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The Macroeconomic Impact of Aluminum and Ferro-Silicon Production and Related Investments in Iceland 1966-1997

Summary

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Main Conclusions:
The study estimates the macroeconomic impact of aluminum and ferro-silicon production and related investments in Iceland 1966-1997. In brief, the main conclusions are:

The estimated Net Present Value (NPV) of net macroeconomic gains during this period is slightly less than 18% of Iceland's Gross Domestic Product (GDP) in 1997.

This is equivalent, in NPV terms, to a windfall gain of 0.5% of GDP in each year during the period in question.

About 60% of the gains can be attributed to better utilization of resources during cyclical downturns. The remaining 40% can be explained by an increase in productivity due to the presence of aluminum and ferro-silicon plants.

Methodology:
First, we estimate the NPV of investments (net of scrap value at the end of 1997) in electric power projects in the absence of aluminum and ferro-silicon production. It is assumed that the presence of aluminum and ferro-silicon plants was a precondition for the large power projects that have been undertaken in the past 30 years, so that in their absence a number of small power stations would have been constructed to keep pace with growth in local demand for electricity. [1] We, thus, obtain an estimate for the additional investment costs attributable to electricity generation for the aluminum and ferro-silicon plants. Additional electric operation and maintenance (O&M) costs are assumed to be a fixed proportion of additional electric investment costs.[2]

Then we proceed to estimate the NPV of additional revenues to Icelanders due to the presence of aluminum and ferro-silicon firms. They fall into the following categories: Additional revenues from electricity sales, additional revenues to state and local governments, additional salaries to plant employees, and additional revenues derived from services (e.g., shipping) provided to these firms as well as from investments made by them.

The calculations of the costs and benefits above assume that the operation of the aluminum and ferro-silicon plants, investments in those plants, and additional investment in electric power projects did not affect the utilization level of factors of production in the economy. Thus, for example, salary gains of employees at the aluminum and ferro-silicon plants are not assumed to equal the total salaries of these employees, but rather the difference between their salaries and the salaries of employees of similar skill level elsewhere in the economy. However, we recognize that for selected periods of cyclical downturns the assumption of full utilization of factors of production is not realistic. Therefore, special adjustments must be made for such periods. Adjustments are made for the period 1967-1969, when the Icelandic economy experienced difficulties in the wake of drastic reductions in fish catch

[1]The construction of this hypothetical scenario was done in cooperation with engineer Edvard Guðnason at Landsvirkjun. He also provided me with cost estimates for the small power projects. No calculations were made to check if the investment path in the hypothetical scenario was optimal.
[2]Additional power station O&M costs are assumed to be 0.7% of additional investment in power stations. Other additional O&M costs are assumed to be 1.0% of other additional investment.

and export prices, and the period 1992-1997, which were years of relatively high unemployment.

The period 1967-1969 is especially important since during that period large investments related to the ISAL plant at Straumsvík, including the construction of the electric power station Búrfell, gave the economy a much needed boost. Similarly, in the last few years investments required by the expansion of the ISAL plant at Straumsvík and Norðurál´s plant at Grundartangi took place during a period of slack in the construction sector. To estimate the macroeconomic benefits of aluminum related investments in the late 1960s a small macroeconomic model was used. The economic impact of aluminum related investments during the period 1992-1997 was estimated using realized investment figures as well as forecasts of their impact made by the National Economic Institute. Effectively, this approach is equivalent to assuming zero opportunity cost of factors of production during cyclical downturns.

The table below summarizes the main results and briefly explains the method used in the calculation of each item.

The NPV of Macroeconomic Gains Derived from the Production of Aluminum and Ferro-Silicon and Related Investments in Iceland 1966-1997 (million ISK)

Real interest rate used in the calculation of NPV of gains:	**3.5 %**	**4.0 %**	**Method used in calculation**
Net gains to Landsvirkjun	10.179	6.013	Additional electricity sales revenues - additional investment costs - additional O&M costs
Net gains to state and local governments	6.220	6.511	Additional taxes (excluding additional taxes on salaries) - net loss on the Icelandic government's investment in Icelandic Alloys (IA)
Net salary gains	16.410	17.554	Total salaries of employees of ISAL and IA - Total salaries of the same number of similarly skilled workers elsewhere in the economy
Other gains	4.001	4.296	5 % of total revenues derived from services purchased and investments made by ISAL and IA
Total NPV of gains assuming full opportunity cost of factors of production	**36.810**	**34.374**	Sum of the items above
NPV of gains during cyclical downturns	**51.500**	**58.000**	Estimated by simulation of macroeconomic model etc.
Total NPV of gains	**88.310**	**92.374**	Sum of the last two rows