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**Laudatio Paul M. Romer on the Occasion of His Receiving the H.C. Recktenwald-Prize**

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English Version

Horst Claus Recktenwald was particularly fond of Adam Smith. His is the best translation of the *Wealth of Nations* into German. In a sense we might say that the publication of Adam Smith's book in 1776 was the birth date of economics as an academic discipline. It is therefore interesting to read the first sentence of this book: "The greatest improvement in the productive powers of labour, and the greater part of the skill, dexterity, and judgement with which it is anywhere directed, or applied, seem to have been the effects of the division of labour." Adam Smith here already provides the answer to the question which the great work asks: what is the source of the wealth of a nation?

Looking back at this beginning of economics as an academic discipline we may then say: economics is the science of the division of labour: It is the science of the institutional set-up which enables society to have a productive system of the division of labour. But, why is sentence 1 of chapter 1 of book 1 of the "*Wealth of Nations*" so right? It is the division of knowledge which enables the economy to make use of so much more human knowledge than fits into the head of any single person. So it is the great "library" of knowledge which generates the wealth of a people; and it is the effective creation of new knowledge which generates the growth of the wealth of a nation and of the world population.

What are the social mechanisms which are effective organisers of the division of labour, of the division of knowledge? Adam Smith's answer is clear. The effective social mechanism is the market. Later on in his treatise he invokes the famous "invisible hand". He says of the merchant: ".....by directing that industry in such a manner as its produce may be of the greatest value, he intends only his own gain, and he is in this, as in many other cases, led by an invisible hand to promote an end which was no part of his intention." For a time of 200 years economic theory centered around the question: what are the conditions under which the principle of the invisible hand applies? This work culminated in the fifties and sixties of the twentieth century in the Arrow-Debreu model of General Equilibrium. The assumptions

which were required to show the Pareto-optimality (indeed, the existence) of the General Equilibrium included the convexity of the production set which meant they excluded non-convexities. They excluded economies of scale.

There is a tendency in economic science – as in every walk of life – to avoid cognitive dissonance. The Pareto-optimality results (i.e. the "invisible hand" results) of General Equilibrium were the more relevant the more realistic the assumptions were which were required for the proof. So economists tended to play down the importance of economies of scale at the level of the economy at large. In this time neoclassical growth theory was born. Robert Solow's two famous papers established this discipline. His method of – what later was to be called – "growth accounting" did for growth what Newton did for classical physics: it applied the mathematical idea of local linearisation to describe a complex object by means of a neat formula. (Newton had to invent the calculus for this purpose, Solow then could build on that Newtonian achievement). The link between the income distribution and the contribution of factors of production to growth was the closest, if you assumed constant returns to scale at the macroeconomic level. And the marginal productivity theory of income distribution is the only theory of income distribution which is fully consistent with the invisible hand. But it only works under constant returns to scale at the macroeconomic level.

The empirical results which were obtained by Solow (which actually attracted very much attention among policy makers: remember the "Sputnik effect" on expenditures into education and research) indicated already the need for future research. Solow showed that growth of income per head was primarily due to the growth of knowledge, was due to shifts in the production function.

So the research agenda was set to explain the growth of knowledge. But at the core of neoclassical economics is the universal validity of the law of diminishing returns. It would also apply to "capital" as a production factor: capital in its physical form, as human capital or as a stock of a past flow of research and development. But it is a mathematical fact that diminishing returns to the entire stock of capital yields the Solovian world of a "natural rate of growth" which cannot be surpassed in the long run. So growth theory did not seem to be able to explain long run differences in growth rates of income per head. Yet the cross country comparison of growth rates seems to indicate that such persistent differences in growth exist.

There were attempts to endogenise the long run rate of growth. But neo-classicism made it difficult to cut through the Gordian knot: people preferred to stick to the law of diminishing returns. It takes a fresh look at things, it takes a young mind, a courage to abandon old beliefs if you successfully jump over such an impressive hurdle like the law diminishing returns. It was Paul Romer who did this in his Ph-D- thesis written at the University of Chicago, but really prepared in a town far away from MIT and Chicago, where Paul spent a year between his graduate work at MIT and his graduate work in Chicago.

On this early masterpiece he then built many refinements and improvements which appeared in the Journal of Political Economy and the American Economic Review as well as in other publications. The central ideas are 1. increasing returns to scale even at the macroeconomic level due to the "public good" properties of knowledge and 2. the inexhaustibility of the pool of as yet undiscovered knowledge. So we have today what has come to be called "new growth theory"; a growth theory, in way, "liberated" from the law of diminishing returns.

Today – not the least due to Paul Romer's work – we try to explain the long run rate of growth. We want to have a social, institutional explanation of growth. This project has by no means been finished. Perhaps it will never be finished. But it connects up with the work of great economists of the past, like Adam Smith or Alfred Marshall, John Maynard Keynes, Werner Sombart, Joseph Schumpeter, Gunnar Myrdal or Nicholas Kaldor; and with great sociologists of the past like Charles-Louis de Montesquieu, Herbert Spencer or Max Weber. It so happens that today, on 31 October, the Protestant part of Germany celebrates the Reformation Day, remembering Luther's fixing of 95 theses at the gate of the Wittenberg church in 1517. Max Weber explained growth by religious beliefs. According to him the stimulus of growth due to the capitalist mode of production could be explained by the "protestant spirit". We have as yet to wait for a mathematical model of the Weber thesis. Nevertheless progress has been made in the social explanation of growth. Thank you Paul Romer for your remarkable part in this advance in knowledge.