

# [Augmented solow growth model](https://assignbuster.com/augmented-solow-growth-model/)

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The augmented Solow model was proposed by Mankiw, Rower and Weil (MRW) in their treatise “ A Contribution to the empirics of Economic Growth”. To better explain the variation in living standards across regions, they propose a model that adds human capital accounting for the fact that labor across different economies can possess different levels of education. To test this model, a proxy variable in the form of human capital accumulation is added as an explanatory variable in the cross-country regression. MRW find that human capital accumulation is directly correlated with savings and population growth and the inclusion of human capital lowers the impact of savings and population. MRW claim that by testing the data, they find that this model accounts for 80% of the cross country income variance [cross–section regression of the 1985 level of output per worker for 98 countries producing an R² of 0. 78 ]

The model also predicts that poor countries are likely to have higher returns to human capital. The incorporation of human capital has the ability to tweak the theoretical modeling and the empirical analysis of economic growth. The theoretical impact will be based on the restructuring of growth process ideology. MRW quote Lucas (1988) stating that although there exist decreasing returns to physical capital accumulation when human capital is held constant, the returns to all reproducible capital (human and physical) are constant. The empirical analysis will be altered as human capital will be included as a variable in the regression to explain differences in economic growth.

Adding human capital to the production function, the augmented Solow equation becomes

Y(t) = K(t) ∂H(t) β(A(t) L(t))1−∂− β

(human capital H, physical capital K, labor L and knowledge or technology ): One significant assumption here is that human capital depreciates at the same rate as physical capital as its production function is considered similar to the function for physical capital. Furthermore MRW assume that 50 to 70% of the total labor income is dependent on the return to human capital. MRW use their model to determine the income as a fraction of the variables investment in physical capital, rate of population growth and the level of human capital. The authors argue that since human capital is positively correlated with the savings rate and negatively correlated with population growth, omitting human capital will bias these variables. MRW conclude that by adding human capital accumulation to the Solow Model tends to make it more robust eliminating a large part of the residual variance.

In order to simplify the model, MRW restrict their focus on human capital investment with relations to education only, thereby ignoring investment in health and other factors influencing human capital. This simplification proves to be reductionist in nature thereby omitting significant determinants of human capital. Furthermore they are unable to account for forgone labor earnings as a part of the cost of education. The estimation of investment in education is difficult in itself as both families and governments allocate expenditure for it. Finally as identified by MRW, all forms of education are not meant for productive purposes with subjects such as philosophy and literature amongst others. Lastly depreciating human capital at the same rate as that of physical capital seems like an unreasonable assumption.

The theoretical framework proposed by MRW has been challenged by Hamilton and Monteagudo who claim that the investment in human capital has no correlation with the changes in growth rates. They believe that the role of human capital accumulation has been exaggerated maintaining that investment in physical capital is primary determinant of economic growth. Hamilton and Monteagudo have described the augmented solow growth model. The authors establish a linearity trend against the economy’s steady-state path and the logarithm of output. The relationship, which is depicted by the slope of the trend, is exogenously determined by the technical progress rate. Furthermore the intercept reflects population growth rate and output shares allocated to investment in human and physical capital.

In their own analysis, the authors find major discrepancy with MRW’s results. Their research depicts that investment in human capital has no correlation with changes in growth rates over time. The proxy for human capital investment provides contrasting results as an increase in human capital investment results in slower instead of faster economic growth. While examining the relationship between the change in output growth and variation of educational commitment the authors get the same result.

A concern realized by the authors was the possibility that the impact of educational investment might require a longer time to materialize into economic growth. To verify this concern the authors compared economic growth during the period of 1975 – 1985 with the educational investment of 1965. The regression was run on 62 of the original 98 countries but the result remained the same. In contrast their analysis provided that investment in physical capital was significant for economic growth, dominating any the other variables, especially human capital.

The dissertation provided by Hamilton and Monteagudo seems to comply with the assertion we have made throughout our paper, i. e. human capital investment is not important for economic growth. Erich Gundlach has also criticized the empirical analysis of MRW questioning their cross-country analysis as being solely motivated by the availability of cross country measures of output and investment in international datasets One limitation is the possibility of the usage of differing proxies across different regions resulting in inaccurate comparison.

For example data collection is poorer in third world countries and the availability of a wide set of benchmarks might be difficult. Klenow and Rodriguez-Clare provide counter-evidence to MRW by employing accounting techniques to prove that the difference in technology rather than the difference in output ratio is the primary determinant of the economic growth. While comparing the two, Gundlach believes that the approach adopted by KRC provides a better depiction of the estimation of the Solow model. He argues that factor accumulation and technology are better determinants of growth as provided by the original solow model.