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## Credit crunch in a small open economy

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We construct an open-economy DSGE model with a banking sector to analyze the impact of the recent credit crunch on a small open economy. In our model the banking sector operates under monopolistic competition, collects deposits and grants collateralized loans. Collateral effects amplify monetary policy actions, interest rate stickiness dampens the transmission of interest rates, and financial shocks generate non-negligible real and nominal effects. As an application we estimate the model for Poland—a typical small open economy. According to the results, financial shocks had a substantial, though not overwhelming, impact on the Polish economy during the 2008/09 crisis, lowering GDP by approximately 1.5 percent.

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## 1. Introduction

The financial crisis affected economies worldwide. It originated from problems with subprime mortgages in the United States, but spread soon to international financial markets. Several financial institutions had to be bailed out by governments. Moreover, the disease soon started to spread to the real economy. Its impact was transmitted i.a. via negative wealth effects (housing and stock market busts), decreased consumer confidence and the crunch in credit markets. Additionally, in the case of small open economies reduced demand for exports and limited access to external funding further contributed to the slowdown<sup>1</sup>. As a result the world economy entered its worst recession since World War II. It is not possible, and probably never will be, to tell precisely how various channels contributed

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<sup>1</sup> For a thorough analysis of the crisis see e.g. BIS (2009).

to the weakening of economic activity in various countries. In particular, it seems unlikely to measure how much of the slowdown in consumption and investment expenditure was due to widespread panic—a sort of animal instinct behavior among households and investors. In this paper we undertake a more decent exercise: we assess the role played in transmitting the slowdown by the banking sector. To do this we construct a general equilibrium model with a banking sector.

The literature incorporating a financial sector into macroeconomic models has been developing fast over the last two decades. A seminal position is [Bernanke and Gertler \(1989\)](#) where financial frictions have been incorporated into a general equilibrium model. This approach has been further developed and merged with the new-Keynesian framework by [Bernanke et al. \(1996\)](#), becoming the workhorse financial frictions model in the 2000's. In this model frictions arise because monitoring the loan applicant is costly—this generates an “external finance premium” and, hence increases the lending rate. This idea has been extensively used i.a. by [Choi and Cook \(2004\)](#) to analyze the balance sheet channel in emerging markets or by [Christiano et al. \(2010\)](#) to study business cycle implications of financial frictions.

A second important direction was introduced by the seminal paper of [Kiyotaki and Moore \(1997\)](#), lately incorporated into the monetary business cycle model by [Iacoviello \(2005\)](#). This line of research concentrates on quantities rather than prices of loans. In the Iacoviello model households accumulate housing wealth, which can be used as loan collateral. Collateral constraints capture the effects of quantitative restrictions generated by the banking sector. An important application is [Gerali et al. \(2010\)](#) where a model with collateral constraints and monopolistic competition in the banking sector was used to analyze i.a. the impact of financial frictions on monetary transmission and a credit crunch scenario. The eruption of the financial crisis contributed to even more interest in these models and probably we will see several new studies in this field soon.

Our model is written in the spirit of [Iacoviello \(2005\)](#) and [Gerali et al. \(2010\)](#). Apart from financial sector issues it has the standard features of new Keynesian models (e.g. [Smets and Wouters, 2003](#)) including monopolistically competitive markets and nominal rigidities in goods and labor markets. We contribute to the existing financial frictions literature by incorporating the model into a small open economy framework (e.g. [Galí and Monacelli, 2005](#); [Altig et al., 2005](#); [Christiano et al., 2005](#); [Adolfson et al., 2005](#)). This seems important, since contemporaneous economies can rarely be treated as closed.

As an application we estimate the model using data for Poland—a typical small open economy. This country has been substantially (though probably somewhat less than most EU countries) affected by the crisis. GDP growth declined from 5.0% in 2008 to 1.8% in 2009 and exports contracted by 9.1% in 2009 ([Fig. 1](#)).

The slowdown was deepened by the restrictive behavior of Polish banks, who significantly increased the cost of borrowing and additionally tightened lending conditions. It should be noted that, similarly to several other small open economies, the behavior of Polish banks was driven by external rather than internal factors. Polish banks have not invested funds in toxic assets, subprime lending was not excessive and the housing market did not crash. Nevertheless the international crisis of confidence transmitted to the Polish interbank market, reducing the volume of transactions and raising spreads. This transmitted to spreads on commercial loans and deposits. Moreover, survey evidence shows that banks drastically tightened lending standards raising i.a. collateral requirements ([NBP, 2009](#)). As a result lending to households and enterprises broke down. Between 1q2008 and 2q2009 new loans to households decreased by a quarter and to enterprises by a third ([Fig. 2](#)). Simulations based on our model show that shocks generated by the Polish banking sector in late 2008 and early 2009 indeed deepened the economic slowdown. We find that they contributed 1.5 percent to the GDP slowdown. Thus, the impact of the turmoil in the banking sector was important but not overwhelming.

The rest of the paper is structured as follows. Section two presents the model, section three the calibration/estimation procedure. Section four shows the results which are then followed by a robustness check in Section 5. Section 6 concludes.

## 2. The model

We model a heterogeneous agents small open economy with financial frictions. Our economy is populated by patient households, impatient households and entrepreneurs. Patient households

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