

Comments on the paper

"Wage Formation, Investment Behavior and Growth Regimes: An Agent-Based Approach"

by M. Napoletano, G. Dosi, G. Fagiolo and A. Roventini

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This paper is part of a series that uses the authors' Keynes+Schumpeter (K+S) model to address both short-run and long-run macroeconomic issues in an agent-based computational economics (ACE) setting. There are two features of the model that I find particularly appealing. First, it deals with the long-run growth consequences of factors which more conventional approaches have regarded as being strictly in the domain of short-run macro theory. In particular, the model is well suited to studying the long-run effects of wage flexibility, a factor that previous writers have taken as affecting only short-run deviations of unemployment from its natural rate. In the K+S model, as in reality, factors that prolong and exacerbate deviations from full employment can impede long-run growth. The paper does a nice job of laying out conditions under which this is more or less likely to happen.

The second aspect of the K+S model that I find appealing is that, like other ACE models, it is capable of dealing with possibly unstable adjustment dynamics that can contribute materially to short-run fluctuations. Unstable adjustment dynamics are ruled out by assumption in the more conventional rational-expectations-equilibrium approach, which assumes the economy is always brought into equilibrium by some unspecified, costless mechanism that uses no time and never fails to converge. By contrast, instability is always a possibility in an ACE model, depending on parameter values, and hence the ACE approach is capable, at least in principle, of shedding light on the circumstances under which, and the extent to which, the economy's adjustment process is likely to affect its macroeconomic performance.

These two aspects are interconnected. A central reason why short-run considerations have long-run consequences is that short-run

deviations from full employment reflect coordination problems. When unemployment rises as an economy enters a recession, there are clearly gains from trade that are going unexploited. In that sense, recessions imply a kind of coordination failure; the economic system is failing to coordinate the beliefs and actions of the various actors within the system. But at the same time, such coordination problems have important long-run consequences, as we have understood at least since Harrod's demonstration that long-run growth can be affected by the difficulty of coordinating firms' investment plans with households' saving decisions. And to deal with these coordination problems for either short-run or long-run analysis, we need a non-equilibrium framework such as ACE.

The central message of the paper is threefold: (1) the functional distribution of income matters for long-run macroeconomic outcomes, (2) wage flexibility can affect these outcomes, but (3) the strength and direction of these effects depend critically on whether investment and production decisions are driven by profitability (the Classical view) or by expectations of aggregate demand (the Keynesian view). In all cases, it seems that low unemployment and stable high growth require an intermediate distribution, with not too large a share going to either labor or capital. But wage flexibility is helpful mainly under the Classical view. These conclusions are all drawn from repeated simulations of the model under alternative parameter values.

The paper does a nice job of explaining its results. I have some quibbles, however, about some of the authors' modeling choices. In particular, their model as presently constituted allows for a very limited subset of all the possible channels through which wage flexibility can affect macroeconomic performance. Thus, the paper has no discussion of the unstable debt-deflation dynamics that could be triggered by excessive flexibility, no zero lower bound on nominal interest rates that might get hit more often if wages were more flexible, no inflation uncertainty that might get exacerbated by more flexibility, and no inflation expectations that could be destabilized if wages were flexible enough. All of these channels tend to make increased wage flexibility a force for worsened macroeconomic performance; all of them have been discussed in the literature at one time or another, going back through Patinkin and Tobin to Keynes and Fisher; and all of them would tend to undermine the particular conclusion reached in the present paper to the effect that wage flexibility generally helps under the Classical view and has little effect on macro performance under the Keynesian view.

Moreover, the channel that is operative in the present model is one whose effects I think are probably overstated. That channel is the one that works through the functional distribution of income - when wages fall in response to unemployment, labor income falls and capital income rises, relative to what they would have been with less flexibility, and this in turn causes a further drop in aggregate demand, and hence in output, because of the assumption that the marginal propensity to consume out of capital income is lower than out of labor income.

Now it may indeed be true that in most countries the MPC out of capital income is less than out of labor income, although I don't know of a paper that has carefully estimated the difference. Nevertheless, I doubt if that difference is anywhere near as large as is assumed in this paper, where capital's MPC is set to zero, and labor's MPC is set to unity.

This is not to say that the paper's main results are wrong. Even though the paper is missing many of the channels through which wage flexibility might impede the restoration of full employment, it could end up with the right overall effect because it exaggerates the one channel that it does include. But errors in opposite directions cancel only by coincidence. I would like to see the authors incorporate these other channels and to attempt a more realistic analysis of the differential MPC channel. This should be quite doable, because one of the virtues of their ACE approach is that there is in principle no limit to how many channels of influence one can consider, since analytical tractability is no impediment to the generation of numerical results.

In summary, the paper makes it clear that the K+S model has a great potential. I look forward to seeing more of that potential realized in the authors' future work.

Reply to Comments

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First of all, we thank very much Peter Howitt for all comments on our paper. They are very insightful and provide a roadmap for future extensions and exercises with the K+S model.

One of the main issues raised by Howitt concerns the channels through which *nominal wage flexibility* can affect macroeconomic performance. Howitt rightly points out that in this model wage flexibility can affect aggregate dynamics only through the *income distribution channel*. We do it on purpose, motivated by the attempt to understand how income distribution can affect the aggregate dynamics of the economy, and in particular its self-recovery capabilities after an adverse shock. More precisely, in our previous work (Dosi *et al.*, 2010), we studied whether in presence of nominal wage flexibility the labor market converges to the full-employment equilibrium. In line with the intuition of Keynes (1936), we found that wage flexibility does not reduce unemployment. In the current work we tested the robustness of the aforementioned result under different income distribution scenarios and different rules of firm investment behavior. We find that nominal wage-flexibility to unemployment is either ineffective or counter-productive in the scenario that is probably the more realistic nowadays, *i.e.* a "demand-led" regime. In turn, this result complements those in Section 2.1 of the paper showing that both the short- and long-run performance of the economy are lower when the income distribution is too unbalanced. Some advanced economies (and the US in particular) have experienced a significant increase in inequality in the recent decades. Our analysis contributes to show that in some circumstances the increase in inequality can yield higher volatility and lower growth, which are not curbed by wage flexibility.

We certainly agree with Howitt that we should explore all the other possible channels through which wage flexibility impact on macroeconomic performance, such as debt-deflation dynamics, zero lower bound on the interest rate, inflation uncertainty, inflation expectations. Indeed, we also conjecture that the presence of these mechanisms is likely to reinforce the adverse effects of income inequality and nominal wage flexibility observed in the demand-led regime, therefore strengthening some of the basic messages of our paper.

Another important point raised by Howitt, relates to the difference in average and marginal propensities to consume (MPC) between workers and capitalists, which in our model is assumed to be very large. Howitt is definitely right in pointing out that this assumption plays a central role in generating most results of the paper. However, our results hold as far as that the marginal propensity to consume of capitalists is lower than that of workers (see Kaldor, 1955, for the original formulation of this argument). In any case, we plan to extend the model allowing for households savings and indebtedness (which indeed played an important role in the recent crisis). Again, we conjecture that by introducing this extension, many of the results of the K+S model about the effects of fiscal, monetary and credit policies (Dosi *et al.*, 2012) will turn out to be reinforced.

References

- Dosi G., G. Fagiolo, M. Napoletano and A. Roventini, 2012. "Income Distribution, Credit and Fiscal Policies in an Agent-Based Keynesian Model." *LEM Papers Series* 2012/03. Laboratory of Economics and Management (LEM), Sant'Anna School of Advanced Studies, Pisa, Italy.
- Dosi G., G. Fagiolo, and A. Roventini., 2010. "Schumpeter Meeting Keynes: A Policy-Friendly Model of Endogenous Growth and Business Cycles." *Journal of Economic Dynamics & Control* 34: 1748–1767.
- Kaldor N., 1955. "Alternative theories of distribution." *The Review of Economic Studies* 23(2), 83–100.

