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Comments on Epidemics in the New Keynesian model by Eichenbaum, Rebelo, and Trabandt”☆

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ABSTRACT

With this paper, Eichenbaum, Rebelo, and Trabandt have made another insightful and influential contribution to the growing literature on the macroeconomics of epidemics. Their papers are paving the way to a new fascinating research program whose objective is to develop empirically plausible macroeconomic models of epidemics. I argued that estimating synthetic COVID shocks in familiar DSGE models provides a good benchmark to evaluate progress toward this goal (Ferroni et al., 2021). Furthermore, evaluating alternative containment measures and how these measures should be deployed (e.g., should containment measures be targeted to the workplaces or somewhere else?) are important matters this research agenda should address. My work with Rottner (Melosi and Rottner, 2020) contributes to developing methods allowing researchers to study contact tracing and testing in macro-epidemiological models of the type studied in Eichenbaum, Rebelo, and Trabandt’s influential works.

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This paper belongs to a very promising research agenda whose focus is to investigate the macroeconomic effects of pandemic crises and to evaluate the effects of containment measures (lockdown, social distancing, testing etc.) through the lens of dynamic stochastic general equilibrium (DSGE) models. Developing structural models that explain the salient facts of the ongoing pandemic crisis is an important step towards improving our understanding of what mix of containment measures and macroeconomic policies can more effectively mitigate the devastating consequences of pandemics.

In this paper, Eichenbaum, Rebelo and Trabandt show how COVID-19 shocks propagate in a stylized New Keynesian DSGE model augmented with a micro-founded epidemic block. They use this model to show that pandemic shocks propagate by affecting the demand for consumption goods and the supply of labor. Furthermore, they show that their stylized model is very promising when it comes to explaining a set of empirical facts that characterized the Pandemic Recession in a few advanced economies.

Eichenbaum, Rebelo, and Trabandt highlight four stylized facts about the Pandemic Recession. First, this recession was much deeper than previous recessions. Second, unlike in other recessions, consumption fell more than GDP and investment during the Pandemic Recession. Third, inflation remained fairly stable during the Pandemic Recession and increased quickly thereafter. Fourth, according to a set of financial stress indices, financial frictions seem to have played a relatively minor role in the Pandemic Recession.

While the macro-epidemiological literature is expanding at a brisk pace and a myriad of new models have been developed, the appropriate yardstick to evaluate the empirical performance of these models is still unclear. The stylized facts

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established in this paper are certainly important progress in this direction. However, these facts only concern the Pandemic Recession and little is known about the long-run consequences of the pandemic.

This point is critical. If the pandemic recession was an abnormal recession, the ensuing recovery was perhaps even more unusual, with a boom in consumption, a shallow recovery in investment, and a rapid surge in inflation. It is hard to know to what extent such anomalies are imputable to the pandemic recession or rather to an unusual combination of fiscal and supply shocks.

In a recent working paper, Ferroni et al. (2021) develop a data-driven procedure to estimate a COVID-19 shock in an empirical Dynamic Stochastic General Equilibrium (DSGE) model. This procedure allows us to isolate the short-run and the longer-run macroeconomic effects of COVID-19 after controlling for the standard business cycle shocks. We construct the pandemic shock as a combination of structural shocks which the model typically uses to explain business cycles, including demand and supply shocks. Moreover, the pandemic shock is assumed to be partly unanticipated (surprise) and partly anticipated (news).

To estimate the combination of model’s shocks defining the pandemic shock, we follow an event-study approach. Specifically, we estimate the weights of those shocks using 2020Q2 data while scaling down the variances of the standard business cycle shocks. We also use the revisions to expectations about GDP growth and inflation in May 2020 from the Survey of Professional Forecasters (SPF) to identify the news received about this synthetic COVID-19 shock. The anticipated structure of the shock is re-estimated in every period.

The proposed approach leverages the rich stochastic structure of empirical DSGE models to estimate the short and longer run macroeconomic effects of the pandemic after controlling for the role played by standard business cycle shocks. The estimated effects of the pandemic can provide a useful empirical benchmark to evaluate competing macro-epidemiological models, such as the one studied in this paper.

Modeling the anticipation structure of pandemic shocks is critical to explain a fifth stylized fact that characterized the Pandemic Recession. Professional forecasters’ expectations about GDP and consumption growth behaved very differently at the trough of the Pandemic Recession when compared to previous recessions. At the trough of the Pandemic Recession (2020Q2), professional forecasters expected that GDP growth and consumption growth would have rebounded already in the following quarter. Such a quick rebound is uncommon to observe in recession, and, as shown in Figs. 1–2, this unusual pattern was not observed at the trough of the Great Recession in the fourth quarter of 2008.

What this means is that agents expected that after the ongoing pandemic wave, the economy would have quickly rebounded as shelter-in-place orders and social distancing measures were relaxed. This peculiar pattern of expectations is an important stylized fact that macro-epidemiological models have to explain. Nevertheless, such an abrupt rebound in expectations about real activity is typically very challenging for existing medium-scale DSGE models to explain. The composite nature of the COVID-19 shock and its anticipation structure allows it to account for this unusual pattern of expectations.

As Eichenbaum, Rebelo, and Trabandt show, the pandemic acts like a simultaneous shock to the demand for consumption goods and the supply of labor. The authors use their calibrated model to study two counterfactuals. In the first counter-
factual, agents become infected only through consumption activities but not by working. In the second counterfactual case, agents can become infected by working but not through consumption activities.

From the first counterfactual, we learn that consumption-based transmission leads to a fall in consumption and a boom in investment. The boom in investment is due to the combined actions of two factors. First, people want to lower consumption to minimize the risk of becoming infected and, later on, want to boost their consumption as the pandemic shock wanes. Second, they wish to keep their hours worked stable at their optimizing levels since they cannot catch the virus by working. The best way to achieve both objectives is to build up capital when the pandemic starts and the risk of catching the virus is rising.

From the second counterfactual we learn that hours worked fall drastically when agents know that they can be infected at their workplaces. At the same time, agents divest heavily to prevent the fall in their labor income from translating into a sizable drop in consumption, which is undesirable from their perspective since they cannot contract the disease by shopping. As a result, consumption falls a bit while investment and hours plummet as the pandemic shock hits.

I see the following takeaways from these two counterfactual exercises. First, as explained by the authors, the labor-transmission triggers a large recession but it cannot explain why consumption fell more than output and investment during the pandemic recession. To match this fact, the second transmission channel of the virus based on consumption is essential. Second, labor-based transmission accounts for the largest chunk of welfare loss in a pandemic.

The latter finding has important normative implications: if containment measures are limited and costly, policymakers should prioritize fighting against the spread of the virus at the workplace. In a recent working paper, Melosi and Rottner (2020) study a particular type of containment measure that can face constraints in its implementation – contact tracing. Our methodology to model contact tracing is general and can be applied to most macro-SIR models, including those studied by Eichenbaum, Rebelo, and Trabandt in this paper and in the other papers they have written on this topic. In our paper, Rottner and I develop a macro-SIR model with asymptomatic transmission and contact tracing, calibrate it to the U.S. data, and show that contact tracing could have been a valuable tool for policymakers to effectively contain the spreading of the virus. Critical to this success is the ability to reconstruct the infection chains of confirmed infected cases, which facilitates the task of quickly detecting spreaders.

Contact tracing is a testing strategy resting on ex-post reconstructing a share of the network of interactions of confirmed infected cases. Formally modeling contact tracing gives rise to arduous computational problems because this testing strategy requires the knowledge of the endogenous network of past interactions established by the confirmed infected cases. The size of this network quickly explodes with the number of past periods used for tracing the contacts of a confirmed case.

Melosi and Rottner (2020) solve this computational problem by modeling the random meetings of a susceptible agent with a given number of infected spreaders as a sequence of Bernoulli trials. We assume that the probability of meeting an asymptomatic spreader in one consumption or labor interaction (one Bernoulli trial) is given by the relative share of consumption and labor of the non-quarantined spreaders. The overall number of meetings (trials) that a susceptible agent

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2 Containment measures are critically constrained in the first few months of a pandemic crisis. Such constraints can be very persistent in those developing countries that cannot afford to build up social-distancing equipment and testing infrastructure at a fast pace.

3 A short non-technical description of the article can be found in Melosi and Rottner (2021).
entertains is an increasing function of how much this agent consumes and works. The probability for an agent to randomly meet with $k$ asymptomatic spreaders when consuming or working is thereby given by a binomial distribution.

Melosi and Rottner (2020) show that modeling random contacts with spreaders as binomial meetings has two important advantages. First, it allows us to provide a statistical micro-foundation of the endogenous risk of getting infected for susceptible agents in the canonical SIR model and in macro-SIR models, such as the one studied by Eichenbaum, Rebelo, and Trabandt. Indeed, it can be shown that when the meeting probabilities are modeled as binomial distributions, the implied (endogenous) probability of becoming infected for a susceptible agent boils down – up to a first order approximation – to be exactly the probability that is assumed by Eichenbaum, Rebelo, and Trabandt in this paper and in other papers they wrote about the COVID-19 crisis. Second, binomial meeting probabilities allow us to break the curse of dimensionality problems which invariably arise when one formally models smart testing. It would be very interesting to apply our methodology to Eichenbaum, Rebelo, and Trabandt’s model to quantify the benefits of prioritizing a specific channel of transmission of the virus (e.g., workplaces) when implementing contact tracing.

With this paper, Eichenbaum, Rebelo, and Trabandt have made another insightful and influential contribution to the growing literature on the macroeconomics of epidemics. Their papers are paving the way to a new fascinating research program whose objective is to develop empirically plausible macroeconomic models of epidemics. I argued that estimating synthetic COVID shocks in familiar DSGE models provides a good benchmark to evaluate progress toward this goal (Ferroni et al., 2021). Furthermore, evaluating alternative containment measures and how these measures should be deployed (e.g., should containment measures be targeted to the workplaces or somewhere else?) are important matters this research agenda should address. My work with Rottner contributes to developing methods allowing researchers to study contact tracing and testing in macro-epidemiological models of the type studied in Eichenbaum, Rebelo, and Trabandt’s influential works.

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