

THE USE OF DSGE MODELS IN FORECASTING: THE RECENT EXPERIENCE OF BANCO DE ESPAÑA

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THE CRISIS AND POST-CRISIS ENVIRONMENT POSE IMPORTANT CHALLENGES TO STANDARD FORECASTING MODELS

- The Great Recession broke down the “small deviation around the trend” assumption and **linear** approximations become poorer.
- The persistence of the recession and the very gradual recovery square better with a **medium-term phenomenon** perspective than with the standard business cycle one.
- Some ongoing processes/phenomena can be naturally understood as **distinctive regimes**: ZLB, deleveraging, fiscal consolidation,...
- **Structural changes** (policy driven) have been common during this period: financial regulation, structural reforms, etc.

A PRAGMATIC APPROACH ON FORECASTING TO DEAL WITH THE COMPLEXITIES OF THE NEW ENVIRONMENT

At BdE, we do not use DSGE models for forecasting but rely increasingly on them to improve our forecasts:

1. Extract insights about the mechanisms/channels through which previous “complexities” affect the main macro variables using structural macro models equipped with the relevant features of the current context:

- financial frictions, deleveraging, fiscal consolidation, ZLB, structural reforms...

2. Inform the forecasting process on potentially relevant channels through:

- revising existing forecasting tools
- enriching judgment

TWO EXAMPLES

1. Building and learning from a macro **model of endogenous & slow deleveraging** calibrated for the Spanish economy:

- How do structural reforms affect the economy following a financial shock with deleveraging and lack of monetary reaction?
- The mechanics of a creditless recovery in a deleveraging episode

2. Incorporating **financial variables in our analysis of inflation**

A MODEL OF ENDOGENOUS DELEVERAGING (I): BASICS

- DGSE model of an economy within a MU with **collateral constraints** a la Kiyotaki-Moore and **long-term debt** (like a typical mortgage).
 - **Two different regimes:**
 - A. “normal times”**: debtors have sufficient net worth and collateral that allows them to obtain new loans;
 - B. “crisis times”**: collateral is scarce, debtors run into negative equity, new credit freezes and existing debts are paid gradually at the contractual rate -> ***deleveraging***
 - **Regime-change**: The economy moves from **A** to **B** after a sufficiently large negative shock and gets back to **A** once borrowers' net worth recovers sufficiently (at an endogenous date).
 - In sum, a tractable DSGE model featuring **financial frictions, non-linearities, endogenous regime-change...**

A MODEL OF ENDOGENOUS DELEVERAGING (II): BASICS

- Versions of the model have been used to address a variety of questions:

➤ Impact of structural reforms in a high-debt environment:

“Structural Reforms in a Debt Overhang”, J. Andrés, O. Arce and C. Thomas, BdE WP 1421

➤ Spillovers between structural reforms, monetary and fiscal policy in an asymmetric MU with endogenous ZLB:

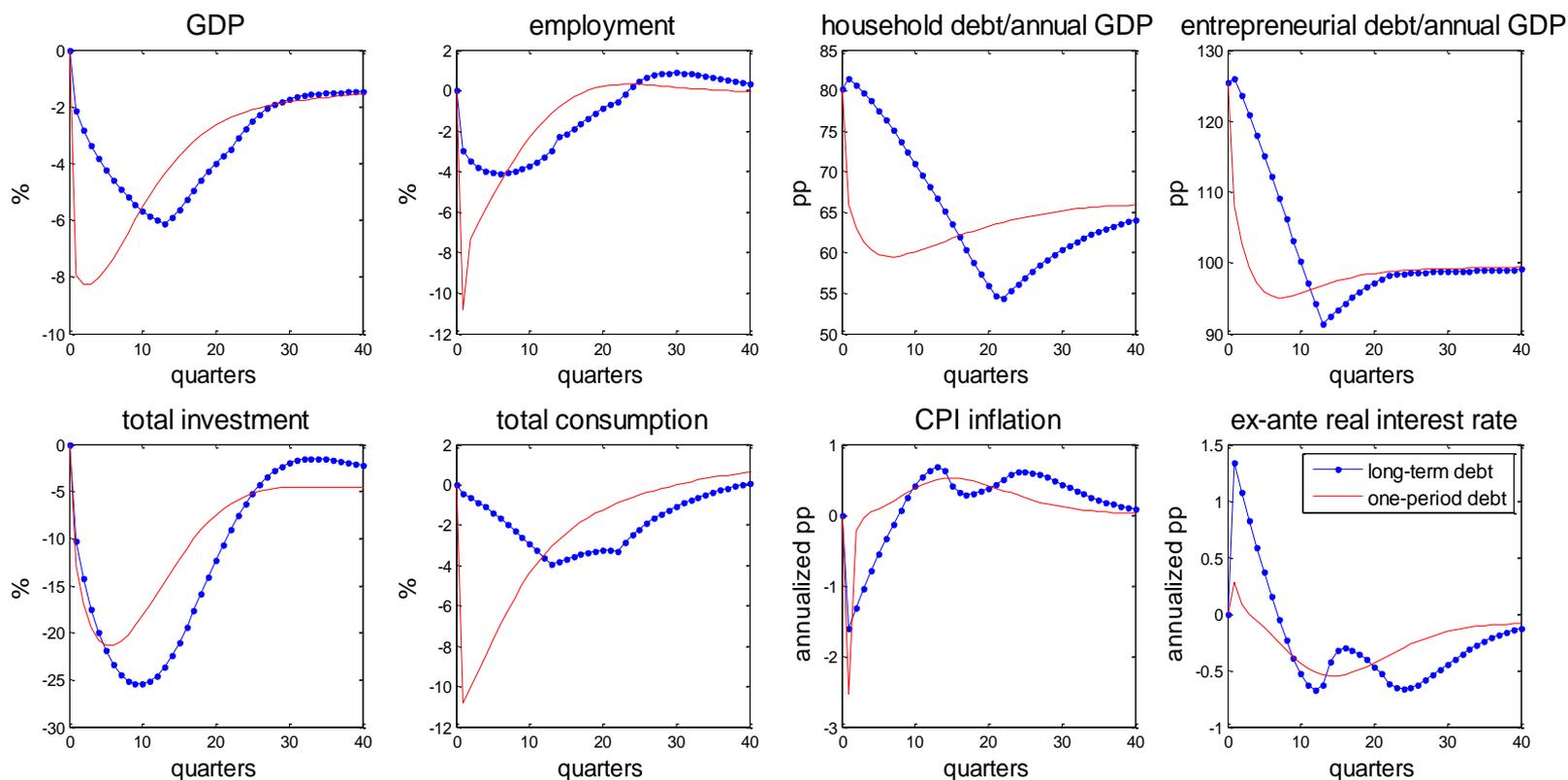
“Policy Spillovers and Synergies in a Monetary Union”, O. Arce, S. Hurtado and C. Thomas, ECB WP 1942

➤ Interactions between fiscal consolidation and deleveraging

“When Fiscal Consolidation Meets Private Deleveraging,” J. Andrés, O. Arce and C. Thomas, mimeo.

A PLAUSIBLE BROAD PICTURE OF THE CRISIS-RECOVERY LOOP

- After a large negative financial shock, **the dynamics of prices and quantities change significantly, raising their persistence** dramatically, wrt standard short-run debt assumption.



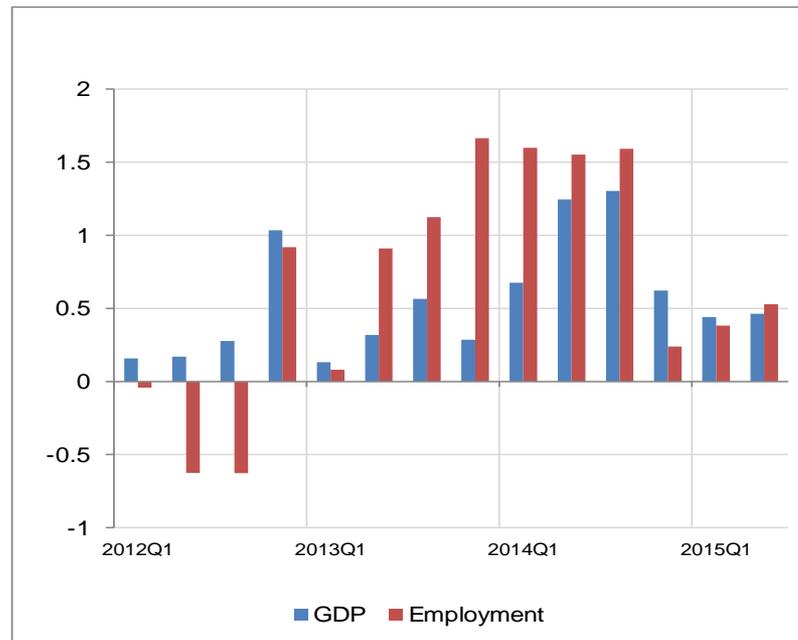
THE SHORT-RUN IMPACT OF A LABOR MARKET REFORM (I)

- In 2012, an ambitious **labor market reform** contributed to moderate wages and make them more flexible.
- Ex ante, **its impact was very uncertain**: no comparable previous evidence and scarce model-based analysis, with some exceptions:
 - Eggertsson et al (2014): At the ZLB, disinflationary reforms are contractionary in the short-run, by raising the real interest rate.
 - Galí-Monacelli (2016): wage flexibility may not be desirable in an economy within a MU.
 - IMF WEO (2016 April): reforms to employment protection and unemployment benefits can be detrimental when the economy is weak.

THE SHORT-RUN IMPACT OF A LABOR MARKET REFORM (II)

- But soon after the reform, we began to underpredict employment and GDP and to overpredict labor productivity....

Forecast errors (pp)



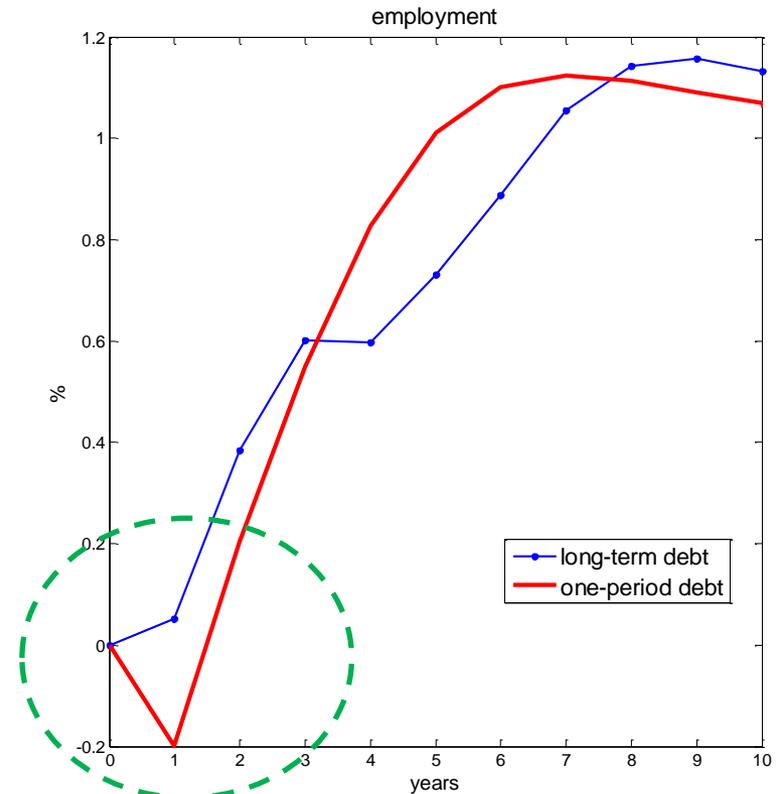
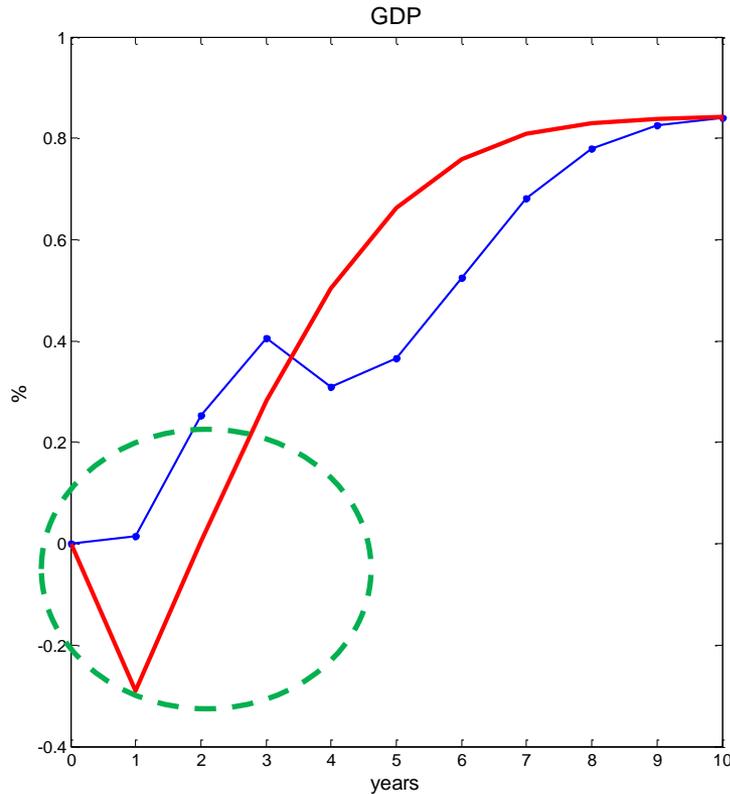
- ...and recent empirical analyses reveal a positive impact of the reform on employment (e.g. Izquierdo et al 2013, BdE 2015, García-Pérez 2016).

THE SHORT-RUN IMPACT OF A LABOR MARKET REFORM (III)

- Our DSGE model would offer some **interesting insights** on this issue:
 - A wage devaluation naturally depresses inflation, which is costly in a high-debt environment....
 - ...but negative intertemporal substitution effects from lower inflation and higher real interest rates become weaker in a credit-crunch cum deleveraging scenario:
 - new credit flows freeze;
 - (strongly) constrained debtors $IMRS^* > R$ and $IMRS$ relatively insensitive wrt R .
 - Long-term debt mitigates the incidence of the debt-deflation channel and helps to buffer the negative Fisherian impact of the reform

THE SHORT-RUN IMPACT OF A LABOR MARKET REFORM (IV)

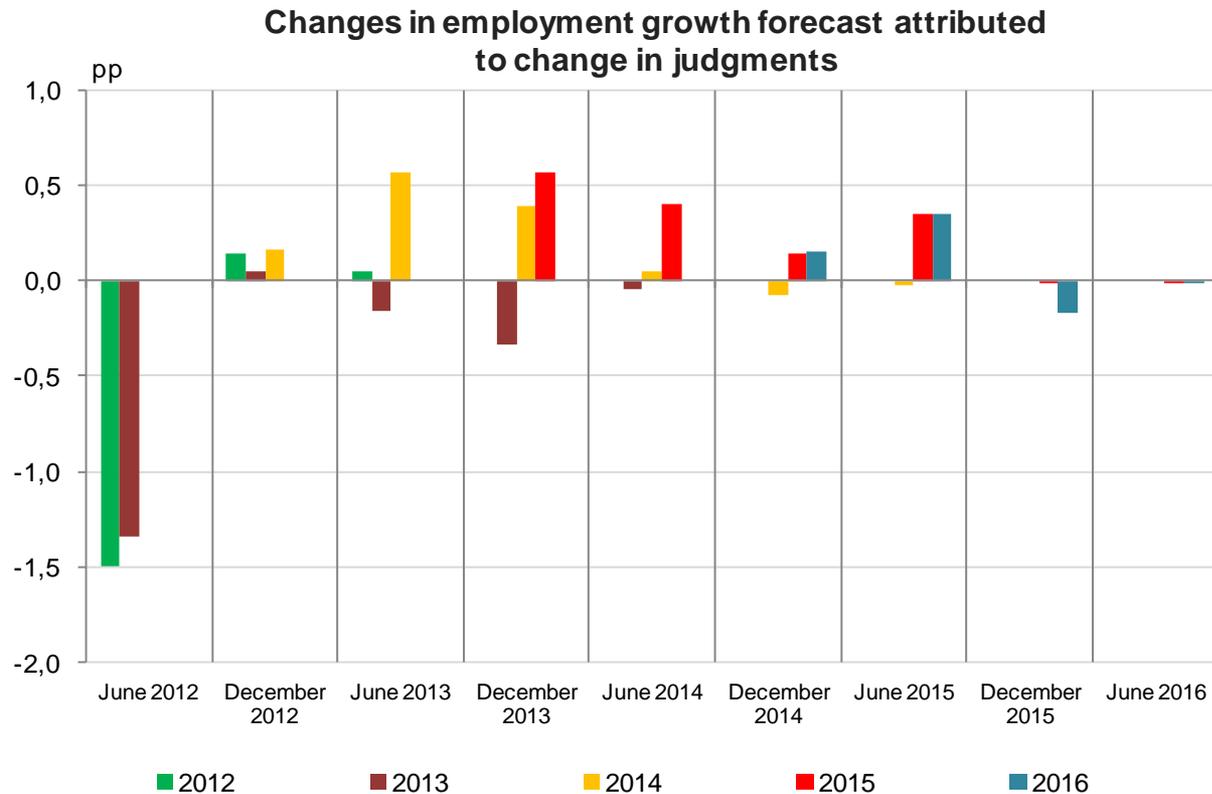
Differential effect of labor market reform on GDP and employment



- Hence, the channels thorough which the reform may be detrimental in the short-run weaken in our relevant scenario of slow deleveraging.

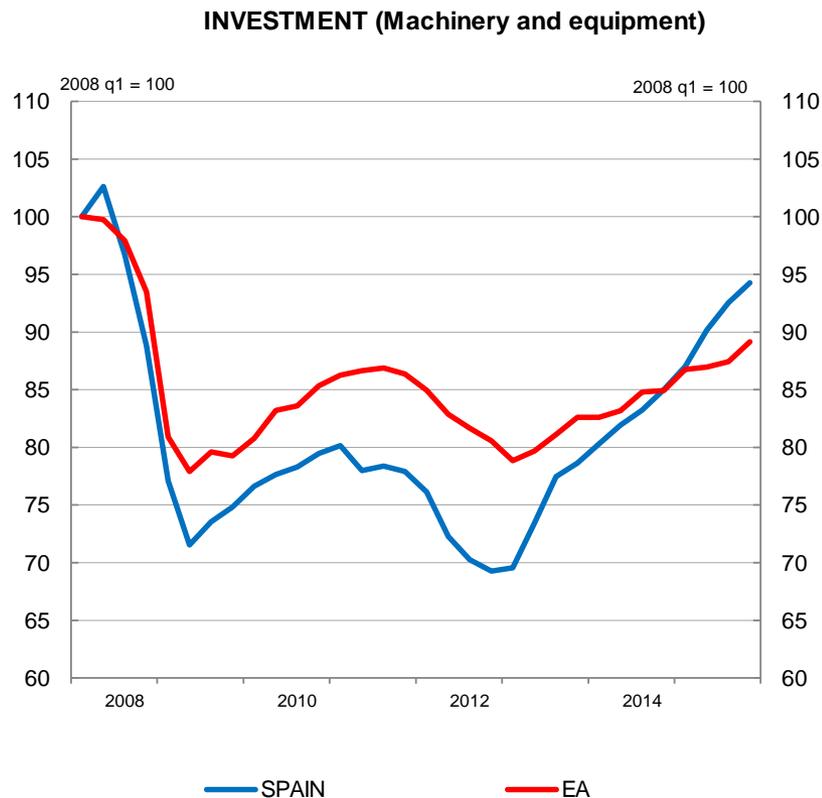
THE SHORT-RUN IMPACT OF A LABOR MARKET REFORM (V)

- We revised our view (judgment) on the likely effects and channels of this important reform in the short-medium term.

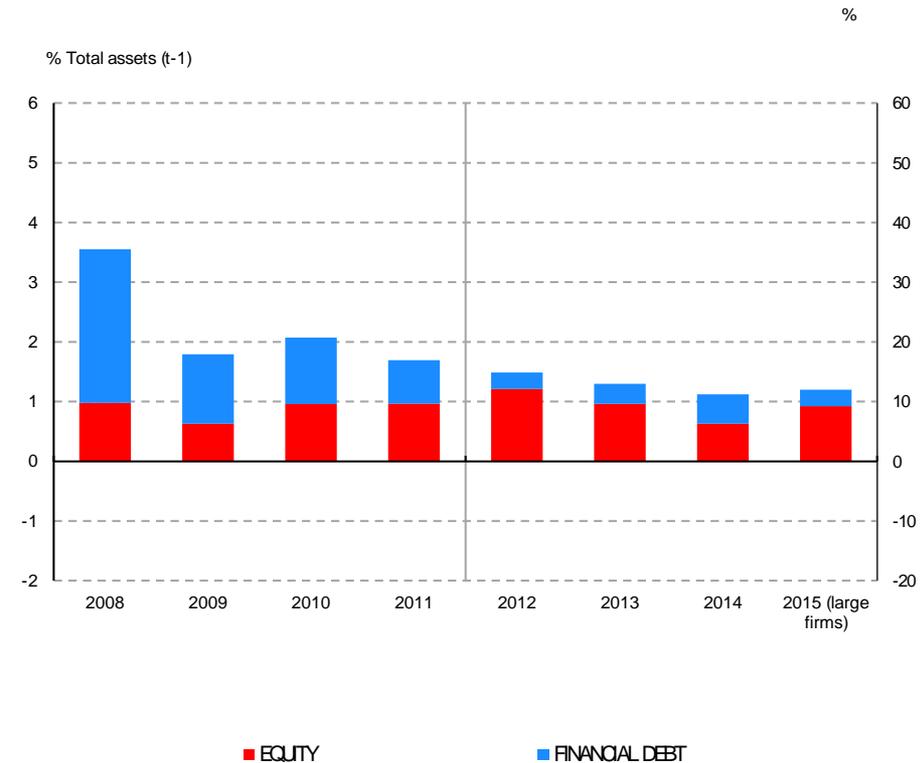


A CREDIT-LESS RECOVERY AND THE ROLE OF REFORMS (I)

- Investment in ES is recovering quite strongly in spite of ongoing corporate deleveraging, thanks to internal funding sources (retained profits).

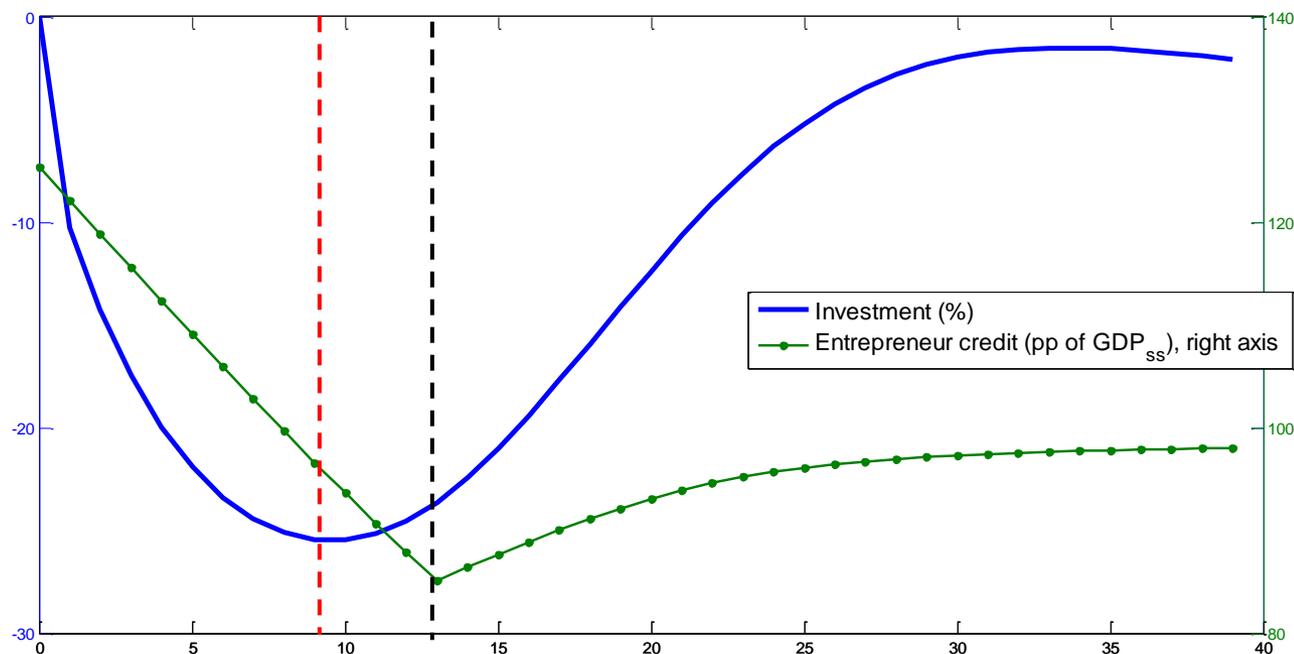


FLOWS OF LIABILITIES OF FIRMS WITH POSITIVE NET INVESTMENT



A CREDIT-LESS RECOVERY AND THE ROLE OF REFORMS (II)

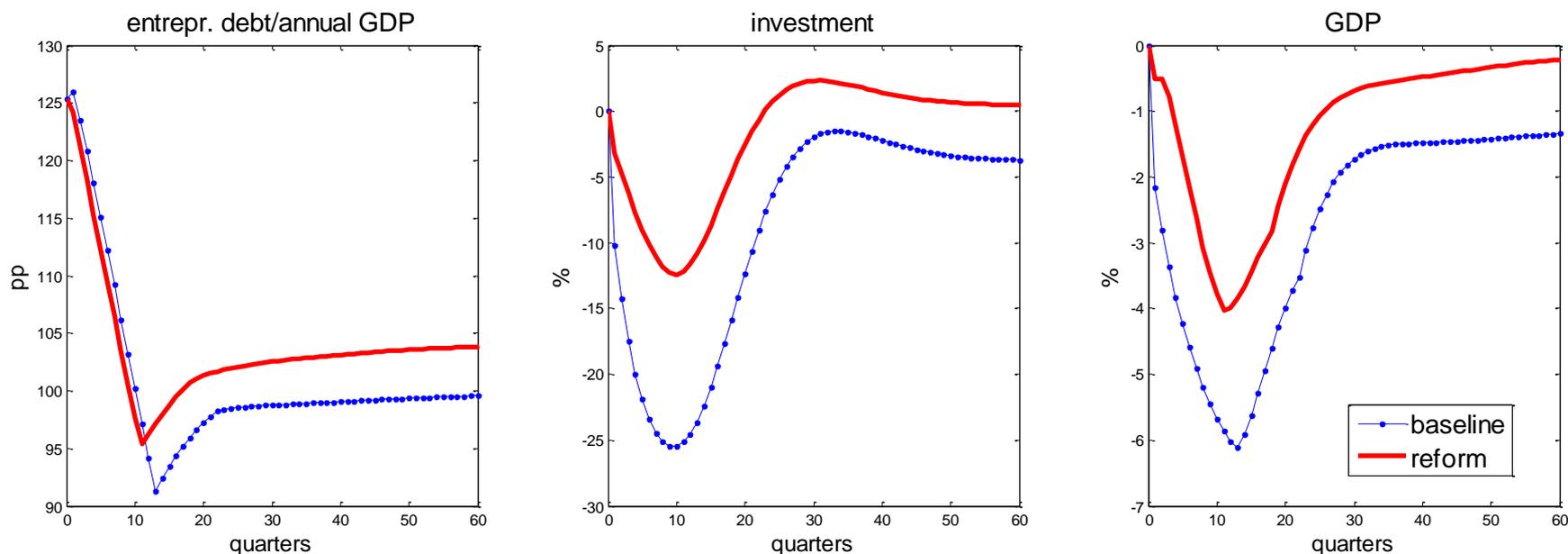
- The DSGE model reproduces this pattern and offers interesting insights:



- As the end of deleveraging approaches, **the demand for K rises in anticipation of the activation of the credit-collateral-investment cycle and before credit recovers...**
- ... and internal funding optimally rises at the expense of dividends pay-out.

A CREDIT-LESS RECOVERY AND THE ROLE OF REFORMS (III)

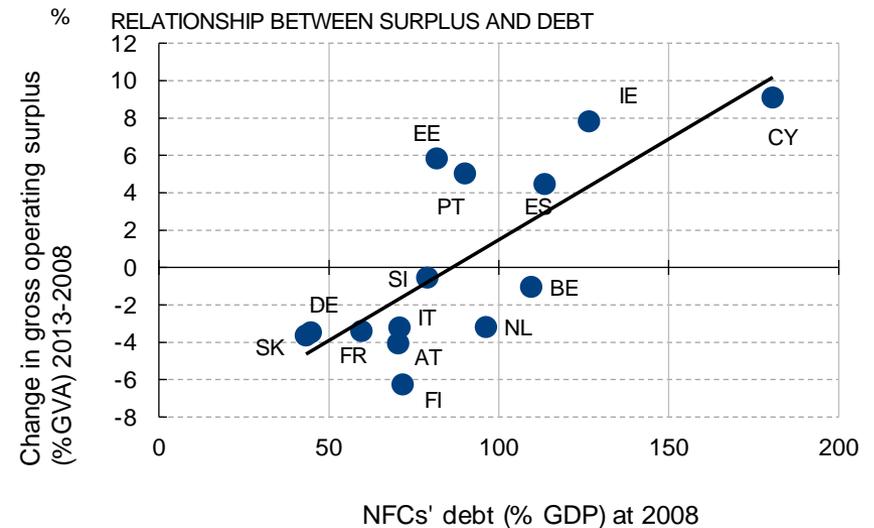
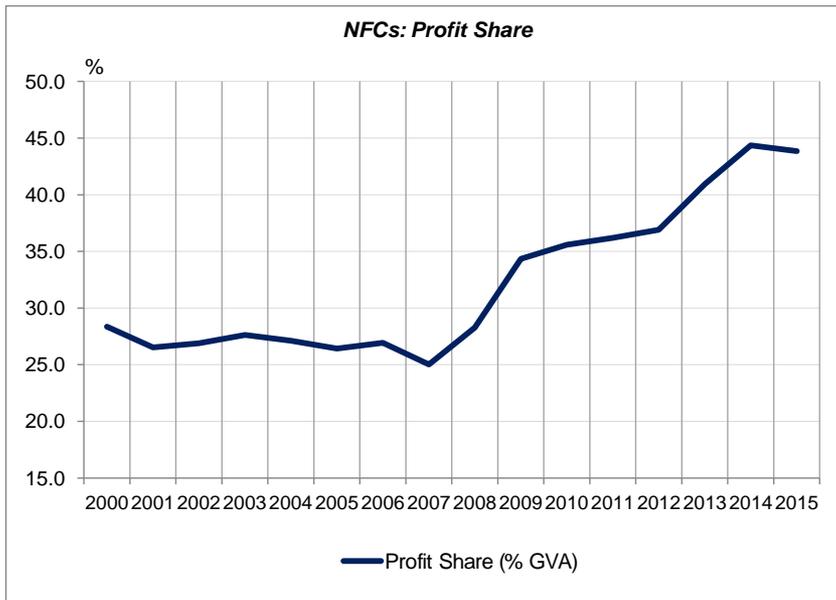
- **Reforms that rise the long-run level of GDP and K-stock may increase investment today and accelerate the accumulation of collateral, reducing the duration and intensity of deleveraging.**



- Partially based on this kind of analysis, **we have modified significantly our empirical model of investment (González-Mínguez et al 2014).**

FINANCIAL FACTORS, PRICES AND INFLATION (I)

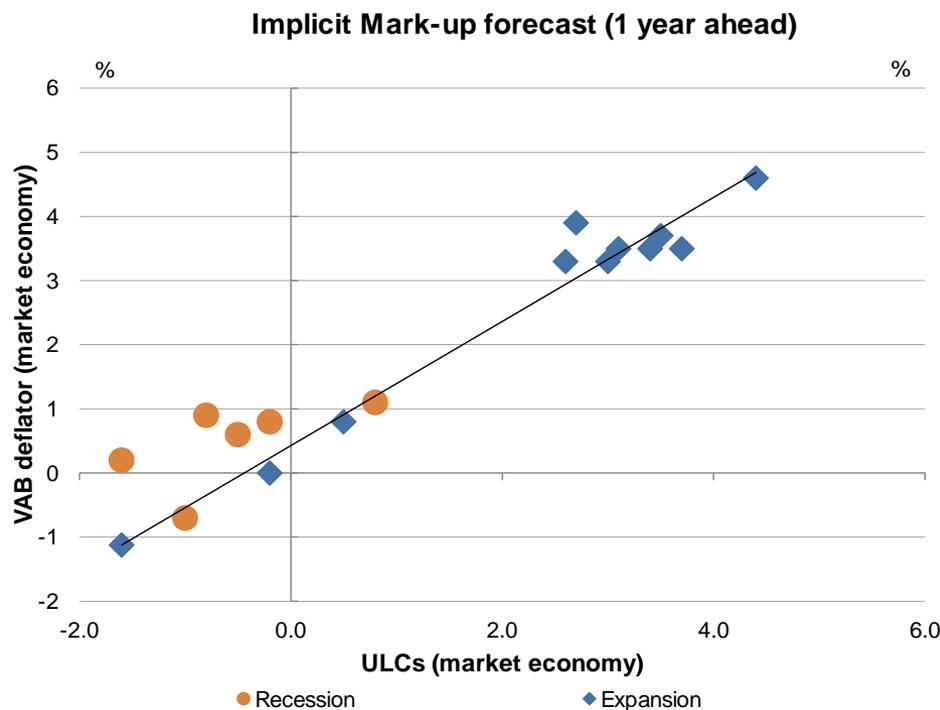
- **Countercyclical mark-ups** in ES (and other periphery countries) during the crisis pose a challenge to inflation analysis.



- Recent DSGE-based research suggests **that financial factors may play a role** (Gilchrist et al. 2016)

FINANCIAL FACTORS, PRICES AND INFLATION (II)

- Montero and Urtasun (2014) provide evidence supporting this hypothesis using micro data for Spanish firms:
 - Firms more leveraged in 2007 *ceteris paribus* set higher mark-ups.
- Based on this, we have introduced an add-on factor in our mark-up projections



TO SUM UP

- We are increasingly aware about the importance of incorporating non-linearities, regime changes, financial factors, etc. into our analysis and forecast.
- Our current standard forecast tools are not well suited to deal directly with these complexities.
- In the meantime, we have found helpful to rely on macro-models based insights to guide some elements of our forecast.
- Until now, macro-model insights mainly feed our judgment, without much direct connection with existing forecast tools.
- Improving this feedback in a quantitatively rigorous manner stands as a priority.