



Inventories, sales uncertainty, and financial strength

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Abstract

We investigate the empirical linkages between sales uncertainty and firms' inventory investment behavior while controlling for firms' financial strength. Using large panels of manufacturing firms from several European countries we find that higher sales uncertainty leads to larger stocks of inventories. We also identify an indirect effect of sales uncertainty on inventory accumulation through the financial strength of firms. Our results provide evidence that financial strength mitigates the adverse effects of uncertainty.

Highlights

► We investigate the effects of sales uncertainty on firms' inventory investment. ► We consider both direct and indirect effects via firms' financial strength. ► We use large panels of manufacturing firms from several European countries. ► Higher sales uncertainty leads to larger stocks of inventories. ► Firm financial strength mitigates the adverse effects of uncertainty.

Introduction

It has long been recognized that we can better understand the behavior of the firm and the cyclical fluctuations in output by studying the changes in inventory investment.³ Over the business cycle, inventories constitute the most volatile component of GDP as they are the first in line to absorb shocks. This is due to inventory investment having a low adjustment cost (for instance compared to that of fixed capital investment). Following Metzler (1941), researchers proposed several inventory investment behavior models based on microeconomic principles including production smoothing, stock-out avoidance, accelerator motive, (S,s) inventory models among others, to explain the inventory holding behavior of firms.⁴ Generally speaking, in these models the marginal cost and benefit of holding inventories determine the inventory investment behavior of firms. More recently, several researchers focusing on the presence of asymmetric information, including Carpenter et al., 1994, Kashyap et al., 1994, Guariglia, 1999, Benito, 2005, and Guariglia and Mateut (2006), show that inventories are determined by the availability of internal funds.

However, we know very little about how inventories are affected as a firm experiences periods of heightened uncertainty. A careful review of the literature yields only two studies where the linkages between uncertainty and inventory investment are empirically examined. Lee and Koray (1994), using aggregate macro level data, investigate the association between sales uncertainty and inventory behavior for the US wholesale and retail trade sector and show that the variance in sales does not affect inventory behavior in either sector. Bo (2001), in contrast, focuses on firm level data and uses a small panel of Dutch companies (770 observations) to investigate the impact of demand uncertainty. She finds that demand uncertainty (measured by the volatility of sales) has a positive and significant impact on inventory investment. Surprisingly, there are no other studies in the literature that investigate the effects of volatility on firms' inventory investment.⁵

In contrast to the empirical research on the inventory accumulation problem, the literature on the fixed investment behavior of the firm has extensively considered the effects of uncertainty. In particular, recent research has demonstrated that uncertainty may exert indirect effects on the fixed capital investment of a firm through firm's leverage, cash holdings or cash flows in addition to its direct impact.⁶ This observation is meaningful for potential lenders would limit the firm's ability to raise external funds by raising the risk premium they require since they cannot accurately evaluate the firm's creditworthiness in an environment with heightened uncertainty. Hence, as uncertainty varies over time, the importance of the variables that capture the financial state of the firm weakens or strengthens affecting the manager's course of action in an environment where asymmetric information makes it hard or impossible to raise external funds. Nevertheless, available research on the inventory accumulation problem of a firm has not considered the direct and the indirect effects of uncertainty.

In this paper, we use firm level data from several countries aiming to provide comprehensive empirical evidence on the effects of firm specific uncertainty on the inventory behavior of a firm. Our investigation concentrates on the impact of sales uncertainty and implements a dynamic inventory investment model to scrutinize the direct and indirect effects of sales uncertainty on inventory accumulation while we control for firms' financial strength. The empirical model employs panels of manufacturing firms from several continental European countries - including Belgium, Finland, France, Italy, Portugal, and Spain.⁷ In our investigation, we use the same model across all countries rather than competing models so that we can stress those commonalities across countries. Our data cover the period 1999-2007 and are obtained from the Amadeus database.

Our results can be summarized as follows. We find that sales uncertainty has a positive impact on inventories indicating that firms facing high demand uncertainty build up inventories to avoid stock-out. However, we also find that the inventory build-up declines as firms hold more liquid assets or extend more trade credit relative to what they receive from their suppliers. This finding suggests that financially unconstrained firms do not increase their stocks to demand shocks. This observation, which is significant for almost all countries in our data set, can be attributed to the ability of a less constrained firm to adapt to changes in demand more easily than a constrained firm which cannot alter its production pattern due to constraints. In particular, one can argue that a less constrained firm has the means to purchase an extra unit of capital, hire labor quickly or outsource production over the business cycle.

The rest of the paper is constructed as follows. Section 2 presents the modeling framework and discusses the methodology we employ in our investigation. It also lays out the approach we implement to generate firm specific uncertainty. Section 3 documents the data. Section 4 presents our empirical findings and Section 5 concludes the paper.

Section snippets

The model

We implement a variant of the stock adjustment model proposed by Lovell (1961), which performs well at explaining movements in aggregate inventory data. Using a similar approach, recent research in the literature has examined the inter-linkages between inventory investment and firms' financial health (see Benito, 2005, Guariglia and Mateut, 2006). This model relates the target stock of inventories to the level of sales and allows for slow adjustment of inventories to the desired level. In our...

Data

To study the impacts of demand uncertainty and firms' financial strength on inventory accumulation, we construct panels of manufacturing firms for several continental European countries using the Amadeus database. Our data set covers the period 1999–2007 and provides balance sheet information of quoted and unquoted manufacturing firms for European countries including Belgium, Finland, France, Italy, Portugal, and Spain....

Empirical findings

We estimate Eqs. (1), (2) for each country separately using the dynamic panel data (DPD) approach developed by Arellano and Bond (1991), as implemented in Stata by Roodman (2009). All models are estimated in first difference terms to eliminate unobserved heterogeneity using the one-step GMM estimator on unbalanced panels of manufacturing firms extracted from continental European countries. For each model, the J statistic (and the corresponding p -value) is the Hansen–Sargan test statistic and it ...

Conclusions

In this paper, we empirically investigate the impact of sales uncertainty on firm's inventory investment behavior. In doing so, we investigate the direct as well as the indirect effects of uncertainty through movements in financial strength of the firm. To carry out our investigation, we construct panels of manufacturing firms from several European countries including Belgium, Finland, France, Italy, Portugal, and Spain to provide comprehensive evidence. Throughout the investigation we use the...

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