COMMENT ON DOSI AND FABIANI

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Let me start by congratulating the authors for having written a very stimulating and interesting paper which, because of its preliminary nature, is but a first step along a potentially fruitful line of research. I welcome alternative microfounded approaches to explain the dynamics of growth.

In the paper, the authors develop a large-scale, dynamic, stochastic model based on the evolutionary approach and they show by simulation that the model is capable of producing trend-stationary income series, high positive first-, second- and third-order autocorrelations of the detrended income series, strong evidence of diverging growth for the countries as a whole, for the developing countries and some evidence, although not significant, of convergent growth for developed countries.

My comments can be subdivided into three parts. First, I briefly comment on the structure of the theoretical model. Second, a few remarks will be made on the fit of the model to the stylised facts. Third, I discuss the approach in relationship with alternative approaches and possible extensions of the current work.

C1 The Theoretical Model

The world economy is represented using a large-scale multicountry two-sector model. The simulation experiments are obtained for 55 countries. From the beginning, the reader gets the impression that the insight becomes blurred by an abundance of details and that the main features of the behaviour of the model could be generated without including the details for 55 countries.

The model is dynamic and stochastic. Several features of the model immediately appear. The decision rules or routines are quite simple and mechanic. Feedback mechanisms and learning do not play an important role. Forward-looking behaviour is almost absent despite the fact that uncertainty is an intrinsic part of the model. Much emphasis, possibly too much, is put on the importance of inertia in the system. The rationale for this is adjustment costs, uncertainty, routine. Also, it is not clear which objective economic agents pursue according to the model. Are they striving for survival? Obviously, they are not profit maximisers.

While I am a proponent too of using simple rules and assumptions whenever appropriate, I have some difficulty in accepting some of the assumptions made. Let me give a few examples:
1. A fixed proportion of the labour force employed in R&D is involved in innovation (re)search. Should this proportion not depend on expected opportunities for progress? If, for instance, innovations have been made recently outside the firm it may become profitable to shift additional resources into search for imitation instead of looking for decreasing returns to scale from innovative (re)search.

2. For the exchange rates and for wages, sophisticated adjustment processes are postulated. For prices, a simple mark-up rule is applied. Would it have been difficult to assume that the mark-up factor varies with the market share or some other indicator of market power?

3. The economic system is not constrained in terms of labour supply. This assumption may be reasonable as far as unskilled labour is concerned. Once different types of labour with different skills are introduced in the model, this assumption may no longer be appropriate. Physical capital is absent from the model. With labour being abundantly available and no physical capital being required for production, the economies in the model can enjoy the use of unlimited resources.

4. Assuming that dead firms are replaced by new entrants with average productivity and not allowing for additional entry is not what I understand by Schumpeter’s concept of creative destruction.

These examples illustrate how the model could be enriched and made more realistic in a straightforward way without leaving the world of evolutionary economics.

C2 Fitting Stylised Facts

Next I should like to comment on the extent to which the model fits the stylised facts. In the simulations, the model generates the kinds of patterns which have been found in the data for several countries. In particular, the model generates divergent growth patterns, deterministic trends in income, and high positive serial correlation in detrended income.

When the latter two measures are taken, the model behaves as well as real business cycle models augmented with an exogenous autoregressive process for technology shocks. It would be interesting to investigate whether this model or variants of it and alternative models such as the new growth models behave in a similar fashion when the other overidentifying restrictions are checked against the information in macroeconomic and sectoral time series using an extended econometric analysis. The interesting question then would be which model explains facts that until now were left unexplained.

With respect to the time-series properties of income generated by the
model, I am not convinced that the finding that income is trend-stationary (as opposed to difference-stationarity) is really in line with the current state of our knowledge about dynamic properties of GNP for many countries. The properties of the model could be compared with the empirical evidence for several countries, not just the US. For instance, for eight out of sixteen OECD countries, Schotman and van Dijk (1990) report evidence in favour of a unit root in the log of real GNP for the sample period 1948–1987, whereas for the remaining eight countries the odds ratio of trend stationarity versus difference stationarity is approximately equal to one.

The test of the catching-up hypothesis in section 5 may not yield robust results. The test is applied in a situation where some countries converge, others do not. The test does not account for the effect of the different states to which the countries grow. In this case, as shown by e.g. Bernard and Durlauf (1992), the outcome of the test may be very sensitive to the type of data used.

As the graph in Figure 6.2 is dominated by series for which initial income is an indicator of future success, it is not surprising that the catching-up hypothesis is rejected. It would also be rejected – I guess – in most cases when the tests were applied to subsets of countries. The rich variety of growth pattern (catching up, falling behind, overtaking) promised in the introduction does not emerge in Figure 6.2. In the sample shown in Figure 6.2, while starting from the same per capita income level, some countries grow fast. Others follow for a while and then fall back. With one exception, no country really overtakes the others in terms of income per employed person. The graph does not exhibit convergence within groups of countries. The simulation experiment does not seem to generate the growth patterns found in real-life multicountry data on per capita income which exhibit within-group convergence and inter-group divergence. The findings shown in Figure 6.2 raise questions about the properties of the mechanisms which generate them. At the starting point, all firms are identical and unconstrained in their resources. Why then are some countries successful while other countries are faced with a worsening economic outlook? Could success be mainly determined by the stochastic process which generates the innovations and imitations, combined with an overdose of inertia? If a country experiences technological success at the beginning, its growth may take off, whereas if it gets confronted with technological failures at the start because of factors of inertia such as the absence of forward-looking behaviour and learning, the country gets locked into a path of slow growth, stagnation or decline.
C3 The Approach

Again, I think that analyses such as the present one are extremely useful to get insights into the dynamics of macroeconomic and sectoral data. But one should go beyond what the authors have done in trying to see whether the data allow us to discriminate among rival models, for instance growth models in the new classical tradition and models formulated in the spirit of evolutionary theory. Extensive simulation of these models may help us to understand their behaviour and to see what kind of patterns the outcomes of the simulations have.

Questions such as do the graphs in Figure 6.2 correspond to the mean of the distribution of the response of the model, what does this distribution look like, how robust are the simulation results, what type of equilibria and how many does the model generate, should be addressed. Will per capita income evolve monotonically over time or will it reach turning points? Is it really appropriate to take as a starting point a stationary situation with identical firms when the purpose of the analyses is to study typically nonstationary processes? What generates the nonstationarities? Would the introduction of additional feedback mechanisms modify the outcomes in an important way? Does the model generate obvious opportunities of unexploited profits which could lead to the entry of new firms or expansion of existing firms? Are the stochastic features really endogenous? These are a few of the exciting questions that could be addressed with the model using the technology developed by the authors. I would warmly welcome studies which take up some of these issues.