<u>RE: Manuscript 580 by Tomas Kögel „The social cost of carbon on an optimal balanced growth path",
now titled "The growth rate of the social cost of carbon in an optimal growth model"</u>

RESPONSE TO THE REFEREE REPORT 2

I first would also like to thank the second referee for his (or her) very useful report.

Physically unlimited flow of pollution

The referee objects that my first revision's application of the Stokey model to carbon emissions fails to account for the limitedness of the stock of fossil fuel in the ground, despite of the fact that burning fossil fuels is the main contribution to carbon emissions. The editor seems to suggests that I should therefore better justify my choice to apply the Stokey model. In my view, the referee is however correct and I therefore wrote in my second revision a second completely revised paper. In this second revision, I now use a model with carbon emissions from burning fossil fuel, as suggested by the second referee.

Extend and type of the modification of Stokey's model

The referee also objects that in my second revision I assumed marginal damages from climate change to be decreasing in the stock of carbon because this seems to be at odds with the standard literature on climate change. I therefore dropped this assumption in my second revision and now assume the marginal damages from climate change to be rising or to be constant in the stock of carbon.

Consistency with Kaldor facts

The referee also objects that I inferred a utility function that is logarithmic in the stock of carbon from the Kaldor fact of constant historical market rates of return on capital despite of a growing stock of carbon in the atmosphere. He argues that in an unregulated market economy constant market rates of return on capital do not require such a utility function and that the past can be best described as such an unregulated market economy without climate policy. The referee is correct. In an unregulated market economy all that is required is consistency of the Ramsey rule with constant market rates and the latter consistency does not require a utility function that is logarithmic in the stock of carbon. I also agree to the referee that the past can be best described as an unregulated market economy without climate policy. In my second revision, I therefore dropped the requirement the utility function to be logarithmic in the stock of carbon and instead assumed a general utility function U(C,P), where U, C and P denotes utility, consumption and the stock of carbon.

Further aspects

I followed the further by the referee suggested aspects as far as they were still relevant in my completely revised paper and as far as it was possible to follow them**.**

Relation to referee report 1

In my second revision, I maintained the by the first referee suggested analysis of the current growth rate of the social cost of carbon (as opposed to an analysis of this growth rate in the future steady state), given the constraints suggested by the second referee (i.e. the constraint not to assume a utility function that is logarithmic in the stock of carbon).