Cyclical Macroeconomic Policy, Financial Regulation, and Economic Growth[1]

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Abstract

This paper investigates the effect of cyclical macroeconomic policy and financial regulation on growth. Using cross-country, cross-industry OECD data, it yields two main findings. First, counter-cyclical fiscal and monetary policies foster disproportionately growth in more credit/liquidity constrained industries. Second, while tighter financial regulation –in the form of higher bank capital ratios- may contribute to reducing the benefit of a counter-cyclical monetary policy, introducing counter-cyclical capital buffers to reduce the pro-cyclicality of credit enhances growth disproportionately in more credit/liquidity constrained, industries and this complements the growth effects of countercyclical monetary policy.

1. Introduction.

Macroeconomic textbooks tend to present the analysis of long-term growth and the study of macroeconomic policies (e.g. fiscal and monetary policies) aimed at achieving short-run stabilization as distinct bodies of research. Indeed, the common wisdom among economists sees little connection between how stabilization policies are being implemented and the average speed at which the affected economy grows. At most does it highlight the importance of stable and consistent policies as exemplified by recommendations to run prudent fiscal and monetary policies through balanced fiscal accounts or moderate inflation.

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Yet recent studies suggested moving further and looking explicitly at the relationship between macroeconomic volatility and the long run growth performance of an economy. Thus Ramey and Ramey (1995) provided some first empirical evidence of a negative correlation between growth volatility and long-run average growth based on cross-country regressions. More recently, Aghion et al. (2010) claimed that greater business-cycle volatility could be detrimental to growth, because credit-constrained firms are forced to cut on productivity-enhancing investments during downturns as they lack the ability to levy capital to finance these investments. And they used cross-country panel analysis to show that indeed higher macroeconomic volatility discourages long-term growth-enhancing investments in countries with lower financial development.

A natural implication of this line of research is that cyclical stabilization policies could help enhance growth in countries or sectors where firms are more credit constrained. For example, a monetary policy that reduces the cost of short-term refinancing in recessions –a typical example of what we refer to as counter-cyclical monetary policy-, can help firms overcome recessions without having to cut on productivity enhancing investments. Moreover it may also provide firms with larger incentives to engage in such investments ex ante, as the likelihood of cuts being necessary ex post during downturns is reduced. Similarly, productivity growth could be enhanced by countercyclical fiscal policies that allow governments to subsidize R&D investments in recessions, by, for instance, issuing public debt during recessions and repaying it during booms.

Yet, excepting some specific forms of policy which affect economic agents directly, like for instance raising taxes, macroeconomic policy is usually intermediated before it reaches its final recipients. This is particularly true for monetary policy. Changes in policy rates do not affect directly lending/borrowing decisions as the final cost of borrowing charged to households or firms also depends on the banking/financial sector characteristics and in

particular on how the banking/financial sector reacts to changes in policy rates.[3] Consequently, how successful monetary policy stabilization can be in fostering growth is likely to depend significantly on such characteristics.

In this paper, we analyze the interplay between the extent to which an industry is prone to be credit-constrained or liquidity-constrained and: (i) cyclical monetary and fiscal policy; (ii) regulatory policy as captured by financial sector characteristics. In particular, we are interested in understanding whether tightening (loosening) capital adequacy rules –insofar as it prompts banks to hold more (less) capital- can dampen or amplify the effects of counter-cyclical monetary policy on growth. Conversely, can the introduction of counter-cyclical capital buffers for banks –insofar as it makes credit less pro-cyclical or more counter-cyclical- provide another source of macroeconomic stabilization besides monetary policy to foster long run growth?

This paper lies at the intersection between several important policy debates. There is first the debate on whether or not governments should intervene with a stimulus package during recessions. Keynesian economists advocate government intervention to stimulate demand and thereby short term growth and employment in downturns. Others question the importance of a "multiplier" effect and instead advocate minimum tax and public spending to maximize firms' incentives to invest and hire. The analysis in the first part of this paper suggests a third –more Schumpeterian- approach, namely to implement counter-cyclical fiscal/budgetary policies to enhance innovation and growth especially in sectors that are more credit constrained. This has implications for the design of budgetary policies. In particular it might be helpful to correct

[3] A similarly argument can be made about the ability to raise aggregate demand using fiscal stimulus if households who get public money use it to pay back previously accumulated debts instead of raising their consumption because the financial sector is unwilling to extend new loans.

public deficit objectives for the business cycle, i.e. having them expressed in structural terms and no longer in nominal terms. This also has implications for fiscal prudence as empirically, soundness in fiscal accounts happens to be a key difference between those countries which manage to run counter-cyclical fiscal policies from those which run a- or even pro-cyclical fiscal policies.[4]

Second, there is the issue as to how monetary policy should or should not adapt to the business cycle, and more specifically whether interest rate setting along the cycle may affect long run growth. In the second part of the paper, we show that more counter-cyclical monetary policies, i.e interest rate rules where cyclical conditions are given a larger weight, inducing lower short term interest rates in recessions but higher short-term interest rates in booms, are more growth-enhancing for sectors that face either tighter credit constraints or tighter liquidity constraints (or are more prone to be subject to liquidity shocks).[5] More generally, this part of the analysis vindicates the view that making things easier during recessions, in particular by lowering nominal interest rates and also by engaging in further easing when cutting interest rates reaches a limit may yield significant benefits.[6]

There is finally the debate on optimal financial regulations which we analyze in the third part of the paper. Recent influential work by Admati et al. (2013) advocates tighter capital ratios for financial institutions. Moreover, the idea to introduce counter-cyclical capital buffers also lies at the top of the banking reform agenda (see Drehmann et al. 2010). We investigate these two aspects separately. First, while acknowledging that higher capital adequacy ratios for banks help mitigate systemic risks stemming from the financial system, we show that they can

[4] See Aghion, Hemous and Kharroubi (2010) for empirical evidence on the positive relationship between fiscal policy counter-cyclicality and fiscal soundness.

[5] This part draws on Aghion, Farhi and Kharroubi (2012).

have two types of adverse consequences. First, they tend to inhibit growth in sectors with lower asset tangibility (typically the most innovative sectors). Second, they adversely affect the growth-enhancing effects of counter-cyclical monetary policy in such sectors. To put it differently, while imposing higher bank capital ratios should certainly contribute to making the aggregate economy safer and more immune to large adverse shocks, at the same time this would call for more counter-cyclical monetary policy to maintain growth in sectors that face tighter credit constraints or tighter liquidity constraints.

Next, we investigate the potential effects of (introducing) increasing counter-cyclicality in capital ratios. As a proxy for such cyclicality, we use the cyclicality of credit provision.[7] We then show that counter-cyclical credit provision enhances growth more in sectors with tighter liquidity constraints, on top of the growth-enhancing effects of monetary policy counter-cyclicality in such sectors.

Overall, our analysis suggests that tighter financial regulation involves a trade-off between on the one hand mitigating the risks and consequences of financial crises and financial instability, and on the other hand reducing the effectiveness of countercyclical monetary policy in enhancing growth in more liquidity constrained sectors. Yet, this latter effect can be circumvented by adopting (i) more counter-cyclical monetary policy and (ii) more counter-cyclical capital buffers.

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[6] This analysis also shows that the benefits of monetary policy stabilisation come equally from bad and good states. This means that raising interest rates in good times is as important as cutting them in bad times. See Aghion, Farhi and Kharroubi (2012) for more details.

[7] There is no available data on the cyclicality of capital ratios. The issue has only emerged recently in policy debates. Yet, we can still use the cyclicality of credit provision to understand the would-be effects of introducing counter-cyclical capital buffers. Our idea is that introducing counter-cyclical capital buffers will necessarily lead, everything else equal, to more counter-cyclical credit provision, Put differently, policy can affect the cyclicality of credit provision essentially with two means: the cyclicality of monetary policy and the cyclicality of bank capital ratio. Hence, differences in credit provision cyclicality can be interpreted as difference in capital ratio cyclicality once monetary policy counter-cyclicality has been controlled for.

The empirical analysis in this paper uses cross-industry, cross-country panel data regressions. We build on the methodology developed in the seminal paper by Rajan and Zingales (1998). Namely, using cross-industry, cross-country panel data, we test whether industry growth is positively affected by the interaction between fiscal or monetary policy cyclicality (computed at the country level) and industry-level measures of financial constraints (computed for each corresponding industry in the United States). The main reason we favor such an approach is because it provides a clear and net way to deal with causality issues.

Above, we mentioned evidence of a negative relationship between business-cycle volatility and long-run growth (e.g in Ramey and Ramey, 1995; Aghion et al, 2010). Yet, this is only indicative of a negative co-movement: it does not determine whether high volatility tends to reduce growth or whether low growth contributes to raising business cycle volatility. By looking at the effect of macroeconomic policies conducted at the country level on long–term growth at the industry level and acknowledging that individual industries are small compared to the total economy, we can confidently rule out the possibility that growth at the industry level affects the cyclical pattern of macroeconomic policy. Instead, we focus on the causality link from macroeconomic policy to industry growth. In other words, to the extent that macroeconomic and regulatory policies can affect industry growth, the opposite (industry growth affecting macroeconomic or regulatory policy) is much less likely to hold.

Based on this empirical analysis, we can assess the economic magnitude of the difference-in-difference effects corresponding to the adoption of different fiscal, monetary or regulatory policies. We first look at the effect of cyclical fiscal and monetary policy, evaluating the magnitude of the growth effects for an industry facing tight credit or liquidity constraints and located in a country running counter-cyclical policy compared to an industry facing lax credit or liquidity constraints and located in a country running pro-cyclical policy. We then similarly

assess the effect of a change in regulatory policy. In particular, we compute the growth loss for an industry facing lax credit or liquidity constraints and located in a country with low bank capital to asset ratio compared to an industry facing tight credit or liquidity constraints and located in a country with high bank capital to asset ratio.[8] We do find economically large effects of cross-country differences in fiscal, monetary and regulatory policy.

The remaining part of the paper is organized as follows. Section 2 describes the empirical methodology and the data used to study the effect of cyclical fiscal and monetary policy. Section 3 presents its main empirical findings. Section 4 extends the previous analysis to investigate the effect of financial regulation. Finally conclusions are drawn in Section 5. Appendix A and B supply details on the sample and the estimations.

2. Methodology and Data.

The empirical framework uses the average annual growth rate of real value added in industry *j* in country *k*, as the dependent variable. As explanatory variables, we introduce industry and country fixed effects $\{\alpha_j ; \beta_k\}$ to control for unobserved heterogeneity across industries and across countries. The variable of interest, $(ic)_j \times (pol)_k$, is the interaction between industry *j*'s intrinsic characteristic $(ic)_j$ and the cyclicality of macroeconomic policy in country *k* $(pol)_k$ observed over the same period for which the average industry growth rate is computed. Finally, we control for initial conditions by including the ratio of real value added in industry *j* in country *k* to the total real value added in the manufacturing sector in country *k* at the

[8] This computation relies on the assumption that the difference in bank capital ratios is entirely driven by a tightening in regulatory policy. From that point of view, the estimates of the difference-in-difference effect we obtain are representing an upper bound. The effective implications of changing the regulatory policy are likely to be smaller than the estimated effect.

beginning of the period. Denoting y^t_{jk} (y^t_k) real value added in industry j (in manufacturing) in country k at time t and ε_{jk} the error term, our main estimation equation can then be expressed as:

$$\frac{\ln\left(y^{t+n}_{jk}\right)-\ln\left(y^{t}_{jk}\right)}{n}=\alpha_j+\beta_k+\gamma\left(ic\right)_j\times\left(pol\right)_k-\delta\log\left(\frac{y^t_{jk}}{y^t_k}\right)+\varepsilon_{jk} \quad (1)$$

Using a similar approach, we can also estimate the effect on industry labor productivity growth, defined as real value added per worker (or per hour worked).

2.1 Macroeconomic Policy.

We start by looking at fiscal and monetary policy. We will turn to regulatory policy in a second step. The cyclical pattern of policy (fiscal or monetary) in country k is estimated as the marginal change in the considered policy (fiscal or monetary) following a change in the domestic output gap. For fiscal policy, we estimate the following equation

$$fb_{kt}=\eta_k+\left(\mathrm{fp}\right)_k z_{kt}+u_{kt} \quad (2)$$

Where fb_{kt} is either total or primary fiscal balance to GDP in country k in time t; z_{kt} is the output gap in country k in time t, which represents the country's current position in the cycle; η_k is a constant; and u_{kt} is an error term.[9] We estimate this equation over the period 1980-2005 using annual data. The estimated coefficient $(\mathrm{fp})_k$ therefore measures fiscal policy cyclicality in country k during the period 1980-2005.[10] A positive (negative) regression coefficient $(\mathrm{fp})_k$ reflects a counter-cyclical (pro-cyclical) fiscal policy as the country's fiscal balance improves (deteriorates) in expansions and deteriorates (improves) in recessions. A

[9] Throughout the paper, the output gap is the percentage difference actual and trend GDP, trend GDP being estimated applying an HP filter on the log of the real GDP. The smoothing parameter is adapted according to the data frequency.

[10] The appendix provides two histograms (1 & 2) reflecting the estimation results of the country-by-country "auxiliary" regression (2).

larger coefficient hence indicates a more counter-cyclical fiscal policy. The cyclicality index of macroeconomic policy $(pol)_k$ used in equation (1) is hence based on the set of estimated parameters $(\text{fp})_k$ when we investigate the effect of fiscal policy counter-cyclicality on industry real value added (labor productivity) growth.

Turning to monetary policy, we consider the real short term interest rate as the policy indicator[11] and estimate the following equation

$$rsir_{kt} = \eta_k + \theta_k rsir_{kt-1} + (\text{mp})_k z_{kt} + u_{kt} \tag{3}$$

where $rsir_{kt}$ is the real short term interest rate in country k in time t, z_{kt} is the output gap in country k in time t, θ_k and η_k are parameters to estimate and u_{kt} is a residual. We estimate this equation over the period 1999-2005 using quarterly data. The estimated coefficient $(\text{mp})_k$ therefore measures monetary policy cyclicality in country k for the estimation period: A positive (negative) regression coefficient $(\text{mp})_k$ reflects a counter-cyclical (pro-cyclical) monetary policy as the central bank tends to make short-term credit more (less) costly in expansions and less (more) costly in recessions. A larger coefficient hence indicates a more counter-cyclical monetary policy. As a complement to equation (3), we also use an alternative approach which allows the monetary policy rule specification to differ across countries. By choosing the specification which fits best country specific characteristics, we can get a better idea of the monetary policy cyclicality.[12,13] The cyclicality index of macroeconomic policy $(\text{pol})_k$ used in equation (1) is hence based on the set of estimated parameters $(\text{mp})_k$ when we investigate the effect of monetary policy counter-cyclicality.

[11] The real short term interest rate is the difference between the nominal interest rate and the annualized quarter-on-quarter CPI inflation.

[12] More precisely, we choose for each country the specification which minimizes the root mean square error (RMSE).

[13] The appendix provides two histograms (3 & 4) reflecting the estimation results of the country-by-country estimates for monetary policy cyclicality.

2.2 Regulatory Policy.

We now turn to the analysis of the effect of regulatory policy. Here we adopt a similar approach to that used for studying the effect of cyclical macroeconomic policy and estimate the following specification:

$$\frac{\ln\left(y_{jk}^{t+n}\right)-\ln\left(y_{jk}^{t}\right)}{n}=\alpha_j+\beta_k+\gamma\left(ic\right)_j\times\left(reg\right)_k-\delta\log\left(\frac{y_{jk}^{t}}{y_k^{t}}\right)+\varepsilon_{jk}\,. \tag{4}$$

where $(\text{reg})_k$ is the indicator for financial regulation in country *k*, other notation being unchanged. As explained above, we look at two different dimensions of financial regulation, tightness and cyclicality.

First, we compute the average bank capital to asset ratio for each country *k* over the period 1999-2005 and use this as our index for financial regulation $(\text{reg})_k$ in equation (4). Here we implicitly assume that an increase in the effective/actual bank capital to asset ratio as least partly reflects a tightening of the financial regulation.

Second to evaluate the potential effects of cyclicality in financial regulation, we consider the cyclicality of credit to non financial firms. Specifically we estimate for each country the following equation:

$$pc_{kt}=\eta_k+\left(\text{rp}\right)_k z_{kt}+u_{kt} \tag{5}$$

where pc_{kt} represents the cyclical component of private credit to non-financial firms to GDP in country *k* in time *t*, η_k is a constant, z_{kt} is the output gap in country *k* in time *t* and u_{kt} is a residual.[14] We estimate this equation over the period 1999-2005 using quarterly data.[15] The estimated coefficient $(\text{rp})_k$ therefore measures credit cyclicality in country *k* for the estimation

[14] The cyclical component pc_{kt} is estimated using an HP filter on the log of the private credit to non-financial firms to GDP. This trend/cycle decomposition is helpful to focus on the higher frequency changes in private credit to GDP and abstract from the lower frequency changes which likely reflect more structural factors like financial deepening.

[15] We estimate financial regulation tightness as well as credit cyclicality on the period 1999-2005 mainly because data prior to this period is not available for the full cross section of countries of our sample.

period: A positive (negative) regression coefficient $(rp)_k$ reflects pro-cyclical (counter-cyclical) credit as the deviation from trend credit tends to be larger (lower) in expansions and lower (larger) in recessions. We then use the estimated parameters $(rp)_k$ as another index for financial regulation $(reg)_k$ in equation (4). Here we implicitly assume that more countercyclical credit at least partly reflects more counter-cyclical capital buffers.

2.3 The Relationship between Macroeconomic and Regulatory Policy.

Finally, we want to investigate the interplay between cyclical macroeconomic policy and financial regulation. For that purpose, we run two additional sets of estimations. First, we include the interaction of industry liquidity/credit constraints and financial sector characteristics on the one hand and cyclical macroeconomic policy on the one hand. This is equation (6).

$$\frac{\ln\left(y_{jk}^{t+n}\right)-\ln\left(y_{jk}^{t}\right)}{n}=\alpha_j+\beta_k+\gamma_m\left(ic\right)_j\times\left(pol\right)_k+\gamma_r\left(ic\right)_j\times\left(reg\right)_k-\delta\log\left(\frac{y_{jk}^{t}}{y_k^{t}}\right)+\varepsilon_{jk} \qquad (6)$$

Through such estimation, one can test whether the growth effects of financial regulation complement or counteract the growth effects of more counter-cyclical macroeconomic policy. Estimating equation (6) may also help figure out whether the effect of cyclical macroeconomic policy is or is not simply capturing cross-country differences in bank capital to asset ratio or vice-versa.

In a second part of our analysis, we include a triple interaction between industry liquidity/credit constraints, financial regulation and cyclical macroeconomic policy:

$$\frac{\ln\left(y_{jk}^{t+n}\right)-\ln\left(y_{jk}^{t}\right)}{n}=\alpha_j+\beta_k+\gamma_m\left(ic\right)_j\times\left(pol\right)_k+\gamma_{mr}\left(ic\right)_j\times\left(pol\right)_k\times\left(reg\right)_k-\delta\log\left(\frac{y_{jk}^{t}}{y_k^{t}}\right)+\varepsilon_{jk} \qquad (7)$$

Estimating this equation should allow us to see for example whether tighter financial regulation -as captured by a higher bank capital to asset ratio- actually amplifies or dampens the growth effect of a more counter-cyclical macroeconomic policy on industry growth in

more financially constrained sectors. We can also evaluate whether cyclical macroeconomic policy has an effect on growth independently of financial sector characteristics or if it essentially depends on the state of financial regulation.

Last, we will mix equations (6) and (7) to check whether the effects of macroeconomic and regulatory policy on growth are either independent of each other or complementing each other or both.[16] We will therefore estimate the following equation:

$$\frac{\ln\left(y_{jk}^{t+n}\right)-\ln\left(y_{jk}^{t}\right)}{n}=\alpha_j+\beta_k+\gamma_m\left(ic\right)_j\times\left(pol\right)_k+\gamma_r\left(ic\right)_j\times\left(reg\right)_k$$
$$+\gamma_{mr}\left(ic\right)_j\times\left(pol\right)_k\times\left(reg\right)_k-\delta\log\left(\frac{y_{jk}^{t}}{y_k^{t}}\right)+\varepsilon_{jk} \quad (8)$$

2.4 Industry Characteristics and Estimation Methodology.

Now turning to industry-specific characteristics, we follow Rajan and Zingales (1998) in using firm-level data pertaining to the United States. In our case, these characteristics are designed to capture two sets of constraints affecting firms: borrowing constraints on the one hand and liquidity constraints on the other. We use asset tangibility as a proxy for borrowing constraints, measured as the median ratio, across firms in a given industry, of the value of net property, plant, and equipment to total assets. As to liquidity constraints, we consider the median ratio, across firms in a given industry of labor costs to total sales. The first measure gives an indication of an industry's difficulty of raising external finance and as such can be considered as a proxy for industry borrowing constraints. The second measure gives an indication of an industry's need for short term financing. Industries with a larger ratio of labor

[16] Note that given the limitations we face for financial data, we will only be able to estimate eq. (6), (7) and (8) using monetary policy. Running a similar exercise for fiscal policy is currently not possible.

costs to sales actually have larger payments to make on a regular basis and should therefore have greater needs for short-term refinancing.

This methodology, which consists in using U.S. firm data to compute industry characteristics, is predicated on the assumptions that (1) differences across industries are driven largely by differences in technology; (2) technological differences persist over time across countries; and (3) countries are relatively similar in terms of the overall institutional environment faced by firms. Under these three conditions, the U.S.-based industry-specific measure is likely to be a valid measure for industries in countries other than the United States. We believe that these assumptions are satisfied especially given our restriction to a set of rich countries that all belong to the Organisation for Economic Co-operation and Development (OECD). For example, if pharmaceuticals require proportionally more external finance or have lower labor costs than do textiles in the United States, this is likely to be the case in other OECD countries as well.[17] Moreover, to the extent that the United States is more financially developed than other countries worldwide, U.S.-based measures are likely to provide the least noisy measures of industry borrowing or liquidity constraints.

Following Rajan and Zingales (1998), we estimate equations (1)-(4)-(6)-(7)-(8) with a simple ordinary least squares (OLS) procedure, correcting for heteroskedasticity bias when needed. In particular, the interaction term between industry-specific characteristics and stabilization policy cyclicality is likely to be largely exogenous to the dependent variable. There are two reasons for assuming this. First, our variable for industry specific characteristics pertains to industries in the United States, whereas the dependent variable involves other countries. Hence, reverse causality, whereby industry growth outside the United States could affect industry specific characteristics in the United States, seems quite implausible. Second,

stabilization policy cyclicality is measured at a macro level, whereas the dependent variable is measured at the industry level, which again reduces the scope for reverse causality as long as each individual industry represents a small share of the total output in the domestic economy.

2.5 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.[18] 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.[19] 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 (2008) Economic Outlook data set. Fiscal policy data exist only on an annual frequency. We therefore use a relatively long time span -beginning in 1980 and ending in 2005- in order to reduce uncertainty around fiscal policy cyclicality estimates. In contrast, there is quarterly data for monetary policy variables. We choose to concentrate on most recent periods (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

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[17] In addition, little convergence has occurred among OECD countries over the past 20 years. Hence, cross-country differences are likely to persist over time.

[18] The sample consists of the following countries: Australia, Austria, Belgium, Denmark, Spain, Finland, France, Greece, Ireland, Italy, Japan, Netherlands, Portugal, Sweden, and United Kingdom.

[19] See appendix for the list of industries in the sample.

monetary policy decisions.[20] Finally, the data for bank capital ratios comes from Bankscope while data on credit to non-financial firms comes from the Bank for International Settlements.[21]

3. Results.

3.1 Fiscal Policy.

We first investigate the effect of fiscal policy counter-cyclicality. To this end, we estimate our main regression equation (1) using asset tangibility as the industry-specific characteristic and two sets of fiscal policy indicators. The first set is built around the total fiscal balance variable, which we consider either as a ratio current GDP or as a ratio of potential GDP.[22] The second set of fiscal policy indicators is built around the primary fiscal balance variable.[23] As in the previous case, we consider it either as a ratio of current GDP or as a ratio of potential GDP. The empirical results show that growth in industry real value added is significantly and negatively correlated with the interaction of asset tangibility and fiscal policy counter-cyclicality (see table 1): a larger sensitivity to the output gap of total fiscal balance to GDP tends to raise industry real valued added growth disproportionately for industries with lower asset tangibility. This result holds irrespective of whether total or primary fiscal balance is considered and whether it is a ratio to actual or potential GDP. As in the previous case, this result holds independent of the precise measure of fiscal policy counter-cyclicality. Applying the same methodology to industry labor productivity provides

[20] Starting in 1999 also allows focusing on post ECB period for Euro Zone countries.

[21] Such data can be obtained at the following address: http://www.bis.org/statistics/credtopriv.htm

[22] The reason why fiscal indicators are considered as a ratio of potential GDP is to make sure that changes in fiscal policy indicators come from fiscal policy itself and not from changes in GDP. Otherwise there could be fluctuations in fiscal policy indicators even if the fiscal balance is constant simply because of fluctuations in GDP. In this case, estimating eq. (2) would point towards counter-cyclical fiscal policy, even if fiscal policy is actually a-cylical.

similar qualitative results: industry labor productivity growth is significantly and negatively correlated with the interaction of asset tangibility and fiscal policy counter-cyclicality (see table 2).

Insert table 1 and table 2 here

Three remarks are worth making at this point. First, the estimated coefficients are highly significant, in spite of the relatively conservative standard-error estimates, which we cluster at the country level. Second, the estimated coefficients remain essentially the same whether the fiscal balance is considered as a ratio of actual or potential GDP. This suggests that we are capturing the effect of fiscal policy rather than just the effect of changes in actual GDP. Using real value added or labor productivity as a growth variable actually provides very similar estimated coefficients for the interaction terms. This suggests that the gain stemming from more counter-cyclical fiscal policy is essentially a productivity growth gain and not merely higher employment growth.

3.2 Monetary Policy

We now turn to investigate the effect of monetary policy counter-cyclicality. To this end, we estimate our main regression equation (1) using either an industry measure of borrowing constraints or an industry measure of liquidity constraints. In the former case, we use industry asset tangibility while in the latter case we use industry labor costs to sales. Moreover we use two measures for monetary policy cyclicality. The first one is based on a common specification to all countries. It is the sensitivity to the output gap of the real short term interest rate, controlling for one quarter lagged real short term interest rate in order to take into account some possible persistence in monetary policy decisions (cf. eq. (3)). A second

[23] The primary fiscal balance excludes net interest payments to or from the government as opposed to total fiscal balance

measure of monetary policy cyclicality is derived as the sensitivity of the real short term interest rate to the output gap, but using country-specific specifications. The specification is chosen for each country among a set of six different equations using a minimizing RMSE criterion.[24]

The empirical results in table 3 show that growth in industry real value added is significantly and negatively correlated with the interaction of industry asset tangibility and monetary policy counter-cyclicality: a larger sensitivity to the output gap of the real short term interest rate tends to raise industry real valued added growth disproportionately for industries with lower asset tangibility. A similar but opposite type of results holds for the interaction between monetary policy cyclicality and industry labor costs to sales: a larger sensitivity of real short term interest rate to the output gap raises industry real valued added growth disproportionately for industries with higher labor costs to sales. These results are consistent with the view that a counter-cyclical monetary policy raises growth disproportionately in sectors that are more liquidity dependent or that face larger difficulties to raise capital, by easing the process of refinancing. Note that these two results extend to the case where monetary counter-cyclicality is estimated using a rule that is allowed to differ across countries. We now repeat the same estimation exercise, but moving the focus to labor productivity growth (see table 4). Our basic conclusion is unchanged as results obtained for value added growth extend to labor productivity growth without difficulty.

Insert table 3 and table 4 here

At this point it is worth making two remarks. First the correlations between the measures of liquidity and borrowing constraints is around -0.6. Liquidity and borrowing constraints are

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which includes all government revenues and expenditures.

therefore two distinct channels through which monetary policy counter-cyclicality affects industry growth. Second, as was the case for regressions using fiscal policy cyclicality, estimated coefficients for the interactions terms are very stable whether the dependent variable is value added growth or labor productivity growth. This confirms that macroeconomic policy cyclicality is a source of long-run growth as it essentially affects labor productivity.[25]

3.3 Regulatory Policy

We last investigate the effect of regulatory policy. To do so, we estimate the regression equation (4) using, as we did for monetary policy, either an industry measure of borrowing constraints (industry asset tangibility) or an industry measure of liquidity constraints (industry labor costs to sales). We start the investigation by looking at the effects of bank capital to asset ratio. Results in column (i) & (iii) in table 5 show that industries with higher asset tangibility tend to grow disproportionately faster in economies where banks maintain higher capital to asset ratio. This finding actually makes sense. When banks have more of their own money at stake in the loans they extend, they likely require stronger guarantees when lending to firms, which is inevitably more difficult to satisfy for firms whose assets are less tangible.[26] Hence a tightening in regulatory policy – assuming it would lead banks to choose

[24] Ideally, we would like to measure monetary policy counter-cyclicality by means of estimating a Taylor rule. The problem however with such estimation is that short term nominal interest rates and inflation rates are not stationary over the period 1999-2005 that we consider for our estimation.

[25] A discrepancy between results for real value added and results for labour productivity growth would have implied that macroeconomic policy cyclicality essentially operates through employment growth, which cannot constitute a source of growth in the long-run.

[26] There is one important point to keep in mind with respect to this finding. Since we focus on manufacturing sectors, we can only say that within manufacturing, industries with less tangible assets get hurt. However it is also clear that asset tangibility is probably higher in manufacturing than in other sectors like the service sector. So applying the same argument across sectors could imply that manufacturing as a whole actually grows faster relative to the service sector when banks maintain higher capital ratios. On the other hand this result highlights the risks of imposing high capital to asset ratios as this could allow sectors highly tangible sectors like construction to outgrow the economy.

to hold more capital- can be expected to raise growth in high tangibility industries to the detriment of low tangibility industries. However there is no evidence of a significant effect on industries according to their labor costs to sales. Industries with higher labor costs to sales do not grow slower because banks choose to hold more capital.

Turning now to the cyclicality of credit, columns (ii) & (iv) show that pro-cyclical credit (i.e. less credit in recessions and more in expansions) to non-financial enterprises does actually hurt more industries with larger liquidity needs: in countries where credit is less pro-cyclical, industries with larger liquidity needs tend to grow faster. However there is no evidence of a significant effect on industries according to the tangibility of their assets. Less tangible industries do not grow slower because credit is more pro-cyclical.[27]

Finally, table 6 extends this analysis to labor productivity growth, showing that results are both qualitatively and quantitatively very similar to those obtained using real value added growth as the dependent variable.

Insert table 5 and table 6 here

3.4 Magnitude of the Effects

How large are the effects implied by the regressions? To get a sense of the magnitudes involved in these regressions, we compute the difference in growth between on the one hand an industry at the third quartile (seventy-fifth percentile) in terms of borrowing or liquidity constraint located in a country at the third quartile in terms of fiscal, monetary or regulatory policy and on the other hand an industry at the first quartile (twenty-fifth percentile) in terms

[27] While the result on liquidity dependent industries makes sense, the absence of a significant effect according to asset tangibility is more surprising, especially given that we have already found a significant effect of monetary policy counter-cyclicality. This discrepancy may have to do with firm's financial structure, intangible firms being essentially equity-financed and hence relatively unaffected by fluctuations in credit.

of borrowing or liquidity constraint located in a country at the first quartile in terms of fiscal monetary or regulatory policy.[28,29]

As it turns out, in the case of fiscal policy counter-cyclicality, the approximate gain in labor productivity growth is between one and two percentage points a year depending the fiscal policy indicator considered.[30] For monetary policy, the growth gain in labor productivity ranges between half and one and half of a percentage point, the latter figure being obtained when the liquidity dependence indicator is considered. Last changes in regulatory policy can have significant effects on industry labor productivity growth since moving from the first to the third quartile for bank capital to asset ratio can redistribute no more than two and a half of a percentage point of productivity growth from low to high tangibility sectors. Yet as we will see below, this effect is actually capturing part of the complementarity between regulatory and monetary policy and is hence overstating the implications of change in financial regulation per se.

Note that these magnitudes are fairly large, especially when compared to the corresponding figures in Rajan and Zingales (1998). According to their results, the gain in real value added growth from moving from the twenty-fifth to the seventy-fifth percentile, both in a country's level of financial development and in an industry's level of external financial dependence, is roughly equal to 1 percentage point a year.

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[28] In this case, we compute the difference in growth between on the one hand an industry at the first quartile in terms of asset tangibility located in a country at the third quartile in terms of fiscal policy counter-cyclicality and on the other hand an industry at the third quartile in terms of asset tangibility located in a country at the first quartile in terms of fiscal policy counter-cyclicality.

[29] Given our difference-in-difference specification, it is impossible to infer the economic magnitudes of the estimated coefficients differently. In particular, the presence of industry and country fixed effects precludes investigating the impact of a change in the cyclical pattern of fiscal policy for a given industry or conversely the effect of a change in industry characteristics (asset tangibility or labour cost to sales) in a country with a given cyclical pattern of fiscal policy. Both these effects are absorbed with our country and industry dummies.

[30] The larger growth gain from a change in fiscal policy cyclicality is obtained using the primary balance and the lower using the total balance.

However, the following considerations are worth pointing out here. First, these are difference-in-difference (cross-country or cross-industry) effects, which are not directly interpretable as countrywide effects. Second, we are just looking at manufacturing sectors, which represent no more than 40 percent of total GDP of countries in our sample. Third, irrespective of the indicator for counter-cyclicality considered, there is a high degree of dispersion across countries in our sample. Hence moving from the twenty-fifth to the seventy-fifth percentile in macroeconomic or regulatory policy corresponds to a radical change in the design of stabilization policies along the cycle, which, in turn, is unlikely to take place in any individual country over a short period of the time. Fourth, this simple computation does not take into account the possible costs associated with the transition from a steady state with low policy counter-cyclicality to a steady state with high policy counter-cyclicality. Yet the above exercise suggests that differences in the cyclicality of fiscal and monetary policy are an important driver of the observed cross-country, cross-industry differences in growth performance.

3.5 Financial regulation and its interplay with the cyclicality of monetary policy

So far we have analyzed separately the effects of macroeconomic policy (fiscal/monetary policy counter-cyclicality) and of financial regulation (bank capital ratios and the cyclicality of credit). We now investigate the potential interactions between the two. Our idea is that the transmission of stabilization policies to the real economy could depend on the characteristics of the banking/financial sector. Thus, one may wonder whether high capital ratios are an obstacle to a rapid and swift transmission of policy stimuli, or instead a guarantee that banks are sound and safe, which in turn could ease transmission of stabilization of policies to the

real economy.[31] Similarly, the cyclicality of credit cannot be examined independently of the cyclicality of monetary policy as the former is likely to reflect (be influenced by) the latter, hence, the importance of investigating the interaction between monetary policy cyclicality and financial regulation. This is what we do next.[32]

3.5.1 Monetary policy cyclicality and average bank equity to asset ratios

Table 7 regresses labor productivity growth on the interaction between industry asset tangibility (labor cost to sales) and monetary policy counter-cyclicality, but adding the interaction between industry asset tangibility (labor cost to sales) and the average bank capital to asset ratio as an extra explanatory variable. As the table shows, a higher bank capital to asset ratio enhances growth disproportionately in sectors with higher asset tangibility: or put differently, higher bank capital ratios tend to be more detrimental for growth in sectors with lower asset tangibility (columns (i) & (ii)). The evidence for industries with higher labor costs to sales is more mixed (columns (iii) & (iv)), thus confirming the absence of results found previously in tables 5 and 6.[33] The conclusion to be drawn is therefore that imposing higher capital to asset ratios in banks can have detrimental effects on relatively intangible sectors. However, as is clear from the table, this adverse effect can be undone if in the meantime monetary policy becomes more counter-cyclical.

Insert table 7 here

Yet, one may ask whether the effect of bank capital to asset ratios just comes on top of the effect of monetary policy counter-cyclicality or whether bank capital to asset ratio actually affects the relationship between monetary policy counter-cyclicality and growth. Could it be

[31] Bech, Gambacorta and Kharroubi (2012) provides evidence that policy stimuli are less effective when the economy experiences a downturn associated with a financial crises, which presumably implies that banks then face significant problems.

[32] We will restrict the study to the interaction of financial regulation and monetary policy counter-cyclicality. Due to data limitations, it is actually not possible to carry out a similar exercise for fiscal policy counter-cyclicality.

for instance that high capital ratios reduce the effectiveness of monetary policy in promoting growth in least tangible sectors?

Table 8 answers this question. It tests whether the relationship between industry growth and the interaction between industry asset tangibility (labor cost to sales ratio) and monetary policy cyclicality is different between countries with relatively large bank capital to asset ratio and countries with relatively low bank capital to asset ratio. To do so, we build a dummy variable which is equal to one for countries with bank capital to asset ratios above the sample median. We then estimate whether there is a significant *extra* effect of the interaction between industry asset tangibility (labor cost to sales ratio) and monetary policy cyclicality on growth when the dummy variable equals one.

We see that the growth-enhancing effect of a counter-cyclical monetary policy on sectors with lower asset tangibility (higher labor costs to sales) is dampened in countries where the bank capital to asset ratio is above the sample median. In other words, high bank capital to asset ratios tends to reduce the benefit of a more counter-cyclical monetary policy in sectors that are more prone to be credit-constrained or liquidity-constrained. This result suggests that higher bank capital to asset ratios limit the ability of the financial system to respond to changes in interest rates and reduces the effectiveness of the monetary transmission channel. This result also implies that the adverse implications of high bank capital to asset ratios might be undone by adopting a more counter-cyclical monetary policy. However as is clear from the estimated coefficients, the interaction of industry asset tangibility (labor cost to sales ratio) and monetary policy cyclicality is not significant anymore for countries with above sample median bank capital to asset ratio, which would suggest that monetary policy simply becomes ineffective when banks maintain a large capital to asset ratio.

[33] Performing the same regression exercise using real value added growth as the dependent variable provides identical results.

Insert Table 8 here

Table 9 runs a horse race between the different interaction terms to get a comprehensive view of the interaction between monetary policy counter-cyclicality and bank capital to asset ratio. It includes the interaction between industry asset tangibility (labor cost to sales) and the average bank capital to asset ratio, the interaction between industry asset tangibility (labor cost to sales) and monetary policy cyclicality and this last interaction for countries with bank capital to asset ratios above the sample median.

The table yields three different results which confirm the previously obtained results in table 7 and table 8. First higher bank capital to asset ratio tends to benefit disproportionately to industries with more tangible asset, which can then grow faster. Second, higher bank capital to asset ratio tends to reduce the benefit that less tangible industries can derive from counter-cyclical monetary policy. Third, high bank capital to asset ratio tends to reduce the benefit that industries with higher labor costs to sales can derive from counter-cyclical monetary policy.

Overall, we can summarize our above discussion as follows. First, high bank capital asset ratios provide a disproportionate growth benefit to industries with high asset tangibility, at the expense of industries with lower asset tangibility. Second, high bank capital asset ratios make monetary policy counter-cyclicality less beneficial to industries with less tangible assets or larger labor costs to sales. In other words, a key effect of high bank capital to asset ratios is to dampen the growth enhancing effect of a more counter-cyclical monetary policy on sectors that are more prone to be credit constrained or liquidity constrained.

Insert Table 9 here

3.5.2 Monetary policy cyclicality and the cyclicality of financial regulation

We now investigate the extent to which the cyclicality in financial regulation enforcement could complement or substitute for the cyclicality of monetary policy in enhancing growth in more credit constrained or liquidity constrained sectors. As noted above, it is not possible to measure directly the cyclicality of financial regulation because up to now financial regulation has not embedded a significant cyclical dimension.[34] We hence rely on the cyclicality of credit because introducing cyclical considerations in financial regulation is bound to affect the cyclicality of credit. We focus on credit to non-financial corporations and ask the two questions raised for bank capital to asset ratio. First does counter-cyclical credit affect industries according to their asset tangibility (their labor cost to sales ratio)? Second, does the effect of monetary policy counter-cyclicality on industry growth get affected by cross-country differences in credit cyclicality?

Table 10 provides an answer to these two questions. There are essentially two take-aways from these estimations. First the cyclicality of credit does not affect industries according the tangibility of assets, neither directly nor indirectly, i.e. through the cyclicality of monetary policy. More precisely, the cyclicality of credit does not have any effect beyond that of monetary policy counter-cyclicality. Second, the cyclicality of credit does affect industry growth according to their labor costs to sales ratio: Industries with a larger labor costs to sales ratio get hurt disproportionately when credit to non-financial firms gets more pro-cyclical. Yet there is no interaction between monetary policy and credit counter-cyclicality. In other words, monetary policy and credit counter-cyclicality play similar but independent roles: raising growth disproportionately for industries with a larger labor costs to sales ratio.

[34] To be fair, the use risk-weighted assets in computing capital to asset ratio could be considered as a cyclicality component. Yet, if anything this indicator has rather introduced a source of pro-cyclicality as measured risks tend go down (up) in expansions (recessions).

Insert Table 10 here

4. Conclusions

We have analyzed the extent to which macroeconomic policy over the business cycle in combination with financial regulatory policy can affect industry growth, focusing on fiscal and monetary policy on the one hand and on bank capital ratio and the cyclicality of credit on the other hand. Following the Rajan and Zingales (1998) methodology, we have interacted these policy measures at the country level with industry-level financial and liquidity constraints (measured with asset tangibility and labor costs to sales in U.S. industries) to assess the impact of this interaction on output growth at the industry level. We have derived three main results. First, a more counter-cyclical macroeconomic policy (fiscal or monetary) significantly enhances output growth in more financially/liquidity constrained industries, that is, in industries whose U.S. counterparts display lower asset tangibility or larger labor costs to sales ratio. Second, a higher bank capital to asset ratio tends to raise growth disproportionately more in industries with larger asset tangibility (and therefore disproportionally less in industries with lower asset tangibility). A more counter-cyclical credit to non-financial firms tends to raise growth disproportionately in industries with larger labor costs to sales ratios. Third and last, a higher bank capital to asset ratio tends to reduce the effect of monetary policy counter-cyclicality.

This new approach to growth and macroeconomic and financial regulatory policy suggests at least two avenues for future research. First, the evidence on the effect of counter-cyclical macroeconomic policy on growth calls for going beyond the debate between supply-side and demand-side economists. While demand considerations can affect the market size for potential innovations, our effects are fundamentally supply-side driven, as they operate

through their influence on innovation incentives.[35] Second, the evidence we produced in this paper on the effects of bank capital and the cyclicality of credit to non-financial firms on growth, suggests non-trivial trade-offs for regulatory policy: in particular higher capital adequacy ratios aimed at reducing systemic risk may also affect adversely industries which we think of as being the main engines of growth in a developed economy. This in turn opens up the issue of how to optimally design financial regulations together with fiscal/monetary policy to reconcile financial stability and growth.

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[35] Thus a more counter-cyclical macroeconomic and/or regulatory policy has both an ex ante and an ex post effect: ex ante it increases innovation incentives by reducing the risk that the innovation will fail in the future due to adverse macroeconomic shocks; ex post it helps to reduce the proportion of firms that will have to cut productivity-enhancing investments following a bad shock.

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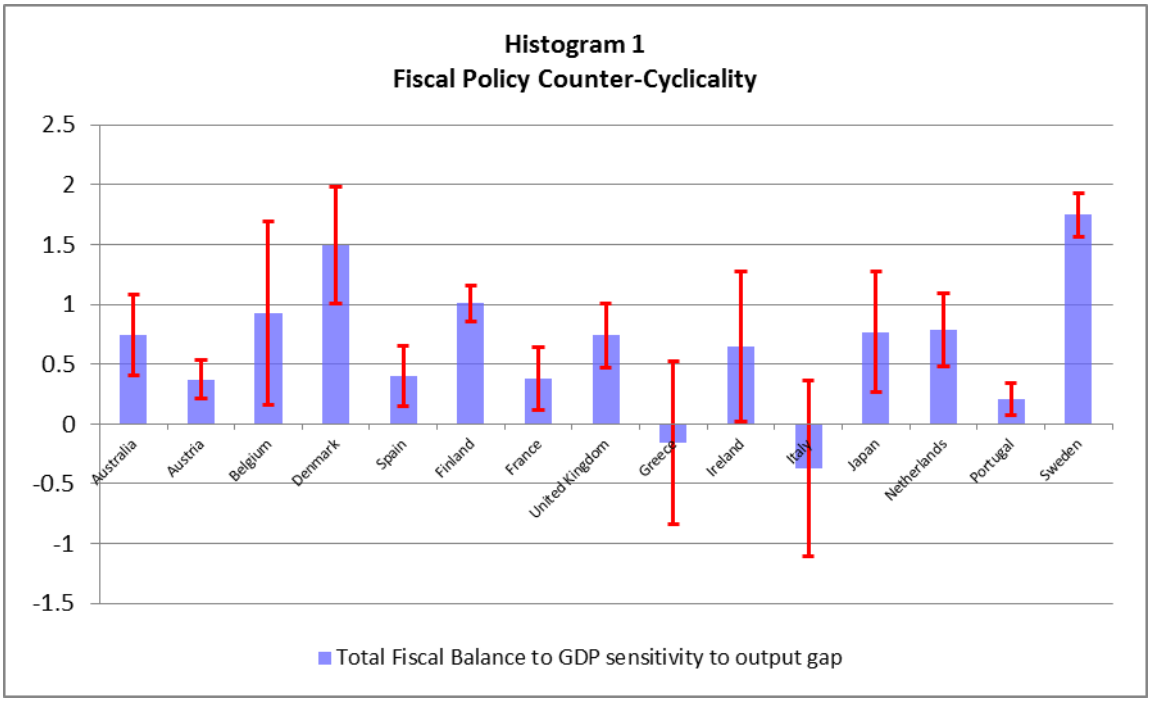
Appendix A. Industries in the sample

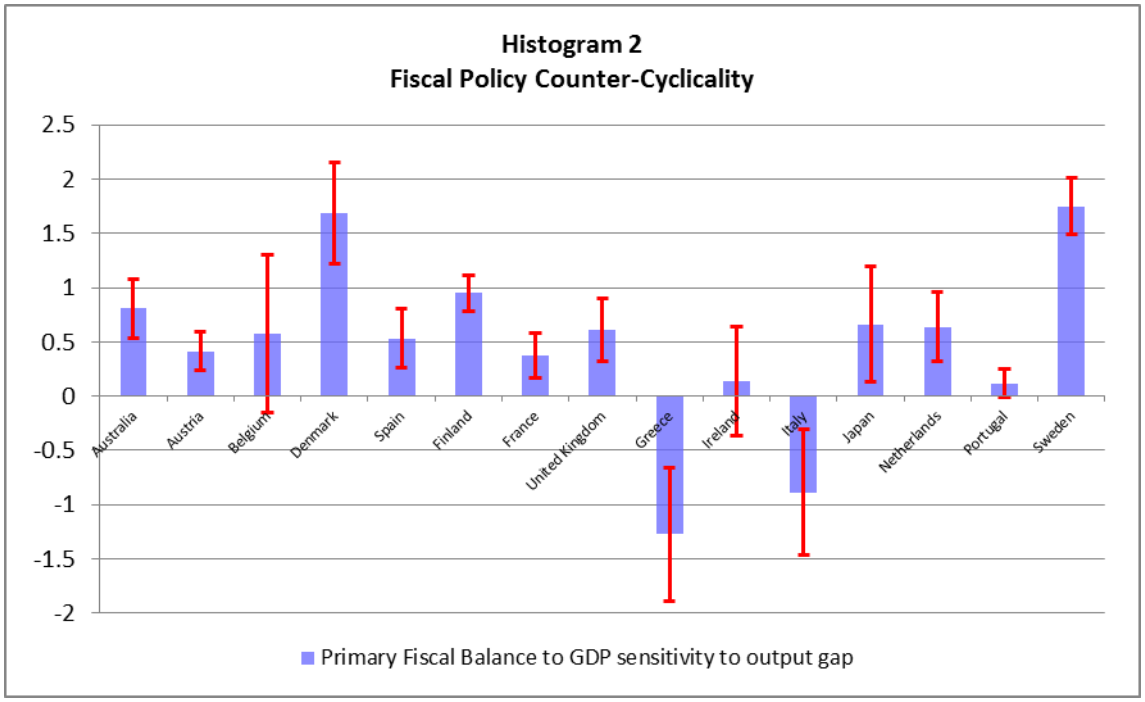
Note: The first column provides the industry code based on the International Standard Industrial Classification (ISIC) revision 3. The second column provides a brief industry description. If an industry description is valid for more than one industry code, the relevant industry codes are reported separated by an "*&*" character. The industry codes noted "*x-y*" represent industries with industry code "*x*" excluding industries with industry code "*y*".

Industry code	Industry title
15&16	FOOD, BEVERAGES, AND TOBACCO
15	Food and beverages
16	Tobacco
17&18&19	TEXTILES, TEXTILE, LEATHER, AND FOOTWEAR
17&18	Textiles and textile
17	Textiles
18	Wearing apparel, dressing, and dying of fur
19	Leather, leather, and footwear
20	WOOD AND OF WOOD AND CORK
21&22	PULP, PAPER, PAPER, PRINTING, AND PUBLISHING
21	Pulp, paper, and paper
22	Printing, publishing, and reproduction
221	Publishing
22-221	Printing and reproduction
23&24&25	CHEMICAL, RUBBER, PLASTICS, AND FUEL
23	Coke, refined petroleum, and nuclear fuel
24	Chemicals and chemical
244	Pharmaceuticals
24-244	Chemicals excluding pharmaceuticals
25	Rubber and plastics
26	OTHER NONMETALLIC MINERAL
27&28	BASIC METALS AND FABRICATED METAL
27	Basic metals
28	Fabricated metal
29	MACHINERY not elsewhere classified,
30&31&32&33	ELECTRICAL AND OPTICAL EQUIPMENT
30	Office, accounting, and computing machinery
31–32	Electrical engineering
31	Electrical machinery and apparatus, not elsewhere classified
313	Insulated wire
31-313	Other electrical machinery and apparatus not elsewhere classified
32	Radio, television, and communication equipment
321	Electronic valves and tubes
322	Telecommunication equipment
323	Radio and television receivers
33	Medical, precision, and optical instruments
331&332&333	Scientific instruments
334&335	Other instruments
34&35	TRANSPORT EQUIPMENT
34	Motor vehicles, trailers, and semi-trailers
35	Other transport equipment
351	Building and repairing of ships and boats
353	Aircraft and spacecraft
35-(351&353)	Railroad equipment and transport equipment not elsewhere classified
36&37	MANUFACTURING NOT ELSEWHERE CLASSIFIED, RECYCLING
36	Manufacturing not elsewhere classified
37	Recycling

Appendix B. Estimation results of the country-by-country fiscal policy regression (2).

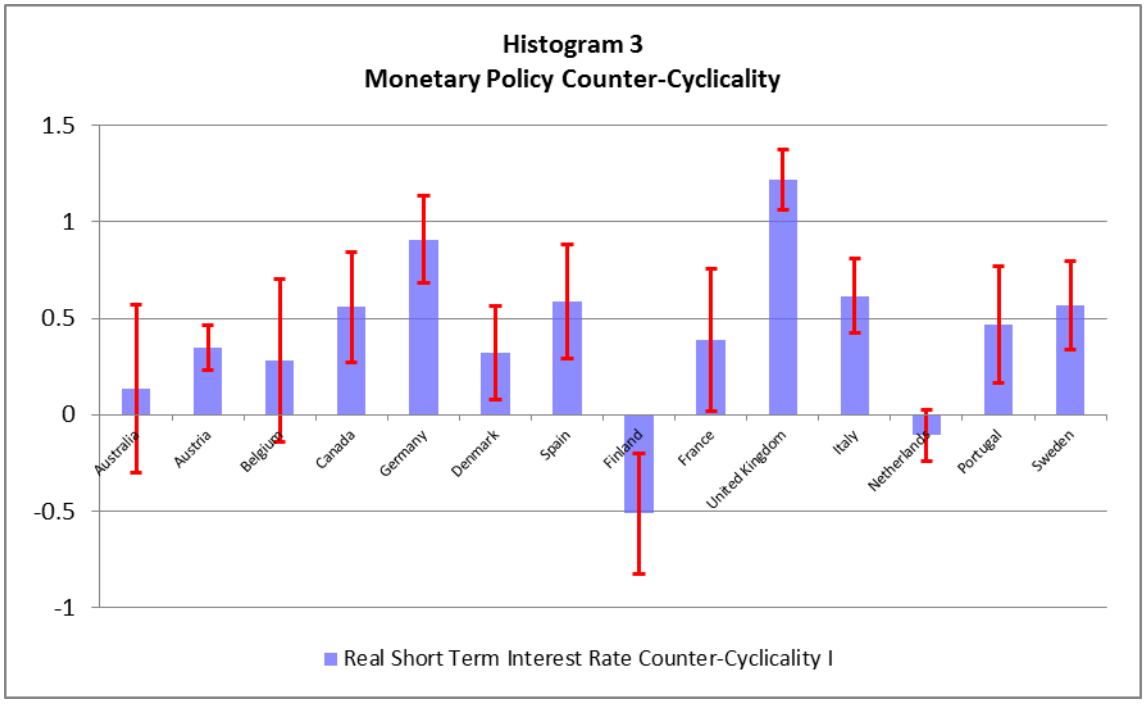
Note: Bars represent the coefficient $(fp)_k$ estimated in the regression (2), for each country. Red lines indicate the confidence interval at the 10% level around the mean estimate of $(fp)_k$, based on the standard errors estimated in the regression (2).

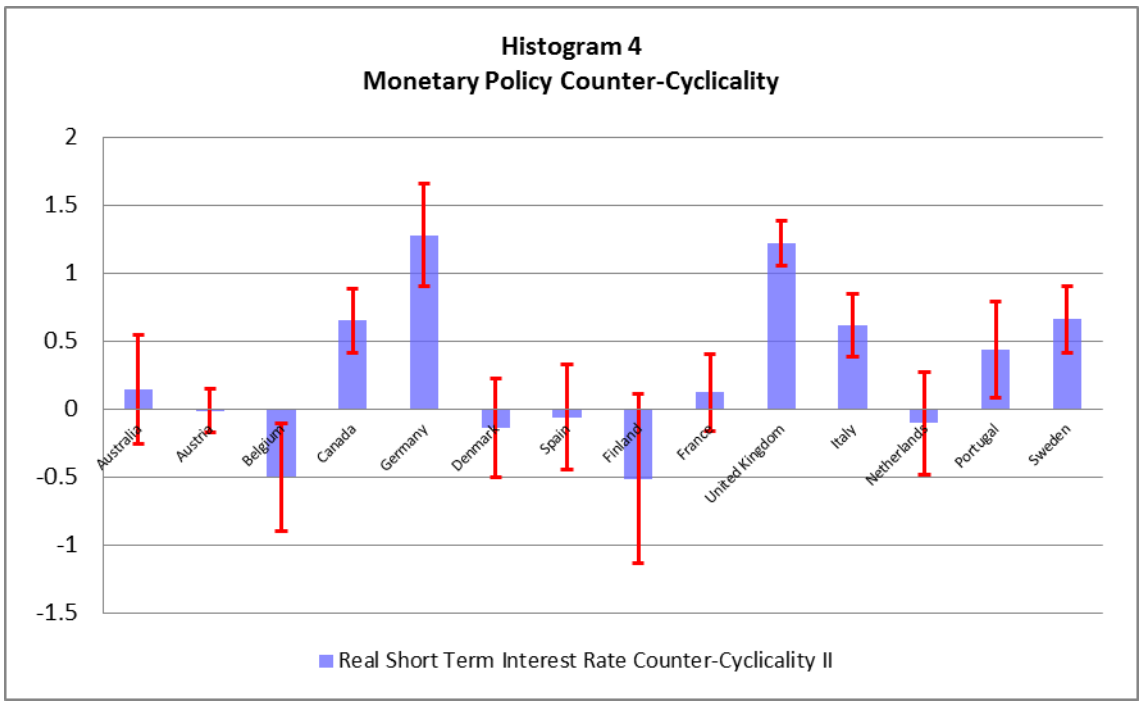




Appendix B. Estimation results of the country-by-country monetary policy regression (3).

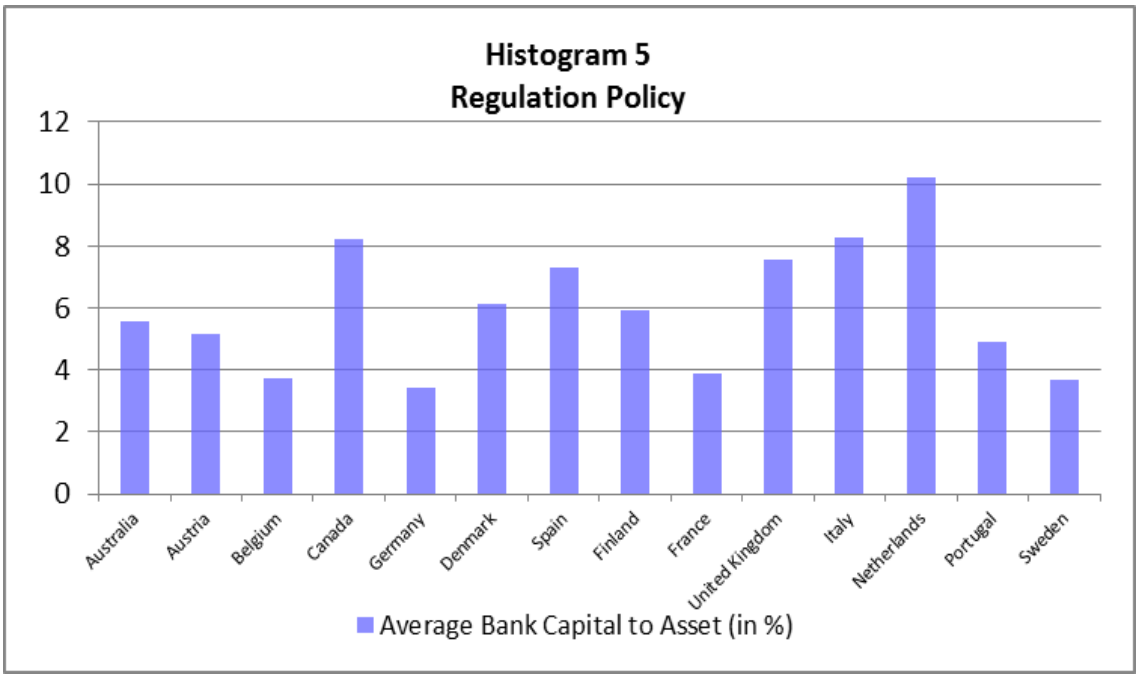
Note: Bars represent the coefficient $(mp)_k$ estimated in the regression (3), for each country. Red lines indicate the confidence interval at the 10% level around the mean estimate of $(mp)_k$, based on the standard errors estimated in the regression (3).





Appendix B. Average bank capital to asset ratio and estimation results of the country-by-country regulatory policy regression (5).

Note: Bars in histogram 5 represent the average bank capital to asset ratio for each country over the period 1999-2005. Bars in histogram 6 represent the coefficient $(rp)_k$ estimated in the regression (5), for each country. Red lines indicate the confidence interval at the 10% level around the mean estimate of $(mp)_k$, based on the standard errors estimated in the regression (5).



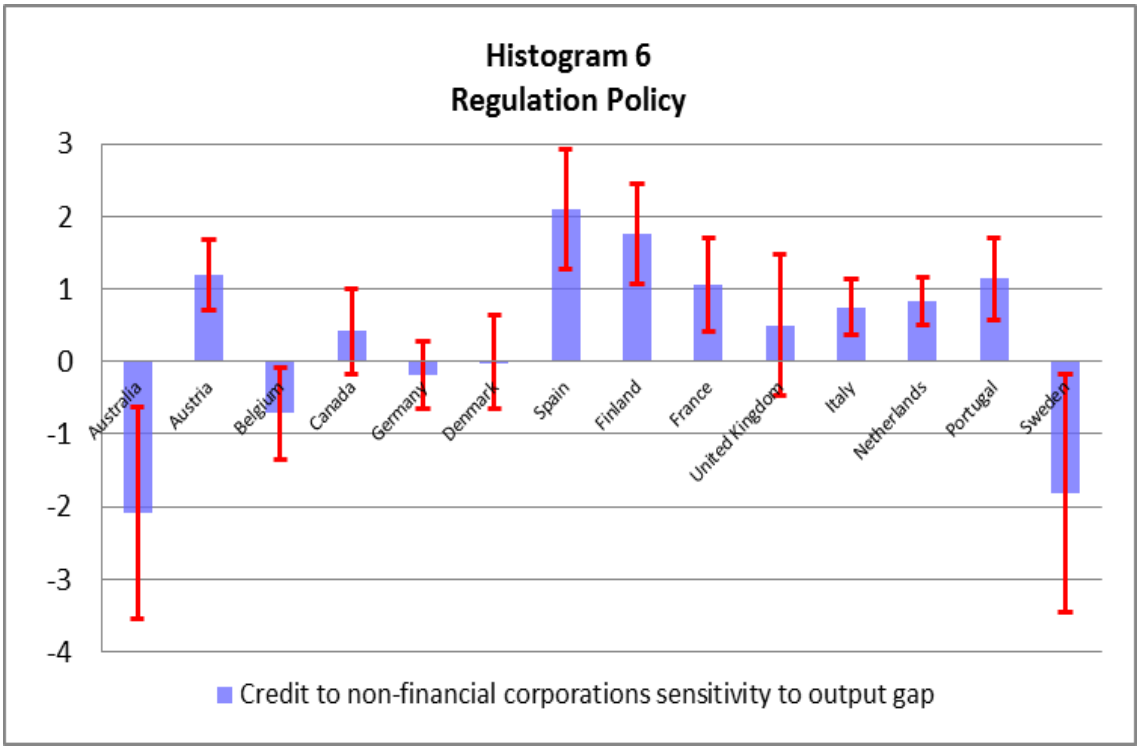


Table 1

Dependent variable: Real Value Added Growth				
	(i)	(ii)	(iii)	(iv)
Log of Initial Share in Manufacturing Value Added	**-0.528**	**-0.530**	**-0.508**	**-0.510**
	(0.350)	*(0.350)*	*(0.351)*	*(0.352)*
Interaction (Asset Tangibility and Total Fiscal Balance to GDP Counter-Cyclicality)	**-13.30*** **			
	(4.406)			
Interaction (Asset Tangibility and Total Fiscal Balance to pot. GDP Counter-Cyclicality)		**-13.24*** **		
		(4.251)		
Interaction (Asset Tangibility and Primary Fiscal Balance to GDP Counter-Cyclicality)			**-8.942*** **	
			(2.895)	
Interaction (Asset Tangibility and Primary Fiscal Balance to pot. GDP Counter-Cyclicality)				**-9.039*** **
				(2.830)
Observations	528	528	528	528
R-squared	0.560	0.561	0.560	0.560

Note: The dependent variable is the average annual growth rate in real value added for the period 1980-2005 for each industry in each country. Initial Share in Manufacturing Value Added is the ratio of industry real value added to total manufacturing real value added in 1980. Asset Tangibility is the fraction of assets represented by net property, plant and equipment for US firms in the same industry for the period 1980-1989. Total Fiscal Balance to (pot.) GDP Counter-Cyclicality is the coefficient of the output gap when total fiscal balance to (potential) GDP is regressed on a constant and the output gap for each country. Primary Fiscal Balance to (pot.) GDP Counter-Cyclicality is the coefficient of the output gap when primary fiscal balance to (potential) GDP is regressed on a constant and the output gap for each country. The interaction variable is the product of variables in parentheses. Estimated coefficients are in percentage. Standard errors -clustered at the country level- are in parentheses. All estimations include country and industry dummies. Significance at the 1% (resp. 5%; 10%) level is indicated by *** (resp. **; *).

Table 2

Dependent variable: Labor Productivity Growth				
	(i)	(ii)	(iii)	(iv)
Log of Initial Relative Labor Productivity	**-2.512*** **	**-2.510*** **	**-2.505*** **	**-2.502*** **
	(0.503)	*(0.503)*	*(0.533)*	*(0.533)*
Interaction (Asset Tangibility and Total Fiscal Balance to GDP Counter-Cyclicality)	**-13.03*** **			
	(4.011)			
Interaction (Asset Tangibility and Total Fiscal Balance to pot. GDP Counter-Cyclicality)		**-12.81*** **		
		(3.971)		
Interaction (Asset Tangibility and Primary Fiscal Balance to GDP Counter-Cyclicality)			**-8.118*** **	
			(2.656)	
Interaction (Asset Tangibility and Primary Fiscal Balance to pot. GDP Counter-Cyclicality)				**-8.220*** **
				(2.642)
Observations	523	523	523	523
R-squared	0.538	0.538	0.535	0.535

Note: The dependent variable is the average annual growth rate in labor productivity for the period 1980-2005 for each industry in each country. Initial Relative Labor Productivity is the ratio of industry labor productivity to total manufacturing labor productivity in 1980. Asset Tangibility is the fraction of assets represented by net property, plant and equipment for US firms in the same industry for the period 1980-1989. Total Fiscal Balance to (pot.) GDP Counter-Cyclicality is the coefficient of the output gap when total fiscal balance to (potential) GDP is regressed on a constant and the output gap for each country. Primary Fiscal Balance to (pot.) GDP Counter-Cyclicality is the coefficient of the output gap when primary fiscal balance to (potential) GDP is regressed on a constant and the output gap for each country. The interaction variable is the product of variables in parentheses. Estimated coefficients are in percentage. Standard errors -clustered at the country level- are in parentheses. All estimations include country and industry dummies. Significance at the 1% (resp. 5%; 10%) level is by *** (resp. **; *).

Table 3

Dependent variable: Real Value Added Growth				
	(i)	(ii)	(iii)	(iv)
Log of Initial Share in Manufacturing Value Added	**-0.0448** *(0.719)*	**-0.0745** *(0.719)*	**-0.0312** *(0.731)*	**-0.0678** *(0.731)*
Interaction (Asset Tangibility and Real Short term Interest Rate Counter-Cyclicality I)	**-18.37*** *(9.88)*			
Interaction (Asset Tangibility and Real Short term Interest Rate Counter-Cyclicality II)		**-15.44**** *(6.43)*		
Interaction (Labor Costs to Sales and Real Short term Interest Rate Counter-Cyclicality I)			**20.48**** *(9.23)*	
Interaction (Labor Costs to Sales and Real Short term Interest Rate Counter-Cyclicality II)				**15.73**** *(7.25)*
Observations	550	550	550	550
R-squared	0.306	0.307	0.305	0.306

Note: The dependent variable is the average annual growth rate in real value added over 1999-2005 for each industry in each country. Initial share in manufacturing value added is the ratio of industry real value added to total manufacturing real value added in 1999. Asset Tangibility is the median fraction of assets represented by net property, plant and equipment for US firms in the same industry for the period 1980-1989. Labor Costs to Sales is the median ratio of labor costs to shipments for US firms in the same industry for the period 1980-1989. Real Short term Interest Rate Counter-Cyclicality I is the coefficient of the output gap when the real short term interest rate is regressed on a constant, the output gap and the one quarter lagged real short term interest rate for each country. Real Short term Interest Rate Counter-Cyclicality II is the coefficient of the output gap in the regression which minimizes the root mean standard error for each country. The interaction variable is the product of variables in parentheses. Standard errors -clustered by industry- are in parentheses. Estimations include country and industry dummies. Significance at the 1% (5%; 10%) level is indicated by *** (**; *).

Table 4

Dependent variable: Labor Productivity Growth				
	(i)	(ii)	(iii)	(iv)
Log of Initial Relative Labor Productivity	**-1.085** *(1.319)*	**-1.122** *(1.294)*	**-1.226** *(1.273)*	**-1.158** *(1.243)*
Interaction (Asset Tangibility and Real Short term Interest Rate Counter-Cyclicality I)	**-17.89*** (9.469)			
Interaction (Asset Tangibility and Real Short term Interest Rate Counter-Cyclicality II)		**-15.65**** (6.926)		
Interaction (Labor Costs to Sales and Real Short term Interest Rate Counter-Cyclicality I)			**22.64**** (8.656)	
Interaction (Labor Costs to Sales and Real Short term Interest Rate Counter-Cyclicality II)				**16.82**** (6.829)
Observations	550	550	550	550
R-squared	0.248	0.251	0.249	0.249

Note: The dependent variable is the average annual growth rate in hour labor productivity over 1999-2005 for each industry in each country. Initial Relative Labor Productivity is the ratio of industry hour labor productivity to total manufacturing hour labor productivity in 1999. Asset Tangibility is the median fraction of assets represented by net property, plant and equipment for US firms in the same industry for the period 1980-1989. Labor Costs to Sales is the median ratio of labor costs to shipments for US firms in the same industry for the period 1980-1989. Real Short term Interest Rate Counter-Cyclicality I is the coefficient of the output gap when the real short term interest rate is regressed on a constant, the output gap and the one quarter lagged real short term interest rate for each country. Real Short term Interest Rate Counter-Cyclicality II is the coefficient of the output gap in the regression which minimizes the root mean standard error for each country. The interaction variable is the product of variables in parentheses. Standard errors -clustered by industry- are in parentheses. All estimations include country and industry dummies. Significance at the 1% (5%; 10%) level is indicated by *** (**; *).

Table 5

Dependent variable: Real Value Added Growth				
	(i)	(ii)	(iii)	(iv)
Log of Initial Share in Manufacturing Value Added	**0.0161** *(0.711)*	**0.0232** *(0.716)*	**-0.00562** *(0.702)*	**0.0116** *(0.727)*
Interaction (Asset Tangibility and Bank Capital to Asset Ratio)	**1.488*** *(0.803)*			
Interaction (Asset Tangibility and Credit to NFC Pro-Cyclicality)		**1.839** *(2.296)*		
Interaction (Labor Costs to Sales and Bank Capital to Asset Ratio)			**-1.208** *(0.844)*	
Interaction (Labor Costs to Sales and Credit to NFC Pro-Cyclicality)				**-5.461**** *(2.335)*
Observations	550	550	550	550
R-squared	0.305	0.300	0.302	0.303

Note: The dependent variable is the average annual growth rate in real value added for the period 1999-2005 for each industry in each country. Initial share in manufacturing value added is the ratio of industry real value added to total manufacturing real value added in 1999. Asset Tangibility is the median fraction of assets represented by net property, plant and equipment for US firms in the same industry for the period 1980-1989. Labor Costs to Sales is the median ratio of labor costs to shipments for US firms in the same industry for the period 1980-1989. Bank Capital to Asset Ratio is the average Bank Capital to Asset Ratio over the period 1999-2005 for each country. Credit to NFC Pro- Cyclicality is the coefficient of the output gap when the deviation from trend of credit to non-financial corporations to GDP is regressed on a constant and the output gap for each country. The interaction variable is the product of variables in parentheses. Standard errors -clustered at the industry level- are in parentheses. All estimations include country and industry dummies. Significance at the 1% (resp. 5%; 10%) level is indicated by *** (resp. **; *).

Table 6

Dependent variable: Labor Productivity Growth				
	(i)	(ii)	(iii)	(iv)
Log of Initial Relative Labor Productivity	**-0.867** *(1.241)*	**-1.039** *(1.240)*	**-0.993** *(1.218)*	**-0.984** *(1.235)*
Interaction (Asset Tangibility and Bank Capital to Asset Ratio)	**1.840*** *(0.972)*			
Interaction (Asset Tangibility and Credit to NFC Pro-Cyclicality)		**0.729** *(3.763)*		
Interaction (Labor Costs to Sales and Bank Capital to Asset Ratio)			**-1.464** *(1.001)*	
Interaction (Labor Costs to Sales and Credit to NFC Pro-Cyclicality)				**-6.773**** *(3.062)*
Observations	550	550	550	550
R-squared	0.251	0.241	0.246	0.247

Note: The dependent variable is the average annual growth rate in labor productivity per hour for the period 1999-2005 for each industry in each country. Initial Relative Labor Productivity is the ratio of industry labor productivity per hour to total manufacturing labor productivity per hour in 1999. Asset Tangibility is the median fraction of assets represented by net property, plant and equipment for US firms in the same industry for the period 1980-1989. Labor Costs to Sales is the median ratio of labor costs to shipments for US firms in the same industry for the period 1980-1989. Bank Capital to Asset Ratio is the average Bank Capital to Asset Ratio over the period 1999-2005 for each country. Credit to NFC Pro-Cyclicality is the coefficient of the output gap when the deviation from trend of credit to non-financial corporations to GDP is regressed on a constant and the output gap for each country. The interaction variable is the product of variables in parentheses. Standard errors -clustered at the industry level- are in parentheses. All estimations include country and industry dummies. Significance at the 1% (resp. 5%; 10%) level is indicated by *** (resp. **; *).

Table 7

Dependent variable: Labor Productivity per hour Growth				
	(i)	**(ii)**	**(iii)**	**(iv)**
Log of Initial Relative Labor Productivity	**-0.880** *(1.394)*	**-0.929** *(1.347)*	**-1.174** *(1.289)*	**-1.099** *(1.257)*
Interaction (Asset Tangibility and Real Short term Interest Rate Counter-Cyclicality I)	**-21.30**** *(9.547)*			
Interaction (Asset Tangibility and Real Short term Interest Rate Counter-Cyclicality II)		**-16.70**** *(6.978)*		
Interaction (Asset Tangibility and Average Bank Equity to Asset Ratio)	**2.103**** *(0.983)*	**1.965*** *(0.982)*		
Interaction (Labor Costs to Sales and Real Short term Interest Rate Counter-Cyclicality I)			**25.00***** *(9.087)*	
Interaction (Labor Costs to Sales and Real Short term Interest Rate Counter-Cyclicality II)				**17.5**** *(7.085)*
Interaction (Labor Costs to Sales and Average Bank Equity to Asset Ratio)			**-1.719*** *(0.986)*	**-1.573** *(1.007)*
Observations	550	550	550	550
R-squared	0.257	0.259	0.254	0.253

Note: The dependent variable is the average annual growth rate in labor productivity per hour for the period 1999-2005 for each industry in each country. Initial Relative Labor Productivity is the ratio of industry labor productivity per hour to total manufacturing labor productivity per hour in 1999. Asset Tangibility is the median fraction of assets represented by net property, plant and equipment for US firms in the same industry for the period 1980-1989. Labor Costs to Sales is the median ratio of labor costs to shipments for US firms in the same industry for the period 1980-1989. Real Short term Interest Rate Counter-Cyclicality I is the output gap sensitivity of the Real Short Term Interest, controlling for the one quarter lagged real short term interest rate. Real Short term Interest Rate Counter-Cyclicality II is the output gap sensitivity of the real short term interest rate in the regression which minimizes the root mean standard error. The interaction variable is the product of variables in parentheses. Standard errors -clustered at the industry level- are in parentheses. All estimations include country and industry dummies. Significance at the 1% (resp. 5%; 10%) level is indicated by *** (resp. **; *).

Table 8

Dependent variable: Labor Productivity per hour Growth					
	Above median	**(i)**	**(ii)**	**(iii)**	**(iv)**
Log of Initial Relative Labor Productivity		**-1.257** *(1.345)*	**-1.217** *(1.289)*	**-1.318** *(1.290)*	**-1.259** *(1.247)*
Interaction (Asset Tangibility and Real Short term Interest Rate Counter-Cyclicality I)		**-33.56**** *(13.97)*			
Interaction (Asset Tangibility and Real Short term Interest Rate Counter-Cyclicality II)			**-24.62**** *(9.373)*		
Interaction (Asset Tangibility and Real Short term Interest Rate Counter-Cyclicality I)	Average Bank Equity to Asset Ratio	**28.49**** *(11.13)*			
Interaction (Asset Tangibility and Real Short term Interest Rate Counter-Cyclicality II)			**19.29**** *(8.657)*		
Interaction (Labor Costs to Sales and Real Short term Interest Rate Counter-Cyclicality I)				**45.30***** *(14.19)*	
Interaction (Labor Costs to Sales and Real Short term Interest Rate Counter-Cyclicality II)					**30.70***** *(10.69)*
Interaction (Labor Costs to Sales and Real Short term Interest Rate Counter-Cyclicality I)	Average Bank Equity to Asset Ratio			**-39.24***** *(13.08)*	
Interaction (Labor Costs to Sales and Real Short term Interest Rate Counter-Cyclicality II)					**-28.82***** *(9.943)*
Observations R-squared		550 0.257	550 0.255	550 0.261	550 0.256

Note: The dependent variable is the average annual growth rate in labor productivity per hour for the period 1999-2005 for each industry in each country. Initial Relative Labor Productivity is the ratio of industry labor productivity per hour to total manufacturing labor productivity per hour in 1999. Asset Tangibility is the median fraction of assets represented by net property, plant and equipment for US firms in the same industry for the period 1980-1989. Labor Costs to Sales is the median ratio of labor costs to shipments for US firms in the same industry for the period 1980-1989. Real Short term Interest Rate Counter-Cyclicality I is the output gap sensitivity of the Real Short Term Interest, controlling for the one quarter lagged real short term interest rate. Real Short term Interest Rate Counter-Cyclicality II is the output gap sensitivity of the real short term interest rate in the regression which minimizes the root mean standard error. The interaction variable is the product of variables in parentheses. Standard errors -clustered at the industry level- are in parentheses. All estimations include country and industry dummies. Significance at the 1% (resp. 5%; 10%) level is indicated by *** (resp. **; *).

Table 9

Dependent variable: Labor Productivity Growth					
	Above median	**(i)**	**(ii)**	**(iii)**	**(iv)**
Log of Initial Relative Productivity		**-1.033** (1.402)	**-1.014** (1.336)	**-1.274** (1.302)	**-1.198** (1.259)
Interaction (Asset Tangibility and Real Short term Interest Rate Counter-Cyclicality I)		**-31.27**** (14.08)			
Interaction (Asset Tangibility and Real Short term Interest Rate Counter-Cyclicality II)			**-23.18**** (9.375)		
Interaction (Asset Tangibility and Real Short term Interest Rate Counter-Cyclicality I)	Average Bank Equity to Asset Ratio	**19.20*** (11.03)			
Interaction (Asset Tangibility and Real Short term Interest Rate Counter-Cyclicality II)			**14.04** (0.087)		
Interaction (Asset Tangibility and Average Bank Equity to Asset Ratio)		**1.722*** (1.009)	**1.804*** (0.999)		
Interaction (Labor Costs to Sales and Real Short term Interest Rate Counter-Cyclicality I)				**43.46***** (13.76)	
Interaction (Labor Costs to Sales and Real Short term Interest Rate Counter-Cyclicality II)					**29.47***** (10.27)
Interaction (Labor Costs to Sales and Real Short term Interest Rate Counter-Cyclicality I)	Average Bank Equity to Asset Ratio			**-33.64***** (10.98)	
Interaction (Labor Costs to Sales and Real Short term Interest Rate Counter-Cyclicality II)					**-25.04***** (8.497)
Interaction (Labor Costs to Sales and Average Bank Equity to Asset Ratio)				**-1.012** (0.906)	**-1.264** (0.955)
Observations		550	550	550	550
R-squared		0.265	0.265	0.263	0.255

Note: The dependent variable is the average annual growth rate in labor productivity per hour for the period 1999-2005 for each industry in each country. Initial Relative Labor Productivity is the ratio of industry labor productivity per hour to total manufacturing labor productivity per hour in 1999. Asset Tangibility is the median fraction of assets represented by net property, plant and equipment for US firms in the same industry for the period 1980-1989. Labor Costs to Sales is the median ratio of labor costs to shipments for US firms in the same industry for the period 1980-1989. Real Short term Interest Rate Counter-Cyclicality I is the output gap sensitivity of the Real Short Term Interest, controlling for the one quarter lagged real short term interest rate. Real Short term Interest Rate Counter-Cyclicality II is the output gap sensitivity of the real short term interest rate in the regression which minimizes the root mean standard error. The interaction variable is the product of variables in parentheses. Standard errors -clustered at the industry level- are in parentheses. All estimations include country and industry dummies. Significance at the 1% (resp. 5%; 10%) level is indicated by *** (resp. **; *).

Table 10

Dependent variable: Labor Productivity Growth					
	Above median	**(i)**	**(ii)**	**(iii)**	**(iv)**
Log of Initial Relative Productivity		**-1.085** (1.341)	**-1.131** (1.301)	**-1.203** (1.321)	**-1.113** (1.286)
Interaction (Asset Tangibility and Real Short term Interest Rate Counter-Cyclicality I)		**-21.74**** (0.0849)			
Interaction (Asset Tangibility and Real Short term Interest Rate Counter-Cyclicality II)			**-18.7**** (0.0768)		
Interaction (Asset Tangibility and Real Short term Interest Rate Counter-Cyclicality I)	Private Credit to NFC cylicality	**10.08** (13.25)			
Interaction (Asset Tangibility and Real Short term Interest Rate Counter-Cyclicality II)			**13.90** (18.14)		
Interaction (Asset Tangibility and Private Credit to NFC cylicality)		**-1.053** (4.366)	**-1.000** (3.896)		
Interaction (Labor Costs to Sales and Real Short term Interest Rate Counter-Cyclicality I)				**16.85*** (0.0873)	
Interaction (Labor Costs to Sales and Real Short term Interest Rate Counter-Cyclicality II)					**13.60*** (0.0696)
Interaction (Labor Costs to Sales and Real Short term Interest Rate Counter-Cyclicality I)	Private Credit to NFC cylicality			**12.48** (12.60)	
Interaction (Labor Costs to Sales and Real Short term Interest Rate Counter-Cyclicality II)					**6.055** (15.14)
Interaction (Labor Costs to Sales and Private Credit to NFC cylicality)				**-7.297**** (2.967)	**-5.566*** (2.879)
Observations		550	550	550	550
R-squared		0.249	0.252	0.255	0.253

Note: The dependent variable is the average annual growth rate in labor productivity per hour for the period 1999-2005 for each industry in each country. Initial Relative Labor Productivity is the ratio of industry labor productivity per hour to total manufacturing labor productivity per hour in 1999. Asset Tangibility is the median fraction of assets represented by net property, plant and equipment for US firms in the same industry for the period 1980-1989. Labor Costs to Sales is the median ratio of labor costs to shipments for US firms in the same industry for the period 1980-1989. Real Short term Interest Rate Counter-Cyclicality I is the output gap sensitivity of the Real Short Term Interest, controlling for the one quarter lagged real short term interest rate. Real Short term Interest Rate Counter-Cyclicality II is the output gap sensitivity of the real short term interest rate in the regression which minimizes the root mean standard error. The interaction variable is the product of variables in parentheses. Standard errors -clustered at the industry level- are in parentheses. All estimations include country and industry dummies. Significance at the 1% (resp. 5%; 10%) level is indicated by *** (resp. **; *).