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## Inventories and optimal monetary policy in a small open economy

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### A B S T R A C T

We study how inventory investment affects the design of optimal monetary policy in a New Keynesian small open economy model. We find that under producer currency pricing, when the intratemporal elasticity of substitution is smaller than 1, optimal monetary policy in our model with inventories is similar to a standard model without inventories. However, when the intratemporal elasticity of substitution is larger than 1, inventory investment increases the importance of nominal exchange rate stabilization relative to a standard model without inventories. The importance of nominal exchange rate stabilization increases with the intratemporal elasticity of substitution.

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## 1. Introduction

While inventory investment is generally a very small fraction of real GDP of an economy, it has long been recognized that fluctuations in inventory investment play an important role in fluctuations of real GDP. For example, [Blinder and Maccini \(1991\)](#) document that even though inventory investment is only roughly one-half of 1 percent of real GDP in the US, in a typical postwar recession in the US, the fall in inventory investment accounts for 87% of the fall of output. [Chung \(1997\)](#) documents similar pattern for Canada, Japan and the UK, where the fall in inventory investment accounts for more than 70% of the fall of output in these countries during postwar recessions. This puzzling empirical fact sparks a lot of research on why inventory investment has such a disproportionate role in business cycle fluctuations.<sup>1</sup> Nevertheless, despite the large literature on the positive aspects of inventory investment, few

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<sup>1</sup> See [Blinder and Maccini \(1991\)](#), [Ramey and West \(1999\)](#) and [Khan \(2003\)](#) for surveys.

studies have investigated the normative aspects of inventory investment. An exception is [Lubik and Teo \(2009\)](#), who study how inventory investment affects the design of optimal monetary policy in a closed economy model. [Lubik and Teo \(2009\)](#) find that optimal monetary policy in a New Keynesian model with inventories deviates from a standard New Keynesian model without inventories as a strict inflation targeting is no longer the optimal policy in a model with inventories. The purpose of this paper is to extend [Lubik and Teo \(2009\)](#) and investigate how inventory investment affects the design of optimal monetary policy in an open economy model.

There are several reasons why inventories can affect the design of optimal monetary policy in a small open economy. First, inventories can affect the dynamics of production as well as trade, and the latter in particular could be of great importance for a small open economy. [Alessandria et al. \(2010\)](#), for instance, find that inventories play an important role in trade dynamics. Second, in the presence of inventories for exported goods and imported goods, exchange rate changes can affect firms' incentives to hold inventories through their effects on export and import demand. Changes in inventory holdings in turn can affect firms' pricing decision. Central bank will then have to take into consideration of the effects of monetary policy on firms' joint decisions on pricing and inventory holdings if it aims to maximize the welfare of the households. This will affect the tradeoffs that the central bank faces.

We introduce inventories into the standard small open economy New Keynesian Dynamic Stochastic General Equilibrium of [Kollmann \(2002\)](#). The model features a utility maximizing representative household, monopolistically firms and a central bank. Inventories are introduced into the model by assuming that inventory stock facilitates sales, as suggested in [Bils and Khan \(2000\)](#). This approach is also used by [Jung and Yun \(2005\)](#) and [Lubik and Teo \(2009\)](#), (2010) in closed economy models. It is consistent with a stockout avoidance motive. [Wen \(2005\)](#) shows that the stockout avoidance theory explains the fluctuations of inventories at different cyclical frequencies better than alternative theories.

Our results can be summarized as follow. Under producer currency pricing and an intratemporal elasticity of substitution that is smaller than 1, optimal monetary policy for a small open economy model with inventories focuses mainly on stabilizing the domestic goods price inflation, similar to the case of a standard model without inventories. However, when the intratemporal elasticity of substitution is larger than 1, optimal monetary policy faces a tradeoff between stabilizing the domestic goods price inflation and stabilizing the nominal exchange rate. This is because exchange rate volatility increases the mean export price, which leads to a lower export revenue when the intratemporal elasticity of substitution is larger than 1. The lower export revenue is undesirable since it reduces real income and consumption. We find that the presence of inventories amplifies the negative effects of nominal exchange rate volatility since it leads to a larger increase in mean export price as firms engage more in costly accumulation of inventories to buffer against the unstable export demand. The larger rise in mean export price in turn leads to a larger drop in mean export revenue, thus increases the importance of stabilizing nominal exchange rate in our model with inventories.

Our work is related to two literatures. First, it is related to the large and growing literature of optimal monetary policy in New Open Economy Macroeconomics. [Corsetti et al. \(2010\)](#) provide a survey of that literature. The studies that are closest to us are [Kollmann \(2002\)](#) and [Sutherland \(2006\)](#). [Kollmann \(2002\)](#) finds that the optimal Taylor style interest rate rule in a small open economy with a low intratemporal elasticity of substitution focuses on stabilizing inflation and does not react much to the nominal exchange rate. [Sutherland \(2006\)](#) on the other hand, finds that a high intratemporal elasticity of substitution increases the importance of nominal exchange rate stabilization. However, unlike our paper, [Sutherland \(2006\)](#) finds that the critical value for a fixed exchange rate to be welfare superior to a strict domestic goods price inflation targeting and a strict CPI inflation targeting is too high to be empirically realistic in his model, which does not have inventories.

The second literature that is related to our work is the large literature on inventory. [Blinder and Maccini \(1991\)](#), [Ramey and West \(1999\)](#) and [Khan \(2003\)](#) provide excellent surveys of this literature. Most of the work in this literature focuses on explaining the empirical regularities of inventories and their relations to GDP and its components. While much of the work in this literature use partial equilibrium models, inventories have also been studied in general equilibrium models, such as [Kydland and Prescott \(1982\)](#) and [Christiano \(1988\)](#). More recent studies such as [Fisher and Hornstein \(2000\)](#), [Khan and Thomas \(2007\)](#) study inventories in S, s environments. Nonetheless, as mentioned above,

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