An artificial recurrent neural network experiment on the future of digital innovation and sustainable economic development in the OECD

Short Abstract— The debate on what factors matter for sustaining economic development has been on for many decades. Although there have been disruptions in the technology space, such disruptions do not necessarily inform economic development. It is therefore imperative to examine factors affecting economic development, particularly in light of recovery from losses brought about by the COVID-19 pandemic. This study conducts machine and deep learning experiments to examine how digital innovation can inform economic development going forward. Data used includes 37 members of the organization for economic co-operation and development (OECD) from 1990 to 2019. OECD members are global leaders in digital innovation and technology, hence, the choice of this economic and trade bloc. With sufficient historical data on economic growth, capital investments and labour force, in-depth forecasting and analysis are conducted using a range of techniques. While an artificial recurrent neural network experiment is conducted, results are compared with linear and polynomial linear regressions, as well as the prophet model.

I. INTRODUCTION

Technological innovation has been a strong contributor to development hypothesis as proposed in Schumpeter's endogenous growth model. This development hypothesis explains how economic development is advanced by creative disruptions and innovations. This goes past the financial development component portrayed by Solow's hypothesis of exogenous innovative advancement. Endogenous development hypotheses further demonstrate that a solid causal relationship exists between mechanical advancement and financial development [1] [2]. With the drive for the role of digital innovation in improving economic development from the theoretical standpoint, several empirical assessments have been conducted in the literature.

Digital innovation can empower better joint effort inside and between groups, providing more customized methods of client commitment, higher representative development and efficiency, and more exact bits of knowledge from information, all of which assist a business with developing and gives it a superior possibility of flourishing. Hence, a technique to change to an advanced business model, both for small to medium to large firms has potentials for boosting the economy at large. With such increased technical changes, firms need to make a computerized advancement system to remain profitable. Updating the systems in an innovative manner will boost their contribution to the national economy.

The relevance of digital innovation for firms [3], tourism industry [4], and entrepreneurial advancement [5] has been examined in the literature. The debate on its impact, however, demonstrates a need to critically examine its impact at a national level. Thus, the aim of this study is to demonstrate that innovative advancement is a major wellspring of economic development. At its center, computerized advancement is the utilization of computerized innovation and applications to improve existing business cycles and labor force effectiveness, upgrade client experience, and dispatch new items or plans of action.

II. RESEARCH QUESTIONS

A. *Does increased digital innovations improve economic development in OECD?*

Alongside other factors that explains economic development, this study seeks to examine whether the adoption of a machine and deep learning model suggest that a change in digital innovation will lead to economic development.

B. Post-COVID-19, will economic development be sustainable?

With the construction and testing of a variety of machine learning models, this study examines the future of economic development using historical data.

III. METHODS

An artificial recurrent neural network experiment is first constructed and tested, and results from other models such as linear regression, polynomial linear regressions and the prophet model are compared.

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