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JEL Classification: N/A

Keywords: N/A

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Monetary Policy, Product Market Competition, and Growth*

Philippe Aghion[†], Emmanuel Farhi[‡], Enisse Kharroubi[§]

August 14, 2018

Abstract

In this paper we argue that monetary easing fosters growth more in more credit-constrained environments, and the more so the higher the degree of product market competition. Indeed when competition is low, large rents allow firms to stay on the market and reinvest optimally, no matter how funding conditions change with aggregate conditions. To test this prediction, we use industry-level and firm-level data from the Euro Area to look at the effects on sectoral growth and firm-level growth of the unexpected drop in long-term government bond yields following the announcement of the Outright Monetary Transactions program (OMT) by the ECB. We find that the monetary policy easing induced by OMT, contributed to raising sectoral (firm-level) growth more in more highly leveraged sectors (firms), and the more so the higher the degree of product market competition in the country (sector).

Keywords: growth, financial conditions, firm leverage, competition

JEL codes: E32, E43, E52.

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1 Introduction

The President of the European Central Bank (ECB), Mario Draghi, declared at the 2014 Economic Policy Symposium in Jackson Hole that he could only do half the work by relaxing monetary policy and that Member States would have to do the other half by implementing structural reforms. In this paper we use sector and firm-level data across a set of Euro and non-Euro area countries to argue that a more pro-active monetary policy is more growth-enhancing in a more competitive environment.

Figure 1 below provides some motivating evidence.[1] This figure summarizes the results from a cross-country cross sector regression where average annual sectoral growth over the period 1995-2005, is regressed on the interaction between liquidity dependence of the corresponding sector in the US[2] and the real short-term interest rates countercyclicality in the country over that same period. The figure shows that moving from the lowest to the highest quartile on both, liquidity dependence and monetary policy countercyclicality, increases sectoral growth significantly in a country with below median barrier to trade and investment (BTI) whereas it has a negligible effect on growth in a country with higher than median BTI.

FIGURE 1 *HERE*

In the first part of the paper we outlay a simple analytical model of the complementarity between product market competition and monetary easing. In this model firms can make growth-enhancing investment but are subject to liquidity shocks that forces them to reinvest money in their project. Anticipating this, firms may have to sacrifice part of their investment in order to secure reinvestment in case of a liquidity shock (liquidity hoarding). A countercyclical monetary policy, which sets high interest rates in expansions and low interest rates in recessions, turns out to be growth-enhancing as it reduces the amount of liquidity entrepreneurs need to hoard to whether liquidity shocks. Moreover, the model predicts that such a countercyclical monetary policy is more growth-enhancing when competition is higher: indeed when competition is low, large rents allow firms to stay on the market and reinvest optimally, no matter how funding conditions change with aggregate conditions.

[1] The appendix provides all the details of the empirical analysis underpinning computations used in Figure 1.
[2] Here we follow the methodology in Rajan and Zingales (1998).

In the second part of the paper we develop our core empirical analysis. We proceed in two steps. First, we perform an industry-level analysis. Then we move on to firm-level analysis. Productivity measures – including TFP- tend to be more reliable at the sector level. Moreover, sectoral analysis enables us to look at the effects of OMT and product market competition on firm demographics, in particular on new firm entry. The firm-level analysis serves as a robustness test to show that the cross-sectoral effects of OMT also hold across firms within sectors. Moreover, it allows us to use the concentration index in a firm's sector to measure the degree of product market competition faced by the firm (e.g. see Aghion et al, 2005).

When performing the industry-level analysis, we consider a set of Euro-Area countries some of which were directly hit by the sovereign debt crisis (Belgium, Italy, Portugal and Spain) and others were not (Austria, France, Germany). We then use interest rate forecasts from the OECD Economic Outlook publication to compute the unexpected change in each Euro Area long-term government bond yield following the announcement of the Outright Monetary Transactions (OMT) program and we regress industry growth on: (i) the country-level unexpected change in long-term government bond yield following OMT; (ii) sectoral indebtedness; (iii) the interaction between the two; (iv) the triple interaction between the unexpected change in bond yields, sectoral indebtedness, and the country-level degree of product market competition. We show that the drop in the unexpected bond yields following OMT had a more positive effect on sectoral growth in more leveraged sectors. Moreover, this latter effect was significant only for sectors located in countries where product market regulation was low prior to OMT.

Then we turn our attention to the firm-level analysis. There we put together a dataset of listed firms from eight European countries (Belgium, Denmark, France, Germany, Italy, the Netherlands, Spain and the United Kingdom). For each country in our sample we gather data on domestic banks holdings of Euro Area countries sovereign debt. Next, using daily data on the yield curve of each Euro Area country, we compute the bank-by-bank revaluation gain on the portfolio of sovereign debt holdings, stemming from the announcement of the OMT policy. And we aggregate these revaluation gains at the country-level so as to obtain a country-level measure of the OMT shock. Following the same methodology as for the sector-level analysis, we regress firm-level growth on the country-level measure of the OMT shock interacted first with a firm-level measure of indebtedness,[3] and second with competition in the firm's sector, where competition is inversely measured by the sectoral Herfindhal index. In this regression, we include the full set of country/sector fixed effects so that sectoral characteristics such as differences in competition or differences in demand are controlled for. Overall, the results of the firm-level analysis parallel to those of the sector-level analysis. First, we find a positive and significant effect of the interaction between the revaluation gain stemming from the OMT policy and firm-level indebtedness on the growth in firm-level sales and firm-level employment. Second, we find that this positive growth gain of OMT in more indebted firms, accrues particularly to firms located in more competitive sectors, i.e. in sectors where the Herfindhal index is low.

The paper relates to several strands of literature. First, to the literature on macroeconomic volatility and growth. A benchmark paper in this literature is Ramey and Ramey (1995) who find a negative correlation in cross-country regressions between volatility and long-run growth. A first model to generate the prediction that the correlation between long-run growth and volatility should be negative, is Acemoglu and Zilibotti (1997) who point to low financial development as a factor that could both, reduce long-run growth and increase the volatility of the economy.. Subsequently, Aghion et al (2010) looked at the relationship between credit constraints, volatility, and the composition of investment between long-term growth-enhancing (R&D) investment and short term (capital) investment, and showed that more macroeconomic volatility is associated with a lower fraction of investment devoted to R&D and to lower productivity growth. More closely related to this paper is Aghion, Hemous and Kharroubi (2012) which showed that more countercyclical fiscal policies affect growth more significantly in sectors whose US counterparts are more credit constrained. Our paper contributes to this overall literature by introducing monetary policy and competition (or product market regulation) into the analysis.[4]

Our paper also speaks to the debate on policy versus institutions as determinants of volatility and growth. Acemoglu et al (2003) and Easterly (2005) hold that both, high volatility and low long-run growth do not directly arise from policy decisions but rather from bad institutions. Our paper contributes to this debate

[3] In addition to this results, the empirical analysis also shows that high debt tends to be a drag on growth but that product market regulation tends to dampen this negative effect.

[4] See also Aghion and Kharroubi (2013) who look at the relationship between monetary policy and financial regulation. It shows that tighter financial regulation –in the form of higher bank capital ratios- may contribute to reducing the growth-enhancing effect of a more counter-cyclical monetary policy.

by showing that monetary policy matters even among industries and firms which are all located in countries with similar property rights and political institutions; yet product market competition also matters.[5]

Third, we contribute to the literature on monetary policy design. In our model, monetary policy operates through a version of the credit channel (see Bernanke and Gertler 1995 for a review of the credit channel literature).[6] More specifically, our model builds on the macroeconomic literature on liquidity (e.g. Woodford 1990 and Holmström and Tirole 1998). This literature has emphasized the role of governments in providing possibly contingent stores of value that cannot be created by the private sector. Like in Holmström and Tirole (1998), liquidity provision in our paper is modeled as a redistribution from consumers to firms in the bad state of nature; however, here redistribution happens ex post rather than ex ante. This perspective is shared with Farhi and Tirole (2012), however their focus is on time inconsistency and ex ante regulation; also in their model, unlike in ours, there is no liquidity premium and therefore, under full government commitment, there is no role for a countercyclical interest rate policy.

The remaining part of the paper is organized as follows. Section 2 develops a simple model to analyze the interplay between monetary policy, competition, and growth. Section 3 looks at the effect on long-term industry growth on the unexpected drop in long-term government bond yields following OMT, and at how the magnitude of this effect is itself affected by product market competition. Section 4 focuses on the firm-level analysis. And Section 5 concludes.

2 Model

2.1 Basic setup

The model is a straightforward extension of that in Aghion et al (2013). The economy is populated by non-overlapping generations of two-period lived entrepreneurs. Entrepreneurs born at time t have utility function $U = \mathbb{E}[c_{t+2}]$, where c_{t+2} is their end-of-life consumption. They are protected by limited liability

[5] See also Aghion et al (2009) who analyze the relationship between long-run growth and the choice of exchange-rate regime; and Aghion, Hemous and Kharroubi (2012) who show that more countercyclical fiscal policies affect growth more significantly in sectors whose US counterparts are more credit constrained.

[6] There are two versions of the credit channel : the "balance sheet channel" and the "bank lending channel". Our model features the balance sheet channel, focusing more on the effect of interest rates on firms' borrowing capacity.

and A_t is their endowment at birth at date t. Their technology set exhibits constant returns to scale. Upon being born at date t, the new generation of entrepreneurs choose their investment scale $I_t > 0$.

At the interim date $t+1$ uncertainty is realized: it consists of both, of an aggregate shock which is either good (G) or bad (B), and of an idiosyncratic liquidity shock. The two events are independent and we denote by μ the probability of a good aggregate shock, and by α the probability of a firm experiencing a liquidity shock.

At date $t+1$, an interim cash flow $\pi_i(c) I_t$ accrues to the entrepreneur where $\pi(c) \in \{\pi_G(c), \pi_B(c)\}$ with $\pi_G(c) > \pi_B(c)$ and c is a parameter which measures the degree of product market competition and $\pi_i'(c) < 0$. We assume in what follows that $c \in \{\underline{c}, \overline{c}\}$, so that $c = \overline{c}$ (resp. $c = \underline{c}$) reflects high competition (resp. low competition) on the product market.

The interim cash flow is not pledgeable to outside investors. But other returns generated by the firm are pledgeable. We assume that in the absence of a liquidity shock, the other returns are obtained already at date $t+1$: namely, the entrepreneur generates the additional return $\rho_1 I_t$, of which ρI_t is pledgeable to investors.[7] If the firm experiences a liquidity shock, then the additional return is earned at date $t+2$ provided additional funds $J_{t+1} \leq I_t$ are reinjected into the project in the interim period. The entrepreneur then gets $\rho_1 J_{t+1}$ at date $t+2$, of which only ρJ_{t+1} is pledgeable to investors.

Entrepreneurs in the economy differ with respect to the probability α of a liquidity shock. Namely: $\alpha \in \{\overline{\alpha}, \underline{\alpha}\}$ with $\overline{\alpha} > \underline{\alpha}$. We interpret the probability α as a measure of liquidity-constraint.

The one period gross rate of interest at the investment date t is denoted by R, whereas R_s denotes the one period gross rate of interest at the reinvestment date $t+1$ when the aggregate shock is s, $s \in \{G; B\}$. We assume:

- **Assumption 1:** $\rho < \min\{R, R_G, R_B\}$

Assumption 1 ensures that entrepreneurs are constrained and must invest at a finite scale. The next

[7] The model assumes that competition only affects short-term profits and not long-run profits. It can actually be argued that if long-run profits are those associated to innovation, they would be less sensitive to competition as innovation is precisely a way to escape it. By contrast, short-term profits are those derived from existing activities and products and thereby more subject to competitive pressures.

assumption determines how easy/difficult reinvestment is, for entrepreneurs facing a liquidity shock.

- **Assumption 2:** $\pi_G(\bar{c}) > 1$ and $1 - \pi_B(\underline{c}) - \rho/R_B > 0 > 1 - \pi_B(\bar{c}) - \rho/R_B$.

Assumption 2 guarantees that, irrespective of the degree of product market competition c, cash flows in the good state are enough to cover liquidity needs and reinvest at full scale if a liquidity shock hits. However, in the bad state, cash flows alone are enough to cover liquidity needs only if competition is low, i.e. $c = \underline{c}$. If competition is high, i.e. $c = \bar{c}$, and the bad state realizes, then a firm facing a liquidity shock will have to use additional liquidity set aside at the investment date t if it wants to reinvest at full scale.

We assume that liquidity hoarding is costly: to purchase an asset that pays-off $x_0 I_t$ at date $t+1$, the entrepreneur needs to hoard the amount $q(1-\mu)\alpha x_0 I_t / R$ at date t, where $q > 1$. The difference $(q-1)$ reflects the cost of liquidity hoarding.

Entrepreneurs face the following trade-off: on the one hand, maximizing the amount invested in its project requires minimizing the amount of liquidity hoarded, which in turn may prevent the firm from reinvesting at large scale if it faces a liquidity shock and the economy experiences a bad aggregate shock; on the other hand, maximizing liquidity to mitigate maturity mismatch requires sacrificing initial investment scale.

2.2 Investment, liquidity hoarding and reinvestment in equilibrium

Let us first consider a firm's reinvestment decision at the interim period $t+1$. If it faces both a liquidity shock and a bad aggregate shock, a firm born at date t can use its short-term profits $\pi(c) I_t$, plus the amount of hoarded liquidity $x_0 I_t$ if any, plus the proceeds from new borrowing at date $t+1$ (the entrepreneur can borrow against the pledgeable final income ρJ_{t+1}), for reinvestment at date $t+1$. More formally, if $J_{t+1} \in [0, I_t]$ denotes the firm's reinvestment at date $t+1$, we must have:

$$J_{t+1} \leq (x_0 + \pi_B(c)) I_t + \frac{\rho}{R_B} J_{t+1} \tag{1}$$

or:

$$J_{t+1} \leq \min \left\{ \frac{x_0 + \pi_B(c)}{1 - \rho/R_B}, 1 \right\} I_t \tag{2}$$

In particular, a lower interest rate in the bad state R_B facilitates refinancing because this increases the ability to issue claims at the reinvestment date and hence reduces the need to hoard liquidity at the investment date which in turn saves on the cost of liquidity given the positive liquidity premium ($q > 1$).

Moving back to date t, we can determine the equilibrium hoarding and investment at that date. Starting with initial wealth A_t, the entrepreneur needs to raise $I_t - A_t$ at date t from outside investors to invest I_t in its project. In addition, the firm must anticipate the need for reinvestment if a liquidity shock hits in the bad aggregate state: to face such possibility, the entrepreneur will rely on both, liquidity hoarding to get the additional liquidities $x_0 I_t$ at date $t+1$ and additional future borrowing by issuing new claims $x_1 I_t$ to investors against the final pledgeable cash flow.

If the return ρ_1 to long-term projects is sufficiently large, then in equilibrium the entrepreneur chooses the maximum possible investment size I_t, which is the investment such that all these calls on investors will have to be exactly matched by the total present expected flow of pledgeable income generated by the firm. Hence the equilibrium investment size I_t will satisfy:

$$(I_t - A_t) + \alpha (1-\mu) \left[\frac{x_1 I_t}{R} + q \frac{x_0 I_t}{R} \right] = (1-\alpha) \frac{\rho}{R} I_t + \alpha \left[\mu \frac{\rho}{R R_G} I_t + (1-\mu) \frac{(\pi_B (c) + x_0 + x_1) \rho}{R R_B} I_t \right], \quad (3)$$

where x_0 and x_1 are optimally chosen in dates t and $t+1$ respectively.

In fact to achieve the maximum investment size I_t the entrepreneur will borrow up to the constraint and choose the minimum amount of liquidity compatible with full reinvestment:

$$x_1 = \rho / R_B \text{ and } x_0 = 1 - \pi_B(c) - \rho / R_B$$

whenever the latter expression holding if is positive; otherwise liquidity hoarding can be avoided and $x_0 = 0$. Overall, if ρ_1 is sufficiently large, the equilibrium investment size I_t is given by:

$$\frac{I_t}{A_t} = \frac{R}{R - \left(1 - \alpha + \alpha \frac{\mu}{R_G}\right) + \alpha (1-\mu) q x} \quad (4)$$

where $x = [1 - \pi_B(1-c) - \frac{\rho}{R_B}]^+$.

2.3 Growth and counter-cyclical interest rates.

We assume that the growth rate of total factor productivity for a firm between period t and period $t+2$ is given by:

$$A_{t+2} = g.I_t.A_t \tag{5}$$

where g is a positive scalar. Then, using the above expression (4) for entrepreneurs' ex ante long-term investment I_t, growth in this economy g_{t+2} writes as :

$$g_{t+2} = \ln A_{t+2} - \ln A_t = \ln g + \ln \frac{R}{R - \left(1 - \alpha + \alpha \frac{\mu}{R_G}\right)\rho + \alpha\left(1-\mu\right) qx}, \tag{6}$$

where $x = [1 - \pi_B(1-c) - \frac{\rho}{R_B}]^+$.

To derive the comparative statics of growth with respect to the cyclicality of interest rates, we consider the effect of changing the spread between the interest rates $\{R_B; R_G\}$ keeping the average one period interest rate at the interim date, $(1-\mu) R_B + \mu R_G = R_m$, constant. A higher R_G will then correspond to more counter-cyclical interest rates. We can rewrite the above equation as:

$$\ln \frac{A_{t+2}}{A_t} = \ln gR - \ln \left[R - \left(1 - \alpha + \alpha \frac{\mu}{R_G}\right)\rho + \alpha\left(1-\mu\right) q \left[1 - \pi_B(c) - \frac{\left(1-\mu\right)\rho}{R - \mu R_G}\right]^+\right] \tag{7}$$

As is clear holding the average interest rate R constant, growth depends on three key parameters: First the degree of interest rate countercyclicality captured here by the level of the interest rate R_G. Second, the probability α for firms to face the liquidity shock and third the degree of product market competition c. Let us detail below the different comparative statics.

2.4 Competition, countercyclical interest rates and growth

Given Assumption 2 which states that firms need to hoard liquidity only when competition is high, we immediately get that growth when competition is low writes as

$$\ln \frac{A_{t+2}}{A_t}\left(\underline{c}\right) = \ln gR - \ln\left[R - \left(1-\alpha+\alpha\frac{\mu}{R_G}\right)\rho\right]$$

while the expression for growth turns out to be

$$\ln \frac{A_{t+2}}{A_t}\left(\bar{c}\right) = \ln gR - \ln\left[R - \left(1-\alpha+\alpha\frac{\mu}{R_G}\right)\rho + \alpha\left(1-\mu\right)q\left[1-\pi_B\left(\bar{c}\right) - \frac{\left(1-\mu\right)\rho}{R-\mu R_G}\right]\right]$$

when competition is high.[8] It follows that an increase in the countercyclicality of monetary policy, i.e. a higher interest rate R_G, is more likely to enhance enhance growth when competition on the product market is high (i.e. when $c = \bar{c}$) than when it is low:

$$\left.\frac{\partial g_{t+2}}{\partial R_G}\right|_{c=\bar{c}} > \left.\frac{\partial g_{t+2}}{\partial R_G}\right|_{c=\underline{c}}$$

Moreover a countercyclical monetary policy, i.e. a higher interest rate R_G, is more likely to benefit to firms facing a larger probability α of the liquidity shock, when competition on the product market is high than when it is low:

$$\left.\frac{\partial^2 g_{t+2}}{\partial R_G \partial\alpha}\right|_{c=\bar{c}} > \left.\frac{\partial^2 g_{t+2}}{\partial R_G \partial\alpha}\right|_{c=\bar{c}}$$

[8] Note that this model, with its current framework, would predict that growth is higher with lower competition. A simple extension that would make the model more realistic from this point of view would be to to introduce an escape competition effect as in Aghion et al (2005). For example by assuming that firms make a pre-innovation profit when they do not invest, and that this pre-innovation profit decreases more with competition than the post investment profit. Importantly, this would not affect the main predictions that (i) more countercyclical interest rates are more growth enhancing for firms that are more prone to liquidity shocks and (ii) that this property holds particularly when competition is high.

3 Sectoral analysis

Here we look at the effect on sectoral growth of the change in unexpected bond yields following the OMT. Specifically, we consider six Euro Area countries -which commonly faced the OMT shock- but had significantly different outcomes, especially in terms of changes in government bond yields. We exploit these cross-country differences along with cross-sectoral differences in indebtedness to infer whether sectors with fragile balance sheets did actually benefit more from the fall in government bond yields for the country they operate in. In addition to this, we use differences in product market regulation among these six Euro Area countries to test how competition changes the growth effects of the accommodation episode that followed the announcement of OMT.

3.1 The economic context

The European sovereign debt crisis started by the end of 2009 as several governments of Euro Area countries (most notably Greece, Portugal, Ireland, Spain and Cyprus) were facing increasing difficulties to repay or refinance their sovereign debt or to bail out over-indebted banks. These growing financial difficulties triggered calls for assistance from third parties like other Euro Area countries, the ECB and the IMF, especially as re-denomination risks mounted, i.e. the risk that these countries may have no other options than to default and exit from the Eurozone.

Several initiatives were undertaken to confront this debt crisis, among which the implementation of the European Financial Stability Facility (EFSF) and European Stability Mechanism (ESM), which acted as vehicles for financial support in exchange of measures designed to address the longer-term issues of government and banking sectors financing needs. The ECB contribution to addressing the European sovereign debt crisis took several forms, including lowering policy rates and providing cheap loans of more than one trillion euro. Yet, the most decisive policy action was on 6 September 2012, by which the ECB announced free unlimited support for all Euro Area countries involved in a sovereign state bailout/precautionary programme from EFSF/ESM, through some yield lowering Outright Monetary Transactions (OMT). Arguing that divergence in short-term bond yields is an obstacle to ensuring that monetary policy is transmitted equally to all the Eurozone's member economies, the ECB portrayed (purchases under) the OMT programme as "an effective back stop to remove tail risks from the euro area" and "safeguard an appropriate monetary policy transmission and the singleness of the monetary policy".[9]

Several studies have confirmed that following the announcement of OMT, a number of yields on Euro Area government bonds shrank considerably. For example, Altavilla et al. (2014) estimate that the Italian and Spanish 2-year government bond yields decreased by about 200 bps after the OMT announcement, yet leaving bond yields of the same maturity in Germany and France unchanged. De Grauwe and Ji (2014) suggest that the shift in market sentiment triggered by the OMT announcement accounts for most of the decline in bond yields that was observed at that time, rejecting the view that improved fundamentals have played a significant role. These results are actually consistent with the fact that OMT was never practically used.

3.2 The empirical methodology

Our goal consists in finding out what real effects had the drop in government bonds yields of Euro Area countries that followed the OMT programme. To do so, we use OECD Economic Outlook quarterly projections for short and long term interest rates to infer the surprise component in the evolution of these interest rates.[10] More specifically we denote r^L_{ctq} the yield on the 10-year government bond in country c in quarter q of year t and $E\left[\left.r^L_{ctq}\right| I_{t-1}\right]$ the projected yield on the 10-year government bond in country c in quarter q of year t, conditional on all information available by the end of year $t-1$.[11] We then compute the forecast error on this yield as

$$FE_{ctq} = r^L_{ctq} - E\left[\left.r^L_{ctq}\right| I_{t-1}\right]$$

[9] Executive Board member, Benoît Cœuré, described OMT as follows: "OMTs are an insurance device against redenomination risk, in the sense of reducing the probability attached to worst-case scenarios. As for any insurance mechanism, OMTs face a trade-off between insurance and incentives, but their specific design was effective in aligning ex-ante incentives with ex-post efficiency."

[10] Given that OMT was targeted to shorter maturity bonds (1-3 years), it would be more natural to look at those shorter maturity bonds than the 10-year bonds. In practise however, OMT affected the whole yield curve of Euro Area countries. Hence looking at the 10-year bond is still acceptable.

[11] Using this methodology implies that the forecast horizon ranges from one to four quarters at most.

Here a positive forecast error reflects a higher than expected rate or yield, implying that funding conditions have unexpectedly tightened. On the contrary negative forecast errors reflect easier than expected funding conditions. Computing these forecast errors for the four most significant Euro Area countries (France, Germany, Italy and Spain) shows a number of striking patterns. First there is a sharp drop in the forecast errors on 10 year government bond yields in Spain and Italy after 2012q3. While yields were significantly larger than expected over 2011, when the sovereign debt crisis was at its height, they ended up being significantly lower than expected over 2013 and 2014. Second, interestingly, these changes do not extend to France and Germany, where the period 2011-2012 does not provide evidence of yields significantly higher than expected as these countries were on the contrary benefiting from their safe haven status.

FIGURE 2 *AND FIGURE* 3 *HERE*

Of course, it is an open question to figure out how much of these changes relate to the specific OMT announcement and we do not intend argue that OMT accounts for all these forecast errors. Yet, irrespective of the extent to which such forecast errors may be accounted for by OMT, they actually provide us with a good measure of the unexpected change in funding conditions in the relevant countries, and as such, are likely to have significant real effects.

3.3 Empirical specification

To investigate the real effects of the unexpected drop in government bonds yields that followed the announcement of OMT, we consider a difference-in-difference approach focusing on the two periods of 2011-2012 and 2013-2014. For each of these periods, we compute the average forecast error on 10-year government bond yields and take the difference as a measure of the unexpected easing in funding conditions.

We then build an empirical specification linking this country-wide measure of lower funding costs to growth at the industry level. Specifically we take as a dependent variable the growth rate at the sector level for each industry-country pair of the sample under study over 2013-2014. Given data availability, we can look at growth in four different variables: real value added, real labour productivity (real value added per worker), real capital productivity (real value added to real capital stock) and total factor productivity. On the right hand side, in addition to saturating the specification with industry and country fixed effects, we control for growth at the industry level over the period 2011-2012, so that all results can be interpreted as changes in growth relative to the 2011-2012 reference period.

Our main variable of interest is the interaction between: (i) an industry's balance sheet indicator -denoted (debt); (ii) and the unexpected change in a country's funding conditions -denoted (omt). As explained above, the latter variable is computed as the difference between long term government bond yield average forecast error over 2013-2014, denoted FE_c^{13-14} and 2011-2012 denoted FE_c^{11-12}:

$$(\text{omt})_c = FE_c^{13-14} - FE_c^{11-12}$$

Turning to industry balance sheet indicators, we consider two measure of indebtedness. A narrow indicator is the stock of bank debt as a ratio of total equity. A wider indicator is the stock bank debt and bonds as ratio of total equity. In addition we will also make use of liquidity indicators by looking at the ratio of *current* bank debt to equity or *current* bank debt and bonds to equity, current liabilities being those with a maturity less than one year. Importantly, industry balance sheet indicators are measured prior to the 2013-2014 period, namely either in 2010 or in 2012. Denoting g_{sc}^{13-14} (g_{sc}^{11-12}) the growth rate of industry s in country c over the period 2013-2014 (over the period 2011-2012), $(\text{reg})_c$ the degree of product market regulation in country c, α_s and α_c industry and country fixed effects, and letting ε_{sc} denote an error term, our baseline regression is expressed as follows:

$$\begin{aligned} g_{sc}^{13-14} = \alpha_s + \alpha_c + \beta_0 . g_{sc}^{11-12} + \beta_1 .(\text{debt})_{sc} + \beta_{11} .(\text{debt})_{sc} \times (\text{reg})_c \\ + \beta_2 .(\text{debt})_{sc} \times (\text{omt})_c + \beta_{21} .(\text{debt})_{sc} \times (\text{omt})_c \times (\text{reg})_c + \varepsilon_{sc} \end{aligned} \tag{8}$$

Here, the coefficient β_{11} determines how product market regulation affects the relationship between corporate indebtedness and growth while the coefficient β_{21} determines how product market regulation affects the differential relationship between the change in funding conditions and growth. Intuitively and consistent with the model derived above, we would expect corporate indebtedness to be a drag on growth, i.e. $\beta_{10} < 0$, while we would expect product market regulation to reduce the growth cost of corporate indebtedness, i.e $\beta_1 > 0$. In addition, a positive coefficient β_2 for instance would imply that highly indebted sectors benefit disproportionately more from an unexpected drop in funding costs while a negative coefficient β_{21} for instance would imply that product market regulation typically reduces the growth benefit of lower funding cost for the most indebted sectors.

3.4 Data Sources

Our data sample focuses on the big four Euro Area countries France, Germany, Italy and Spain to which we add Austria, Belgium and Portugal. Focusing on this limited set of countries is driven by data availability considerations. Our data come from various sources. Industry-level real value added, employment, capital stock and total factor productivity are drawn from the European Union (EU) KLEMS data set and cover the whole economy wherever data is available. Our source for sectoral balance sheet data is the BACH database. We draw from this dataset the sector-level balance sheet data for equity, bank debt, bonds, current bank debt and current bonds and financial payments. We carry out the estimations using the balance sheet data for either year 2010 or 2012 so that in both cases, the announcement of OMT would not contaminate these measures.[12,13] The product market regulation data comes from the OECD and is measured for the year 2013. Finally, forecast errors in government bond yields are computed using quarterly data from the different vintages of the OECD Economic outlook database.[14]

3.5 Results

Table 1 provides the estimation results for specification (8) under different parameter restrictions for each of the four different growth dependent variables referred to above (value added, labour productivity, capital

[12] In addition, the data for 2010 is not affected by the sovereign debt crisis.

[13] Using the actual balance sheet data instead of those pertaining to the corresponding US sector has two advantages. First, we can exploit the cross-country heterogeneity as the same sector features pretty diverse balance sheets when looking at different sectors. Second, the European sovereign debt crisis hit some countries more severely than others. This has prompted very diverse change in sectoral indebtedness across countries. These two features represents two sources of heterogeneity that can usefully be exploited in our context.

[14] The OECD publishes twice a year (June and December) forecasts over a two year horizon for a number of macroeconomic variables. We consider for each year $t + 1$ forecasts of the December issue of year t so that the forecast horizon nevers exceeds four quarters.

productivity and total factor productivity). In addition Table 1 estimations use the ratio of bank debt to equity as a measure of sectoral indebtedness. Table 2 provides a similar set of regressions, but using the wider measure of sectoral indebtedness, the ratio of bank debt and bonds to total equity. In a nutshell, the empirical results suggest that the interaction of the unexpected reduction in government bonds yields following OMT and corporate indebtedness, irrespective of the specific measure considered, seem to have had a significant effect on industry growth, but only to the extent that cross-country differences in product market competition are taken into account. More precisely, looking at the second and third row of Table 1, the estimation results show that the sectoral bank debt to equity ratio on its own, has no effect on growth. However this actually hides a significant positive effect of product market regulation, which acts to dampen the negative effect of indebtedness on growth. Put differently, a large bank debt to equity ratio acts as a drag on growth but only insofar as product markets are relatively unregulated. Product market regulation therefore acts to reduce the burden of high debt on growth. Interestingly, this result holds similarly for all our four growth variables, including total factor productivity growth. It also holds in a similar fashion when using the wide ratio -bank debt and bonds to equity- as a measure of sectoral indebtedness instead of the narrow ratio -bank debt to equity- (second and third row of Table 4), although it is fair to say that the latter estimation results show weaker significance.

TABLE 1 *AND* 2 *HERE*

Turning now to the fourth and fifth row of Table 1, we can see that, on its own a drop in funding costs -as captured by the change in forecast errors on government bond yields- does not benefit in a significant way to either more or less indebted sectors, this holding equally, irrespective of the specific definition of sectoral indebtedness (see fourth and fifth row of Table 2). If anything, the interaction between the drop in the government bond yield and the sectoral bank debt to equity ratio carries a negative, although not significant, coefficient, suggesting that highly indebted sectors would benefit less from easier financial conditions, a result that seems at odds with any simple intuition. Yet as was the case for sectoral indebtedness, this inconclusive result hides conflicting patterns as highly indebted sectors do actually benefit more from easier funding conditions, but only in countries where the index for product market regulation is rather low. Otherwise, in countries with tightly regulated product markets, easier funding conditions either benefit equally to sectors with high and low debt, or they actually benefit more to sectors with lower indebtedness. Moreover, the turning point for the index of product market regulation beyond which the effect of the interaction term turns from positive to negative (6th row in Table 3 and Table 4) shows remarkable consistency across the different estimations, irrespective the specific growth dependent variable and irrespective of the specific definition of sectoral indebtedness.

3.6 Quantifying the effect of product market regulation.

Based on the empirical results described above, we can draw conclusions for each country of our sample as to what extent sectors located in each of these countries may have benefited from the unexpected drop in long term yields that followed OMT. To do so, we consider the product market regulation index in each country and simulate two scenarios. First we look at the change in real value added growth stemming from a 10% increase in the bank debt to equity ratio. Second, we look at the change in real value added growth stemming from the combination of a 10% increase in the bank debt to equity ratio and a 100 basis points drop unexpected drop in long term government bonds yields. Two main conclusions can be drawn from this exercise. First there are two groups of countries: Austria, Germany and Italy on the one hand and Belgium, France and Spain on the other hand. In the former group, where the product market regulation index is rather low, an increase in indebtedness tends to reduce growth while the combination of an increase in indebtedness and a reduction in government bond yields tends to raise growth. Interestingly, in these computations which assume a 100 basis point unexpected reduction in government bond yields, the latter positive effect tends to dominate from a quantitative standpoint the former negative effect. In the second group of countries, Belgium, France and Spain, where product market regulation is rather tight, indebtedness has no significant direct effect on growth. Moreover, the reduction is government bonds yields that followed OMT has rather, if anything, benefited to sectors with relatively low bank debt to equity. Tight product market regulation has therefore acted to shield the economy from the cost of high indebtedness. However at the same time, it has also redirected the benefits of lower funding costs to those sectors which had relatively stronger balance sheets, i.e. lower bank debt and hence arguably those sectors that were less in need for support.

FIGURE 4 *AND* 5 *HERE*

3.7 Investigating the role of liquid liabilities

Up to now, the empirical analysis has focused on the role of leverage and indebtedness in affecting growth at the sector-level and as a transmission channel for the effects of changes in funding conditions on growth. In this section, we aim at expanding the analysis to investigate the role of liquid liabilities. Specifically we consider bank debt and bonds with a less than one year maturity and build two sector-level indicators of liquid financial liabilities: (i) the ratio between bank debt with a less than one year maturity and equity and (ii) the ratio between bank debt and bonds with a less than one year maturity and equity. We then extend the empirical specification (8) to allow the indicator of liquid financial liabilities -denoted cde- to affect growth independently of leverage. Specifically, we first test whether holding liquid financial liabilities has a direct effect on growth at the sector level, beyond and above the direct effect of leverage and indebtedness; and how product market regulation affects this direct linkage if any.

$$\begin{aligned} g^a_{sc} &= \alpha_s + \alpha_c + \beta_0.g^b_{sc} + \beta_{10}.(\text{bs cde})_{sc} + \beta_1.(\text{bs cde})_{sc} \times (\text{reg})_c \\ &+\beta_2.(\text{bs})_{sc} \times (\text{omt})_c + \beta_{21}.(\text{bs})_{sc} \times (\text{omt})_c \times (\text{reg})_c + \varepsilon_{sc} \end{aligned} \tag{9}$$

For example it may well be that holding debt with a short maturity actually amplifies the drag from leverage on growth as such sectors are forced to forego profitable growth opportunities in order to ensure they will be able to service their debt, particularly those maturing quickly.

Second, we test whether holding liquid financial liabilities affects the benefits a sector can derive from changes in funding conditions that followed OMT:

$$\begin{aligned} g^a_{sc} &= \alpha_s + \alpha_c + \beta_0.g^b_{sc} + \beta_{10}.(\text{bs})_{sc} + \beta_1.(\text{bs})_{sc} \times (\text{reg})_c \\ &+\beta_2.(\text{bs cde})_{sc} \times (\text{omt})_c + \beta_{21}.(\text{bs cde})_{sc} \times (\text{omt})_c \times (\text{reg})_c + \varepsilon_{sc} \end{aligned} \tag{10}$$

Here it might well be that sectors with significant amounts of short term debts may actually benefit more from lower funding costs, as these debts are maturing more quickly and hence provide more opportunities to benefit from the lower funding costs. The empirical evidence gathered in Table 3 shows that neither the ratio of current debt to equity nor the ratio of current debt and bonds to equity seem to have a direct effect on growth, beyond and above that of leverage. Estimation results of specification (9) suggest that what has a direct effect on growth is the amount not the maturity of financial liabilities in relation to the level of equity. Things are different when it comes to how the reduction in funding costs transmits to growth: Results from estimating specification (10) suggest that when a sector holds liquid liabilities, this raises the benefit that can be expected from a reduction in government bond yields, but also makes product market regulation more costly. This is consistent with the view that when liabilities have a shorter maturity, firms can more quickly reap the benefit of refinancing their debts on more favorable terms. Yet the results suggest that firms may have less incentives to turn this "financial windfall profit" into real decisions that would deliver higher growth when they are holding monopoly rents. Product market regulation therefore acts to decouple firms' financial strength from firms' real decisions.

TABLE 3 *HERE*

3.8 Interest payments and firm demography

So far, we have established that sectors more heavily indebted benefited disproportionately more from the drop in long term interest rates that followed the announcement of the OMT program. Also, this benefit was larger in countries where product market regulation was lower. In this section, we aim at disentangling the channels through which these two results can take place. Specifically, we focus on two possible channels. The first one relates to the financial effects of the OMT policy. More specifically, we ask the question of whether sectors did benefit a reduction on their interest payments after the OMT shock and the more so for those more heavily indebted. Table 4 below provides evidence showing that this is indeed the case: Interest payments to equity did fall by more for more heavily indebted sectors located in countries where the fall in long-term interest rates was larger. Columns (5)-(8) also show that a similar result holds for the change in interest payments to equity. However, product market regulation acted to reduce the drop in (the change) interest payments to equity. On this last result, a couple of different interpretations are possible. On the one hand, it may be that firms facing strong competition are eager to refinance existing debt to cash in the benefit of lower interest rates. It may also be that firm debt carries a shorter maturity when competition is stronger. It may finally be that banks are less willing to engage in debt renegotiation or debt refinancing when product market regulation is tighter.

TABLE 4 *HERE*

Next we turn to firm demography. Here we aim at finding out whether the previously identified real effects of OMT did take place through a change in firm demography. To do so, we focus on two variables. First the entry rate, defined as the fraction of sectoral employment in newly created firms, tends to depend positively on the interaction between sectoral indebtedness and the unexpected drop in government bond yields following OMT. In addition we observe that this positive effect was dampened in countries where product market regulation is tighter. Interestingly sectoral indebtedness has no independent significant effect on entry rates. Turning to post entry employment growth, we observe a similar set of result, product market regulation acting to limit the benefit heavily indebted sectors can draw from the drop in government bond yields.

TABLE 5 *HERE*

Overall, these results confirm that product market regulation tends to limit entry and post-entry growth, by reducing the effect of easier funding conditions in highly indebted sectors.

4 The firm-level analysis

In this section, we explore the relationship between credit constraints, performance, and the interplay between OMT and product market competition at the firm level. We start by describing the empirical specification and the data and measurement. And then we present our empirical results.

4.1 The empirical specification

To study the real effects of OMT at the firm-level, we use the following baseline difference in difference specification:

$$\log y_{i,s,c}^{post} = \alpha_{s,c} + \log y_{i,s,c}^{pre} + \log x_{i,s,c} + \log x_{i,s,c} \times OMT_c + \varepsilon_{i,s,c}. \tag{11}$$

The dependent variable, denoted $y_{i,s,c}^{post}$, is the average log of a firm-level real outcome like sales or employment, over the period 2013-2014. In this notation, firms are denoted with the subscript i, sectors are denoted with the subscript s and countries are denoted with the subscript c. On the right hand side, we include the full set of sector-country fixed effects to control for any sector-specific shock. All the estimated effects are therefore measured relative to their sector-country average. In addition, we control for the firm-level real outcome $y_{i,s,c}^{pre}$ in the period that preceded the implementation of OMT. $x_{i,s,c}$ is a firm-level variable (in particular the firm's leverage), and the term $\log x_{i,s,c} \times OMT_c$ captures the interaction between this firm-level variable and OMT. Thus, we test whether more leveraged firms benefit more or less from the OMT policy.

Next, we introduce competition at the sector level, proxied by concentration indexes. We thus estimate the equation:

$$\log y_{i,s,c}^{post} = \alpha_{s,c} + \log y_{i,s,c}^{pre} + \log x_{i,s,c} + \log x_{i,s,c} \times hh_{s,c} + \log x_{i,s,c} \times OMT_c + \log x_{i,s,c} \times OMT_c \times hh_{s,c} + \varepsilon_{i,s,c} \tag{12}$$

The interaction term $\log x_{i,s,c} \times hh_{s,c}$ captures how the effect of leverage varies between high vs. low concentration sectors; and the triple interaction $\log x_{i,s,c} \times hh_{s,c} \times OMT_c$ captures the extent to which the effect of OMT on more leveraged firms, was itself stronger for firms located in high versus low concentration sectors.

4.2 The data

We now present the data and how we construct our firm-level and concentration measures.

4.2.1 Firm-level data

We use firm-level data on income statement and balance sheet form Worldscope. Our data covers Belgium, Denmark, France, Germany, Italy, the Netherlands, Spain, Portugal and the United Kingdom. From this data source, we retrieve data on sales, employment, market capitalization, staff costs and total liabilities, which will be our different dependent variable $y_{i,s,c}$. From the same data source, we also retrieve data on firm leverage, which we measure either as the (log of) the ratio of total assets to total equity or the (log of) the ratio of total assets to total liabilities. Overall, we have between 2'200 and 3'000 firms depending on the specification we use.

4.2.2 Building our monetary policy shock variable.

For each country in our sample we consider the portfolio of sovereign debt holdings held by national banks. This data comes from the EBA 2012 capital exercise. This allows us to compute, for each country, the average portfolio of sovereign debt holdings, with a breakdown by government issuer and maturity. We then compute the revaluation gain on this portfolio due to the OMT policy by taking for each maturity and sovereign issuer the corresponding change in bond yields around the time of announcement of the OMT policy, using daily data on the sovereign yield curve. Next, to transform changes in yields into changes in price, we assume that all sovereign bond holdings are zero-coupon bonds. Summing up across all available maturities and sovereign issuers we end up with the average revaluation gain each country's banking sector benefited from as a result of the OMT policy. Our identification assumption is therefore that a firm with a given leverage from a given sector should grow faster when located in a country where the banking sector experienced a larger revaluation gain as a result of the OMT policy.

Formally, let us denote by $A_{b;i,m}$ the amount of bank b's holdings of sovereign debt of country i of maturity m and $y_{i,m}^{pre}$ (resp. $y_{i,m}^{pre}$) the yield on country i government debt of maturity m before (resp. after) the OMT shock. We compute the revaluation gain $\Delta_{b;i,m}$ as

$$\Delta_{b;i,m} = A_{b;i,m} \left[\frac{1}{\left(1 + y_{i,m}^{post}\right)^m} - \frac{1}{\left(1 + y_{i,m}^{pre}\right)^m} \right]$$

Next, letting n_c denote the number of banks in country c, we sum up over these revaluations gains across maturities, sovereign issuers and then we average across banks of each country of our sample ($b \in B_c$) so that our OMT variable can be expressed as:

$$OMT_c = \log \left[\frac{1}{n_c} \sum_{b \in B_c} \sum_{i,m} \Delta_{b;i,m} \right].$$

Finally, we need to specify the starting point and ending point for the yields, i.e. $y_{i,m}^{pre}$ and $y_{i,m}^{post}$. Recall that on June 26, 2012 Mario Draghi gave his famous "whatever it takes" speech, and that the implementation details on the OMT policy were released on August 2, 2012. We thus choose as starting points either the yields on June 26, 2012 or the average yield over the three preceding days, i.e. from June 22 to June 26, 2012. As for the end point, we pick either the yields on August 7, 2012 or the average government yields between August 3 and August 7, 2012.

In the tables below, columns "(a)" use the difference in yields between August 7, 2012 and June 26, 2012. Columns "(b)" use the difference in yields between August 7 and the average over June 22-26, 2012. Columns "(c)" use the difference between the average yield over August 3-7, 2012 and the yield on June 26, 2012. Finally, columns "(d)" use the average yield over August 3-7,2012 and the average yield over June 22-June 26, 2012.

4.2.3 Concentration indices.

To measure competition, we rely on a set of Herfindhal indices, which we compute using three different variables, namely: total sales, employment and total assets. If $\theta_{i,s,c}$ denotes firm i's share in total sales, total employment or total assets, within sector s in country c,, the Herfindhal index for sector s in country c is computed as

$$hh_{s,c} = \sum_i \theta_{i,s,c}^2$$

Given that these Herfindhal indices are computed using the sample of firms we work with, we shall exclude from our regressions with concentration indices all sectors for with an Herfindhal above 0.95, as larger Herfindhal numbers could be simply be due to the fact that our sample only contains a limited number of firms for the corresponding sectors.

4.3 Results

4.3.1 Firm leverage and OMT

Here we present the firm-level results based on equation (11). Table 6 regresses the log of firm sales post OMT on the log of firm sales pre OMT, on firm's leverage and on the interaction n between firm leverage and OMT. The first four columns use the log of the ratio of (liquid) assets to equity as the measure of firms' leverage. The last four columns use the log of the ratio of assets asset to liability as the (inverse) measure of firms' leverage.[15] The coefficients on the second row indicate that firm leverage affects the growth of the log of firm sales negatively, but the coefficients on row 3 to 6 point to OMT mitigating this negative effect of leverage on firms' sales growth, and to the fact that OMT had a more positive impact on more highly leveraged firms. Table 7 reproduces the same exercise but with firm-level employment instead of sales: again, more leverage affects employment growth negatively, but OMT mitigates this effect so that OMT induces more employment growth in more highly leveraged firms.

TABLES 6 *AND* 7 *HERE*

In Table 8 we regress firms' market capitalization, staff wage bill, and total liabilities (which measures firms' ability to borrow) post-OMT on the pre-OMT values of the corresponding variables, leverage and the interaction between leverage and OMT. Again, we see that more highly leveraged firms experience a higher growth in market capitalization, staff wage bill and total liabilities post OMT.

TABLE 8 *HERE*

[15] We have:

$$\text{asset} = \text{equity} + \text{liability}$$

so that

$$\frac{\text{asset}}{\text{liabilities}} = 1 + \frac{\text{equity}}{\text{liabilities}}$$

whereas

$$\frac{\text{asset}}{\text{equity}} = 1 + \frac{\text{liabilities}}{\text{equity}}.$$

4.3.2 The interaction between OMT and market concentration

We now look at how product market concentration in the firm's sector interacts with OMT, based on equation (12). Table 9 regresses firm employment post OMT on its pre-OMT value, on firm leverage, on the interaction between firm leverage ad OMT, on the interaction between firm leverage and market concentration, and on the triple interaction between firm leverage, OMT, and market concentration. Rows 7, 8, and 9 use firms' total assets, firms' employment, and firms' sales respectively to compute the Herfindahl index in a given firm's sector. Leverage is measured by the asset to equity ratio. The coefficients on rows 3 to 5 indicate that more market concentration mitigates the negative direct effect of leverage on firm employment growth . Next, the coefficients on rows 7 to 9 indicate that more market concentration mitigates the positive effect of OMT on employment growth in more highly leveraged firms. Table 10 repeats the same exercise, but using firm sales instead of firm employment: we find that more market concentration mitigates the negative direct effect of leverage on firm sales growth, and that more market concentration mitigates the positive effect of OMT on sales growth in more highly leveraged firms.

TABLES 9 *AND* 10 *HERE*

5 Conclusion

In this paper we developed a simple model in which firms can make growth-enhancing investment but are subject to liquidity shocks that forces them to reinvest money in their project. Anticipating this, firms may have to sacrifice part of their investment in order to secure reinvestment in case of a liquidity shock (liquidity hoarding). A countercyclical interest rate policy is therefore growth-enhancing as it helps firms reduce the amount of liquidity hoarding. Moreover our model predicts that such a policy is more growth-enhancing when the probability to be hit by a liquidity shock is higher and when competition is higher: indeed when competition is low, large rents allow firms to stay on the market and reinvest optimally, no matter how funding conditions change. Cyclical fluctuations matter less for firms holding monopoly power than for those facing tight competition.

We then confronted these predictions to the data. More precisely, we looked at the effect on sectoral growth and on firm growth of an unexpected drop in long-term government bonds following the announcement of OMT. We found that more highly leveraged sectors/ firms benefit more from this unexpected drop, and the more so in countries/sectors with lower product market regulation or market concentration.

Our analysis can be extended in several directions. A first extension, which we are currently pursuing, is to investigate the relationship between structural reforms and monetary policy stimulus using bank-firm matched data. Here, we follow Chodorow-Reich (2014) to build a firm-specific measure of financial constraint using bank-firm existing credit relationships. We then want to investigate the growth effect of quantitative easing by the ECB, which raises banks' profits through valuation gains on government bond holdings. Our conjecture is that firms borrowing heavily (little) from such banks benefit more (less) of a relaxation of their borrowing constraint. But this relaxation in financial constraints translated into an increase in employment and capital expenditures only in the most competitive sectors.

A second extension would be to look at labor market regulation and see whether we find the same complementarity between a proactive monetary policy and labor market flexibility as the one we found in this paper between a proactive monetary policy and product market competition.

A third extension is to look at how product market competition interacts with fiscal policy, drawing the parallel with our analysis in this paper of how product market competition interacts with monetary policy. In particular we want to revisit the debate on the multiplier, introducing market structure as an interactor. But also we want to look at how fiscal policy can affect macroeconomic activity also through its potential induced effects on product market competition. More generally, we see the current paper as a first step towards introducing IO into standard macroeconomics.[16]

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6 Appendix

6.1 Appendix 1

This section provides the details of the empirical analysis underpinning Figure 1 presented in the introduction.

We proceed in two steps. First, we rely on the well-know Rajan-Zingales approach: We estimate the joint effect of industry liquidity dependence and country-level interest rate cyclicality on growth at the industry level across a set of manufacturing sectors and countries. As is the rule in this approach, we impute differences in liquidity dependence across sectors to those observed over a set of similar sectors in the US. Finally we test whether the joint effect of sectoral liquidity dependence and country-level interest rate cyclicality on industry growth actually depends on the (inverse) degree of product market competition measured by the index for product market regulation.

We take as a dependent variable the growth rate at the sector level for each industry-country pair of the sample under study. Given data availability, we can look at growth in real value added and growth in real labour productivity (real value added per worker). For obvious reasons, we will focus on the latter. On the right hand side, we introduce industry and country fixed effects. Industry fixed effects are dummy variables which control for any cross-industry difference in growth that is constant across countries. Similarly country fixed effects are dummy variables which control for any cross-country difference in growth that is constant across industries. Our main variable of interest is the interaction between: (i) an industry's level of financial constraint -denoted (fc); (ii) a country's degree of monetary policy countercyclicality-denoted (ccy). In addition, we consider two other variables of interest: First the interaction between the latter variable and (iii) the degree of product market regulation -denoted (reg) which we measure at the country level. Second, the interaction between industry financial constraints and the degree of product market regulation. Denoting g_{sc} the growth rate of industry s in country c, α_s and α_c industry and country fixed effects, and letting ε_{sc} denote an error term, our baseline regression is expressed as follows:

$$g_{sc} = \alpha_s + \alpha_c + \beta_1.(\text{fc})_s \times (\text{reg})_c + \beta_2.(\text{fc})_s \times (\text{ccy})_c + \beta_{21}.(\text{fc})_s \times (\text{ccy})_c \times (\text{reg})_c + \varepsilon_{sc} \qquad (13)$$

The coefficients of interest are β_1, β_2 and β_{21}. According to the model derived above, we would expect that a more counter-cyclical real short-term interest rate has a stronger growth-enhancing effect on more financially constrained industries, i.e. $\beta_2 > 0$ and the more so when the level of product market regulation is lower, i.e. $\beta_{21} < 0$ (recall that (reg) is an inverse measure of competition). Last, we also expect that financially constrained sectors perform better when product market regulation is tighter, i.e. $\beta_1 > 0$ as the presence of monopoly rents can actually soften the impact of financial constraints.

6.2 The explanatory variables

6.2.1 Industry financial constraints

We consider two different variables for industry financial constraints $(\mathrm{fc})_s$, namely credit constraints and liquidity constraints. Following Rajan and Zingales (1998), we use US firm-level data to measure credit and liquidity constraints in sectors outside the United States. Specifically, we proxy industry credit constraint with asset tangibility for firms in the corresponding sector in the US. Asset tangibility is measured at the firm level as the ratio of the value of net property, plant, and equipment to total assets. We then consider the median ratio across firms in the corresponding industry in the US as the measure of industry-level credit constraint. This indicator measures the share of tangible capital in a firm's total assets and hence the fraction of a firm's assets that can be pledged as collateral to obtain funding. Asset tangibility is therefore an inverse measure of an industry's credit constraint. Now to proxy for industry liquidity constraints, we use the labor cost to sales ratio for firms in the corresponding sector in the US. An industry's liquidity constraint is therefore measured as the median ratio of labor costs to total sales across firms in the corresponding industry in the US. This captures the extent to which an industry needs short-term liquidity to meet its regular payments vis-a-vis its employees. It is a positive measure of industry liquidity constraint.[17]

Using US industry-level data to compute industry financial constraints, is valid as long as: (a) differences across industries are driven largely by differences in technology and therefore industries with higher levels of

[17] Liquidity constraints can also be proxied using a cash conversion cycle variable which measures the time elapsed between the moment a firm pays for its inputs and the moment it is paid for its output. Results available upon request are very similar to those obtained using the labor cost to sales ratio as a proxy for liquidity constraint.

credit or liquidity constraints in one country are also industries with higher level levels of credit or liquidity constraints in another country in our country sample; (b) technological differences persist across countries; and (c) countries are relatively similar in terms of the overall institutional environment faced by firms. Under those three assumptions, US-based industry-specific measures are likely to be valid measures for the corresponding industries in countries other than the United States. While these assumptions are unlikely to simultaneously hold in a large cross-section of countries which would include both developed and less developed countries, they are more likely to be satisfied when the focus turns, as is the case in this study, to advanced economies.[18] For example, if pharmaceuticals hold fewer tangible assets or have a lower labor cost to sales than textiles in the United States, there are good reasons to believe it is likely to be the case in other advanced economies as well.[19]

6.2.2 Country interest rate cyclicality

Now, turning to the estimation of real short-term interest rate cyclicality, $(ccy)_c$, in country c, we measure it by the sensitivity of the real short-term interest rate to the domestic output gap, controlling for the one-quarter-lagged real short-term interest rate. We therefore use country-level data to estimate the following country-by-country "auxiliary" equation:

$$rsir_{ct} = \eta_c + \theta_c.rsir_{ct-1} + (\text{ccy})_c.y\_gap_{ct} + u_{ct}, \tag{14}$$

where $rsir_{ct}$ is the real short-term interest rate in country c at time t –defined as the difference between the three months policy interest rate and the 3-months annualized inflation rate-; $rsir_{ct-1}$ is the one quarter lagged real short-term interest rate in country c at time t; y_gap_{ct} measures the output gap in country c at time t -defined as the percentage difference between actual and trend GDP.[20] It therefore represents the country's current position in the cycle; η_c and θ_c are constants; and u_{ct} is an error term. The regression

[18] The list of countries in the estimation sample is available in $FIGURE$ 1.

[19] Moreover, to the extent that the United States is more financially developed than other countries worldwide, US-based measures are likely to provide the least noisy measures of industry-level credit or liquidity constraints.

[20] Trend GDP is estimated applying an HP filter to the log of real GDP. Estimations, available upon request, show that results do not depend on the use of a specific filtering technique.

coefficient $(\text{ccy})_c$ is a positive measure of interest rate countercyclicality. A positive (negative) regression coefficient $(\text{ccy})_c$ reflects a counter-cyclical (pro-cyclical) real short-term interest rate as it tends to increase (decrease) when the economy improves.

FIGURE A.1 HERE

6.2.3 Competition

We use as an (inverse) measure of competition the intensity of barriers to trade and investment (BTI). This is a country-wide indicator that measures the difficulty with which existing corporations can trade and invest.

6.3 Data sources

Our data sample focuses on 15 industrial OECD countries. The sample does not include the United States, as doing so would be a source of reverse causality problems. Our data come from various sources. Industry-level real value added and labor productivity data are drawn from the European Union (EU) KLEMS data set and are restricted to manufacturing industries. The primary source of data for measuring industry-specific characteristics is Compustat, which gathers balance sheets and income statements for U.S. listed firms. We draw on Rajan and Zingales (1998), Braun (2003), Braun and Larrain (2005) and Raddatz (2006) to compute the industry-level indicators for borrowing and liquidity constraints. Finally, macroeconomic variables used to compute stabilization policy cyclicality are drawn from the OECD Economic Outlook data set. We use quarterly data for monetary policy variables over the period (1999-2005), during which monetary policy was essentially conducted through short-term interest rates to make sure that our auxiliary regression does capture the bulk of monetary policy decisions. Finally, the BTI data comes from the OECD and is measured for 1998.

6.4 Results

6.4.1 Countercyclical monetary policy and growth

We now turn to investigate the effect of monetary policy countercyclicality. To this end, we estimate our main regression equation (13) using as an industry measure of financial constraints either industry asset tangibility or industry labor costs to sales, the former being an inverse measure of financial constraints.

We first estimate equation (13) assuming $\beta_1 = \beta_{21} = 0$. We therefore start by shutting down any role for competition. The empirical results in Table 1 show that growth in industry real value added per worker is significantly and negatively correlated with the interaction of industry labor costs to sales and monetary policy countercyclicality (column (1)). A larger sensitivity to the output gap of the real short term interest rate tends to raise industry real valued added per worker growth disproportionately for industries with higher labor cost to sales. A similar but opposite type of results holds for the interaction between monetary policy cyclicality and industry asset tangibility: column (1) in Table 2 shows that a larger sensitivity of the real short term interest rate to the output gap raises industry real valued added per worker growth disproportionately less for industries with higher asset tangibility. These results are consistent with the view that a counter-cyclical monetary policy raises growth disproportionately in sectors that are more financially constrained or that face larger difficulties to raise capital, by easing the process of refinancing.[21]

6.4.2 Introducing competition

We now extend the previous regressions to allow the measure of barriers to trade and investment to affect industry growth, i.e. $\beta_1 \neq 0$ and $\beta_{21} \neq 0$. These estimations yield two results. First, barriers to trade and investment are less harmful for financially constrained sectors: Columns (2)-(4) in Table 1 show that the interaction of industry labor costs to sales and barriers to trade and investment relates positively to industry growth. Similarly, columns (2)-(4) in Table 2 show that the interaction of industry asset tangibility and barriers to trade and investment relates negatively to industry growth. This is evidence that monopoly

[21] It is worth noting that the correlation across sectors between asset tangibility and labor costs to sales is around -0.6. These are therefore two distinct channels through which interest rate counter-cyclicality affects industry growth.

rents help financially constrained firms go through downturns. However, column (4) also shows (in Table A.1 and in Table A.2) that barriers to trade and investment significantly reduce the benefits of monetary policy countercyclicality: Only when such barriers to trade and investment are below the sample median does the interaction between interest rate countercyclicality and financial constraints correlates positively with industry growth. When barriers to trade and investment are above the sample median, then interest rate countercyclicality has no effect. This means is that monopoly rents tend reduce monetary policy "effectiveness" insofar as this suggests that financially constrained firms have less incentives to raise credit and innovate in downturns.

TABLES A.1 AND A.2 HERE

Figure 1, presented in introduction, shows the magnitude of the difference-in-difference effect when considering the labor cost to sales ratio as a measure of financial constraints. It shows that a sector with high labor cost to sales located in country with high interest rate countercyclicality grows on average 1.6 percentage points more quickly than a sector with low labor cost to sales located in country with low interest rate countercyclicality grows, this growth difference holding when barriers to trade and investment are low. By contrast when barriers to trade and investment are large, this growth difference is negligible.

FIGURE 1 HERE

Overall, this suggests that active monetary policy tend to be more effective when product markets are less regulated, i.e. policy accommodation and structural reforms complement each other in generating more growth.

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Figure 1

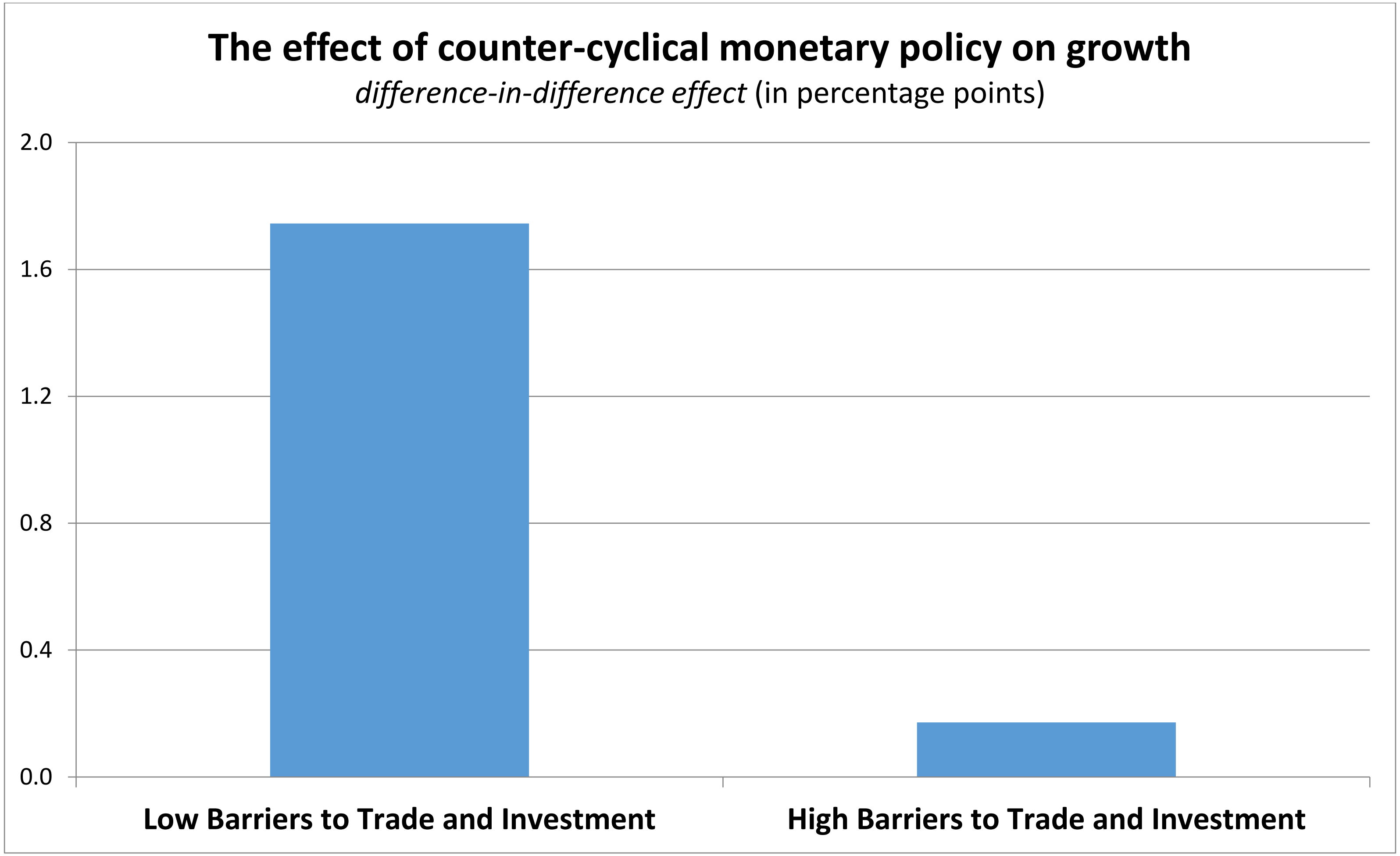
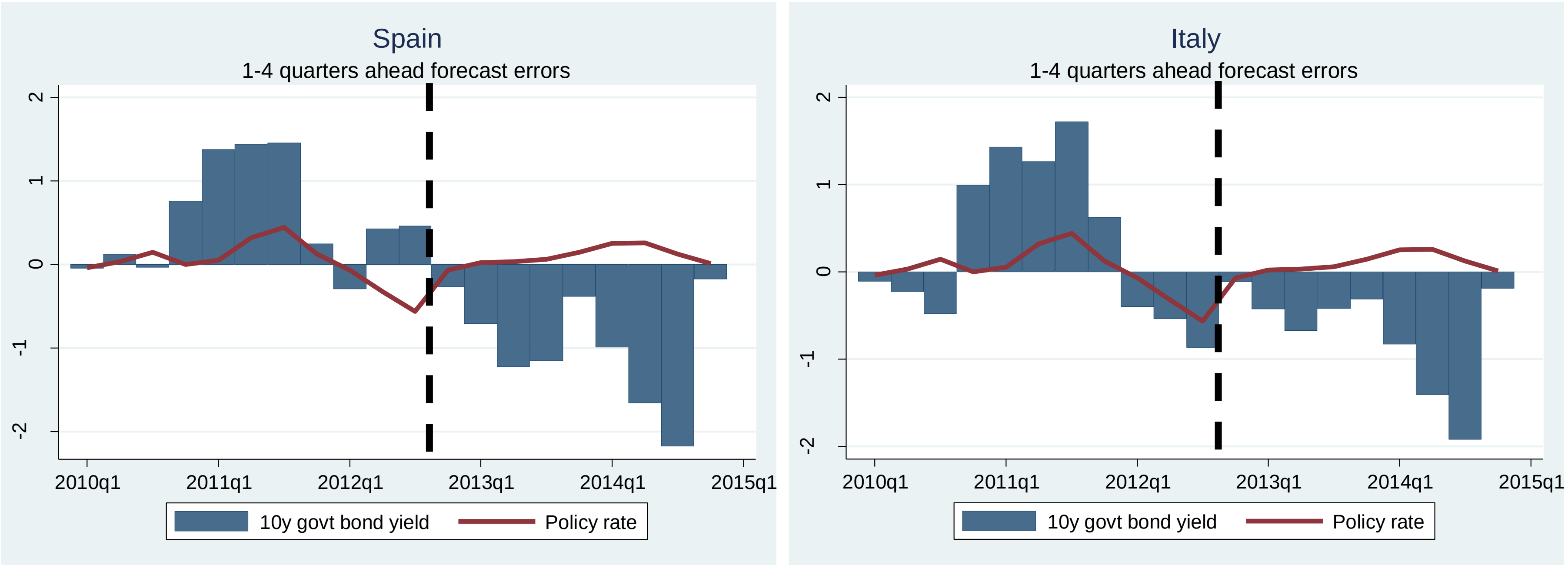

The effect of counter-cyclical monetary policy on growth
difference-in-difference effect (in percentage points)
2.0
1.6
1.2
0.8
0.4
0.0
Low Barriers to Trade and Investment
High Barriers to Trade and Investment

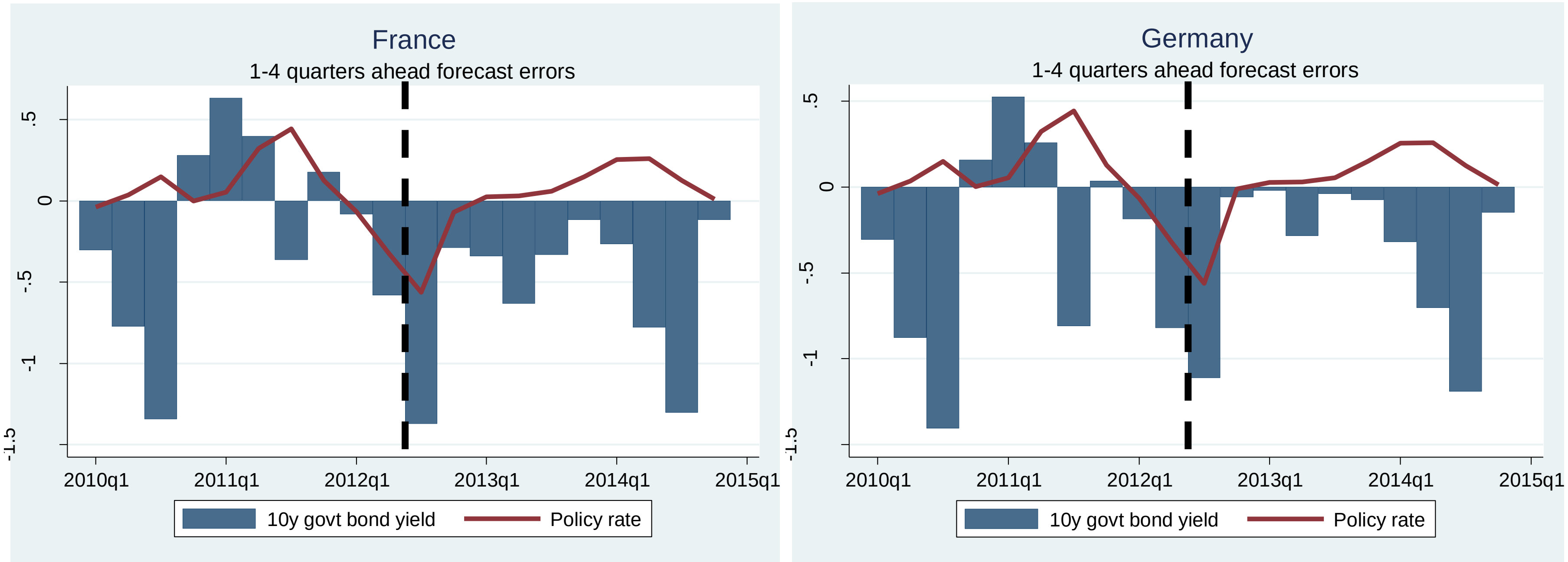
Figure 2



Spain
1-4 quarters ahead forecast errors
-2
-1
0
1
2
2010q1
2011q1
2012q1
2013q1
2014q1
2015q1
10y govt bond yield
Policy rate
Italy
1-4 quarters ahead forecast errors
-2
-1
0
1
2
2010q1
2011q1
2012q1
2013q1
2014q1
2015q1
10y govt bond yield
Policy rate

37

Figure 3


France
1-4 quarters ahead forecast errors
Germany
1-4 quarters ahead forecast errors
.5
0
-.5
-1
-1.5
2010q1
2011q1
2012q1
2013q1
2014q1
2015q1
10y govt bond yield
Policy rate

38

Table 1

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Growth dependent variable	**Value Added**			**Labour Productivity**			**Capital Productivity**			**Total Factor Productivity**		
Lagged dependent variable	**0.290****	**0.274****	**0.271****	**0.149**	**0.145**	**0.152**	**0.361****	**0.309***	**0.302***	**0.255**	**0.245**	**0.245**
	(0.108)	*(0.104)*	*(0.105)*	*(0.129)*	*(0.129)*	*(0.132)*	*(0.169)*	*(0.161)*	*(0.158)*	*(0.208)*	*(0.214)*	*(0.204)*
Bank debt to equity	**-0.0101**	**-0.0169**	**-0.258****	**-0.0139**	**-0.0171**	**-0.233****	**-0.0241**	**-0.0254**	**-0.284****	**-0.0232**	**-0.0270**	**-0.627***
	(0.0100)	*(0.0102)*	*(0.112)*	*(0.0113)*	*(0.0118)*	*(0.102)*	*(0.0176)*	*(0.0177)*	*(0.134)*	*(0.0245)*	*(0.0266)*	*(0.349)*
Interaction (bank debt to equity and PMR)			**0.179****			**0.161***			**0.196***			**0.438***
			(0.0863)			*(0.0794)*			*(0.101)*			*(0.249)*
Interaction (bank debt to equity and MP accomodation)	**-0.0201***	**0.377*****	**0.705*****	**-0.0223**	**0.170**	**0.463*****	**-0.0228**	**0.690*****	**1.064*****	**-0.0267**	**0.352**	**2.948**
	(0.0112)	*(0.116)*	*(0.163)*	*(0.0141)*	*(0.120)*	*(0.160)*	*(0.0295)*	*(0.241)*	*(0.310)*	*(0.0357)*	*(0.653)*	*(1.749)*
Interaction (bank debt to equity, MP accomodation and PMR)		**-0.277*****	**-0.516*****		**-0.134**	**-0.347*****		**-0.497*****	**-0.768*****		**-0.260**	**-2.075***
		(0.0848)	*(0.122)*		*(0.0882)*	*(0.121)*		*(0.173)*	*(0.224)*		*(0.445)*	*(1.213)*
Turning point for PMR			**1.37**			**1.33**			**1.39**			**1.42**
Observations	189	189	189	189	189	189	144	144	144	117	117	117
R-squared	0.512	0.525	0.535	0.479	0.482	0.491	0.402	0.425	0.434	0.414	0.415	0.430

39

Table 2

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Growth dependent variable	Value Added			Labour Productivity			Capital Productivity			Total Factor Productivity		
lagged dependent variable	**0.296****	**0.285*****	**0.280****	**0.162**	**0.160**	**0.164**	**0.356****	**0.325****	**0.321****	**0.269**	**0.259**	**0.266**
	(0.109)	*(0.103)*	*(0.103)*	*(0.134)*	*(0.133)*	*(0.134)*	*(0.168)*	*(0.157)*	*(0.152)*	*(0.210)*	*(0.216)*	*(0.199)*
bank debt and bonds to equity	**-0.00247**	**-0.00840**	**-0.243***	**-0.00890**	**-0.0113**	**-0.240****	**-0.0178**	**-0.0254**	**-0.237**	**-0.0148**	**-0.0197**	**-0.796***
	(0.0105)	*(0.0106)*	*(0.130)*	*(0.0120)*	*(0.0130)*	*(0.114)*	*(0.0210)*	*(0.0209)*	*(0.160)*	*(0.0289)*	*(0.0330)*	*(0.402)*
Interaction (bank debt and bonds to equity and PMR)			**0.174***			**0.170***			**0.158**			**0.562***
			(0.101)			*(0.0906)*			*(0.125)*			*(0.287)*
Interaction (bank debt and bonds to equity and MP accomodation)	**-0.0264***	**0.246****	**0.594*****	**-0.0260**	**0.0854**	**0.423****	**-0.0274**	**0.519***	**0.831****	**-0.0267**	**0.389**	**3.680***
	(0.0138)	*(0.115)*	*(0.203)*	*(0.0163)*	*(0.145)*	*(0.192)*	*(0.0324)*	*(0.264)*	*(0.346)*	*(0.0382)*	*(0.743)*	*(1.883)*
Interaction (bank debt and bonds to equity, MP accomodation and PMR)		**-0.189****	**-0.441*****		**-0.0774**	**-0.322****		**-0.380****	**-0.606****		**-0.286**	**-2.585***
		(0.0822)	*(0.150)*		*(0.105)*	*(0.145)*		*(0.185)*	*(0.251)*		*(0.504)*	*(1.304)*
Turning point for PMR			**1.35**			**1.31**			**1.37**			**1.42**
Observations	189	189	189	189	189	189	144	144	144	117	117	117
R-squared	0.512	0.517	0.524	0.475	0.476	0.483	0.404	0.416	0.421	0.405	0.407	0.425

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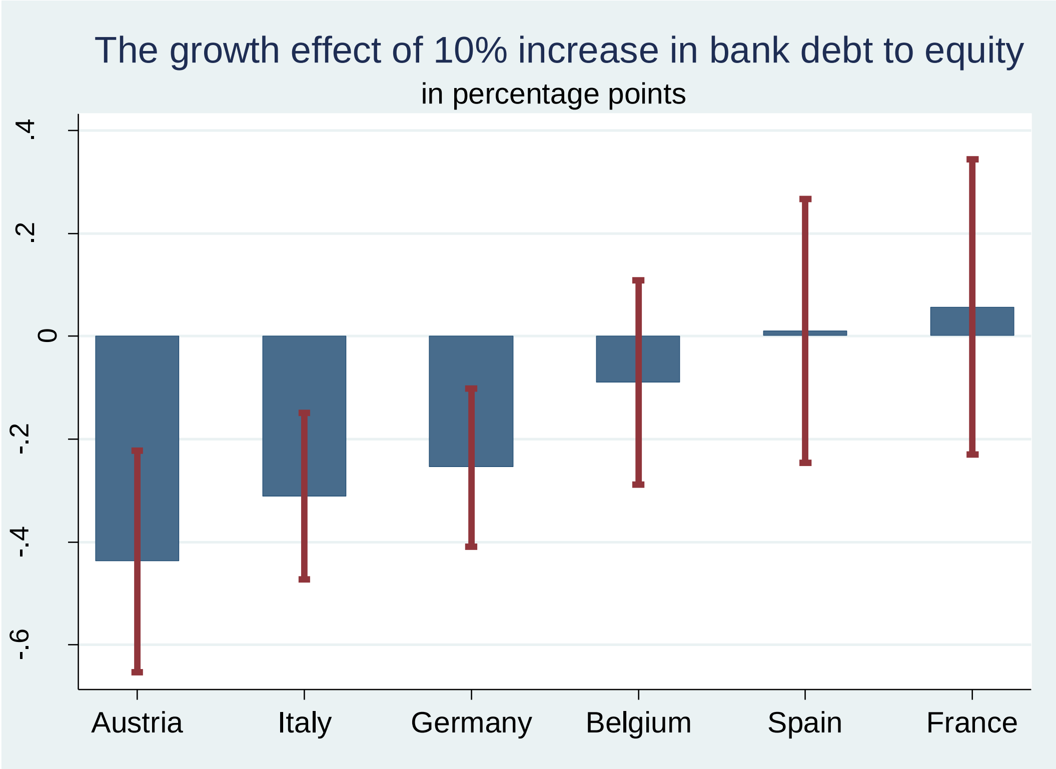
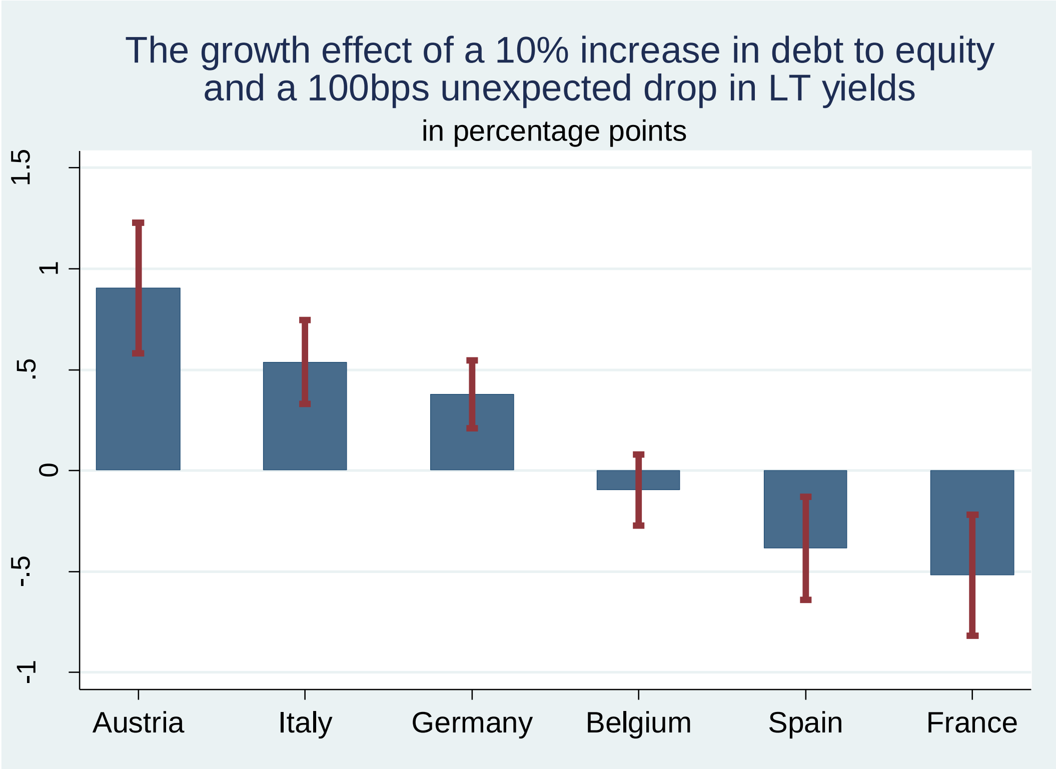
Figure 4


The growth effect of 10% increase in bank debt to equity
in percentage points
.4
.2
0
-.2
-.4
-.6
Austria
Italy
Germany
Belgium
Spain
France

41

Figure 5


The growth effect of a 10% increase in debt to equity
and a 100bps unexpected drop in LT yields
in percentage points
1.5
1
.5
0
-.5
-1
Austria
Italy
Germany
Belgium
Spain
France

42

Table 3

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent growth variable: Value Added Growth						
Debt variable	bank debt			bank debt and bonds		
Lagged dependent variable	**0.271****	**0.241****	**0.256****	**0.280****	**0.258****	**0.272*****
	(0.105)	*(0.105)*	*(0.100)*	*(0.103)*	*(0.101)*	*(0.0994)*
Debt to Equity ratio	**-0.258****	**-0.242***	**-0.237****	**-0.243***	**-0.203**	**-0.228***
	(0.112)	*(0.130)*	*(0.116)*	*(0.130)*	*(0.140)*	*(0.134)*
Interaction(Debt to Equity ratio and PMR)	**0.179****	**0.179***	**0.164***	**0.174***	**0.153**	**0.162**
	(0.0863)	*(0.0964)*	*(0.0891)*	*(0.101)*	*(0.105)*	*(0.103)*
Current Debt to Equity ratio		**0.0265**			**0.0340**	
		(0.0997)			*(0.115)*	
Interaction (**Current** Debt to Equity ratio and PMR)		**-0.0356**			**-0.0410**	
		(0.0736)			*(0.0896)*	
Interaction(Debt to Equity ratio and MP accomodation)	**0.705*****	**0.664*****	**0.496*****	**0.594*****	**0.504****	**0.422***
	(0.163)	*(0.156)*	*(0.178)*	*(0.203)*	*(0.216)*	*(0.218)*
Interaction(Debt to Equity ratio, MP accomodation and PMR)	**-0.516*****	**-0.484*****	**-0.360****	**-0.441*****	**-0.373****	**-0.314***
	(0.122)	*(0.116)*	*(0.133)*	*(0.150)*	*(0.159)*	*(0.164)*
Interaction (**Current** Debt to Equity ratio and MP accomodation)			**0.192****			**0.242****
			(0.0901)			*(0.108)*
Interaction (**Current** Debt to Equity ratio, MP accomodation and PMR)			**-0.143****			**-0.175***
			(0.0701)			*(0.0877)*
Observations	189	189	189	189	189	189
R-squared	0.535	0.548	0.540	0.524	0.534	0.530

43

Table 4

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable	**Interest payments to equity**				**Change in Interest payments to total equity**			
Lagged dependent variable	**1.011*** *(0.0642)*	**0.999*** *(0.0750)*	**0.964*** *(0.0894)*	**0.968*** *(0.0875)*	**0.0609** *(0.148)*	**0.0485** *(0.159)*	**0.0299** *(0.155)*	**0.0359** *(0.156)*
Interaction (**Sectoral indebtedness** and **unexpected drop in yield**)	**-0.130**** *(0.0529)*	**-0.127**** *(0.0503)*	**-1.362*** *(0.690)*	**-2.254**** *(0.900)*	**-0.155*** *(0.0778)*	**-0.150*** *(0.0763)*	**-2.219**** *(0.945)*	**-3.435*** *(1.781)*
Interaction (**Sectoral indebtedness** and **unexpected drop in yield** with **PMR**)			**0.957*** *(0.515)*	**1.642**** *(0.679)*			**1.597**** *(0.696)*	**2.531*** *(1.352)*
44 **Sectoral indebtedness**	**-0.0748** *(0.0614)*	**-0.480** *(0.657)*	**-0.104*** *(0.0545)*	**1.148** *(0.710)*	**-0.179** *(0.155)*	**-1.076** *(1.039)*	**-0.245*** *(0.131)*	**1.467** *(1.886)*
Interaction (**Sectoral indebtedness** with **PMR**)		**0.302** *(0.517)*		**-0.948*** *(0.545)*		**0.664** *(0.836)*		**-1.296** *(1.455)*
Observations	214	214	214	214	215	215	215	215
R-squared	0.773	0.774	0.784	0.788	0.460	0.463	0.483	0.489

Table 5

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent variable	**Entry rate**				**New entrants employment growth**			
Lagged dependent variable	**0.742*** **	**0.750*** **	**0.766*** **	**0.767*** **	**0.135**	**0.140**	**0.131**	**0.145**
	(0.0900)	*(0.0871)*	*(0.0889)*	*(0.0897)*	*(0.0968)*	*(0.0958)*	*(0.0966)*	*(0.0898)*
Interaction (**Sectoral indebtedness** and **Unexpected Drop in Yield**)	**0.00461** **	**0.00436** **	**0.0906***	**0.0986** **	**-0.0559***	**-0.0536***	**0.515**	**1.979*** **
	(0.00175)	*(0.00176)*	*(0.0528)*	*(0.0440)*	*(0.0288)*	*(0.0277)*	*(0.422)*	*(0.645)*
Interaction (**Sectoral indebtedness, Unexpected Drop in Yield** and **Product Market Regulation**)			**-0.0663**	**-0.0725** **			**-0.441**	**-1.563*** **
			(0.0399)	*(0.0338)*			*(0.320)*	*(0.498)*
Sectoral indebtedness	**-0.00276**	**0.0591**	**-5.72e-05**	**-0.0113**	**0.190** **	**-0.256**	**0.208** **	**-1.828*** **
	(0.00360)	*(0.0706)*	*(0.00494)*	*(0.0612)*	*(0.0907)*	*(0.443)*	*(0.0907)*	*(0.623)*
Interaction (**Sectoral indebtedness** and **Product Market Regulation**)		**-0.0458**		**0.00848**		**0.331**		**1.542*** **
		(0.0518)		*(0.0454)*		*(0.348)*		*(0.491)*
Sectors × Countries	35×7	35×7	35×7	35×7	35×7	35×7	35×7	35×7
Observations	221	221	221	221	210	210	210	210
R-squared	0.930	0.931	0.933	0.933	0.718	0.719	0.720	0.731

45

Table 6

Dependent variable: log of firm sales 2013-2014								
firm leverage:	**Asset to Equity**				**Asset to Liabilities**			
method used to compute revaluation gains:	(a)	(b)	(c)	(d)	(a)	(b)	(c)	(d)
log of firm sales 2010-2011	**0.932***	**0.932***	**0.932***	**0.932***	**0.941***	**0.941***	**0.941***	**0.941***
	(0.00903)	*(0.00903)*	*(0.00904)*	*(0.00904)*	*(0.00860)*	*(0.00858)*	*(0.00859)*	*(0.00858)*
log of firm leverage 2012	**-0.471**	**-0.396**	**-0.430**	**-0.430**	**0.773***	**0.505**	**0.723***	**0.610***
	(0.217)	*(0.184)*	*(0.178)*	*(0.177)*	*(0.278)*	*(0.235)*	*(0.246)*	*(0.236)*
Interaction (log of firm leverage and log of revaluation gain (a))	**0.0639**				**-0.0972***			
	(0.0278)				*(0.0346)*			
Interaction (log of firm leverage and log of revaluation gain (b))		**0.0556**				**-0.0638**		
		(0.0244)				*(0.0301)*		
Interaction (log of firm leverage and log of revaluation gain (c))			**0.0575**				**-0.0885***	
			(0.0226)				*(0.0302)*	
Interaction (log of firm leverage and log of revaluation gain (d))				**0.0586**				**-0.0753**
				(0.0231)				*(0.0296)*
Observations	2,918	2,918	2,918	2,918	2,954	2,954	2,954	2,954
R-squared	0.945	0.945	0.945	0.945	0.944	0.944	0.944	0.944

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Table 7

Dependent variable: log of 2013-2014 firm employment								
firm leverage:	Asset to Equity				Asset to Liabilities			
method used to compute revaluation gains:	(a)	(b)	(c)	(d)	(a)	(b)	(c)	(d)
log of 2010-2011 firm employment	**0.955***** *(0.00971)*	**0.955***** *(0.00970)*	**0.955***** *(0.00970)*	**0.955***** *(0.00970)*	**0.950***** *(0.00982)*	**0.950***** *(0.00982)*	**0.950***** *(0.00982)*	**0.950***** *(0.00981)*
log of 2012 firm leverage	**-0.697**** *(0.352)*	**-0.541**** *(0.273)*	**-0.605**** *(0.295)*	**-0.544**** *(0.269)*	**0.856**** *(0.338)*	**0.717**** *(0.328)*	**0.782***** *(0.303)*	**0.658*** *(0.363)*
Interaction (log of firm leverage and log of revaluation gain (a))	**0.0886**** *(0.0440)*				**-0.113***** *(0.0426)*			
Interaction (log of firm leverage and log of revaluation gain (b))		**0.0702**** *(0.0351)*				**-0.0966**** *(0.0421)*		
Interaction (log of firm leverage and log of revaluation gain (c))			**0.0752**** *(0.0361)*				**-0.101***** *(0.0371)*	
Interaction (log of firm leverage and log of revaluation gain (d))				**0.0688**** *(0.0337)*				**-0.0864*** *(0.0451)*
Observations	2,323	2,323	2,323	2,323	2,317	2,317	2,317	2,317
R-squared	0.953	0.953	0.953	0.953	0.954	0.954	0.954	0.954

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Table 8

Dependent variable: 2013-2014 log of	Market capitalization				Staff cost				Total Liabilities			
	(a)	(b)	(c)	(d)	(a)	(b)	(c)	(d)	(a)	(b)	(c)	(d)
log of 2011-2012 dependent variable	0.996***	0.997***	0.996***	0.996***	0.950***	0.949***	0.949***	0.949***	0.926***	0.926***	0.926***	0.926***
	(0.00719)	(0.00719)	(0.00719)	(0.00719)	(0.00932)	(0.00932)	(0.00932)	(0.00932)	(0.00906)	(0.00907)	(0.00907)	(0.00908)
log of 2012 firm asset to equity ratio	-0.909**	-0.708**	-0.872***	-0.757**	-0.908***	-0.653***	-0.703***	-0.674***	-0.563**	-0.319	-0.397**	-0.327
	(0.376)	(0.316)	(0.327)	(0.309)	(0.257)	(0.219)	(0.197)	(0.201)	(0.260)	(0.245)	(0.190)	(0.209)
Interaction (log of 2012 firm asset to equity ratio and log of revaluation gain (a))	0.114**				0.121***				0.0830**			
	(0.0473)				(0.0327)				(0.0331)			
Interaction (log of 2012 firm asset to equity ratio and log of revaluation gain (b))		0.0903**				0.0910***				0.0530*		
		(0.0407)				(0.0286)				(0.0321)		
Interaction (log of 2012 firm asset to equity ratio and log of revaluation gain (c))			0.107***				0.0934***				0.0605**	
			(0.0402)				(0.0247)				(0.0239)	
Interaction (log of 2012 firm asset to equity ratio and log of revaluation gain (d))				0.0943**				0.0917***				0.0527*
				(0.0388)				(0.0258)				(0.0269)
Observations	3,015	3,015	3,015	3,015	2,297	2,297	2,297	2,297	3,240	3,240	3,240	3,240
R-squared	0.933	0.933	0.933	0.933	0.948	0.947	0.948	0.948	0.939	0.939	0.939	0.939

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Table 9

Dependent variable: log of 2013-2014 firm Sales												
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		(a)			(b)			(c)			(d)	
log of 2010-2011 firm Sales	**0.936*** **	**0.936*** **	**0.935*** **	**0.936*** **	**0.936*** **	**0.935*** **	**0.936*** **	**0.935*** **	**0.935*** **	**0.936*** **	**0.935*** **	**0.935*** **
	(0.00910)	*(0.00912)*	*(0.00916)*	*(0.00910)*	*(0.00912)*	*(0.00915)*	*(0.00910)*	*(0.00912)*	*(0.00914)*	*(0.00910)*	*(0.00912)*	*(0.00915)*
log of 2012 firm leverage	**-1.241*** **	**-1.432*** **	**-1.057** **	**-0.993*** **	**-1.332*** **	**-1.015*** **	**-0.761** **	**-0.888*** **	**-0.710** **	**-0.873*** **	**-1.064*** **	**-0.869*** **
	(0.454)	*(0.469)*	*(0.442)*	*(0.354)*	*(0.418)*	*(0.376)*	*(0.326)*	*(0.268)*	*(0.309)*	*(0.320)*	*(0.293)*	*(0.319)*
Interaction (log of firm leverage and HH index of TA)	**1.509** **			**1.062* **			**0.738**			**0.847**		
	(0.675)			*(0.557)*			*(0.499)*			*(0.515)*		
Interaction (log of firm leverage and HH index of Sales)		**2.057*** **			**1.909*** **			**1.290*** **			**1.503*** **	
		(0.717)			*(0.683)*			*(0.440)*			*(0.512)*	
Interaction (log of firm leverage and HH index of Employment)			**1.323** **			**1.425** **			**0.805* **			**1.114** **
			(0.625)			*(0.566)*			*(0.482)*			*(0.502)*
Interaction (log of firm leverage and log of revaluation gain)	**0.157*** **	**0.184*** **	**0.142*** **	**0.128*** **	**0.174*** **	**0.139*** **	**0.0947** **	**0.113*** **	**0.0965** **	**0.110*** **	**0.137*** **	**0.118*** **
	(0.0568)	*(0.0584)*	*(0.0547)*	*(0.0456)*	*(0.0534)*	*(0.0481)*	*(0.0403)*	*(0.0330)*	*(0.0380)*	*(0.0407)*	*(0.0370)*	*(0.0403)*
Interaction (log of firm leverage and log of revaluation gain and HH index of TA)	**-0.186** **			**-0.131* **			**-0.0860**			**-0.101**		
	(0.0866)			*(0.0749)*			*(0.0638)*			*(0.0680)*		
Interaction (log of firm leverage and log of revaluation gain and HH index of Sales)		**-0.264*** **			**-0.250*** **			**-0.164*** **			**-0.193*** **	
		(0.0911)			*(0.0897)*			*(0.0561)*			*(0.0667)*	
Interaction (log of firm leverage and log of revaluation gain and HH index of Employment)			**-0.188** **			**-0.205*** **			**-0.120** **			**-0.161** **
			(0.0780)			*(0.0739)*			*(0.0599)*			*(0.0646)*
Observations	2,685	2,685	2,685	2,685	2,685	2,685	2,685	2,685	2,685	2,685	2,685	2,685
R-squared	0.944	0.944	0.944	0.944	0.944	0.944	0.944	0.944	0.944	0.944	0.944	0.944

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1
firm leverage: asset to equity ratio

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Table 10

Dependent variable: log of 2013-2014 firm employment												
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
		(a)			(b)			(c)			(d)	
log of 2010-2011 firm employment	**0.956*** **	**0.956*** **	**0.956*** **	**0.956*** **	**0.955*** **	**0.956*** **	**0.956*** **	**0.955*** **	**0.956*** **	**0.955*** **	**0.955*** **	**0.956*** **
	(0.00978)	*(0.00972)*	*(0.00970)*	*(0.00977)*	*(0.00970)*	*(0.00969)*	*(0.00976)*	*(0.00970)*	*(0.00969)*	*(0.00977)*	*(0.00971)*	*(0.00969)*
log of 2012 firm leverage	**-2.841*** **	**-2.197** **	**-2.212** **	**-1.600** **	**-1.545*** **	**-1.343** **	**-2.935*** **	**-2.478*** **	**-1.850** **	**-1.917*** **	**-1.846*** **	**-1.378** **
	(1.095)	*(0.933)*	*(0.929)*	*(0.634)*	*(0.568)*	*(0.541)*	*(1.101)*	*(0.959)*	*(0.870)*	*(0.730)*	*(0.653)*	*(0.587)*
Interaction (log of firm leverage and HH index of TA)	**3.965** **			**2.211** **			**4.673*** **			**2.959*** **		
	(1.569)			*(0.927)*			*(1.734)*			*(1.138)*		
Interaction (log of firm leverage and HH index of Employment)		**2.856** **			**2.167*** **			**3.702*** **			**2.817*** **	
		(1.330)			*(0.790)*			*(1.429)*			*(0.953)*	
Interaction (log of firm leverage and HH index of Sales)			**2.718** **			**1.604** **			**2.646** **			**1.845** **
			(1.249)			*(0.721)*			*(1.242)*			*(0.807)*
Interaction (log of firm leverage and log of revaluation gain)	**0.357*** **	**0.284** **	**0.278** **	**0.204** **	**0.206*** **	**0.172** **	**0.360*** **	**0.312*** **	**0.228** **	**0.239*** **	**0.239*** **	**0.172** **
	(0.137)	*(0.117)*	*(0.116)*	*(0.0812)*	*(0.0728)*	*(0.0693)*	*(0.135)*	*(0.118)*	*(0.106)*	*(0.0914)*	*(0.0818)*	*(0.0735)*
Interaction (log of firm leverage and log of revaluation gain and HH index of TA)	-0.493**			-0.277**			-0.570***			-0.365**		
	(0.197)			*(0.120)*			*(0.213)*			*(0.144)*		
Interaction (log of firm leverage and log of revaluation gain and HH index of		-0.379**			-0.300***			-0.476***			-0.375***	
		(0.167)			*(0.104)*			*(0.176)*			*(0.122)*	
Interaction (log of firm leverage and log of revaluation gain and HH index of Sales)			-0.339**			-0.203**			-0.324**			-0.229**
			(0.157)			*(0.0950)*			*(0.153)*			*(0.104)*
Observations	2,184	2,184	2,184	2,184	2,184	2,184	2,184	2,184	2,184	2,184	2,184	2,184
R-squared	0.951	0.951	0.951	0.951	0.951	0.951	0.951	0.951	0.951	0.951	0.951	0.951

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

firm leverage: Asset to equity ratio

Figure A.1

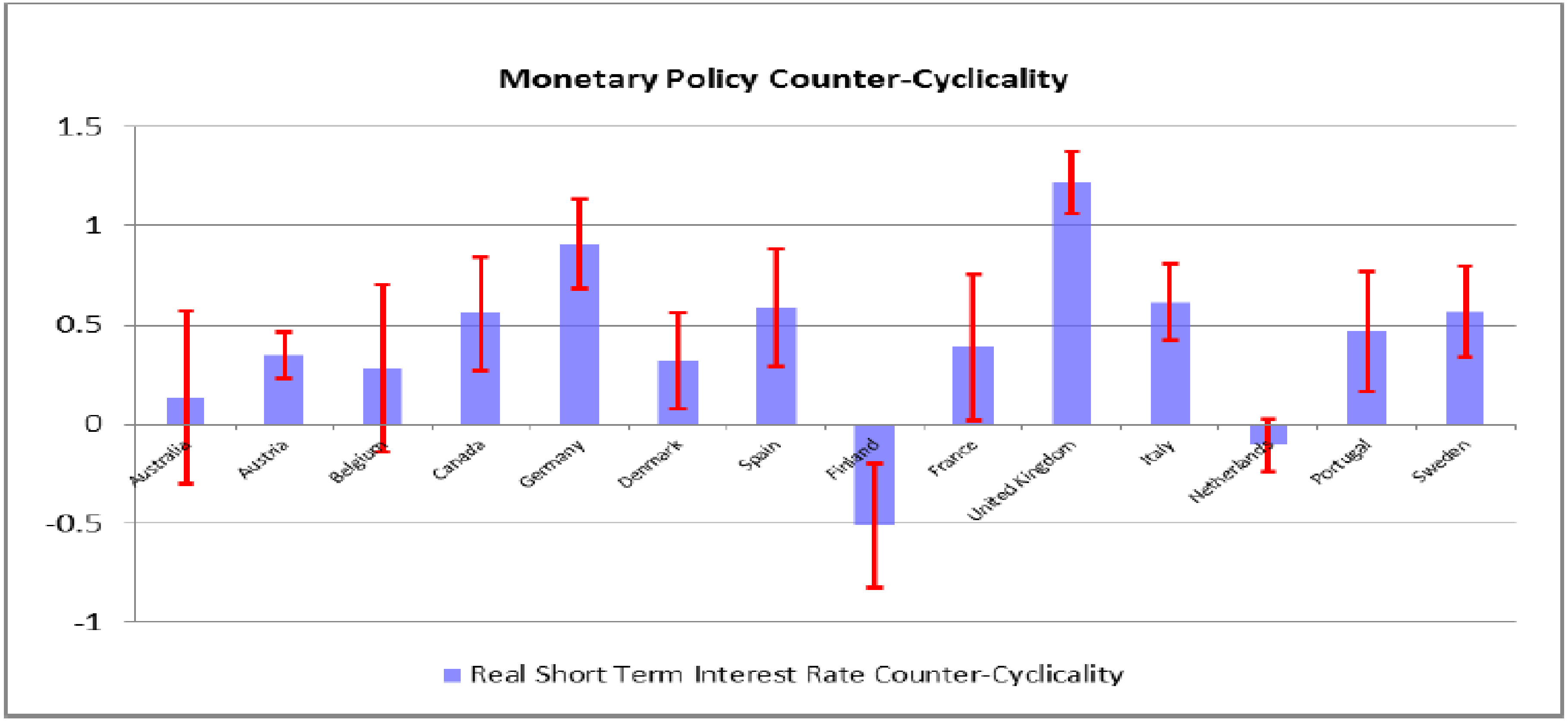
Monetary Policy Counter-Cyclicality
1.5
1
0.5
0
-0.5
-1
Australia
Austria
Belgium
Canada
Germany
Denmark
Spain
Finland
France
United Kingdom
Italy
Netherlands
Portugal
Sweden
Real Short Term Interest Rate Counter-Cyclicality

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Table A.1

		(1)	(2)	(3)	(4)
Dependent variable: Labour productivity Growth					
	Dummy variable				
log of initial hourly labour productivity		**-3.492*** *(1.059)*	**-3.580*** *(1.071)*	**-3.642*** *(1.091)*	**-3.646*** *(1.092)*
Interaction (Labor Costs to Sales and Interest rate counter-cyclicality)		**19.51**** *(8.924)*		**15.01***** *(4.708)*	
Interaction (Labor Costs to Sales and Barriers to Trade and Investment)			**24.08**** *(9.475)*	**21.06***** *(6.069)*	**25.82***** *(6.906)*
Interaction (Labor Costs to Sales and Interest rate counter-cyclicality)	*Below median BTI*				**18.02**** *(6.962)*
Interaction (Labor Costs to Sales and Interest rate counter-cyclicality)	*Above median BTI*				**6.697** *(4.317)*
Observations		552	552	552	552
R-squared		0.361	0.357	0.368	0.369

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Table A.2

	Dummy variable	(1)	(2)	(3)	(4)
Dependent variable: Labour productivity Growth					
log of initial hourly labour productivity		**-3.461*** ** *(1.116)*	**-3.438*** ** *(1.093)*	**-3.539** ** *(1.178)*	**-3.522** ** *(1.186)*
Interaction (Asset Tangibility and Interest rate counter-cyclicality)		**-14.89*** ** *(3.772)*		**-10.08** ** *(3.473)*	
Interaction (Asset Tangibility and Barriers to Trade and Investment)			**-12.01** *(9.343)*	**-9.149*** *(4.344)*	**-13.72** ** *(5.778)*
Interaction (Asset Tangibility and Interest rate counter-cyclicality)	*Below median BTI*				**-13.19*** ** *(3.237)*
Interaction (Asset Tangibility and Interest rate counter-cyclicality)	*Above median BTI*				**-1.33** *(7.865)*
Observations		552	552	552	552
R-squared		0.359	0.354	0.365	0.365

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