

Age, technology adoption, and the agricultural productivity in the era of Agriculture 4.0

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Abstract

Agriculture 4.0 is a current agenda for both developed and developing countries as its benefits to increase the agricultural productivity are inevitable. The need to feed the world has become an important issue in the global scene and the world must increase the food production more than 70% by 2050 (De Clerck et al., 2018). Therefore, food security is now considered as a part of national security. It is also noteworthy to mention that the negative impact of climate change on agriculture is under debate; first, severe reduction in agricultural productivity due to temperature increases, heat waves, droughts, unusual climate conditions may occur in near future. Second, natural resources have been becoming more scarce than ever due to climate change, therefore conventional usage of water, soil can be stressed as agricultural inputs. Thirdly, the conventional agriculture has been criticized to pollute the environment due to use of chemical substances and contributing to Greenhouse Gas releases (in animal husbandry); new developments in production must be integrated to sustain the reduction in pollution. To overcome these negative impacts of climate change on agriculture and increase productivity, Agriculture 4.0 offers solution while applying digitalization in the production process.

As is well known, neoclassical approach to production function takes capital, labour, natural resources, and entrepreneurs as the factors of production. In addition to debates regarding quality of factors not being taken into account and technology as being an exogenous factor, demographic characteristics of entrepreneur are also missing in the related literature. However, there is a long debate on the effect of farmer's age on the productivity in the agricultural production processes through several channels such as physical capital investment decisions and attitude towards innovations in agricultural technologies. It is argued that aging of the formers leads to a significant decline in the productivity because as farmers get older they become more conservative, lose their physical capacity, and become more reluctant to the application of new technologies (Tauer, 1984, 1995; Corner-Thomas, 2015). Moreover, studies show that younger farmers can highly contribute to economic performance and sustainability (Zagata and Sutherland, 2015; Brennan et al., 2016).

Since Agriculture 4.0 is the future of feeding the world and agricultural sector, and young farmers show higher capabilities in the adoption of new technologies this study aims to show the impact of age in technology adoption and agricultural productivity. Therefore, we utilize an extended version of the Cobb Douglas Production Function. Along with physical capital and labour, we add farmer as the entrepreneur weighted with an age factor. Furthermore, in different versions of the production function we incorporate several other variables such as usage of fertilizers, agricultural subsidies, and expenditure on research and development in order to control the effects of these factors.

In the second stage, on the basis of theoretical and empirical constructs we drive an estimable regression function from the extended production function. Incorporating the countries and time period for which data is available we set up a panel data model. By doing so, we investigate the effect of aging on agricultural productivity and examine country specific and time specific deviations. Empirical findings are expected to provide policy implications and suggestions for future agricultural policy design.

Keywords

Farmer age, Agriculture 4.0, Technological Adoption, Productivity

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Presenter Profiles

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