

The paper builds an agent based model to study the impact of unemployment subsidies on aggregate output and unemployment in a framework with financial market imperfections and firms' leverage. The model developed in the paper has several markets, including a credit market, a deposit market, a market for labor, a consumption goods market. A distinctive feature of the model is that in all the above mentioned markets, prices and quantities are determined out of decentralized matching processes which are described in detail. The paper's main finding is that - under some conditions - unemployment benefits have a stabilizing effect on the economy. More precisely, the unemployment benefits shift down the trade-off between firm leverage and unemployment which characterizes the business cycle dynamics in the model. Moreover, the authors perform a robustness analysis of the foregoing results with respect to the size of unemployment benefits. This analysis confirms that the result about the positive effect of unemployment benefits on fluctuations holds in a wide region of the parameter tuning the size of unemployment benefits. At the same time a level of unemployment benefits that is too high squeezes profits and has a destabilizing effect (rather than a stabilizing one) on the aggregate dynamics of the economy.

I found the paper very interesting. The idea of modeling the matching between supply and demand in many markets simultaneously constitutes an original contribution to the literature. Also the results about the beneficial role of unemployment subsidies are interesting and complementary to previous ones in the literature. Accordingly, I am quite favorable to the publication in the journal. I only have few comments that the authors should take into account in the preparation of the final version of the paper and which I discuss below

Main comments

- The attempt to model the decentralized matching process in many markets simultaneously is one of the main contributions of the papers. At the same time, I also think the authors do not emphasize enough the role played by the structure of the different matching processes in their model. To give some examples which clarify my meaning, the authors model in detail the matching process in the deposit market. However, it is not clear how competition and heterogeneous interest rates among banks in that market should affect the overall business cycles dynamics. Furthermore, at p. 14 the authors provide an interesting discussion of the dynamics underlying business cycles in their model. However, in their discussion they do not provide any intuition about how the characteristics of the matching process in the market for goods and labor may impact on such a dynamics. I think that such discussions should be added to the paper.
- Business cycles in the model are basically determined by the interplay between firm leverage and the dynamics of the wage-profit struggle (see e.g., Goodwin, 1967, Akerlof and Stiglitz, 1969.

An increase in profits expands investment which in turn raises employment and wages. In turn the rise in wages erodes profits and sets the premises for the recessionary phase. This wage struggle will be affected by the rate at which, respectively, wage growth reacts to reductions in unemployment (Eq. 6) and price growth reacts to changes in inventories (Eq. 10). So far, the

assumptions made by the authors imply the same expected growth rate and the same growth rate variance for both wages and prices. In addition, wages and prices reacts to variables that are positively correlated (a reduction in inventories is likely to be associated with a reduction in unemployment and therefore a rise in demand). This has some consequences for the wage-profit dynamics of the model and, in turn, both for the characteristics of business cycles and for the influence of unemployment subsidies. I think the authors could try to perform some additional sensitivity experiments where the parameter α (which determines the expected growth rate of wages and prices) takes a different value for wages and prices. In alternative, the authors could try to make heterogeneous the support of the uniform distribution determining the stochastic growth of prices and wages. Notice that these modifications would introduce in the model different degrees of sluggishness of prices and wages and to see their impact on the overall business cycles dynamics. This would shed more light about the relations between, on the one hand, the structure of the decentralized matching process in the labor and goods markets, and aggregate dynamics on the other hand.

- The role played of the parameter "g" (fraction of public workers), is not clear and should be explained. Also, what are the consequences of rising unemployment subsidies rather than increasing the amount of public workers?
- The results of the model about the role of unemployment subsidies are very complementary to previous ones in the agent-based models. In particular, the finding about the stabilizing role of unemployment subsidies into a regime where investment is profit-driven complements similar ones obtained in the models by Dosi et al (2010, 2012) where investment is driven by expectations about demand. This complementarity could be stressed more in the paper. In addition, the authors could also have a look at the paper of Napoletano et al. (2013), which perform a comparison between profit-led and demand-led regimes and the role of wage flexibility in the two regimes.

Minor comments

-p. 2, references to Challe et al (2012), Holmstrom and Tirole (1998), Woodford (1990), are missing from the references list

-p. 2, seven lines from the bottom of the page: "constrained" instead of "constraint"

-p. 8, beginning of Section 2.3, "In the goods market" instead of "In the credit market".

-p. 9, first line of Section 2.4, "deposit" instead of "depoit"

-p. 10, two lines below Eq. 13. Negative profits should be subtracted from current net-worth. Please check.

-p. 11. In the same page bad debt from a defaulting firm is first measured as $(A_{ft}+B_{ft})/B_{ft}$ and then as $1-(A_{ft}+B_{ft})/B_{ft}$. Please check consistency

-p. 12, beginning of Section 2.6. Expenditure for unemployment subsidies is not counted in the government's current expenditure. Is this correct? If yes the authors should explain that unemployment benefits are entirely financed out of taxes.

- p. 16, 6 lines from the top. "stabilizes" instead of "stabilize" and "despite" instead of "nevertheless"
- p. 16, 7 lines from the top. "loses" instead of "looses"
- p. 17, 4 lines below the figure. "decreases" instead of "decreases"
- p. 21, 7 lines from the top. "heterogenous agents" instead of "heterogegeous agents"
- p. 22, 8 lines from the bottom, "providing" instead of "provinding"

References

- Akerlof, George A., and Joseph E. Stiglitz. "Capital, wages and structural unemployment." *The Economic Journal* 79.314 (1969): 269-281.
- Dosi, Giovanni, Giorgio Fagiolo, and Andrea Roventini. "Schumpeter meeting Keynes: A policy-friendly model of endogenous growth and business cycles." *Journal of Economic Dynamics and Control* 34.9 (2010): 1748-1767.
- Giovanni Dosi & Giorgio Fagiolo & Mauro Napoletano & Andrea 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.
- Goodwin, Richard M. "A growth cycle." *Socialism, capitalism and economic growth* (1967): 54-58.
- Greenwald, Bruce C., and Joseph E. Stiglitz. "Financial market imperfections and business cycles." *The Quarterly Journal of Economics* 108.1 (1993): 77-114.
- Mauro Napoletano & Giovanni Dosi & Giorgio Fagiolo & Andrea Roventini, 2012. "Wage Formation, Investment Behavior and Growth Regimes: An Agent-Based Analysis," *Revue de l'OFCE*, n. 124, pages 235-261.