Structure and Macroeconomic Performance:
Heterogeneous Firms and Financial Fragility*

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Summary. In this paper we adopt a new macrodynamic tool, i.e. a system of non-linear difference equations describing the evolution over time of the first and second moments of the distribution of firms' degrees of financial robustness captured by the ratio of the equity base to the capital stock - the equity ratio for short - which affects supply and capital accumulation decisions. For particular configurations of parameters the dynamic patterns of the average equity ratio and the variance generate irregular and asymmetric time series in which growth and fluctuations are jointly determined (fluctuating growth).

4.1 Introduction

According to the mainstream view, fluctuations are the equilibrium adjustment process which follows a shock; therefore, they have to be analyzed using the impulse-propagation approach. This view has been recently criticized as ad-shockery (Cochrane, 1991; Zarnowitz, 1998). Moreover, it is very difficult for the theory to explain well known stylized facts concerning the business cycle such as persistence, asymmetry and the occurrence of large fluctuations due to small shocks. One candidate for explaining those puzzles is the role of financial factors in business fluctuations, which in turn is rooted in the notion of asymmetric information (Greenwald and Stiglitz, 1988, 1990, 1993; Bernanke and Gertler, 1989, 1990; Bernanke et al., 1994, 1998; Kiyotaki and Moore, 1997).

The notion of asymmetric information of the New Keynesian Economics (Mankiw and Romer, 1991), in turn, is inconsistent with the representative agent hypothesis (Stiglitz, 1992). In fact, asymmetric information is relevant

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inasmuch as agents are different from one another: it is only in this context that phenomena such as adverse selection or moral hazard may exist. Moreover, empirical evidence at the microeconomic level suggests that heterogeneity matters and aggregation of heterogeneous agents is of central relevance in macroeconomic modelling, since there is systematic evidence of individual differences in economic behavior (Stoker, 1993). Several contributions show that aggregate dynamics and individual heterogeneity are intertwined, because neglecting individual heterogeneity in aggregate equations generates spurious evidence of dynamic structure (Lippi and Forni, 1996).

According to us, therefore, a consistent theory of the business cycle has to take agents' heterogeneity seriously: the evolution over time of the distribution of heterogeneous agents must be the cornerstone of business cycle theory.

In this paper, therefore, we build a simple model of production and investment of financially constrained heterogeneous firms in an uncertain environment with capital market imperfections due to asymmetric information. Each firm is characterized by the degree of financial fragility, inversely related to the ratio of the equity base or net worth to the capital stock the equity ratio for short which affects supply and investment decisions. The links among financial conditions, supply and capital accumulation are explained in section 3. The dynamics of the macrovariables which describe the business cycle (such as the rate of change of the aggregate capital stock) are determined by the evolution over time of the entire distribution of firms according to their degree of financial fragility. In particular, in section 4 we derive the laws of motion of the mean and the variance of the distribution of firms' equity ratio. In section 5 we explore the properties of the two-dimensional nonlinear map which describes the dynamics of the first and second moments of the distribution. For particular (but not implausible) configurations of parameters, the dynamic patterns of the mean and the variance of the distribution of firms' equity ratio generate irregular and asymmetric time series in which growth and fluctuations are jointly endogenously determined (fluctuating growth).

4.2 Background Assumptions

We model a closed economy without a public sector. In order to simplify the argument, we assume that firms carry on production in a competitive environment by means of a linear technology (uniform across firms) which uses only capital as an input\(^3\). In particular we distinguish between "hard capital", i.e. machinery and equipment, which is a fixed factor of production in the short run and becomes variable only in the long run by means of investment activity, and "soft capital", i.e. circulating capital such as inventories, maintenance

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\(^3\) Greenwald and Stiglitz (1993), on the contrary, assume that the only factor of production is labour.