

## 論文の内容の要旨

論文題目 Crisis, growth and heterogeneities of firms in economic systems:  
agent-based simulations and empirical evidence

(経済システムにおける危機、成長と企業の異質性：エージェントベース  
シミュレーション及び実証研究)

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Traditional macroeconomic models usually adopt a representative agent framework for the sake of simplicity and thus neglect the heterogeneity of firms. However, various researches on statistical physics and complex systems have shown that systems composed of heterogeneous particles or agents could have very different macroscopic properties from the ones composed of homogeneous particles or agents.

In this thesis, through the establishments, numerical simulations and analyses of a series of stylized macroeconomic agent-based models with the consideration of firm heterogeneities, it is found that these computational studies can indeed provide some unique insights into understanding the macroeconomic implications of the firm heterogeneity. In fact, the appearance of complex phenomena in a real economic system can be mapped into several phase diagrams with clear boundaries. Consequently, the economic crises and growth can be understood as the critical phenomena and phase transitions in statistical physics, which cannot be captured by traditional macroeconomic general equilibrium models.

According to the methodology of this new theory on macroeconomy, this thesis contributes to the research on economic growth and crisis by three aspects:

- (1) How the strong heterogeneity of firms' profitability can invalidate loose monetary policies, which are popular in many countries since the 2008 financial crisis and are intended to re-stimulate the economy. Furthermore, this thesis proposes that excessive liquidity in an economy may increase the financial fragility and lead to severe economic crisis.
- (2) How the heterogeneity in firms' productivity drives technology cycles, during which both "creative destruction" and active R&D play the roles so that the economy can reach its full potential to achieve total factor productivity growth. This thesis also suggests that the implementation of industrial policies and patent laws should consider the structure of industries in an economy. Otherwise, they could destabilize the economy and slow down the productivity growth.
- (3) With the heterogeneity in the demand functions of products or services, multi-equilibrium will emerge in the economic system. The introduction of non-linear demand functions provides a new approach to understand the industry dynamics and the different outcomes of firm size distributions in sectors with different characteristics of the products or services.