

https://dspace.org/

Structural changes in seaborne coal markets and a modelled response of economic implications for the South African coal industry

Rademeyer, Maryke Carleen

2021
https://hdl.handle.net/10539/33383

Downloaded from a DSpace repository. https://dspace.org/

Abstract

Economics govern the growth and decline of all industries. The South African coal mining industry is no exception. For many years it has been believed that the prof-itability of coal mining in South Africa is strongly dependent on the profitability of exports. The international coal market has experienced highs and lows over the past ten years and concerns have been raised as to how South African coal production and coal supply for domestic usage would be affected over the longer term if the profitability of exports is not sustained. As such, this thesis presents the theories and applications that have been added to the field of mineral economics in order to investigate the economic implications for coal mining, and the broader coal industry in South Africa, should the market for coal exported from South Africa deteriorate. Firstly, a production function for mining operations is derived which better captures the effects of economies of scale seen in mining than other conventional cost functions. Secondly, a characterisation of the lead-time in mining project investment is created to describe the period from the time of investment until production capac-ity becomes operational. These two functions are then integrated into a net present value model of the cash flows over the life of a multi-product coal mining project. This mining model, GENCOMIN, is cast as a problem in static optimisation and solved computationally. The results indicate that the investment part dominates the mine owner's decision-making when seeking to maximise profit over the life of the project. Further, a general equilibrium model of the multi-product domestic South African coal market, DOTRAMOD, is developed and solved computationally as an optimisation problem. DOTRAMOD is then extended with a mining profit and an investment algorithm in accordance with the result from GENCOMIN which indi-cated the importance of the investment consideration. The extended DOTRAMOD problem is solved computationally, yielding the key result that a persistent decline in the demand for coal exported from South Africa would lead to the closures of multi-product coal mines in South Africa and a subsequent reduction in coal sup-ply for local power stations. This is expected to have implications for coal mining employment and South Africa's energy security. The work presented in this thesis is truly multi-disciplinary, and addresses topics in production economics, coal trade and marketing, and mine project investment.