Title of the contribution:
Advancement of Cloud Computing Use and its Impact on Macroeconomics in Japan

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Abstract:
The market for cloud computing is expected to rapidly expand and change the nature of ICT across all sectors; cloud computing transforms ICT from a tool dependent upon investment and physical ownership to one that can easily make use of outside resources.

For the purpose of this research, the advance of cloud computing use and its impact on Japanese macroeconomics were estimated and analyzed utilizing a DSGE (Dynamic Stochastic General Equilibrium) model-based simulation.

DSGE is a sophisticated simulation tool employed to describe how macroeconomic variables collectively evolve over time by modeling the theory of microeconomics, and has been used primarily in monetary and fiscal policy by academic researchers and policy makers, such as governments, central banks and international organizations. If evaluating the contributions of the cloud computing diffusion to GDP and productivity is the only objectives, an ordinary production function approach can be employed. However, a DSGE approach can measure not only GDP and productivity but also its influence on the total economy, including the impacts on households and the labor market. Also, the majority of researches on DSGE are on monetary and fiscal policies and the number of researches that DSGE is applied to other areas, such as ICT, is small and limited.

In 2009 Dr. Federico Etro, using DSGE, empirically demonstrated that the diffusion of cloud computing has a positive contribution to GDP, employment and business creation in EU countries. His model can be summarized as follows: (1) Cloud computing reduces the ICT initial fixed costs of entry and production of all firms in all sectors, turning part of those fixed costs into variable costs; (2) The lowered barriers to entry result in an increase to the number of market entrants; (3) Competition in each market is enhanced and tends to reduce markups; and (4) As a GPT (General Purpose Technology), cloud computing does not directly augment TFP (Total Factor Productivity); however, there occurs gradual ICT capital accumulation over time.

In this research, based mainly on Etro's DSGE model, the impact of the advancement of cloud computing use on Japanese macroeconomics is estimated. The main objectives of the research, rather than to ascertain its exact GDP growth rate contribution, are (1) To determine whether there is a (realistic) sustainable growth path of macroeconomic variables in Japan's case, under the certain conditions where the shock of the advancement of cloud computing use exists and (2) To illustrate the dynamic interaction of the macroeconomic variables. However, in order to more accurately reflect the behavior of cloud computing penetration in Japan, several modifications were made to Etro's approach, including: (1) A model that incorporates the effect of ICT capital and the effect of nature of stickiness (persistency) of ICT investment was built, assuming an endogenous market structure; (2) With this model, a DSGE simulation was conducted on a system comprised of a single sector of cloud computing; (3) Then the impact of the advancement of cloud computing use on Japanese macroeconomics was estimated based on the relationship between the system and whole Japanese economy; and (4) In order to calibrate the simulation's parameters and estimate the relationship between the system and whole Japanese economy, Japan's latest published macroeconomic statistics and a web-survey's results were used. The web-survey was conducted in March 2014 with 1,527 valid responses, targeting businesspeople in Japan who have a position at their firms that involves screening and/or making final decisions on ICT investments, which include internal ICT system, network infrastructure, servers, and information securities.

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