European Economic Review 95 (2017) 142–167

Contents lists available at ScienceDirect

European Economic Review

journal homepage: www.elsevier.com/locate/euroecorev

Habit formation in consumption: A meta-analysis☆

Tomas Havranek[a,b,*], Marek Rusnak[a,b], Anna Sokolova[c,d]

[a] Czech National Bank, Na Prikope 28, 115 03 Prague 1, Czechia
[b] Charles University, Opletalova 26, 110 00 Prague 1, Czechia
[c] National Research University Higher School of Economics, Krivokolennyy per. 3a, 101000 Moscow, Russia
[d] University of Nevada, 1664 N Virginia St, NV 89557, Reno, USA

ARTICLE INFO

Article history:
Received 18 July 2016
Accepted 17 March 2017
Available online 23 March 2017

JEL classification:
C83
D12
E21

Keywords:
Habit formation
Consumption
Meta-analysis
Bayesian model averaging
Frequentist model averaging

ABSTRACT

We examine 597 estimates of habit formation reported in 81 published studies. The mean reported strength of habit formation equals 0.4, but the estimates vary widely both within and across studies. We use Bayesian and frequentist model averaging to assign a pattern to this variance while taking into account model uncertainty. Studies employing macro data report consistently larger estimates than micro studies: 0.6 vs. 0.1 on average. The difference remains 0.5 when we control for 30 factors that reflect the context in which researchers obtain their estimates, such as data frequency, geographical coverage, variable definition, estimation approach, and publication characteristics. We also find that evidence for habits strengthens when researchers use lower data frequencies, employ log-linear approximation of the Euler equation, and utilize open-economy DSGE models. Moreover, estimates of habits differ systematically across countries.

1. Introduction

The concept of habit formation in consumption is crucial for the explanation of various stylized facts in macroeconomics and finance. For example, in the asset pricing literature consumption habit helps reconcile the theory with the observed moments of asset returns. Mehra and Prescott (1985) show that the standard Lucas (1978) tree model fails to replicate the high equity premium and low risk-free rate at reasonable model parameters. Constantinides (1990) argues that habit formation solves this problem, as it can generate large variability in the marginal rate of substitution in consumption alongside smooth consumption growth—a feature that allows one to replicate high risk premium without having to rely on large risk aversion. Further refinements of the model suggested by Campbell and Cochrane (1999), Abel (1999), and Allais (2004) make it possible also to generate plausible variability in equity returns and the risk-free rate, while adding habits to a real business cycle framework helps explain the joint behavior of asset prices and consumption (Boldrin et al., 2001).

☆ An online appendix with data, code, and additional results is available at meta-analysis.cz/habits. We gratefully acknowledge helpful suggestions by the editor Eric Leeper, an anonymous associate editor, and two anonymous referees. We thank Jan Babecky, Alexei Boulatov, Kamil Galuscak, Zuzana Irsova, Simona Malovana, Udara Peiris, Sergey Pekarski, Herakles Polemarchakis, Tom Stanley, Federica Teppa, Dimitrios Tsomocos, and Stefan Zimmermann for their comments on earlier versions of the manuscript. We acknowledge support from the Czech Science Foundation (grant #15-02411S). Anna Sokolova acknowledges support from the Basic Research Program at the National Research University Higher School of Economics. The views expressed here are ours and not necessarily those of the Czech National Bank.

* Corresponding author at: Czech National Bank, Czechia.
E-mail address: tomas.havranek@ies-prague.org (T. Havranek).

http://dx.doi.org/10.1016/j.euroecorev.2017.03.009
0014-2921/

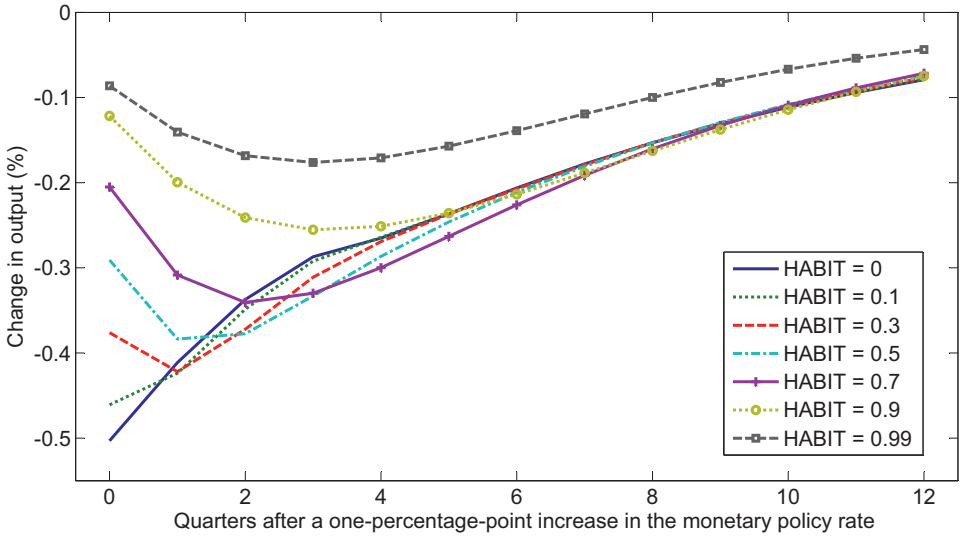

Fig. 1. The importance of habit formation for DSGE models. Notes: The figure shows simulated impulse responses of GDP to a one-percentage-point increase in the monetary policy rate. We use a calibrated version of the model developed by Smets and Wouters (2007) and vary the value of the habit formation parameter while leaving all other parameters calibrated at the posterior values from Smets and Wouters (2007). For the simulations we use Matlab code from the Macro-economic Model Data Base (Wieland et al., 2012).

The presence of habit formation implies that past consumption choices affect current preferences. This notion violates the independence axiom used by Koopmans (1960) to derive the classic discounted utility model. Due to the growing popularity of models with habits, researchers have made efforts to develop theoretical underpinning for utility that is non-separable over time and features habit formation. Rozen (2010) lays out axiomatic foundation for a utility function displaying linear internal habits, describing a decision maker whose preferences depend on the history of past consumption choices. Rustichini and Siconolfi (2014) present a general axiomatic approach that allows for time-separable and non-separable utility as special cases, while He et al. (2013) put forward a model that incorporates habits as well as satiation in utility.

Studies that feature general equilibrium models have come to rely on consumption habit as a means of replicating a delayed hump-shaped response of macro variables to policy shocks (Fuhrer, 2000; Del Negro et al., 2007). This is because habit formation makes abrupt changes in consumption costly, thereby inducing smoothness in consumption dynamics (for a detailed discussion see Kano and Nason, 2014). But the quantitative predictions of such models largely depend on the size of the parameter specifying the strength of habit formation. Fig. 1 shows how the impulse response of output to a nominal interest rate shock changes in the popular model by Smets and Wouters (2007) when we assume different values of habit formation: the modeled behavior of the economy within one year after the shock depends heavily on the assumed strength of habits.[1]

Dozens of papers have estimated the habit formation parameter, but their results vary widely. The variance can be partially attributed to differences in the data used in the estimation: some studies analyze Euler equations for aggregate consumption (Carroll et al., 2011; Everaert and Pozzi, 2014; Fuhrer, 2000), some employ micro panel data sets (Alessie and Teppa, 2010; Collado and Browning, 2007; Dynan, 2000), and others use DSGE models (Christiano et al., 2005; Smets and Wouters, 2007), often employing prior values for the habit parameter. A brief look at the results of the seminal studies in each category suggests that the estimates are all over the place: Fuhrer (2000) shows that habit formation is crucial for his model to fit the data and obtains estimates that lie within the range 0.8–0.9. In contrast, Dynan (2000) uses panel household data and finds no evidence of habit formation. Christiano et al. (2005) estimate the same parameter using a DSGE model and obtain a value in the range 0.5–0.7.[2]

In this paper we investigate whether this diversity in the estimates of the habit parameter can be explained through differences in study designs used by researchers. We present what to our knowledge is the first quantitative synthesis—or a meta-analysis—of the evidence from the literature estimating habit formation. Meta-analyses attempt to trace variation

[1] Fig. 1 closely resembles Kano and Nason (2014, Fig. 1) depicting the impulse-response function of consumption growth rate to a real interest rate shock for different values of the habits parameter. Remarkably, the result of Kano and Nason (2014) does not rely on the full New Keynesian DSGE model: they derive it using a log-linear approximation of the Euler equation and an AR(1) process for the real interest rate. Absent habit formation, the Euler equation sets consumption growth equal to the real interest rate, an AR(1); therefore, the impulse-response function peaks at 0 and decays afterward. With habit formation, current changes in consumption are associated with a utility loss in the future—in consequence, changes in the interest rate lead to a gradual adjustment of consumption growth.

[2] Sampling uncertainty would seem to suggest that habit estimates of 0.5 and 0.9, for example, are not that far apart, but Fig. 1 shows that the economic implications of consumption habit differ greatly across this range of estimates.