News-driven inflation expectations and information rigidities[*]

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Abstract

Using a large news corpus and machine learning algorithms we investigate the role played by the media in the expectations formation process of households, and conclude that the news topics media report on are good predictors of both inflation and inflation expectations. In turn, in a noisy information model, augmented with a simple media channel, we document that the time series features of relevant topics help explain the time-varying information rigidity among households. As such, we provide a novel estimate of state dependent information rigidities, and present new evidence highlighting media's role for understanding inflation expectations and information rigidities.

JEL-codes: C11, C53, D83, D84, E13, E31, E37

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1 Introduction

The fourth estate, i.e., the news media, plays an important role in society, and is a primary source from which most people get information.[1] In macroeconomics, expectations are center stage. But, expectations are shaped by information, and information does not travel unaffected through the ether. Rather, it is digested, filtered, and colored by the media. Surprisingly, however, the potential independent role of the media in the expectation formation process has received relatively little attention in macroeconomics.

This paper builds on a growing literature providing evidence in favor of information rigidities rather than full information rational expectations (Coibion and Gorodnichenko (2012), Dovern et al. (2015), Coibion and Gorodnichenko (2015), Armantier et al. (2016)), and investigates the potential role played by the media for households' inflation expectations in such settings.

In particular, we take the view that agents make endogenous information choices (Sims (2003), Woodford (2009), Mackowiak and Wiederholt (2009)), but that no agent has the resources to monitor all events that are potentially relevant for her decision, and thereby delegate their information choice to specialized news providers who report only a curated selection of events. As formalized in Nimark and Pitschner (2019), the media works as "information intermediaries" between agents and the state of the world.[2] Two implications of these views are that: i) media coverage should predict households' inflation expectations, and ii) the degree of information rigidity, as defined more precisely below, will be time-varying and a function of media coverage.

These implications are tested in two stages. First, the predictive relationship between news and expectations is addressed. To this end, we hypothesize that when the media writes extensively about topics related to, e.g., technology or health, even without explicitly mentioning terms related to inflation, this reflects that something is happening in these areas that potentially have economy-wide effects, and might therefore also affect inflation expectations. In turn, this conjecture is made operational using a Latent Dirichlet Allocation (Blei et al. (2003)) model, and a large news corpus extracted from the *Dow Jones Newswires Archive* (DJ), to construct 80 time series measures of the news topics media writes about, i.e., the different types of news reporting.

Using penalized linear regressions to handle the high dimensional predictive problem, and focusing on inflation and households' inflation expectations, measured by the University of Michigan Surveys of Consumers (MSC), we find that the news topics written about

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[1]See, for example, Blinder and Krueger (2004), Curtin (2007), and Fullone et al. (2007).

[2]Rather than agents ex-ante deciding on the expected usefulness of a particular signal, as in, e.g., the costly information literature (Grossman and Stiglitz (1980)), knowledge of events is jointly determined ex-post through a delegated information choice mechanism.

in the media have high predictive power for both inflation and expectations. As predicted by standard economic theory, there is also a large intersection in the selected news topic sets for these two outcome variables, and the narrative realism of the approach is good. Topics about, e.g., technology, health, and politics, all significantly affect households' inflation expectations. Additional results strongly indicate that this type of textual data contain information not captured by a large set of roughly 130 conventional economic indicators, suggesting that the media is an important information source for households. In contrast, but following the intuition that the media matters foremost for households and less so for professionals, there is little evidence for a relationship between news topics and inflation expectations from the Survey of Professional Forecasters (SPF).

The MSC micro-data is used to further validate the news-topic-based approach, and shows that the predictive relationship between news topics and expectations align well with conventional stereotypes and what we know about expenditure patterns and media consumption habits. News related to health and politics, for example, tend to be more important for elderly survey respondents than for young people.

Turning to information rigidities, and media's potential role in explaining them, we augment the noisy information framework in Coibion and Gorodnichenko (2015) by allowing for state dependence in the degree in information rigidity, and an explicit, but simple, role for the media. The mechanics of the model are straight forward. When an important event happens, media coverage potentially becomes more persistent, and the signal less noisy, and thereby easier to filter for the agents. Accordingly, information rigidity is reduced as agents put more weight on new information relative to their previous forecasts.[3]

Testing these predictions empirically highlight the media channel. Information rigidities among households show high-frequency variation across time, and this variation can be explained by the time-varying persistence and noise-to-signal ratio in relevant news coverage, as the theory predicts. The regression fit is dominated by the persistence measure, and when media persistence is high, information rigidities tend to be low. We further show, in a falsification experiment, that this result is unlikely to be obtained by chance, and using the persistence of inflation itself, or other economic indicators with predictive power for household expectations, do not deliver theory consistent results.

The contribution, and novelty, of our analysis is threefold. First, by analyzing the relationship between expectations, information frictions and the media our analysis speaks directly to work by Doms and Morin (2004), Pfajfar and Santoro (2013), Lamla and Lein

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[3]This contrasts with the conventional model, where the degree of information rigidity would be determined by properties of inflation itself, but mirrors our assumption that the media works as "information intermediaries" between agents and the state of the world.

(2014), Dräger and Lamla (2017), and Ehrmann et al. (2017). The epidemiological model of inflation expectations by Carroll (2003) is particularly well known. However, we make an important contribution in how we use text as data in this setting. In contrast to the earlier literature, which have either based their analysis on counting inflation terms in the news to measure media (inflation) intensity, or used survey variables measuring whether people have heard news about prices, we take a topic-based approach. And, indeed, this approach delivers results in accordance with theory, while the traditional text- and survey-based methods do not.

Second, we provide direct evidence of high frequency time-variation in the degree of information rigidity among households in the U.S. As such, our results complement Loungani et al. (2013), Coibion and Gorodnichenko (2015), and Dovern et al. (2015) who document low frequency state-dependence in the degree of information rigidity among professionals and in international panels.

Third, we are the first to establish a relationship between information rigidities and media coverage within a well established theoretical framework used to test for information rigidities (Coibion and Gorodnichenko (2015)).

In sum, the analysis conducted here provide positive evidence in favor of the state-dependent information rigidity view, but emphasizes the role of information providers (Nimark and Pitschner (2019)). For this reason, the analysis also speaks to the literature trying to identify the causal effect of the media. This has been relatively unexplored in macroeconomics, but has received much more attention in other branches of the literature and in other sciences (Gentzkow et al. (2011), Shiller (2017), King et al. (2017), Prat (2018)).

References

Armantier, O., S. Nelson, G. Topa, W. van der Klaauw, and B. Zafar (2016). The Price Is Right: Updating Inflation Expectations in a Randomized Price Information Experiment. *The Review of Economics and Statistics 98*(3), 503–523.

Blei, D. M., A. Y. Ng, and M. I. Jordan (2003). Latent Dirichlet Allocation. *J. Mach. Learn. Res. 3*, 993–1022.

Blinder, A. S. and A. B. Krueger (2004). What does the public know about economic policy, and how does it know it? Working Paper 10787, National Bureau of Economic Research.

Carroll, C. D. (2003). Macroeconomic Expectations of Households and Professional Forecasters. *The Quarterly Journal of Economics 118*(1), 269–298.

Coibion, O. and Y. Gorodnichenko (2012). What can survey forecasts tell us about information rigidities? *Journal of Political Economy 120*(1), 116–159.

Coibion, O. and Y. Gorodnichenko (2015). Information rigidity and the expectations formation process: A simple framework and new facts. *The American Economic Review 105*(8), 2644–2678.

Curtin, R. (2007). *What US Consumers Know About Economic Conditions*. OECD.

Doms, M. and N. J. Morin (2004). Consumer sentiment, the economy, and the news media. Finance and Economics Discussion Series 2004-51, Board of Governors of the Federal Reserve System (US).

Dovern, J., U. Fritsche, P. Loungani, and N. Tamirisa (2015). Information rigidities: Comparing average and individual forecasts for a large international panel. *International Journal of Forecasting 31*(1), 144–154.

Dräger, L. and M. J. Lamla (2017). Imperfect information and consumer inflation expectations: Evidence from microdata. *Oxford Bulletin of Economics and Statistics 79*(6), 933–968.

Ehrmann, M., D. Pfajfar, and E. Santoro (2017). Consumers' Attitudes and Their Inflation Expectations. *International Journal of Central Banking 13*(1), 225–259.

Fullone, F., M. Gamba, E. Giovannini, and M. Malgarini (2007). *What Do Citizens Know about Statistics*. OECD.

Gentzkow, M., J. M. Shapiro, and M. Sinkinson (2011). The effect of newspaper entry and exit on electoral politics. *American Economic Review 101*(7), 2980–3018.

Grossman, S. J. and J. E. Stiglitz (1980). On the impossibility of informationally efficient markets. *The American Economic Review 70*(3), 393–408.

King, G., B. Schneer, and A. White (2017). How the news media activate public expression and influence national agendas. *Science 358*(6364), 776–780.

Lamla, M. J. and S. M. Lein (2014). The role of media for consumers' inflation expectation formation. *Journal of Economic Behavior & Organization 106*, 62 – 77.

Loungani, P., H. Stekler, and N. Tamirisa (2013). Information rigidity in growth forecasts: Some cross-country evidence. *International Journal of Forecasting 29*(4), 605 – 621.

Mackowiak, B. and M. Wiederholt (2009). Optimal sticky prices under rational inattention. *The American Economic Review 99*(3), 769–803.

Nimark, K. P. and S. Pitschner (2019). News media and delegated information choice. *Journal of Economic Theory 181*, 160 – 196.

Pfajfar, D. and E. Santoro (2013). News on Inflation and the Epidemiology of Inflation Expectations. *Journal of Money, Credit and Banking 45*(6), 1045–1067.

Prat, A. (2018). Media power. *Journal of Political Economy 126*(4), 1747–1783.

Shiller, R. J. (2017). Narrative economics. *American Economic Review 107*(4), 967–1004.

Sims, C. A. (2003). Implications of rational inattention. *Journal of Monetary Economics 50*(3), 665 – 690. Swiss National Bank/Study Center Gerzensee Conference on Monetary Policy under Incomplete Information.

Woodford, M. (2009). Information-constrained state-dependent pricing. *Journal of Monetary Economics 56*(S), 100–124.