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On the gains from monetary policy commitment under deep habits

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ABSTRACT

I study the welfare gains from commitment relative to discretion in the context of an equilibrium model that features deep habits in consumption. Policy simulations reveal that the welfare gains are increasing in the degree of habit formation and economically significant for a range of values consistent with U.S. data. I trace these results to the supply-side effects that deep habits impart on the economy and show that they ultimately weaken the stabilization trade-offs facing a discretionary planner. Most of the inefficiencies from discretion, it turns out, can be avoided by installing commitment regimes that last just two years or less. Extending the commitment horizon further delivers marginal welfare gains that are trivial by comparison.

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1. Introduction

Habit formation has become a fixture of modern equilibrium models of the business cycle. Most take the view that households form habits from consumption of a single aggregate good. That the aggregate good is itself composed of differentiated products, however, raises the question of whether it might be preferable to model consumption habits directly at the level of individual good varieties.

Ravn et al. (2006) adopt this view of preferences, which they describe as "deep habits", and show that it has two major implications for aggregate dynamics. First, the consumption Euler equation turns out to be identical to the one derived from a traditional habit-persistence model. The essential role that this equation plays in matching certain empirical regularities, notably, consumption and asset-price dynamics, should thus carry over to a deep habits setting as well.[2] Second, unlike aggregate-level habits, deep habits alter firms'pricing decisions in a way that gives rise to counter-cyclical mark-ups in equilibrium. Not only is this observation consistent with U.S. experience (e.g., Rotemberg and Woodford, 1999; Mazumder, 2014), recent studies have demonstrated that it also strengthens the model's internal propagation mechanisms. Ravn et al. (2006) show that by inducing counter-cyclical mark-ups, deep habits can account for the observed procyclical responses of consumption and wages to a government spending shock. When grafted into a sticky-price framework,

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[2] Standard models of habit formation have been used to resolve the equity premium puzzle (e.g., Abel, 1990; Constantinides, 1990) as well as the risk-free-rate puzzle (e.g., Campbell and Cochrane, 1999). They also appear frequently in medium-scale DSGE models to generate the "hump-shaped" responses of aggregate consumption and output to various economic shocks identified in the data (e.g., Christiano et al., 2005; Smets and Wouters, 2007).

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Ravn et al. (2010); Lubik and Teo (2014), and Givens (2015) find that deep habits impart substantial inertia on inflation, thereby lessening the need for dubious features like backward indexation or high levels of exogenous rigidity.[3]

In light of these and other empirical successes, it is surprising that the literature has had relatively little to say about the normative implications of deep habits. I take up this task here with an application to optimal monetary policy. Specifically, I compute and then analyze the welfare differential between optimal commitment and discretion using a sticky-price equilibrium model that gives prominence to deep habits in consumption. In the context of rational expectations, discretionary policy suffers from a well-known "stabilization bias" (e.g., Woodford, 2003), a dynamic inefficiency that distorts the volatility of the economy's response to unexpected shocks. Policymakers can reverse these distortions and, in the process, advance the welfare of private agents by switching to optimal commitment. The extent to which commitment increases welfare, however, is plainly model dependent. So in practice, establishing whether the gains are large or small is ultimately an empirical matter. The superior fit displayed by models containing deep habits suggests that they could provide credible information on the potential size of these gains in the real world.[4]

The case for estimating the gains from commitment using only data-consistent models was first made by Dennis and Söderström (2006) who argued that such information is critical in deciding whether public investments in the economy's commitment technology justify the costs. To provide context, the authors estimated the welfare gap using several famous empirical models and found substantial variation among them. Obscuring their results, however, is the fact that the models featured in the study lack coherent microeconomic foundations and, as such, are incapable of providing an ideal measure of social welfare consistent with household preferences. As a result, the authors took the usual step of articulating social welfare through an exogenously-specified loss function defined over the weighted variances of inflation, the output gap, and nominal interest rate smoothing (e.g., Rudebusch and Svensson, 1999). But without explicit reference to private utility, it is doubtful that such an objective function encapsulates the true welfare cost of discretion.

I avoid this critique here by employing the correct measure of welfare based on a quadratic approximation of the average household's utility function. As shown by Leith et al. (2012), it is possible to write the approximation as a particular weighted sum of three terms: squared inflation, the output gap, and the "habit-adjusted" output gap (i.e., deviations from Pareto-efficient levels). To compute the welfare differentials, I maximize this criterion separately under commitment and discretion and record the value function in both cases. Gaps between the two are then converted into units of consumption in order to provide a tangible interpretation of the losses generated by the stabilization bias.

Of course, outcomes under commitment and discretion will differ only insofar as the structural model implies meaningful trade-offs between inflation and output gap stability. I bring up this point because the conventional sticky-price framework has long been criticized on exactly these grounds. Indeed, in the standard model, any policy that stabilizes inflation also stabilizes the output gap (e.g., Blanchard and Galí, 2007). Some common procedures for overcoming this so-called "divine coincidence" include putting extraneous supply shocks in the Phillips Curve (e.g., Clarida et al., 1999) or an interest rate variability term in the objective function (e.g., Amato and Laubach, 2004). These kinds of arbitrary extensions to the model, however, are unnecessary here. As explained by Leith et al. (2012), incorporating deep habits elicits an *endogenous* policy trade-off between inflation and the two output gap concepts described above. Such a trade-off emerges because the consumption externality induced by habit formation drives a wedge between the flexible-price (zero adjustment cost) equilibrium and the efficient equilibrium. Thus any shock to the economy–whether it be a preference or a productivity shock–creates tension between two separate policy goals in the short run: minimizing price adjustment costs and neutralizing the habit externality. The former is achieved by holding inflation equal to target inflation and the latter by aligning output with its efficient level (i.e., a zero output gap).

Policy simulations carried out in this paper confirm that the welfare differential between commitment and discretion is strictly increasing in the degree of deep habits and economically significant for a range of values that span known estimates. At the habit value estimated by Ravn et al. (2006), for example, the gap is equivalent to 0.188% of consumption, or about $90 per person per year. Most of the gains from commitment, it turns out, trace directly to the restrictions that deep habits impose on the log-linearized Phillips Curve equation. There one sees that the main forcing process for inflation depends positively on the real interest rate in addition to firms'marginal cost of production. This means that adjustments to the interest rate will have immediate supply-side effects on inflation that counteract the familiar demand-side effects of policy on marginal cost. Such opposing influences will obviously frustrate efforts to stabilize inflation under either policy. Quantitative results show, however, that these adverse supply-side effects, which become stronger as deep habits intensify, are easier to manage with commitment than with discretion.

The full commitment program requires that the policy authority implement – in all future periods – the procedures specified by an optimal state-contingent plan. A natural question then is whether, or to what extent, increases in welfare can be achieved with a policy that mimics this behavior for a limited rather than indefinite number of periods. The *quasi*-commitment equilibrium concept developed by Schaumburg and Tambalotti (2007) provides a means of answering this question. Under quasi-commitment, the monetary authority defaults on its policy obligations (i.e., it re-optimizes) with some

[3] Zubairy (2014b) shows that deep habits provide a transmission channel for government spending shocks powerful enough to create multiplier effects consistent with estimates found in the VAR literature.

[4] In a sticky-price sticky-wage model, Ravn et al. (2010) demonstrate that replacing aggregate habits with deep habits improves the fit between simulated responses to a monetary shock and those estimated from a structural VAR. Using likelihood-based methods to evaluate a nested model, Givens (2015) shows that the data favor a specification in which habits are stronger at the product level than at the aggregate level.

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