

Università LUISS Guido Carli

Dottorato di Ricerca in Economics

XXIII Ciclo

Summary

Tesi di Dottorato

**Relationship Between *R&D* Spending and
Education Level in the Economy**

Candidato

dott.ssa Ilaria Fabbri

Relatore

prof. Pietro Reichlin

24th of February 2012

Relationship Between *R&D* Spending and Education Level in the Economy

Ilaria Fabbri

24th of February 2012

Summary

Introduction and Motivation

This work investigates the relationship between *R&D* expenditure, and the education level in the economy. Looking at the empirical data it is shown that the growth rate of education is positive to *R&D* expenditure and that the higher schooling level, the greater *R&D* expenditure is. Consequently, the higher *R&D* investments, the more efficient research and the higher patents production are. Technological advancements determine the efficiency of a new stock of equipment goods, and they are the key driver of business cycles. So, what's the best way to stimulate investments in *R&D*, and how an *R&D* development affects economic growth?

To this scope, I have built a DSGE model with endogenous growth. Simulation results demonstrate a high correlation between *R&D* investments, and a knowledge rate increase, in response to an investment-specific technological shock. The shock considered is temporary, but it shows a high persistence even in a long term. The simulation exercise is repeated twice, first time the shock is over the equipment investment variable, second time it concerns the schooling-education variable.

In the model, economic growth depends on innovation efficiency, and not on how many people work in the *R&D*-equipment production sector. That efficiency is supported by an increase in the schooling-education growth rate. Finally, the economic growth process is slow because of delays in the diffusion of new technologies, it is a *slow adoption process*.

The work is organized as follows. Chapter 1 reviews the growth literature, using the standard neoclassical growth model as a point of departure, and focusing on the research that has developed regarding the intersection

of endogenous growth, and investment-specific technological change in the business cycle. It explores the relationship among four variables. On one hand, economic growth and capital accumulation, and on the other hand it treats strategic complementarities between knowledge and *R&D*, or better between schooling-education growth rate and technological shocks.

Chapter 2 supplies an empirical analysis focused on *R&D* data spending within the European Union (UE) in comparison with the rest of the world.

Chapter 3 builds a dynamic stochastic general equilibrium model (DSGE) of endogenous growth. I calibrate, and simulate, the model in order to analyze how the investment-specific technological shock affects the economy.

The main mathematical computations are provided in Appendix A.

This thesis basically, takes inspiration from these papers: the RBC model built in Greenwood Hercowitz and Krusell (1998), which was the first to suggest that investment-specific technological shocks could be an alternative to neutral technology shocks as a source of economic growth; and from the knowledge-based growth model as built in Romer (1990) and in Jones (1995), where it is asserted that the stock of knowledge determines the development of the economy.

Conclusion

The analysis in this work suggests that investment-specific technological changes may trigger innovative investments and be a persistent source of economic fluctuations. The present model considers two types of labor and divides capital stock into structures and equipment capital. Hence, we can demonstrate that only one kind of labor increases (the equipment production sector's labor), and in the same way that there is only one capital extension (the equipment capital). It is important to highlight that since the model considers an investment-specific technological shock, and not a TFP shock, current output is only indirectly affected by the shock. The model's simulation results demonstrate that a good way to entice investments in *R&D* can be a positive shock over the schooling-education variable. Hence, it is not how many people devote their time to working in the equipment goods production sector, which determine the rate of economic growth. But it is, rather, an increase in the efficiency of the equipment goods, as demonstrated in the empirical data.