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How Expectations About Future Productivity Drive Inventories

By [Thomas A. Lubik](#), [Christoph Gortz](#) and [Christopher Gunn](#)

To what extent do expectations about future productivity developments drive business cycles? This *Economic Brief* reviews the state of the literature and discusses how new research by the authors establishes a novel method to answer. We specifically focus on firms' inventories, which stock goods available for future sales. We find that these inventories expand strongly to news about future productivity developments. This confirms that expectations about future productivity are a powerful force behind aggregate fluctuations, a finding with important implications for widely used economic models.

The idea that beliefs and anticipation about future events are key drivers of business cycles has received much attention over the past two decades. A specific aspect is the notion that future productivity movements are revealed and believed by economic actors to some extent in advance, so that they affect economic conditions today. Economists call such anticipation of future events "news," and the arrival of such news is a "news shock," or an unanticipated event that drives beliefs about future events.

In this article, we discuss our recent paper "[Is There News in Inventories?](#)," which identifies such news shocks about future productivity developments in macroeconomic data and evaluates economic mechanisms that transmit the shocks in the economy.

In addition, we frame our discussion in the context of inventories and their relevance for understanding news shocks. This is a new aspect that has so far been neglected in the literature but is a central element for business cycle theory and empirics.

Why Do Economic Actors React to News?

How can news about future events affect the economy? Consider the following: Suppose you receive news of a substantial future pay raise. You might celebrate with a meal at a nice restaurant or with the purchase of that long-wanted but far too expensive racing bike. Typically, one would not wait for the higher pay to actually appear in the bank account but would celebrate and consume now in anticipation of the higher pay in the future.

When projecting this example onto the whole economy in the context of news about future technologies or productivity improvements, something analogous happens. Expectations about future technological advances are associated with higher wealth in the future. This makes households feel wealthier now and — like in the above example — causes higher spending. In turn, this causes a rise in GDP before the new technologies are actually available.

The primary impact of a news shock is what economists call a wealth effect. Knowledge about higher productivity, GDP and income in the future makes households feel wealthier now than they really are based on the current fundamentals (namely current GDP and income).

Since consumers generally prefer similar consumption over the years — what economists call consumption smoothing — they thus want to pull some of this future wealth forward and enjoy it now. This raises consumption demand in the present when the news shock arrives. It also puts downward pressure on labor supply since perceived future riches reduce consumers' desire to work.

At the same time, there is a countervailing effect at play. Since productivity is anticipated to be higher in the future, the cost of making things in the future will decrease. Consequently, firms would want to shift production into the future to take advantage of these lower costs. But to produce more things, firms also need to employ more workers, which have to be hired at higher wages since the wealth effect wants them to work less.

Investment similarly faces conflicting forces. To be able to produce more cheaply in the future, production capability has to be expanded, and the investment to do so has to be started now. At the same time, increasing investment is cheaper in the future when productivity is in fact higher.

This discussion leads us to speculate that all of these macroeconomic quantities move in unison in response to news shocks: Anticipation of higher future productivity raises consumption, investment, output and a potentially unclear effect on the labor supply. There is a question of how strong these effects are based on an intertemporal substitution effect that counters the wealth effect. But this would have to be decided by looking at the data.

Is There News in the Data?

The idea that shifts in expectations and beliefs about future technology can be powerful enough to drive booms and trigger recessions has been recognized by economists for 100 years, as seen in the 1927 book "Industrial Fluctuations" by the British economist Arthur Pigou. While the idea itself seems persuasive, actually measuring such news about productivity is by no means straightforward.

Economists have suggested various methods to detect news shocks in the data and to measure their effects. One method is to measure them directly via the effects of expectations from data on the level of productivity. However, calculating the economy-wide level of productivity is notoriously difficult and prone to a certain degree of measurement error, which could affect the results on the economic effects of news shocks.

In recent years, the construction of productivity measures improved (as seen in the 2014 working paper "A Quarterly, Utilization-Adjusted Series on Total Factor Productivity"), and methodologies were developed to minimize the distortionary effects of any remaining measurement error (as seen in the 2021 paper "Revisions in Utilization-Adjusted TFP and Robust Identification of News Shocks").

Alternatively, one can also think about a more indirect approach. For instance, movements in stock prices — which arguably respond strongly to information about the future — can be used to learn how expectations drive business cycles, as seen in the 2006 paper "Stock Prices, News and Economic Fluctuations."

Recent studies also suggest proxying news about future technologies by using firms' patent filings, as seen in the 2022 paper "Patent-Based News Shocks." The success of these indirect approaches crucially hinges on whether variables — such as stock prices and patent filings — are adequate proxies for expectations about future technology and whether they contain sufficient information to be representative for the entire economy.

What these empirical studies have uncovered is that our speculation is accurate. In response to news shocks, these macroeconomic quantities move in unison: An anticipation of higher future productivity raises consumption, investment, output and the labor supply. Moreover, this is consistent with the intuition outlined above, whereby the wealth effect seems to dominate the intertemporal substitution effect.

What Role Do Inventories Play?

In comparison with existing research, recent work — the 2016 paper "What Do Inventories Tell Us About News-Driven Business Cycles?," our 2020 paper "What Drives Inventory Accumulation? News on Rates of Return and Marginal Costs" and the paper we're focusing on in this article, "Is There News in Inventories?" — establishes a new layer of scrutinizing the data for news by investigating how firms respond to technology news shocks by changing the level of goods in stock for sale.

Inventories are suitable as a new litmus test to establish the relevance of expectations in driving business cycles for two reasons:

- Inventories arguably respond strongly to news because accumulating and holding goods for sale is costly and requires forward planning.
- Inventories are one of the key variables behind business cycle fluctuations in the sense that reductions in the level of goods in stock account for a substantial share of the decline in GDP during recessions.

For these two reasons, bringing inventories to the table can substantially enrich our understanding of the relevance of shifts in expectations for business cycle fluctuations.

Inventory stock increases during booms and declines during recessions. This so-called pro-cyclical behavior of inventories is widely documented. (An example would be the 2012 paper "[Inventories, Inflation Dynamics and the New Keynesian Phillips Curve](#).") Arguably, news shocks can then only be a relevant driving force for booms and recessions if they cause inventories to follow this same pro-cyclical movement, as discussed in the aforementioned paper "[What Do Inventories Tell Us About News-Driven Business Cycles?](#)" For this reason, the response of inventories to news shocks can serve as a consistency check on their importance in explaining business cycles.

Our research finds that, in response to positive news about future technology — measured using a variety of direct and indirect approaches — not only do GDP, investment, consumption and hours worked increase, but inventory stock also rises and hence moves pro-cyclically alongside these quantities. This finding provides strong evidence for the powerful force of news about productivity in driving business cycles.

Capitalizing on Knowledge to be Shocked by News

Economists use models as laboratories to analyze the behavior of the economy and to organize their thinking about how to interpret patterns found in the data. Any reasonably useful theoretical model should therefore be largely consistent with the empirical facts under investigation.

In the specific case of news shocks, this means that a model needs to be able to generate the empirically documented expansion in output, inventories, consumption, investment and hours worked in light of news about higher future productivity. However, the standard model for studying the effects of news shocks — as presented in the 2009 paper "[Can News About the Future Drive the Business Cycle?](#)" — does not include inventories. When we extend the standard model with inventories, as in our paper "[Is There News in Inventories?](#)" we find that it is essentially impossible to generate an expansion of inventories in response to a productivity news shock. In fact, inventories decline as the intertemporal substitution effects dominate.

Why do inventories decline in the standard model? When news arrives, consumers feel wealthier, and this drives up sales. Firms face two opposing effects:

- They want to increase their stockholdings alongside sales to avoid stockouts.
- They need to increase production to satisfy higher demand.

But increasing the inventory stock alongside higher sales is only possible with higher production. Increased production, however, also implies that the costs of making things increase at given level of workers, capital and productivity. In light of this, firms may actually choose to draw down their inventories to avoid higher production costs and restock them once higher productivity is realized in the future.

When we extend the standard model in our research to include inventories, the second motive dominates the first, and inventories decline because these marginal costs rise strongly. The key to resolving this issue is introducing another mechanism so that the first effect actually dominates the second and, hence, inventories rise in response to news as observed in the data. This mechanism is knowledge capital.

The Importance of Knowledge Capital

Knowledge capital is a firm's understanding of how to best make use of its resources through expertise in organizing labor, operating machinery, using materials, etc. This knowledge is accumulated while working on the job or engaging with production more generally, a process that is often referred to as learning by doing, as noted by the 1962 paper "[The Economic Implications of Learning by Doing.](#)"

In response to a news shock, firms increase their demand for labor since the value of knowledge rises. This induces workers to increase their hours despite the desire to work less because of the wealth effect. The rise in hours-worked expands firms' knowledge and allows them to earn higher profits in the future when productivity eventually rises. Importantly, this mechanism dampens the initial rise in marginal cost and thereby allows for an expansion of inventories alongside the other macroeconomic aggregates.

It's News to Me: Implications for How Economists Think About the World

Our study shows that this model can be a useful laboratory for the economy as it matches the behavior we also see in the data. Moreover, we show that productivity news shocks in this environment are a powerful force behind U.S. business cycles. Economists think about business cycle fluctuations as the result of shocks to the economy. They are usually categorized as monetary or fiscal shocks, shocks that spill over from foreign economies, or changes in productivity.

Our research makes the case that news about productivity shocks — even when these shocks have not even happened yet — is a powerful additional source of economic fluctuations. And looking at inventories is a key way of figuring out what these shocks are and when they occur.

Christoph Görtz is an associate professor of economics at the University of Birmingham. Christopher Gunn is an associate professor of economics at Carleton University. Thomas A. Lubik is a senior advisor in the Research Department at the Federal Reserve Bank of Richmond.

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