Schumpeter’s models of competition and evolution

Taking status on a doctoral dissertation for DIMETIC session 1

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Introduction

Throughout the various works of Joseph Schumpeter there are at least two different but related models of competition. In his earlier writings (e.g Schumpeter (1934)) novelty is introduced into the economic system by new firms while incumbent firms only change in order to adapt to the new competitive environment. This model of competition is also known as the Mark I model and is distinguishable by its focus on entrepreneurial activity as the source of innovation.

In Schumpeter’s later works (e.g. Schumpeter (1950)), on the other hand, he modelled incumbent firms as including R&D divisions capable of producing innovations, while he assumed more or less explicitly that economies of scale and barriers to entry had marginalized the role of entrepreneurial innovation. This model is also referred to as his Mark II model.

Common for these models is that they describe a process of Schumpeterian competition, that is, a set of population dynamics in which there are mechanisms for generating innovative routines, for selection among these routines and for retaining superior routines.

The positive aspect of the doctoral dissertation concerns the quantification of the mechanisms of Schumpeterian competition and the econometric testing of its role in Schumpeter’s grander schema of waveform evolution.

The normative aspect of the doctoral dissertation concerns the relationship between the evolution of policy relevant aspects of society on the one hand versus Schumpeterian competition on the other. A main thesis for the normative part of the dissertation is that orthodox ideas of what constitutes a “healthy” organisation of industry need to be revised. The simplest example is that of perfect competition, which from an orthodox point of view leads to socially optimal prices and quantities, while it from a Schumpeterian perspective is an indication of a “dead” industry - an industry that has stopped evolving.

Structure and Approach

The objective of the dissertation is to provide a link between the the routines employed by firms at the micro level and the evolution of macro level variables. As such, it has a strong focus on developing the necessary methodology. But, as indicated above, the dissertation will not be a series of methodological discussions. The goal is to apply the analysis of economic evolution in problem oriented research as well.

The dissertation is written as a series of papers. Three papers will reflect the progression of the research programme. These will be presented in turn on the following pages. A further three papers are planned for linking the research programme to the scientific community and these will be presented below.

A One of the latter three papers will be a formal literature review. This does not mean that the research project itself will be undertaken before the relevant literature is studied; only that the formal literature review will

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1 This may sound a bit vague. As an example, take the use of temporary employment contracts. At the firm level the use of such contracts reflects the routines employed in the development and maintenance of human resources. Changes in the use of temporary contracts at the national level will be closely related to the role of human resources in competition among firms; and the institutional setting for this competition may be affected by policy makers.
not be written up before all of the various levels of the research programme have been explored.

B As a fortunate coincidence my PhD period coincides with my supervisors presidency of the International Schumpeter Society (ISS), the ISS Conference in Aalborg in 2010 and the publication of two books on Schumpeter and Schumpeterian economics by my supervisor. A second short paper will therefore be a contribution to the ISS; it will possibly be structured as a comment on the forthcoming books by my supervisor.

C The possibility of a third paper is included in order to make room for collaborative work. It is not of crucial importance that this paper is written, but if the possibility for collaborative work presents itself it should be exploited.

It is not necessary that the three papers A-C are made. It is, though, highly anticipated that they will be made, as each of them contribute uniquely to the overall PhD process.

The remaining three papers; i.e. those reflecting the progress of the research programme, can be summarised as follows:

1. The first paper is methodologically driven. It focusses on applying tools from the study of biological evolution to describing the relationship between firms, competition between them and macroeconomic change. This paper is well under way.

2. The second paper driven by theory. It explores the concept of routines and discuss the degree to which the evolution of firm-level routines can be captured by an evolving macroeconomic variable, cf. footnote 1.

3. The third paper will employ the insight into theory and methodology developed in the first two papers to study macroeconomic evolution. It will in a sense be driven by data, as it is the availability of data that will determine the exact form of the analyses.

The following three sections will describe the papers 1-3 in more detail.

1 The first paper

In the field of biology statistical tools are employed to describe the evolution of characteristics of species. These statistical tools can be employed in population analysis in the social sciences without suggesting any further analogies with biology, other than noticing that in the competition for resources there are winners as well as losers in both fields of science. These statistical tools rely on the delimitation of populations of competing units. By describing society as a population of competing firms the tools may be employed for studying how the society evolves over time.

The first paper of the dissertation focusses on exploring the possibilities of these statistical tools, in particular the technique known as Price’s equation for

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2The focus here is on Price’s equation but another good example is the use of Lotka-Volterra systems of equations; also known as predator-prey models in game theory.
decomposing changes in a weighted mean into a number of underlying mechanisms. The applicability of Price’s equation to problems outside of biology has been pointed out by several researchers including George Price himself. A multitude of references are employed in this first paper but the primary source is Andersen (2004). Price’s equation decomposes evolution into an intra-firm innovation effect, an inter-firm selection effect and an the effects of entering and exiting firms respectively. By interpreting these effects as the mechanisms of Schumpeterian competition, Price’s equation allows for an empirical application of Schumpeter’s models of evolution.

An important thing to remember when mapping the industrial dynamics underlying evolution is that without a theory of why evolution has progressed as it has, the research does not contribute much to the field. A falsifiable hypothesis is need (Winter, 1987). E.g. It is possible to show that the share of workers with third level education has been and still is increasing and that the rate of increase varies across industries and time. But without a theory of why this has happened, we do not have a theory of (economic) evolution.

To simplify the requirements to the underlying theory the first paper has focussed on the firm level characteristic “labour productivity”. It does not require lengthy arguments to substantiate that high values for this characteristic are indicators of competitive advantage and that, as a consequence, the average value will tend to increase over time. Furthermore, there exists a literature on productivity growth that decomposes the change in aggregate productivity to the micro level by means of a methodology, which may readily be rewritten as Price’s equation. These studies can thereby be reinterpreted as studies of Schumpeterian competition and compared to the analysis of the evolution of populations of Danish firms (see e.g. Foster et al. (1998) for an analysis of the US or Andersson (2006) for an analysis of Sweden).

More details on the first paper are given in subsection 1.1 below. But the methodological deliberations have transgressed the scope of the paper. Price’s equation is closely related to two results from biology known respectively as Fisher’s Fundamental Theorem of Natural Selection and The Secondary Theorem of Natural Selection. These can broadly been summarised in the statement that the rate of change in the mean is positively related to the variance or, more figuratively, variety is the fuel of evolution. Metcalfe (1998) generalises this statement to what he terms Fisher’s Principle: studying the evolution of a variable by studying the moments of the distribution of the variable. Metcalfe develops Fisher’s Principle to also include the third moment about the mean, which is closely relates to the skewness of the distribution. The fourth moment about the mean is closely related to the kurtosis of the distribution and thus describes whether the distribution has fat tails. In this sense, the focus of Dosi (2007) on the size of the tails is also an application of Fisher’s Principle. The possibilities for applying Fisher’s Principle in the dissertation were presented and discussed at an informal seminar at Aalborg University in early 2009.

3It is probably straightforward to show that the neck of the giraffe has slowly grown longer over millennia, but without a theory for why this has happened, we are not much wiser.

4Notice that the mean of a distribution is equal to the first moment about the origin while the variance is equal to the second moment about the mean.
1.1 Entrepreneurs and Economic Selection

The current working title of the first paper is *Entrepreneurs and Economic Selection*. The title is a reference to two of the mechanisms of Schumpeterian competition. The paper is well under way. It was presented at a conference in January, it has been accepted for a conference later in the spring and it has been submitted to a further two conferences in the summer. The following is the most recently used abstract:

This paper explores the possibility for employing the conceptualisation of competition developed by Joseph Schumpeter in empirical analysis. Schumpeterian competition describes the interaction among firms by a number of mechanisms for the introduction of novelty and the selection among this novelty. It is argued in the paper that tools from biological population analysis provides statistical tools for dealing with such evolutionary processes and that these tools have already been applied implicitly in productivity studies.

The results of these productivity studies is discussed and a similar analysis undertaken with Danish data. It is argued that some results are consistent across the various analyses; particularly that the mechanism of economic selection is stronger in manufacturing than in services and that Schumpeter’s Mark I model of competition is a source for conceptualisation of competition in service sectors.

2 The second paper

The objective of the dissertation’s second paper is to provide theoretical support for the interpretation of evolving variables as reflecting the evolution of routines in the population of firms. It is not expected that the paper will be purely theoretical; as far as possible the arguments should be substantiated empirically. Detailed survey data is available for the dissertation work and it is expected that this will suffice for the this paper.

Discussing the nature of the concept of routines is particularly important for two mechanisms of Schumpeterian competition. One is the novelty generating mechanism of incumbent firms: How and why do organisations change? The other is the mechanism of retention: For routines to be the object of selection there must be some inertia to change at the firm level. This is one of the central features of the models of organisational ecology as presented by e.g. Hannan and Freeman (1984). Hannan and Freeman argue that established organisations do not change much. Truly novel organisational forms and routines must be introduced into the population through the creation of new organisations. This is closely in accordance with Schumpeter’s early model of competition, also known as the Mark I model.

A discussion at the periphery of the dissertation’s problem area is the appropriateness of using biological analogies when studying economic evolution. While the dissertation is not intended as a contribution to this discussion it will nevertheless have to touch upon it. The discussion includes such topics as minute analogies to biological concepts, the usefulness of Universal Darwinism.

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3 The four completed waves of the Danish DISKO survey
in economics and requirements to place on an analysis for it to be categorised as evolutionary. (Hodgson and Knudsen, 2006; Buenstorf, 2006; Winter, 1987).

Work on the second paper is expected in the summer of 2009.

3 The third paper

The third paper of the dissertation will present an analysis of economic evolution. As the object is to some degree to illustrate the potential of the approach, the choice of which evolving aspect of society to focus on will not be made until some preparatory econometric research has been undertaken and the literature has been studied.

It is important that the chosen variable plays a role in the competition among firms, and that this role is not constant over time and across industries. Aside from searching the literature for factors that are deemed important for firm survival it will also be necessary to perform econometric analyses using hybrids of cross section and time series models to identify important traits that have varying effects depending on context. It is likely that this work will be left out of the final version of the third paper.

The third paper may be said to be driven by data. By experimenting with the available databases a proxy\(^{6}\) for the routines of firms will be chosen based on how interesting the evolutionary path of the proxy has been. The paper will consist of an analysis of this evolution and contain a discussion linking the chosen proxy to “routines” as described in the literature. It will thus be building on the methodological and theoretical developments of the first two papers.

It is expected that the evolution of the proxy will differ across time and industries and these differences will be explained in terms of regression analysis taking institutional factors as the explanatory variables. The third paper will thus include a normative, policy oriented perspective in that it will estimate the effects of context upon the mechanisms of Schumpeterian competition.

Summing up

To sum up: The PhD dissertation with the working title *Schumpeter’s models of competition and evolution* will consist of three papers. The first of these focusses on methodology and is well under way. The second paper focusses on theory and the outline of the paper is starting to take shape. The third paper is somewhat driven by data and focusses on the relationship between institutions and policy on the one hand and the mechanisms of Schumpeterian competition on the other.

References


\(^{6}\)It may e.g. be the share of workers with third level education, the share of workers on temporary contracts or perhaps the export intensity of sales.


