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How Regions Grow: Trends and Analysis

ANNEX C

Summary of Neoclassical and Endogenous Growth Models

Table C.1. **Summary table: growth theories**

Neo-classical growth models		
Model	Assumptions/Premises	Prediction
Ramsey (1928)	• Homogenous goods • Constant preferences and population • Innovation is reflected in wealth accumulation	Utility function that determines savings and wealth accumulation
Solow (1956) and Swan (1956)	• Diminishing returns to capital and labour • Constant return to scale productions function • Constant savings rate	Convergence of countries depending on their steady-state level which in turn is conditional on savings, population growth and the production function. Diminishing returns to capital imply that in the absence of technological change, growth would stop. As empirically long-run growth does not stop, technological progress was assumed to be exogenous.
Cass (1965) and Koopmans (1965)	• Saving rate is endogenously determined. • Constant returns to scale • No external sector • Homogeneous outputs and factors • Diminishing marginal rate of substitution • Positive marginal productivities • Population and labour grow constantly and are exogenous.	Absolute convergence. If all countries have the same steady-state income path, then differences in initial income will represent different positions with respect to the common steady-state, and hence the faster the growth rate.

Table C.1. **Summary table: growth theories** *(cont.)*

Neo-classical growth models		
Endogenous Growth Models		
Model	**Assumptions/Premises**	**Prediction**
Arrow (1962) and Sheshinski (1967)	• Differences in types of capital (new capital being preferred to old one) • Constant returns to scale • Learning, a process of acquiring knowledge is endogenous to the model • Only one capital-labour ratio is optimum • Learning only takes place in the capital sector, no learning occurs once the capital good is created and is being used. • Learning is a by-product of production instead of a product of a learning system (based on universities for instance) • Knowledge is non-rival.	Discoveries immediately spillover to the entire economy as knowledge is non-rival
Romer (1986) Lucas (1988)	• Knowledge is an input of production • Knowledge displays increasing marginal productivity • Increasing returns to scale • Decreasing returns in the production of new knowledge • Knowledge produces externalities.	Competitive assumptions can be maintained and determines an equilibrium rate of technological progress but the growth rate is not Pareto optimal. At the end, growth and knowledge can increase boundlessly. No convergence is predicted.
Romer (1987, 1990) Aghion and Howitt (1992)	• Imperfect competition • Technological change arises from intentional decisions from profit-maximising agents. • Technology is a non-rival partially excludable good.	R&D activities reward firms through monopolistic power. The equilibrium is not Pareto optimal, but rather one with monopolistic competition. The stock of human capital determines growth, but too little human capital will be devoted to R&D. Also, integration into world markets increases growth rates, and large populations are not sufficient to generate growth.