1 Introduction

Fiscal policies that aim to boost consumer spending in recessions have been tried in many countries in recent decades. The nature of these policies has varied widely, perhaps because traditional macroeconomic models have not provided plausible guidance about which policies are likely to be most effective - either in a welfare metric (reducing misery) or a GDP metric (increasing output).

But a new generation of macro models has shown that when microeconomic heterogeneity across consumer circumstances (wealth; income; education) is taken into account, the consequences of an income shock for consumer spending depend on a measurable object: the intertemporal marginal propensity to consume (IMPC) introduced in Auclert, Rognlie, and Straub (2018). The IMPC extends the notion of marginal propensity to consume (MPC) to account for the speed at which households spend. Fortuitously, new sources of microeconomic data, particularly from Scandinavian national registries, have recently allowed the first reasonably credible measurements of the IMPC (Fagereng, Holm, and Natvik (2021)).

This combination of developments makes it possible, really for the first time, to conduct quantitatively credible structural analyses of the likely effectiveness of alternative stimulus policy choices - both in welfare and in GDP terms.

Here, we construct a heterogeneous agent (HA) model calibrated to match both the measured IMPC and a measure of the distribution of liquid assets across consumers. Our main innovation (relative to the existing HA macro literature) is introduced to allow our model to match a substantial body of evidence—from Fagereng, Holm, and Natvik (2021) and elsewhere[1]—that a change in income induces a "disproportionate" change in spending immediately upon receipt. The immediate change is disproportionate in the sense that a benchmark model of optimal nondurable consumption spending cannot match both the measured steep falloff in spending between the period when the income shock arrives and the next period, and the gradual subsequent decline in spending.[2] We capture this fact by assuming that consumers spend a fixed fraction of their labor income each period, which we call the "splurge" factor. This spending occurs regardless of their current wealth and fits with the empirical evidence that even high-liquid-wealth households have high initial MPCs (see Crawley and Kuchler (Forthcoming), and the extensive literature cited therein). By contrast, in a standard one- or two-asset buffer-stock model, high-liquid-wealth households smooth their consumption through transitory shocks and exhibit low MPCs.[3]

The resulting structural model could be used to evaluate a wide variety of consumption stimulus policies. We examine three policies that have been implemented in recent

[1] See Parker, Souleles, Johnson, and McClelland (2013); Ganong and Noel (2019); and Olafsson and Pagel (2018).

[2] A popular (and plausible) explanation for this first-period excess spending is that it may reflect spending on "small durables" rather than pure nondurables (cf. Laibson, Maxted, and Moll (2022)).

[3] The splurge is also consistent with evidence, from Ganong and Noel (2019), that spending drops sharply following the large and predictable drop in income after the exhaustion of unemployment benefits.

recessions in the United States (and elsewhere): an extension of unemployment insurance (UI) benefits, a means-tested stimulus check, and a payroll tax cut. (We assume all these policies are debt financed; see section 2 for details.)

Our first metric of policy effectiveness is "multiplication bang for the buck": For a dollar of spending on a particular policy, how much multiplication is induced? Timing matters because in our model the size of any "consumption multiplier" depends on the economic conditions that prevail when the extra spending occurs. Our strategy to illuminate this point is twofold. First, we calculate the policy-induced spending dynamics in an economy with no multiplier (and, therefore, with no multiplication-bang-for-the-buck). We then follow Krueger, Mitman, and Perri (2016)'s approach to modeling the aggregate demand externality. In this approach, output depends mechanically on the level of consumption relative to steady state. By contrast to Krueger, Mitman, and Perri (2016), the aggregate demand externality in our model is switched on only when the economy is experiencing a recession—there is no multiplication for spending that occurs after our simulated recession is over. A less stark assumption (for example, the degree of multiplication depends on the distance of the economy from its steady state, or the endogenous time-varying multiplication that arises in a New-Keynesian model) would perhaps be more realistic but also much harder to assess clearly.

Because our model's outcomes reflect the behavior of utility-maximizing consumers, we can calculate another, possibly more interesting, measure of the effectiveness of alternative policies: their effect on consumers' welfare. Even without multiplication, a utility-based metric can justify countercyclical policy because the larger idiosyncratic shocks to income that occur during a recession may justify a greater-than-normal degree of social insurance. We call this 'welfare bang for the buck.'

The principal difference between the two metrics is that what matters for the degree of spending multiplication is how much of the policy-induced extra spending occurs during the recession (when the multiplier matters), while effectiveness in the utility metric also depends on who is doing the extra spending (because different recipients have very different marginal utilities).

In the case of the policies compared here, an advantage of the stimulus checks (as we model them) is that they are distributed immediately upon commencement of the recession, at which point the multiplier is fully in force; our model implies that much of the induced extra spending occurs soon enough that it is multiplied. Because "extended" UI payments may be made after the recession is over, a substantial proportion of UI-extension-induced spending will occur when there is no multiplier. However, the fact that UI recipients have a high MPC implies that the *utility* consequences of the UI policy for them will still be considerable, even if their post-recession spending does not get multiplied (section 4).

Because high-MPC consumers have high marginal utility, a standard aggregated welfare function would favor redistribution to such consumers even in the absence of a recession. We are interested in the degree of *extra* motivation for redistributive policies present in a recession, so we construct our social welfare metric specifically to measure only the *incremental* social welfare effect of alternative policies during recessions (beyond whatever redistributional logic might apply during expansions – see section 4.3).

Households do not prepare for recessions (they are "MIT shocks") and double the unemployment rate and the average length of unemployment spells. The end of the recession occurs as a Bernoulli process calibrated for an average recession length of six quarters, leading to a return of the unemployment rate to normal levels over time. When the multiplier is active, any reduction in aggregate consumption below its steady-state level directly reduces aggregate productivity and thus labor income. Hence, any policy stimulating consumption will also boost incomes through this aggregate demand multiplier channel.

Our results are intuitive. In the economy with no recession multiplier, the benefit of a sustained payroll tax cut is small. One reason there is any (welfare) benefit at all, even for people who have not experienced an unemployment spell, is that the heightened risk of unemployment during a recession increases the marginal value of current income because it helps them build extra precautionary reserves to buffer against the extra risk. A second benefit is that, for someone who becomes unemployed some time into the recession, the temporary tax reduction will have allowed them to accumulate a larger buffer to sustain them during unemployment. Finally, in a recession, there are more people who will have experienced a spell of unemployment, and the larger population of beneficiaries means that the consequences of the prior mechanism will be greater. But, quantitatively, all of these effects are small.

When a multiplier exists, the tax cut has more benefits, especially if the recession continues long enough that most of the spending induced by the tax cut happens while the economy is still in recession (and the multiplier still is in force). The typical recession, however, ends long before our "sustained" wage tax cut is reversed—and even longer before lower-MPC consumers have spent down most of their extra after-tax income. Accordingly, even in an economy with a multiplier that is powerful during recessions, much of the wage tax cut's effect on consumption occurs when any multiplier that might have existed in a recession is no longer operative.

Even leaving aside any multiplier effects, the stimulus checks have more value than the wage tax cut, because at least a portion of such checks go to unemployed people who have both high MPCs and high marginal utilities (while wage tax cuts, by definition, go only to persons who are employed and earning wages). The greatest "welfare bang for the buck" comes from the UI insurance extension, because almost *all* of the recipients are in circumstances in which they have a high MPC and a high marginal utility, whether or not the multiplier aggregate demand externality exists.

And, in contrast to the wage-tax cut, both the UI extension and the stimulus checks concentrate most of the marginal increment to consumption at times when the multiplier (if it exists) is still powerful. A disadvantage of the UI extension, in terms of "multiplied bang for the buck," is that (relative to the assumed-to-be-immediate-upon-recession checks), more of any extended UI payouts are likely to occur after the recession is over (when, by assumption, there is no multiplication). Countering this disadvantage is the fact that the MPC of UI recipients is higher than that of stimulus check recipients; in the end, our model says that these two forces roughly balance each other, so that the "multiplied bang for the buck" of the two policies is similar. In the welfare metric, however, there is still considerable marginal value to UI recipients who receive their

benefits after the recession is over (and no multiplier exists), so in the welfare metric, the relative value of UI benefits is increased compared with the policy of sending stimulus checks.

We conclude that extended UI benefits should be the first weapon employed from this arsenal, as they have a greater welfare benefit than stimulus checks and a similar "multiplied bang for the buck." But a disadvantage is that the total amount of stimulus that can be accomplished with the UI extension is constrained by the fact that only a limited number of people become unemployed. If more stimulation is called for than can be accomplished via the UI extension, checks have the advantage that their effects scale almost linearly in the size of the stimulus. The wage tax cut is also, in principle, scalable, but its effects are smaller than those of checks because recipients have lower MPCs and marginal utility than check and UI recipients. In the real world, a tax cut is also likely the least flexible of the three tools: UI benefits can be further extended, and multiple rounds of checks can be sent, but multiple rounds of changes in payroll tax rates would likely be administratively and politically more difficult.

The policies we analyze here are deliberately stylized and therefore may not match any particular policy actually implemented historically. But the tools we are using could be easily modified to evaluate a number of other policies. For example, in the COVID-19 recession in the US, not only was the duration of UI benefits extended, but those benefits were also supplemented by very substantial extra payments to every UI recipient. We did not calibrate the model to match this particular policy, but the framework could easily accommodate such an analysis.

1.1 Related literature

This paper is closely related to the empirical literature that aims to estimate the effect of transitory income shocks and stimulus payments. In particular, we focus on Fagereng, Holm, and Natvik (2021), who use Norwegian administrative panel data with sizable lottery wins to estimate the MPC out of transitory income in the quarter it is obtained, as well as the pattern of expenditure in the following quarters. We take their estimates as an input and build a model that is consistent with the patterns they identify. The empirical literature that arose in the aftermath of the Great Recession in 2008 to evaluate the effect of stimulus payments made during the recession is also closely related. Important examples are Parker, Souleles, Johnson, and McClelland (2013) and Broda and Parker (2014). Both of these papers exploit the effectively random timing of the distribution of the payments and identify a substantial consumption response. In our model, consumers do not adjust their labor supply in response to the stimulus policies, which is broadly consistent with the empirical findings in Ganong, Greig, Noel, Sullivan, and Vavra (2022). All these results indicate a substantial MPC that is difficult to reconcile with representative agent models that tend to imply that transitory income shocks are mostly smoothed.

Thus, the paper also relates to the literature presenting models with heterogeneous agents ("HA models") that are built to be consistent with the evidence from micro-data discussed earlier. A key example is Kaplan and Violante (2014), who build a model

where agents save in both liquid and illiquid assets. Their model yields a substantial consumption response to a stimulus payment, since MPCs are high both for constrained, low-wealth households and for households with substantial net worth that is mainly invested in the illiquid asset (the "wealthy hand-to-mouth"). Carroll, Crawley, Slacalek, and White (2020) present an HA model that is similar in many respects to the one we study. Their focus is on predicting the consumption response to the 2020 U.S. CARES Act, a policy implemented in the spring of that year when a lockdown was in place to limit the spread of the coronavirus. The policy contains both an extension of unemployment benefits and a stimulus check. However, neither of these papers attempts to evaluate and rank the effectiveness of different stimulus policies, as we do in this paper.

In more recent work, Kaplan and Violante (2022) discuss different mechanisms used in HA models to obtain a high MPC and the tension between that work and fitting the wealth distribution. We use one of the mechanisms they consider, *ex-ante* heterogeneity in discount factors, but also extend the model to include splurge consumption. We obtain a model that delivers both high average MPCs and a distribution of liquid wealth consistent with the data. Therefore, our model does not suffer from what Kaplan and Violante (2022) call the "missing middle" problem. In addition, we focus not only on the initial MPC, but also on the propensity to spend out a windfall for several quarters after it is obtained.

One of the criteria we use to rank policies is the extent to which spending is "multiplied," and our paper therefore relates to the vast literature discussing the size and timing of any multiplier. Our focus is on policies implemented in the aftermath of the Great Recession, a period when monetary policy was essentially fixed at the zero lower bound (ZLB). We therefore do not consider monetary policy responses to the policies we evaluate, and our work thus relates to papers such as Christiano, Eichenbaum, and Rebelo (2011) and Eggertsson (2011), who argue that fiscal multipliers are higher in such circumstances. Hagedorn, Manovskii, and Mitman (2019) present an HA model with both incomplete markets and nominal rigidities to evaluate the size of the fiscal multiplier in a rich setting. They also find that the multiplier is higher when monetary policy is constrained at the ZLB. However, the key to their result is not that the nominal rate is stuck at zero, but that it does not respond to the fiscal policy they consider. Unlike us, they focus on government spending and are interested in different options for financing that spending. They do not consider the different policies involving transfers directly to households that we study. Ramey and Zubairy (2018) investigate empirically, using a long historical dataset, whether there is support for the model-based results that fiscal multipliers are higher in certain states. They also focus on government spending and find that the multipliers are generally low. While they find evidence that multipliers are higher when there is slack in the economy or the ZLB binds, the multipliers they find are still below one in most specifications. In any case, we condition on policies being implemented in a recession—when, this literature argues, multipliers are higher—but it is not crucial for our purposes whether the multipliers are greater than one or not. We are concerned with relative multipliers, and the multiplier is only one of the two criteria we use to rank the different policies we consider.

The second criterion we use to rank policies is our measure of welfare. Thus, the paper

relates to the recent literature on welfare comparisons in HA models. Both Bhandari, Evans, Golosov, and Sargent (2021) and Dávila and Schaab (2022) introduce ways of decomposing welfare effects into different terms. In the former case, these are aggregate efficiency, redistribution and insurance, while the latter further decomposes the insurance component into intra- and intertemporal components. These papers are related to ours, but we do not focus decomposing welfare effects into different components. Regardless of decomposition, we want to (1) use a welfare measure as an additional way of ranking policies and (2) introduce a measure that abstracts from any incentive for a planner to redistribute in the steady state (or "normal" times).

Finally, a recent related paper is Kekre (2022), which evaluates the effect of extending unemployment insurance in the period from 2008 to 2014. He finds that this extension raised aggregate demand and implied a lower unemployment rate than without the extension. However, he does not attempt to compare the stimulus effects of extending unemployment insurance with other policies.

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