



Monetary transmission mechanism with firm turnover



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ABSTRACT

An expansionary monetary policy shock increases the entry rate and the number of firms in the US. A pure sticky price model predicts that the number of firms in the economy should go down after a monetary expansion, but this prediction is at odds with the empirical findings. In marked contrast, the cost channel mechanism generates an increase in the number of firms that is consistent with the data. A key insight is that the greater price stickiness is, the stronger the cost channel needs to be to generate firm dynamics that are consistent with the data.

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1. Introduction

The recent financial and economic crisis demonstrated the importance of financial markets in shaping macroeconomic dynamics, but the workhorse channel in monetary transmission models is still the sticky price mechanism. Although the mechanism has been shown to be effective in fitting some of the data, it also predicts that the number of firms should decrease after monetary easing. This paper shows that this is at odds with the empirical findings. It then asks whether the cost channel can help in explaining the effects of a monetary shock. The paper shows that a sticky price model that has been complemented by cost channel financial friction¹ can fit the dynamics of the number of firms observed in the data and illustrates how financial frictions are important in the monetary transmission mechanism. The results demonstrate that the greater price stickiness is, the stronger the cost channel needs to be to generate firm dynamics that are consistent with the data.

The paper first shows that the number of new firms grows rapidly and strongly after an expansionary monetary shock. As the exit margin remains initially unchanged, the number of firms operating in the economy increases because of new firms coming to the market. At a later stage the number of failures drops, adding to the increase in the number of firms. The paper uses data on firm creation and destruction, and on establishment births and deaths in the US for various periods after WWII. The empirical evidence is based on a small structural vector autoregressive (VAR) model for the US economy, which takes in real GDP, the GDP deflator inflation rate, the federal funds rate, and several measures of firm turnover which are included either one-by-one or in groups. I adopt the recursive approach with contemporaneous restrictions and put the

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¹ The mechanism has several names; in a seminal paper (Christiano et al., 1997) called it the limited participation model, and it has later also been called working capital for firms or the cash-in-advance constraint for firms. The terms have the same meaning in this paper unless otherwise clearly stated.

firm turnover measure into the central bank information set so as to identify monetary shocks, but the results are very robust to various changes in the model.

The empirical findings use extensive new high quality data from various sources, and in this way they contribute to the literature on measuring the effects of monetary policy on the creation and destruction of firms and establishments. The paper demonstrates that a rapid increase in the number of firms and establishments comes from the entry margin and not the exit margin. [Bergin and Corsetti \(2008\)](#) use a small scale VAR of monthly data and impose short-run restrictions placing the entry variable outside the central bank information set in order to identify the monetary shock. They find an effect on the number of new firms only when they use non-borrowed reserves to identify the monetary shock, but not when they use the more standard federal funds rate (FFR). The current paper finds strong effects on the entry of new firms by using quarterly data for the FFR to identify the shock. [Lewis \(2009\)](#) takes a sign restriction approach to estimate the effect of a monetary shock on net entry. She finds that net entry increases only with a significant lag after a monetary expansion and more recently [Lewis and Poilly \(2012\)](#) find a similar effect from a monetary shock on net entry using a VAR model with short-run restrictions. I find similar results in this paper for net entry, but in addition I employ new data on bankruptcy filings from the US Bankruptcy Courts together with the establishment death data of the BLS to demonstrate that the firm destruction margin remains initially unchanged and the exit rates decline later following the positive monetary shock.

The theoretical part builds a dynamic stochastic general equilibrium (DSGE) model with endogenous firm creation, with sunk cost in the labour used to establish a firm, and exogenous firm destruction following [Bilbiie et al. \(2007\)](#), [Bergin and Corsetti \(2008\)](#), [Uhlig \(2009\)](#) and [Bilbiie et al. \(2012\)](#). The model first replicates the finding in the literature that in a sticky price model without the cost channel, an interest rate cut leads to a drop in the number of firms. This is because the expansionary shock leads to an increase in demand for consumer goods and consequently to a higher demand for labour. Labour costs thus increase equally for producing goods and for creating firms. Lower profits per firm cut the creation of new firms and reduce labour demand to a level where the free entry condition is satisfied. This stands in contrast to the empirical results.

As a theoretical contribution the paper shows that including a sufficiently strong cost channel on top of price stickiness, as proposed by [Christiano et al. \(1997\)](#) and later employed by many others, including [Christiano et al. \(2005\)](#), [Ravenna and Walsh \(2006\)](#), [Rabanal \(2007\)](#) and [Uhlig \(2009\)](#), leads to an increase in the number of firms after a monetary expansion that is observed in the data. The main assumption in the mechanism is that firms borrow funds from financial intermediaries to produce output, in particular firms borrow funds for wages. In order to create an expansionary monetary policy shock, the central bank lends additional resources to financial intermediaries to achieve a certain target for the interest rate. Financial intermediaries lend these additional resources to firms, which now get loans at lower interest rates. The cost channel cuts the cost of production and the cost of creating new firms. The stronger the cost channel is, the smaller the increase in the overall cost of production is, leading to stronger expansion in the economy, contributing to the increase in the net present value of a firm. Moreover, potential entrants that borrow from banks to meet the entry costs benefit from lower interest rates. Increased labour demand from entry generates wage growth up to the point where the entry cost equals the net present value of firms. Clearly there are very low levels of the cost channel that are too weak to overturn the counterfactual reaction of firm creation from the sticky price mechanism, but the stronger the cost channel is given price stickiness, the smaller the drop in entry. At a certain level the cost channel becomes strong enough to flip the reaction of firm creation so that the entry of new firms becomes positive after an expansionary monetary shock. The importance of the cost channel does not mean that prices cannot be sticky and does not contradict the importance of the role of slow price adjustment. However, the stickier prices are, the higher the level that the cost channel needs to be at for it to fit the effect of the monetary shock on firm turnover. The model is kept simple to show clearly the mechanism that affects firm turnover. The paper calibrates the model to US data and shows that reasonable levels of the cost channel are sufficient to reverse the counterfactual prediction of the sticky price mechanism. I calibrate the cost channel parameter to 1.276 as estimated by [Ravenna and Walsh \(2006\)](#) and use financial data on the US to show that the parameter is at the lower end on a scale of possible values.

Recently [Lewis and Poilly \(2012\)](#) have also included a cost channel on top of sticky prices and sticky wages in order to analyse the role that variable mark-ups play in inflation when the number of firms is variable. They restrict the parameter to between zero and one and reach an estimate for the cost channel between 0.5 and 0.9. Unlike in this paper, the cost channel in their paper is not sufficient to change the reaction of firm entry after a monetary shock. The current paper contributes to the growing literature on the importance of financing in firm dynamics and shows that a very simple framework is sufficient to match the data qualitatively. [Bergin et al. \(2014\)](#) show how access to finance is crucial for new firms empirically, while the [Macnamara \(2014\)](#) model of entry and exit includes a working capital channel but does not look at monetary shocks. Supporting the working capital mechanism in the paper, [Robb and Robinson \(2014\)](#) find empirical evidence that new firms do borrow a lot of resources, and in fact outside debt is on average the largest single category of funding for start-ups during their first year of operation. In addition, [Gross and Verani \(2013\)](#) find that better financing conditions make exporting easier. [La Croce and Rossi \(2015\)](#) introduce an elaborate financial sector on top of an endogenous entry framework. They also have a cost channel in production, but not in the creation of firms and they do not look at monetary policy shocks.²

² See also [Bergin et al. \(2014\)](#), [Gross and Verani \(2013\)](#), and [Robb and Robinson \(2014\)](#) for recent evidence of financial frictions in firm turnover.

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