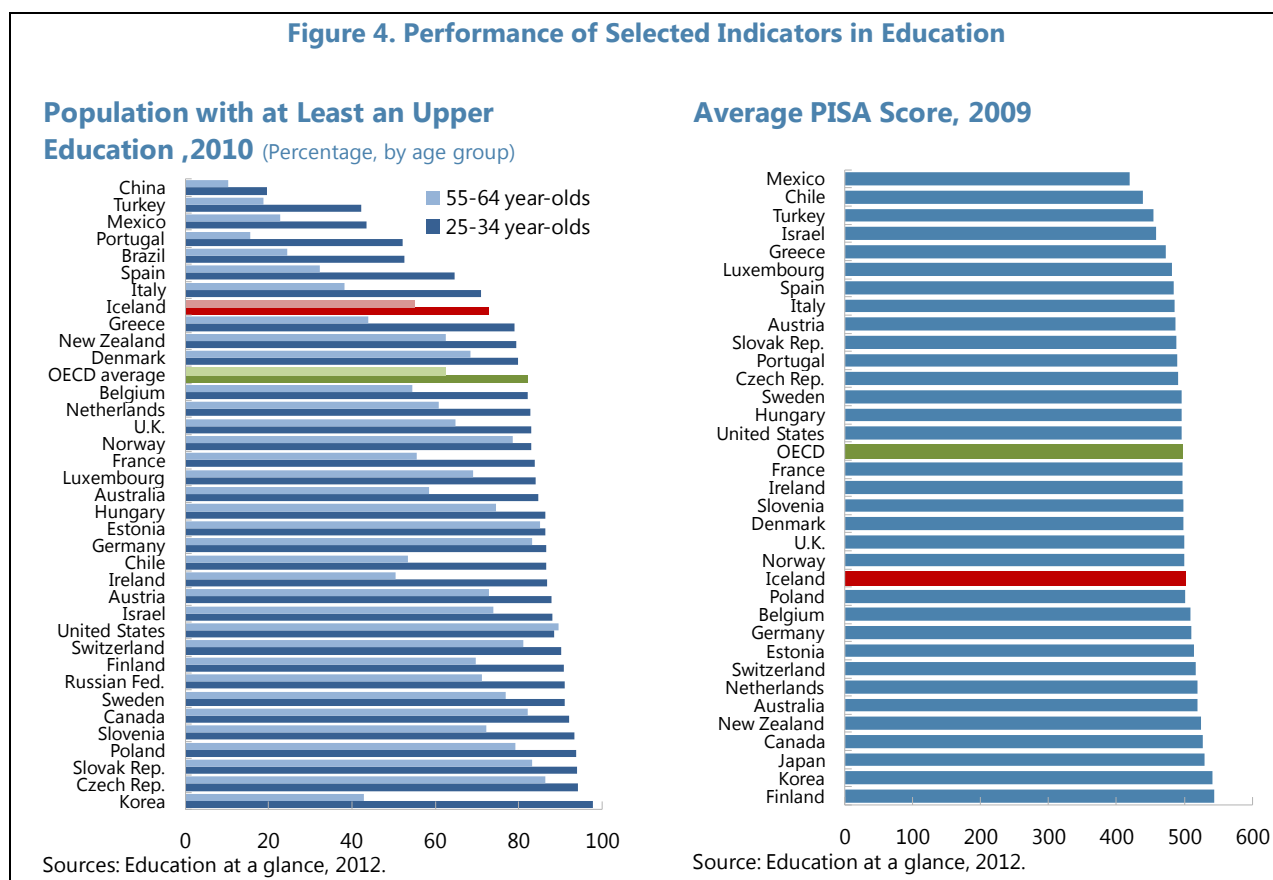
Source: IMF (2010)

### *Overview of the Education System and its Performance*

**7. The education system in Iceland is divided into four levels where both the central and local governments play important roles.** It encompasses 1) pre-school, covering the ages up to 6 years, 2) compulsory school, made of primary and lower secondary school in a single structure, covering the ages from 6 to 16, 3) upper secondary school, covering the ages from 16 to 20 and 4) higher education, aged 20 and older. Education has traditionally been organized within the public sector, and there are very few private institutions in the school system. Local municipalities oversee preschool and compulsory schools and bear the cost of their construction and operation. The central government's role in compulsory education is limited to monitoring the implementation of laws and regulations, the publication of educational materials and the organization of coordinated national examinations (OECD, 2008a). However, upper secondary schools are operated and funded by the State, though local municipalities contribute 40 percent to the cost of new buildings (European Commission, 2009). The Ministry of Education, Science and Culture supervises the budgets of upper secondary schools and higher education, school work and issues the necessary curriculum.

**8. Educational outcomes have been average by international comparison.** Iceland's workforce continues to be characterized by a gap in the skill spectrum between the low skilled and highly skilled, leading Iceland to fall behind in the middle part of the skill distribution, as shown by a relatively low upper secondary school attainment (Figure 4). Given that Icelanders spend an unusually long time to complete upper-secondary education, with most students taking the university entrance examination at the age of 20, relatively few students complete their studies. Both the share of those with only compulsory education (more than one-third) and those with tertiary education (more than a quarter) is higher than the OECD average (OECD, 2006). Moreover, Icelandic

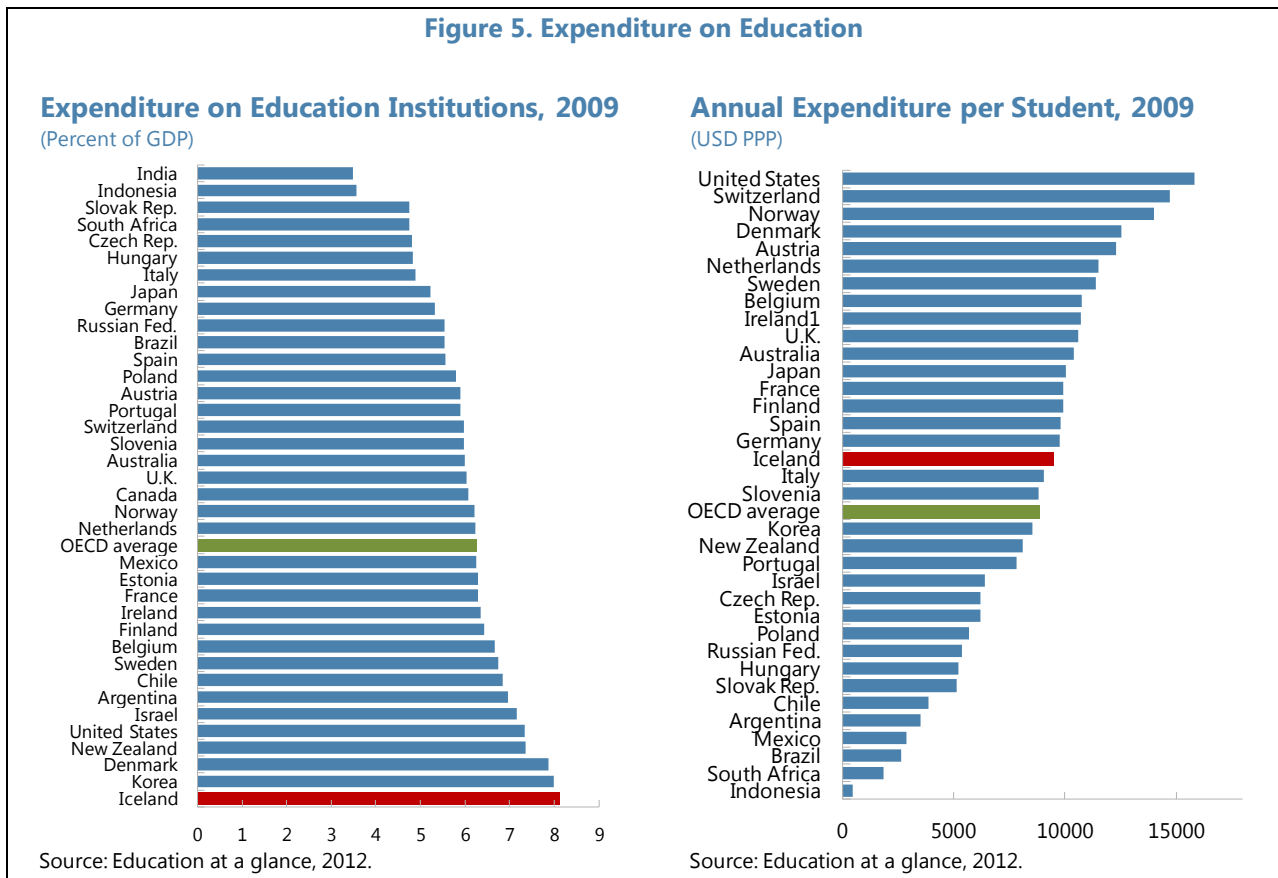
students' PISA scores are in the average range of the OECD countries.<sup>2</sup> Scores in reading and mathematics are statistically significantly above the OECD average while the score in the science scale is statistically significantly below the OECD average (OECD, 2010).



**9. Iceland's total education spending in percent of GDP is the highest among OECD countries.** In 2009, it reached 8.1 percent of GDP, about 2 percentage points more than the OECD average (Figure 5). Given Iceland's relatively young population, expenditure per student does not stand out although it still exceeds the OECD mean. This largely reflects very high expenditure on compulsory education, with per student spending at the primary and lower secondary level surpassing the OECD mean by one-third and one-fifth, respectively (OECD, 2012). Although the geography and population distribution in the country may justify a large teaching personnel body, the pupil-per-teacher ratios in the primary and secondary levels are too low by international comparison in relation to the educational achievements measured through international tests (OECD, 2006).

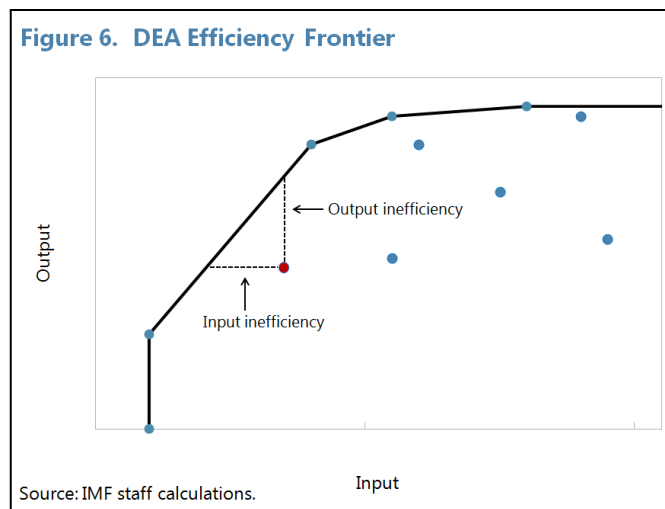
<sup>2</sup> The Program for International Student Assessment (PISA) is a triennial OECD international survey of the knowledge and skills of 15-year-old pupils, an age at which students in most countries are near the end of their compulsory time in school. PISA ranks countries according to their performance in reading, mathematics, and science by their mean score in each area. The PISA scores are used as a proxy for educational achievements of students at the end of their secondary education, although it should strictly apply to lower secondary education, given the data constraints on the breakdown of spending between lower and upper secondary education.

Figure 5. Expenditure on Education



### C. Assessing Efficiency of Public Spending in Health and Education

**10. A data envelopment analysis (DEA) methodology is used to assess whether the outcomes in health and education are efficient.** This involves tracing a “best practice frontier” populated by countries that provide the optimal combination of inputs and outputs. This frontier is constructed using linear programming techniques from the most efficient observations which then “envelop” the less efficient ones (Sutherland and others (2007)). Potential efficiency gains are derived by measuring the distance from the frontier and expressing it as a ratio of an observation’s distance from the efficiency frontier to the distance from the axis. These gains can be defined as the amount by which input could be reduced while holding constant the level of output (input inefficiency) or as the amount by which output could be increased while holding constant the level of input (output orientation), as shown in Figure 6. The observations on the efficiency frontier will by construction have a value of one while the “enveloped” observations will carry an “efficiency score” of less than one. For the purpose of identifying potential savings, i.e. inducing similar outcomes at lower costs, the measurement of efficiency in this paper will be expressed in terms of input efficiency.

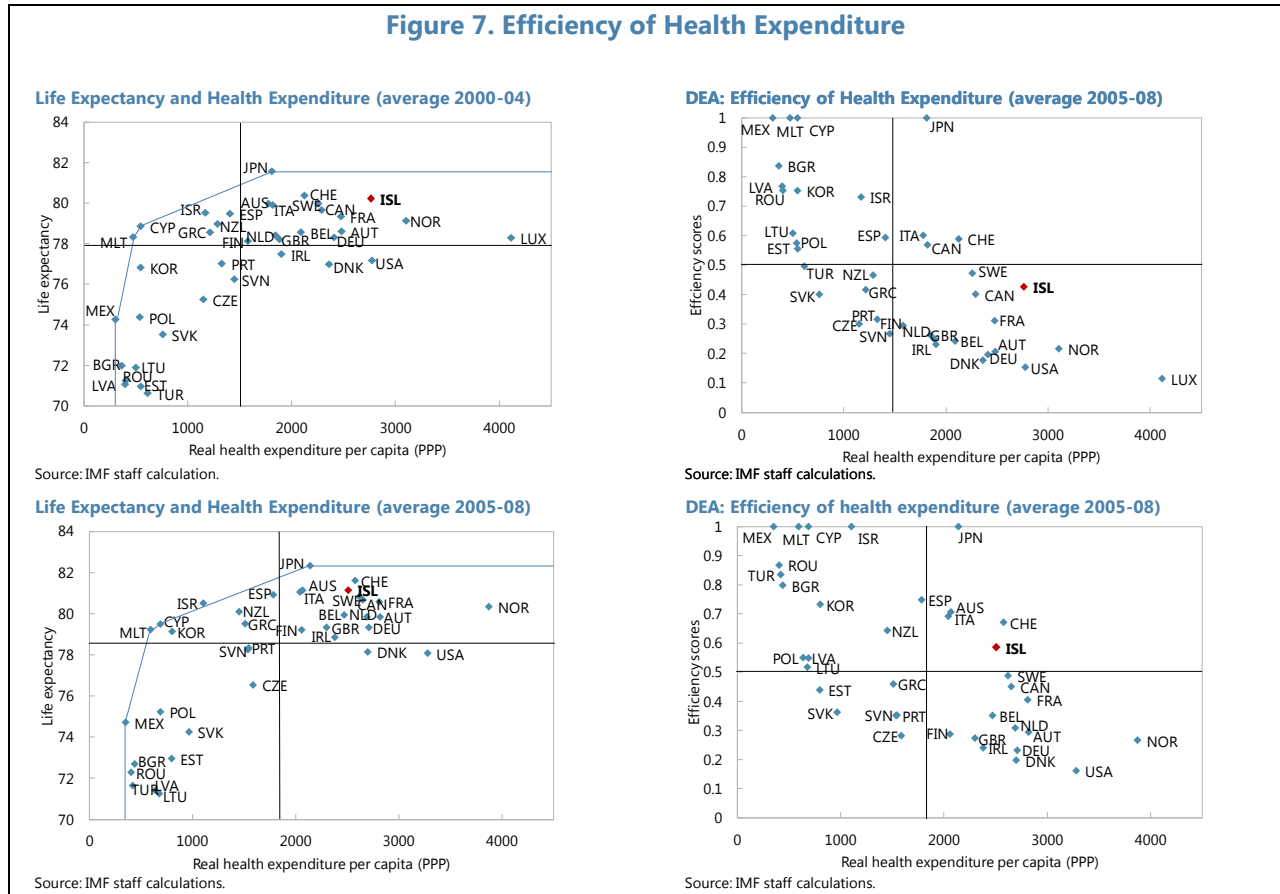


**11. The DEA methodology has numerous advantages although its appeal comes with numerous caveats.** The DEA is relatively easy to implement given the mathematical estimation technique. In addition, it doesn't require a specific functional form for the production function avoiding issues related to specification and estimation problems. Finally, it allows to benchmark performance between countries and provides an intuitive interpretation of the results. Nonetheless, some of these advantages come with important caveats. The mild assumptions in terms of functional forms mean that the DEA is not amenable to statistical inference analysis such as constructing confidence intervals. Moreover, the assumption of the existence of an efficiency frontier implies that any country could move to the frontier by freely accessing the technology of production and by being unhampered by the country's own idiosyncratic conditions. In addition, the methodology assumes that any deviations from the frontier are due to inefficiencies rather than the result of omitted or uncontrollable variables. Finally, given that DEA efficiency scores are relative measures of efficiency, they could be sensitive to sample selection and measurement error.<sup>3</sup> The use of an OECD sample helps alleviate some of these constraints since most OECD countries share similar institutional and economic features. Nonetheless, because some limitations are difficult to mitigate, the efficiency results are expressed in terms of the maximum potential savings as opposed to the need to reach the efficiency frontier.

**12. The analysis is separated into two time intervals, 2000–04 and 2005–08, in order to compare the evolution of expenditure efficiency over time.** Since the outcomes in health and education are relatively constant over time, taking averages over these periods should be sufficient to gauge the developments in expenditure efficiency. 2008 was chosen as the last observation year for two reasons: 1) it is the last year for which comparator data on education are available, setting the upper limit on a common denominator year and 2) it is the last year before the full effect of the financial crisis. While the government has slowed down the pace of spending on health and education following the crisis (Figure 1), this policy was a consequence of fiscal consolidation on all expenditure items rather than a deliberate policy reform in the areas of health and education. As a

<sup>3</sup> The alternative techniques, such as the Stochastic Frontier Analysis, impose more structure on the data, require a large panel data which are often unavailable, and can be computationally challenging as the estimation is amenable to non-convergence.

result, 2008 can be viewed as the last year of a steady state environment. Nonetheless, we assume that the efficiency scores remain constant and use the level of government spending in health and education observed in 2011 to estimate the potential savings. As a result, the efficiency gains that will ensue can be viewed as an upper bound.



**13. Health care savings could reach up to 3.2 percent of GDP.** Figure 7 shows the results of the efficiency analysis for health. The left-hand-side charts depict the efficiency frontier of health expenditures per capita against life expectancy for two periods: 2000–04 and 2005–08. Both the horizontal and vertical lines inside the charts represent averages of the variable depicted in the corresponding axis. Notice that Cyprus, Malta, Mexico, Israel, and Japan define the efficiency frontier for the later period. The right-hand side column illustrates the corresponding efficiency scores for each period and shows that Iceland’s efficiency score has improved from 0.42 to 0.58 between the two periods. The improvement of efficiency between the two periods is striking but independent of the impact of the crisis, which did not start until end-2008. The adoption of the new long-term health plan in 2001 (Ministry of Health, 2004) which included new spending targets and rationalization policies may have led to an improvement in efficiency.<sup>4</sup> Using this latest period’s

<sup>4</sup> Given that the DEA approach is not a parametric estimation approach, changes in the estimates from one period to another cannot be interpreted as an implicit test of the model’s misspecification. Instead, it should be interpreted as a measure of efficiency change.

efficiency score, Iceland could save 42 percent of resources and achieve the same output in health care. This implies a potential saving of 3.2 percent of GDP given that expenditure on health reached 7.6 percent of GDP in 2011 (Figure 1).

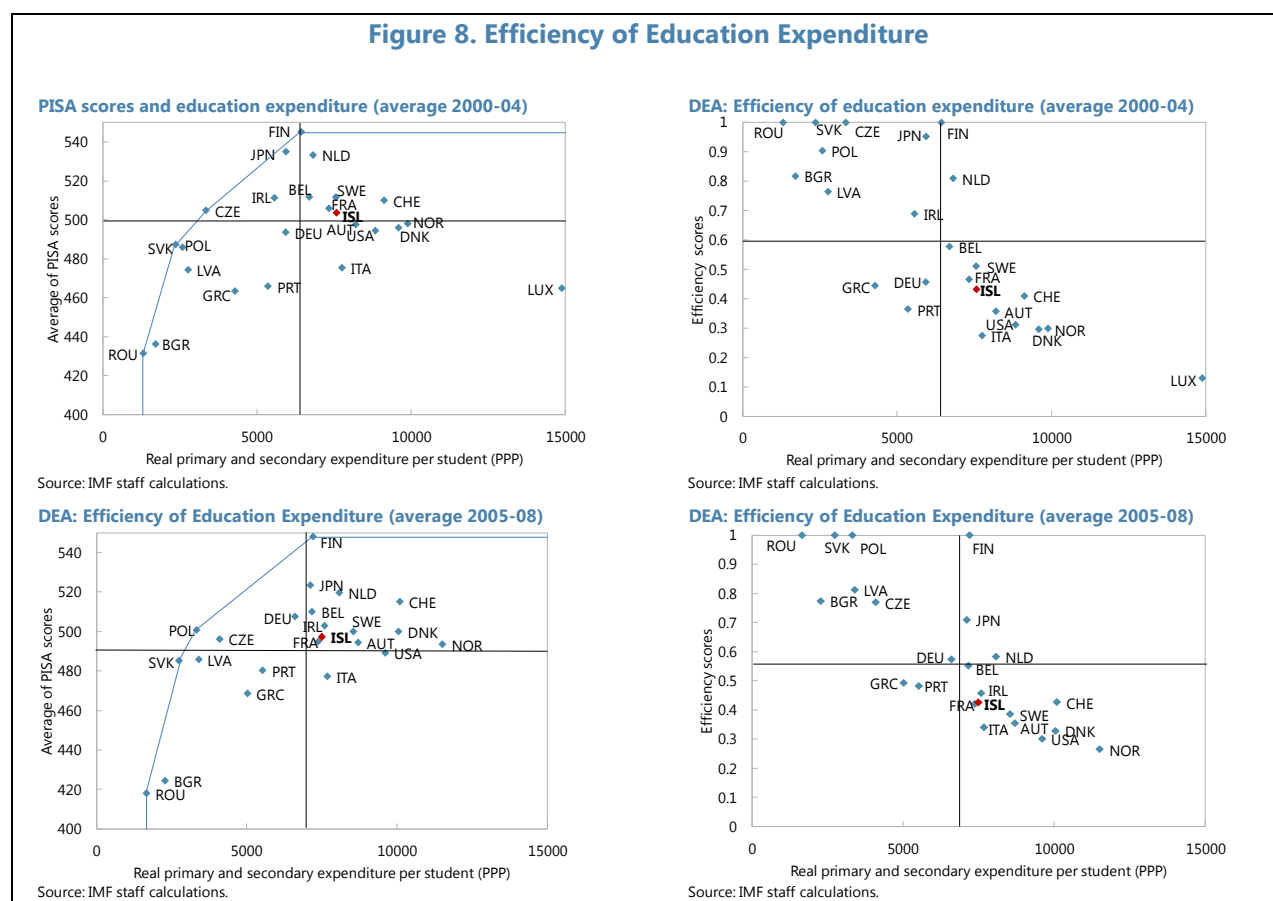
#### 14. Savings in education up to the upper secondary level could reach 3.3 percent of GDP.

The efficiency analysis for the education sector is summarized in Figure 8. The left-hand side column depicts the efficiency frontier of real public expenditure per student in primary and secondary education against the average PISA scores over the same two time periods as before. Notice that Finland, Poland, Romania, and Slovakia define the efficiency frontier for the later period. The right-hand side column illustrates again the corresponding efficiency scores for each period and shows that Iceland's efficiency score has stagnated at 0.43 throughout the two periods. Iceland could therefore spend 57 percent less resources on education up to the upper secondary level and yet still achieve the same quality of outcomes. This implies potential savings of 3.3 percent of GDP annually given that expenditure on education up to the upper secondary level reached 5.7 percent of GDP in 2011.

### D. Policies to Improve Efficiency in Health and Education

#### 15. The above analysis suggests potential budgetary savings of up to 6.5 percent of GDP.

This section discusses the policies that could be implemented to achieve these savings.



**16. A number of reforms have been identified to improve the health care system.** There have been several reports and studies over the last decade which underlined the potential for savings in the healthcare sector in Iceland (Ministry of Health (2004), National Audit Office (2004), OECD (2008b)), although these studies have not systematically quantified the potential savings. Most recently, the Ministry of Welfare commissioned a report “to analyze the performance of the Icelandic health care system and identify opportunities for short-term savings and more long-term healthcare reform” (Ministry of Welfare, 2011).<sup>5</sup> The main recommendations from this report and from the OECD (OECD, 2008b) are summarized in Box 1.

**Box 1. Main Recommendations on Healthcare System Reform**

- Consider the introduction of “gate-keeping”, with general practitioners or nurses assessing the need for treatment and directing patients to the most appropriate level of care.
- Further reduce reliance on costly hospital care, which is high by international comparison, by eliminating excess hospital beds and promoting home care rather than nursing homes (or intermediate solutions).
- Reduce the high cost of pharmaceuticals by promoting competition and the use of generic drugs. In particular, competitive bidding should be introduced for all government purchases of drugs and cost sharing should be modified so as to provide incentives for the supply and purchase of cheaper drugs.
- Improve planning and performance management of the system, in particular by using outcomes measurements and relying on electronic health databases.
- Enhance patient flows through better care integration and better patient guidance via programs profiling risk groups with personalized guidance to decrease care needs.

**17. The existence of various levels in education, each with a different focus, necessitates the design of reforms specific to each educational stage.** Moreover, the decentralization to municipalities of primarily and lower secondary education adds a layer of needed specificity when exploring ways to improve value for money in education. Nevertheless, there has been recognition by Icelandic policymakers that the most important reform should be the one focused on the duration of education, which is unusually long (OECD, 2007). As noted, Icelandic students complete their secondary education generally at the age of 20, whereas in most other countries students finish comparable programs at the age of 18 or 19. Shortening the duration of upper secondary education would entail significant savings while allowing young people to commence their university studies one year earlier, extending their working career and lifetime income (OECD, 2009). In addition, municipalities, which oversee compulsory education, should consider increasing net teaching time, among the lowest in the OECD, together with pupil-teacher ratios. Such reorganization would entail cost savings and might also have a positive effect on educational achievements by improving the average quality of teachers (OECD, 2009).<sup>6</sup>

<sup>5</sup> See The Boston Consulting Group (2011).

<sup>6</sup> Expenditure data on tertiary education was not available to extend this analysis to the tertiary level. However, there is scope for consolidation in the higher education sector as well by encouraging studies abroad to lower the full range of tertiary programs being currently supplied (OECD, 2007).

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