Credit Constraints, Cyclical Fiscal Policy and Industry Growth*

Philippe Aghion, David Hemous, Enisse Kharroubi

October 2009

Abstract

This paper evaluates whether the cyclical pattern of fiscal policy can affect growth. We first build a simple endogenous growth model where entrepreneurs can invest either in short-run projects or in long-term growth enhancing projects. Long-term projects involve a liquidity risk which credit constrained firms try to overcome by borrowing on the basis of their short-run profits. By increasing firms' market size in recessions, a countercyclical fiscal policy will boost investment in productivity-enhancing long-term projects, and the more so in sectors that rely more on external financing or which display lower asset tangibility. Second, the paper tests this prediction using Rajan and Zingales (1998)'s diff-and-diff methodology on a panel data sample of manufacturing industries across 15 OECD countries over the period 1980-2005. Empirical evidence confirms that industries with relatively heavier reliance on external finance or lower asset tangibility tend to grow disproportionately faster in countries with more-counter-cyclical fiscal policy, this being true in terms of value added, labour productivity and R&D expenditures.

Keywords: growth, financial dependence, fiscal policy, counter-cyclicality

JEL Classification: E32, E62

*We thank, Roel Beetsma, Andrea Caggese, Olivier Jeanne, Ashoka Mody, Philippe Moutot, and participants at CEPR Fondation Banque de France Conference (Nov. 2007), IMF Conference on Structural Reforms (Feb. 2008), CEPR-CREI Conference on Growth, Finance and the Structure of the Economy (May 2008), SED 2008 Summer Meetings (July 2008), ECFIN conference on the quality of public finance and growth (November 2008), CEPR 2009 ESSIM (May 2009). The views expressed here are those of the authors and do not necessarily reflect the views of Banque de France. Philippe Aghion, Harvard University, paghion@fas.harvard.edu. Enisse Kharroubi, Banque de France, enisse.kharroubi@banque-france.fr

1 Introduction

Standard macroeconomic textbooks generally comprise two largely separate parts: the analysis of long-run growth, which at best is linked to structural characteristics of the economy (education, R&D, openness to trade, financial development); and the short term analysis, which emphasizes the short-term effects of productivity or demand shocks and the effects of macroeconomic policies (fiscal and/or monetary) aimed at stabilizing the economy. Yet, recently the view that short-run stabilization policies should have no significant impact on long run growth, has been challenged by several empirical papers, notably Ramey and Ramey (1995) who find a negative correlation in cross-country regression between volatility and long-run growth.[1] More recently, using a Schumpeterian growth framework, Aghion, Angeletos, Banerjee and Manova (2008) (henceforth AABM) have argued that higher macroeconomic volatility affects the composition of firms' investments and in particular pushes towards more pro-cyclical R&D investments in firms that are more credit constrained.

This paper goes one step further by analyzing the effect of a more countercyclical fiscal policy on industry growth, depending upon the financial constraints faced by the industry[2]. Our basic purpose is two fold. It is first to show that the link between volatility and growth is not only structural: macroeconomic policies that affects the former also affects the latter. Second, we want to argue that even if the impact of a countercyclical fiscal stimulus policy on aggregate GDP may be limited in the short-run, such a policy may entail economically significant gains in terms of increased long-run growth.

Our analysis proceeds in two steps. First, we build a simple model to illustrate how the cyclical component of fiscal policy can affect growth in sectors that are more or less financially constrained. Second, we use cross industry/cross-country panel data to test our main theoretical predictions, and provide empirical evidence of a more positive and significant impact of stabilizing fiscal policy on industry growth in more financially constrained industries.

[1] Additional evidence can be found in the work of Bruno (1993) on inflation and growth, of Hausman and Gavin (1996) for Latin American countries, or more recently Imbs (2007)

[2] Showing that a more countercyclical fiscal policy has a disproportionate significant positive effect on growth in more financially constrained industries, would also point to a welfare effect of such a policy that should go well beyond the welfare improvement pointed out by Lucas (1987): in his model with exogenous growth, the welfare gains from stabilization only, are welfare equivalent to a very modest increase in long-run growth.

In our model, fiscal policy impacts on long-run growth by affecting the extent to which investment is directed towards productivity enhancing activity. More specifically, as in AABM, firms choose to direct their investmentS either towards short-run projects that do not increase the stock of knowledge in the economy, or towards productivity enhancing long-term projects. The completion of long-term innovative projects is in turn subject to a liquidity risk: namely, such projects can only be implemented if the firm overcome a liquidity shock that may occur during the interim period. Consequently, credit constrained firms may also choose to invest in the short-run project in order to generate cash-flow revenues which will subsequently help them overcome the liquidity shock. The aggregate business cycle interferes with firms' decision to invest in long-term innovative projects, through a market size effect. Namely, the market size for both long-term and short-term projects is lower during a recession than during a boom; however, current market size does not affect the allocation of investment between long-run and short-run projects as much as expected future market size affects long-term investment.[3] This, together with the assumption that a recession is more likely to occur tomorrow if it is already occurring today, implies: first, that firms will engage less in long-term productivity-enhancing investments during recessions than during booms; second, that a policy which commits to increase market-size by the time long-term projects are to be completed, induces firm to increase long-term investment. This effect is stronger the lower the market-size prior to government intervention and also the more credit-constrained firms are.

In the second part of the paper we test the main prediction of the model, namely that a countercyclical fiscal policy increases disproportionately productivity growth, the higher the share of investment financed through external capital and the lower asset tangibility.

To do so, a simple approach would be to regress growth outcomes (e.g output or labour productivity growth) on some indicator reflecting the degree fiscal policy countercyclicality and the interaction between this indicator and a measure of credit constraints. Everything else remaining equal, such an approach should tell us for example about how much extra growth can be expected from moving say from a more to

[3]A higher market size today, has two counteracting effects on investment composition. On the one hand it encourages higher short-term investment since these will yield higher short-run profits. On the other hand, it encourages higher long term investment since the higher cash-flow induced by the increased market size in the short run, will also help credit-constrained firms overcome interim liquidity shocks and thereby complete their long term projects.

a less procyclical fiscal policy. However, there are at least three important issues that preclude a proper interpretation of this type of straightforward exercise. First, the cyclicality of (fiscal) policy is typically captured by a unique time-invariant parameter which only varies across countries. As a result, standard cross-country panel regression cannot be used to assess the effect of the cyclical pattern of fiscal policy on growth in as much as the former is perfectly collinear to the fixed effect that is traditionally introduced to control for unobserved cross-country heterogeneity.[4] Second, the causality issue -does a positive correlation between fiscal policy countercyclicality and growth reflect the effect of fiscal policy cyclicality on growth or the effect of growth on the cyclical pattern of fiscal policy- cannot be properly addressed while keeping the analysis at a pure macroeconomic level.[5] But then, how can we use the results from the regression analysis to estimate the growth gain/loss from a change in the cyclical pattern of fiscal policy and then draw policy implications? [6] A final concern is identification: a cross-country panel regression, particularly one which is restricted to a small cross-country sample, is unlikely to be robust to the inclusion of additional control variables reflecting alternative stories. Thus, even if cross-country panel regressions may point at correlations between the cyclical pattern of fiscal policy and growth, the channel through which this correlation works is not likely to be well identified by a pure country level analysis.

The approach we follow in this paper allows us to address each of the above issues. More specifically, we follow the methodology developed in the seminal paper by Rajan and Zingales (1998) and use cross-industry/cross-country panel data on a sample of 15 OECD countries over the period 1980-2005, to test whether industry growth is positively affected by the interaction between fiscal policy cyclicality (which is computed at country level for all countries in the sample) and industry level external financial dependence or asset tangibility (which are computed for each corresponding industry in the US). This approach helps us overcome the three issues stated above: first, even though we estimate the countercyclicality of fiscal

[4] To solve this issue, Aghion and Marinescu (2007) introduce time-varying estimates of fiscal policy cyclicality. While this helps controlling for unobserved heterogeneity, it comes at the cost of loosing precision in the estimates of fiscal policy cyclicality.

[5] One particular reason for this, is that fiscal policy cyclicality is used in growth regressions as a right hand side variable meanwhile the estimation of time-varying fiscal policy cyclicality requires using the full data sample. See Aghion and Marinescu (2007).

[6] One answer to this problem would be to use instrumental variables. However cross-country panel IV regressions typically use internal instruments, i.e. lagged values of right hand side variables. In the case of time-varying estimates of fiscal policy cyclicality, this implies embodying forward information into the instruments which then can no longer be fully exogenous.

policy at country level by a time-invariant coefficient (which we derive for each country by regressing various indicators of fiscal policy on the output gap in this country over a given time period), and therefore fiscal policy countercyclicality in each country is collinear to that country's fixed effect, the interaction between the country level measure of countercyclicality and the industry level variable is not. Second, the interaction term helps solve the identification issue to the extent that by working at cross-industry level we have enough observations that our results withstand the introduction of country fixed effects plus a whole set of structural variables as additional controls. Finally, this approach helps us deal with the causality issue: in particular, to the extent that macroeconomic policy should affect industry level growth whereas the opposite - industry level growth affecting macroeconomic policy- is less likely to hold, finding a positive and significant interaction coefficient in the growth regressions, is informative as to whether the cyclical pattern of fiscal policy indeed has a causal impact on growth.[7] However, there is a downside to the industry level investigation: namely, our difference in difference analysis has little to say about the magnitude of the macroeconomic growth gain/loss induced by different patterns of cyclicality in fiscal policy. At best, our empirical estimates provide qualitative evidence of the growth effect of countercyclical fiscal policy.[8]

Our empirical results can be summarized as follows. First, fiscal policy countercyclicality - measured as the sensitivity of a country's total or primary fiscal balance (relative to GDP) to time variations in its output gap - has a disproportionate positive significant and robust impact on industry growth, the higher the extent to which the corresponding industry in the US relies on external finance, or the lower asset tangibility of the corresponding sector in the US. This result holds whether industry growth is measured by real value added growth or by labour productivity growth. It also holds for industry-level R&D expenditures. Using the regression coefficients one can assess the magnitude of the corresponding diff-in-diff effect: that is, how much extra growth do we generate when say fiscal policy countercyclicality and external financial

[7] Fiscal policy cyclicality could be endogenous to the industry level composition of total output if for example industries that benefit more from fiscal policy counter-cyclicality do lobby more for counter-cyclical fiscal policy. However, to the extent that there are decreasing returns to scale (which is likely to be the case in the manufacturing industries featuring in our empirical analysis), this would rather imply a downward bias in our estimates of the positive impact of fiscal policy counter-cyclicality on growth. Hence controlling for this possible source of endogeneity would only reinforce our conclusions by reducing this downward bias.

[8] Extrapolating from our results to derive more aggregate numerical conclusions, is further complicated by our focusing on the growth for manufacturing industries while the total share of manufacturing industries in total value added is about 40% not more. In particular, assessing the global macroeconomic effect of fiscal policy cyclicality would require an assessment of the impact on the service sector.

dependence move from the 25% to the 75% percentile. The figures happen to be relatively large, especially when compared to the equivalent figures in Rajan and Zingales (1998). This in turn suggests that the effect of a more countercyclical fiscal policy in more financially constrained industries, is economically significant. Second, we show that our baseline result is robust to: (i) distinguishing between industries with positive financial dependence and industries with negative financial dependence; (ii) removing particular countries from the regression exercise; (iii) adding control variables such as financial development, inflation, and average fiscal balance interacted with the industry level variables (external financial dependence or asset tangibility); (iv) instrumenting fiscal policy cyclicality with economic, legal and political variables. Third, we decompose fiscal policy between its revenue and expenditure sides. We then obtain two somewhat surprising results: first, countercyclicality in total government revenues has approximately the same effect as countercyclicality in total government expenditures. Second, when focusing on primary government expenditures and revenues, the empirical evidence shows that the effect of countercyclicality in primary government expenditures (interacted with industry financial dependence or asset tangibility), is about twice as large as the impact of countercyclicality in primary government revenues.[9]

Our analysis contributes to at least three ongoing debates among macroeconomists: 1) is there a (causal) link between volatility and growth?; 2) what is the optimal design of intertemporal fiscal policy? 3) what are the effects of a countercyclical fiscal stimulus on aggregate output? That the correlation between long-run growth and volatility is not entirely causal, is stressed by 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. More recently, Acemoglu, Johnson, Robinson and Thaicharoen (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. However, fiscal policy cyclicality varies a lot even among OECD countries (Lane (2003)) which share similar institutions. And our own finding of significant correlations between growth

[9] As it turns out, over the most recent period, countercyclicality in government revenues appears to have had little effect on industry real value added and labour productivity growth. Besides, this result is confirmed for R&D expenditures: the interaction of industry financial dependence and government expenditures counter-cyclicality does has a significant positive effect on indsutry R&D spending while the the interaction of industry financial dependence and government revenues does not.

and countercyclical fiscal policy in a sample of OECD countries, also speaks to the importance of cyclical fiscal policy, over and above the effect of more structural variables. As mentioned previously, AABM defend the view that higher volatility should induce lower growth by discouraging long-term growth-enhancing investment particularly in more credit constrained firms. Aghion, Bacchetta, Ranciere and Rogoff (2006) build on that insight when analyzing the relationship between long-run growth and the choice of exchange-rate regime.[10]

The case for a countercyclical fiscal policy was most forcefully made by Barro (1979): a countercyclical fiscal policy helps smooth out intertemporal consumption when production is affected by exogenous shocks, thereby improving welfare. Another justification for countercyclical fiscal policy stems from a more Keynesian view of the cycle: namely, to the extent that a recession corresponds to an increase in the inefficiency of the economy, appropriate fiscal or monetary policy that raises aggregate demand can bring the economy closer to the efficient level of production (see Galí, Gertler, López-Salido (2007)).[11] The effect of fiscal policy in our model is different: fiscal policy affects growth through a market-size effect: e.g by increasing expenditures, the government can induce firms to devote more investment to long-term projects, as innovations will then pay out more.[12]

Finally, an extended literature looks at the - short-run - output response to an exogenous increase in government spending or to a tax cut. Importantly in these papers, GDP is usually detrended, so that all long-run effects are shut down. Although most economists would agree on the fact that a fiscal shock should increase short-run output, there is no consensus on the magnitude of the effect.[13] In particular, papers

---

[10] See Aghion and Banerjee (2005) and Aghion and Howitt (2009, ch14) for more complete literature reviews on the link between volatility and long-run growth.

[11] Consequently, government purchases needs to remain above the level implied by the optimal provision of public good, as their role is dual: providing a public good, and increasing the efficiency in the economy (Galí (2005)).

[12] In Barro (1990)'s AK model however, growth decreases with utility-type government expenditures and it increases only initially with productive government expenditures. Let us also mention political economy explanations for why fiscal policy often fails to be countercyclical (for instance Alesina, Campante, and Tabellini (2008))

[13] Skeptical views on the importance of the effect of fiscal shocks include Mountford and Uhlig (2008) who defend tax cuts over government spending increases, or Perotti (2005) who shows, based on a sample of 5 OECD countries, that government spending multipliers larger than 1 can be seen only in the US pre-1980 period, but who does not find that tax cuts works better than government spending increases. On the other hand, Fatas and Mihov (2001b) find that an increase in government spending (especially government wage expenditures increase) induces increases in consumption and employment. All the above mentioned papers use VAR analysis, and Blanchard and Perotti (2002) use a mixed VAR - event study approach to show that both, increases in government spending and tax cuts have a positive effect on GDP; they also find - like Alesina, Ardagna, Perotti and Schiantarelli (2002) - that fiscal policy shocks have a negative effect on investment; note that this does not contradict our theory which points at investments being directed towards more productivity enhancing projects as the channel whereby long-run growth is enhanced by a more countercyclical fiscal policy.

that introduce rational expectations and long-run wealth effects, will typically predict a lower value of the multiplier (based on the idea that consumers anticipate that an increase in government spending today is likely to result in an increase in taxes tomorrow).[14] We move beyond this debate by looking only at the long-run effect of a more countercyclical fiscal policy: even if the short-run effect of a more countercyclical policy was more in line with the prediction of low multipliers, our results point to economically significant long-run effects.

The remaining part of the paper is organized as follows. Section 2 develops the theoretical model and derives the main predictions to be subsequently tested. Section 3 details the econometric methodology and presents the data sources used in our estimations. Section 4 presents our baseline results. Section 5 presents the robustness checks, in particular whether the growth impact of countercyclical fiscal policy is robust to the inclusions of additional structural characteristics. Section 6 looks at the composition of fiscal policy into its expenditure and revenue components. Section 7 looks at the effect of countercyclical fiscal policy on R&D investment. Finally Section 8 concludes.

2 Cyclical fiscal policy and growth: a toy model

2.1 Basic setup

The environment The model builds on Aghion, Angeletos, Banerjee and Manova (2008), henceforth AABM. We consider a discrete time model of an economy populated by a continuum of two-periods lived entrepreneurs (firms). Each firm starts out with a positive amount of wealth $W = wT$, where T denotes the accumulated knowledge at the beginning of the current period, and w denotes the firm's knowledge adjusted wealth. Initial wealth can be invested in two different projects: a short term investment project

Somewhat closer to the analysis in this paper, Tagkalakis and Athanasios (2008) shows on a panel of 19 OECD countries from 1970 to 2002 that the effects of fiscal policy changes on private consumption is higher in recessions than in expansions. Interestingly, they explain this phenomenon by the presence of more liquidity constrained consumers in recessions, and show that the effect is more pronounced in countries characterized by less developed consumer credit markets.

[14] For example Cogan, Cwik, Taylor and Wieland (2009) use the Smets-Wouters (2007) model and compute the effect of a permanent increase by 1% of GDP of government expenditures as of 2009: by 2011 Q4, they find that the increase in GDP is only equal to 0.44%, whereas Romer and Bernstein (2009) find a 1.57% increase. Finally, based on narrative records, Romer and Romer (2007) find that - exogenous - tax increases are highly contractionary.

that generates output in the current period and a long term innovation project which, when successful, generates production with higher productivity next period. The short term investment project may involve maintaining existing equipment, expanding a business using the same kind of technology and equipment, or increasing marketing expenses. The long term project may consist in learning a new skill, learning about a new technology, or investing in R&D. Investing in the long term project increases the stock of knowledge available in the economy next period, whereas investing in the short term project does not contribute to knowledge growth.

Both, short term and long term profits are proportional to market demand (see Acemoglu and Linn (2006)). More specifically, by investing capital $K = kT$ in the short term project, where k denotes the knowledge adjusted short-run capital investment, a firm generates short-run profits

$$\Pi_1(K, P_j) = T\pi_1(k, P_j),$$

where

$$\pi_1(k, P_j) = P_j k$$

is the knowledge-adjusted short-run profit, P_j is proportional to the private component of demand, and j denotes the aggregate state of the economy. The realization of state $j \in \{L, H\}$ captures an aggregate trade (or market size) shock P, which can take two value $P_H > P_L$ and follows a Markovian process with probability p of remaining in the same state in the next period. As is often done in the literature on real business cycles, we assume that $p > 1/2$, i.e that the aggregate shock on P displays some positive degree of persistence over time.

Now, consider firms' long term investments. As in AABM, we shall assume that after the R&D investment $Z = zT$ has been incurred, where z denotes the knowledge-adjusted long-term innovative investment, the firm faces an idiosyncratic liquidity shock $C = cT$, where c is uniformly distributed on the interval $[0, \overline{c}]$. Only those firms that are able to raise enough money to pay their liquidity cost, will be able to produce in the second period.

Given that all firms start out with same initial wealth $W = wT$, there is no borrowing and lending in equilibrium at the beginning of a period. However, once the idiosyncratic liquidity shocks are realized, firms with low liquidity shocks will typically lend to firms facing higher liquidity shocks.[15]

As in AABM, we assume that due to ex post moral hazard considerations[16] firms cannot borrow more than $\mu - 1$ times their current cash flow in order to overcome the liquidity shock. We can interpret μ as a proxy for the tangibility of the firm' assets: more tangible assets are typically associated with lower monitoring costs for potential creditors, and therefore to a higher value of the credit multiplier μ[17]. The parameter $\overline{c}$ reflects for example the extent to which the firm depends upon external finance: the higher $\overline{c}$, the less likely it is that the firm will be able to cover its liquidity shock using only its retained earnings $T\pi_1(k, P_j)$. In fact, given the uniformity of the distribution of liquidity costs, long-term investments will survive the liquidity shock with probability

$$\delta(P, k) = \Pr(cT \leq \mu T \pi_1(k, P_j)) = \min(\frac{\mu P k}{\overline{c}}, 1),$$

which is increasing in μ and decreasing in $\overline{c}$.

A firm that has invested $Z = zT$ in the long term project and then manages to overcome its liquidity shock[18], will innovate with probability λz and then earn ex post profits

$$T\left(E\left(P_h|j\right) + g_j\right),$$

where $E\left(P_h|j\right)$ is the expected (private) market size next period, conditional upon the economy being in state j today, and g_j denotes the volume of government expenditures tomorrow if the economy is in state j

[15] Credit constraints prevent firms from achieving full insurance against these idiosyncratic liquidity shocks.

[16] See Aghion, Banerjee and Piketty (1999).

[17] Following Aghion, Banerjee and Piketty (1999) or AABM, we take μ to be constant over time. Alternative formulations, for example Holmstrom and Tirole (1995) based on ex ante moral hazard, would generate a credit multiplier which is negatively correlated with the interest rate, and therefore typically procyclical. A procyclical μ would only reinforce the optimality of countercyclical fiscal policy established later in this section.

[18] The model is built in order to illustrate the empirical results that the more externally financially dependent firms are the one that benefits the most from contracyclicality. Hence we want to abstract from other factors that will favor contracyclicality, which is why we use linear technologies.

today[19]. If innovation does not occur production tomorrow is competitive, therefore firms earn zero profit, yet g_j is still spent. We assume that entrepreneurs are risk-neutral and consume all their wealth in the second period of their life.

We assume that $\lambda\left(E\left(P_h|j\right)\right) > P_j$, so that absent credit constraints and binding liquidity shocks, entrepreneurs invest all their initial endowment in the long term project, no matter government expenditures g_j over the cycle.

Growth Knowledge growth results entirely from aggregate R&D intensity. If T_t denotes the knowledge stock at the beginning of period t, we thus assume

$$\frac{T_{t+1} - T_t}{T_t} = \int_0^1 z_t di = z_t.$$

Government policy Unlike private agents, the government has costless and unbounded access to international credit each period before the state of the world is revealed.[20] Government's policy is determined each period before the current state j of nature is revealed, but can be dependent on the previous state of nature (denoted by x). Government policy therefore consists of a 4-uple $s_L^x, s_H^x, g_L^x, g_H^x$, where s_j^x denote the subsidies/tax that a firm must pay before initiating its investments, and g_j^x denotes the government expenditures next period, if the current state is j and the state last period was x. The s part of goverment policy directly affects firms' net cash at the beginning of the period, whereas the g part affects ex post market size. The timing of government intervention, can be described as follows: (i) at the beginning of each period, before the state of nature j for that period is realized, the government chooses its policy $(s_j^x, g_j^x)_{j=L,H}$ which depends upon the state of the world x at the end of last period; (ii) once the current state of nature $j = H, L$ is realized, the government implements the policy (s_j^x, g_j^x).

[19] Our analysis encompasses the case where tomorrow' s private revenue is proportional, not equal to the expected private market size $E\left(P_h|j\right)$. This just involves reinterpreting the multiplier λ.

[20] We shall assume that the government can credibly commit to a budget limit. This, in turn, is consistent with the assumption that the government can borrow more and at lower cost than private agents. Here, we also refer the reader to Homstrom and Tirole (1998) on private versus public provisions of liquidity.

Timing of events The overall timing of events within each period, is as follows: (i) the state of nature j is realized; (ii) firms make their investment decisions, given their correct anticipations about government policy (s_j^x, g_j^x); (iii) liquidity shocks are realized and firms lend to or borrow from one another; (iv) firms that can overcome their idiosyncratic liquidity shocks innovate and thereby generate a profit next period.

2.2 A firm's maximization problem

In this subsection we take government policy as given and analyze firms' optimal investment decisions. Given that firms are ex ante identical, there exists a symmetric equilibrium where all firms make the same investment decisions, and we concentrate attention on this particular equilibrium. For simplicity we take the discount factor between two periods to be equal to 1. Then, once the current state of nature j is realized, a representative firm in state j chooses knowledge-adjusted investments (k, z) to maximize the expected present value, that is current profits plus expected future revenues:

$$\max \left\{ P_j k + \lambda z \min \left(\tfrac{\mu P_j k}{\bar{c}}, 1 \right) E_{h|j} \left(P_h + g_j^x \right) \right\}$$
$$\text{subject to: } k + z \leq w + s_j^x.$$

One can first establish:

Lemma 1 *If there is always a positive probability of unsuccessful innovation, the manager chooses*

$$z_j = \max \left\{ 0; \frac{1}{2} \left(w + s_j^x - \frac{\bar{c}}{\mu \lambda \left(E_{h|j} \left(P_h \right) + g_j^x \right)} \right) \right\}$$

Proof. Recall that we assumed that $\lambda \left(E \left(P_h | j \right) \right) > P_j$.

First notice that the solution cannot feature $\frac{\mu P_j k}{\bar{c}} > 1$, indeed if it were the case then the program would be linear in z, so as we assumed $P_j \leq \lambda E \left(P_h | j \right)$, the firm's owner would profitably deviate by increasing z in all points of the region $\frac{\mu P_j k}{\bar{c}} > 1$. Thus the solution must feature $\frac{\mu P_j k}{\bar{c}} \leq 1$.

Now consider the case where there is a positive probability of unsuccesful innovation (this will happen when

$\frac{\mu P_j\left(w+s_j^x\right)}{\bar{c}} \leq 1$), then the first order condition for the maximization problem leads to:

$$
\begin{aligned}
z_j &= \frac{1}{2}\left(w+s_j^x-\frac{\bar{c}}{\mu\lambda\left(E_{h|j}\left(P_h\right)+g_j^x\right)}\right) \\
k_j &= \frac{1}{2}\left(w+s_j^x+\frac{\bar{c}}{\mu\lambda\left(E_{h|j}\left(P_h\right)+g_j^x\right)}\right)
\end{aligned}
$$

So, if $w+s_j^x > \frac{\bar{c}}{\mu\lambda\left(E_{h|j}(P_h)+g_j^x\right)} > 0$ ($z_j > 0$) and $\frac{1}{2}\left(\frac{\mu P_j}{\bar{c}}\left(w+s_j^x\right)+\frac{P_j}{\lambda\left(E_{h|j}(P_h)+g_j^x\right)}\right) < 1$, the optimum will be this interior solution (with a positive probability of unsuccessful innovation).

If $w+s_j^x < \frac{\bar{c}}{\mu\lambda\left(E_{h|j}(P_h)+g_j^x\right)}$, the solution will be $z_j = 0$; finally if $\frac{1}{2}\left(\frac{\mu P_j}{\bar{c}}\left(w+s_j^x\right)+\frac{P_j}{\lambda\left(E_{h|j}(P_h)+g_j^x\right)}\right) > 1$, the solution will feature $\frac{\mu P_j k}{\bar{c}} = 1$ so that $k_j = \frac{\bar{c}}{\mu P_j}$ and $z_j = w+s_j^x-\frac{\bar{c}}{\mu P_j}$. ■

In particular when

$$
z_j = \frac{1}{2}\left(w+s_j^x-\frac{\bar{c}}{\mu\lambda\left(E_{h|j}\left(P_h\right)+g_j^x\right)}\right) > 0,
$$

then government taxes/subsidies s_j^x do not affect the difference between the long term innovative investment z and the short term capital investment k: a higher s increases the amount of cash available for firms to invest, however it does not affect the relative profitability of long versus short term investments. Increasing g_j^x will instead affect the market size for successful innovators tomorrow and therefore the relative profitability of long term innovative investment compared to short run capital investment.

Remark 1 *The fact that government expenditures are targeted towards long term projects is not the driving force behind this last conclusion. To see this, suppose instead that government expenditures decided at t, also affect the market for short term projects at t. This has two effects on firms born in period t: on the one hand, investing in short term projects becomes more attractive because market size is increased in the short run; on the other hand, firms now have more cash in hand to overcome the potential liquidity shock. As long as we are in an interior solution case (with $z > 0$ and $\frac{\mu\beta(P_j+g_x)k}{\bar{c}} < 1$) these two forces turn out to exactly* *offset each other.*[21]

Remark 2 *Whether profits of short term investments are linear in k (as it is the case here) or proportional to k^{α} (as it is the case in AABM) does not affect our results: in the latter case, we would then get $z_j = \frac{1}{1+\alpha}\left(w + s_j^x - \frac{\alpha\overline{c}}{\mu\lambda\beta\gamma\left(E_{h|j}(P_h)+g_j^x\right)}\right)$.*

2.3 Growth effect of increasing the countercyclicality of government spending

The main conjecture we consider in the empirical part of the paper, is that a more countercyclical fiscal policy, and particularly more countercyclical government expenditures, are more growth-enhancing in sectors that are more dependent on external finance or in sectors with more intangible capital. Here, we show how our toy model generates this prediction.

More formally, consider the case where in both states of the world $z_j = \frac{1}{2}\left(w + s_j^x - \frac{\overline{c}}{\mu\lambda\left(E_{h|j}(P_h)+g_j^x\right)}\right)$. Then, the expected growth rate is simply equal to

$$E\left(z|x\right) = pz_x + \left(1-p\right)z_{-x}$$

or equivalently

$$E\left(z|x\right) = \frac{1}{2}\left(w + ps_x^x + \left(1-p\right)s_{-x}^x - \frac{\overline{c}}{\mu\lambda}\left(\frac{p}{E_{h|x}\left(P_h\right)+g_x^x} + \frac{1-p}{E_{h|-x}\left(P_h\right)+g_{-x}^x}\right)\right).$$

Now consider the growth effect of moving from an acyclical policy whereby $g_x^x = g_{-x}^x = g^x$ to the

[21] *Indeed the representative firms then choose k, z such that*

$$\max\left\{\beta\left(P_j+g_x\right)k + \lambda z\min\left(\frac{\mu\beta\left(P_j+g_x\right)k}{\overline{c}},1\right)E_{h|j}\left(\beta\left(P_h+g_j^x\right)\right)\right\}$$
$$\Leftrightarrow\quad \max\left\{\beta k + \lambda z\left(\frac{\mu\beta k}{\overline{c}}\right)E_{h|j}\left(\beta\left(P_h+g_j^x\right)\right)\right\}$$
$$\text{subject to}\quad : \quad k + z \leq w + s_j^x$$

so the interior solution is still given by

$$z_j = \frac{1}{2}\left(w + s_j^x - \frac{\overline{c}}{\mu\lambda\beta\left(E_{h|j}\left(P_h\right)+g_j^x\right)}\right)$$

countercyclical policy $g_L^x = g^x + (1 - p_L)\varepsilon$ and $g_H^x = g^x - p_L\varepsilon$ (with $p_L = p$ if $x = L$, and $p_L = 1 - p$ if $x = H$). In other words, we consider the growth effect of a mean preserving spread in government consumption, with $g_L^x - g_H^x = \varepsilon$. We have:

$$E(z|x) = \frac{1}{2}\left(w + p_L s_L^x + (1 - p_L)s_H^x - \frac{\overline{c}}{\mu\lambda}\left(\frac{p_L}{pP_L + (1-p)P_H + g_L^x} + \frac{1 - p_L}{pP_H + (1-p)P_L + g_H^x}\right)\right).$$

Thus

$$\begin{aligned}\frac{\partial E(z|x)}{\partial\varepsilon} &= \frac{1}{2}\frac{\overline{c}p(1-p)}{\mu\lambda}\left(\frac{1}{(pP_L + (1-p)P_H + g^x + (1-p_L)\varepsilon)^2} - \frac{1}{(pP_H + (1-p)P_L + g^x - p_L\varepsilon)^2}\right)\\ &> 0\end{aligned}$$

as long as $(2p - 1)(P_H - P_L) > \varepsilon$.[22]

Moreover

$$\frac{\partial^2 E(\lambda z|x)}{\partial\overline{c}\partial\varepsilon} > 0.$$

Thus the more firms depend upon external finance (that is, the higher $\overline{c}$), the more positive is the growth response to a more countercyclical expenditures policy.

Similarly

$$\frac{\partial^2 E(\lambda z|x)}{\partial\mu\partial\varepsilon} < 0$$

So the tighter firms' credit constraints, for example because of higher asset intangibility (that is the lower μ), the more growth benefits from countercyclical policy.

A mean preserving spread of s_j on the contrary has no impact on growth, since the equilibrium R&D intensity z is linear in the amount of initial wealth available for investment. Hence:

[22] We can see from the above expression that if μ was procyclical the benefit from countercyclicality would be higher. Indeed, in this case, under laissez-faire firms would cut long term investments by more during slumps.

Proposition 2 *When optimal investment is an interior solution, a mean preserving spread in government expenditures towards more countercyclicality increases long-term investment in R&D as long as* $g_L^j - g_H^j \leq (2p-1)(P_H - P_L)$. *Moreover, this effect is increased when* $\bar{c}$ *is higher or* μ *is lower. On the contrary, a change in* $s_L^j - s_H^j$ *does not have any long-term growth effect.*

Thus, a smaller expected market size for long term projects reduces the amount of knowledge augmenting investment. Given that the credit constraint induces a concavity in the firm's profit function (since more long term investment also means a lower probability to overcome the liquidity shock), more countercyclical expenditure policy will increase expected growth. The probability that long term projects do not carry through, is increasing in z, and all the more so when $\bar{c}$ is higher or μ is lower. This in turn explains why R&D incentives and therefore growth will be enhanced by a more countercyclical policy, all the more in firms which depend more upon external finance or in firms with less tangible assets.

One can show that the growth-maximizing level of countercyclicality is obtained for $\varepsilon = (2p-1)(P_H - P_L)$ (as long as this translates into positive government spending in both states of the world), that is for expected long term projects with market size equalized across states of nature.

Remark 3 *One could go further and derive the growth maximizing policy subject to the constraint that the budget must be balanced in expectation - and also subject to some upper limit on the allowed government deficit in each period. In fact one can show that the growth-maximizing policy subject to these constraints, is to increase the market size for long term investments up to the point where the marginal benefit of government expenditures (which is to increase the share of entrepreneurial wealth devoted to long-term investments) is equal to its marginal cost (which is to reduce the entrepreneur's ex ante wealth because of taxation). This optimal market size is given by* $\sqrt{\frac{\bar{c}}{\mu\lambda}}$*: in other words, since the expected private market size is smaller when the economy is currently in a slump, government expenditures should be higher in a slump than in a boom in order to maximize RD incentives and thereby knowledge growth. Finally, letting the government smooth its budget over the cycle makes it possible to have a countercyclical policy in government expenditures without requiring a procyclical policy in taxes.*

Overall, the main prediction of the model is that countercyclical government expenditures are more growth-enhancing for firms that are more dependent upon external finance or in firms with less tangible assets, and that the countercyclicality of government expenditures matters at least as much as the countercyclicality in tax or subsidies. We now take this prediction to the data.

3 Econometric methodology and data

The left-hand side (henceforth, LHS) variable of our main estimation equation, is the average annual growth rate of real value added or alternatively labour productivity in industry j in country k for a given period of time, say $[t; t+n]$. Labour productivity is defined as the ratio of real value added to total employment.[23] On the right hand side (henceforth, RHS), 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 $(ic_j) \times \left(fpc_k^{t,t+n}\right)$, is the interaction between industry j's characteristic (namely, external financial dependence or asset tangibility) and the degree of (counter-) cyclicality of fiscal policy in country k over the period $[t, t+n]$. Finally, we control for initial conditions by including the term $\log\left(\frac{y_{jk}^t}{y_k^t}\right)$ as an additional regressor on the RHS of the estimation equation. When the LHS variable is real value added growth, y_{jk}^t is the initial real value added in industry j in country k and y_k^t is total real value added in the manufacturing sector in country k. When the LHS variable is labour productivity growth, then y_{jk}^t is the initial labour productivity in industry j in country k whereas y_k^t is the average labour productivity in the manufacturing sector in country k. Letting ε_{jk} denote the error term, our main estimation equation can then be expressed as:

$$\frac{1}{n}\left[\ln\left(y_{jk}^{t+n}\right) - \ln\left(y_{jk}^t\right)\right] = \alpha_j + \beta_k + \gamma\left(ic_j\right) \times \left(fpc_k^{t,t+n}\right) - \delta \log\left(\frac{y_{jk}^t}{y_k^t}\right) + \varepsilon_{jk} \quad (1)$$

Following Rajan and Zingales (1998) we measure industry specific characteristics using firm level data in the US. External financial dependence is measured as the average across all firms in a given industry of the ratio of capital expenditures minus current cash flow to total capital expenditures. Asset tangibility is

[23] Although we also have access to industry level data on hours worked, we prefer to focus on productivity per worker and not productivity per hour as measurement error is more likely to affect the latter than the former.

measured as the average across all firms in a given industry of the ratio of the value of net property, plant and equipment to total assets. This methodology is predicated on the assumptions that: (i) differences in financial dependence/asset tangibility across industries are largely driven by differences in technology; (ii) technological differences persist over time across countries; (iii) countries are relatively similar in terms of the overall institutional environment faced by firms. Under those three assumptions, the US based industry-specific measure is likely to be a valid interactor for industries in countries other than the US.[24] Now, there are good reasons to believe that these assumptions are satisfied particularly if we restrict the empirical analysis to a sample of OECD countries. For example, if pharmaceuticals require proportionally more external finance than textiles in the US, this is likely to be the case in other OECD countries. Moreover, since little convergence has occurred among OECD countries over the past twenty years, cross-country differences are likely to persist over time. Finally, to the extent that the US are more financially developed than other countries worldwide, US based measures of financial dependence as well as asset tangibility are likely to provide the least noisy measures of industry level financial dependence or asset tangibility.

We now focus attention on how to measure fiscal policy cyclicality over the time interval $[t, t+n]$, i.e how to construct the RHS variable $\left(fpc_k^{t,t+n}\right)$. Our approach is to measure fiscal policy cyclicality as the marginal change in fiscal policy following a change in the domestic output gap. Thus we use country-level data over the period $[t; t+n]$ to estimate the following country-by-country "auxiliary" equation:

$$def_k^\tau = \eta_k + \left(fpc_k^{t,t+n}\right) z_k^\tau + u_k^\tau, \tag{2}$$

where: (i) $\tau \in [t; t+n]$; (ii) def_k^τ is a measure of fiscal policy in country k in year τ : for example total fiscal balance, primary balance, total government expenditures, or government revenues, as a ratio of GDP; (iii) z_k^τ measures the output gap in country k in year τ, that is the percentage difference between actual and potential GDP, and therefore represents the country's current position in the cycle; (iv) η_k is a constant and u_k^τ is an error term.

[24] Note however that this measure is unlikely to be valid for the US as it likely reflects the equilibrium of supply and demand for capital in the US and therefore is endogenous.

Equation (2) is estimated separately for each country k in our sample. For example, if the LHS of (2) is the ratio of fiscal balance to GDP, a positive (resp. negative) regression coefficient $(fpc_k^{t,t+n})$ reflects a countercyclical (resp. pro-cyclical) fiscal policy as the country's fiscal balance improves (resp. deteriorates) in upturns.

Moreover, as robustness checks, we consider the case where fiscal policy indicators in regression (2) are measured as a ratio to potential and not current GDP. This alternative specification helps make sure that the cyclicality parameter $\left(fpc_k^{t,t+n}\right)$ captures changes in the numerator of the LHS variable -related to fiscal policy- rather than in the denominator -related to cyclical variations in output-.[25] Furthermore more elaborated fiscal policy specifications could also be considered. In particular, following Gali and Perrotti (2003), a debt stabilization motive as well as a control for fiscal policy persistence could be included. Thus, letting b_k^τ denote the ratio of public debt to potential GDP in country k in year τ, we could estimate fiscal policy cyclicality $\left(fpc_{2,k}^{t,t+n}\right)$ over the period $[t; t+n]$ using the modified "auxiliary" equation:[26]

$$def_k^\tau = \alpha_k + \left(fpc_{2,k}^{t,t+n}\right) z_k^\tau + \beta_k b_k^{\tau-1} + \gamma_k def_k^{\tau-1} + \varepsilon_k^\tau \qquad (3)$$

where z_k^τ is as previously the output gap in country k in year τ, $def_k^{\tau-1}$ is the fiscal policy indicator in country k in year $\tau-1$ and ε_k^τ is an error term.

Following Rajan and Zingales (1998), when estimating our main equation (1) we rely on a simple OLS procedure, correcting for heteroskedasticity bias whenever needed, without worrying much further about endogeneity issues. In particular, the interaction term between industry specific characteristics and fiscal policy cyclicality is likely to be largely exogenous to the LHS variable, be it industry value added or labour productivity growth. First, our external financial dependence variable pertains to industries in the US while the growth variables on the LHS involves other countries than the US. Hence reverse causality whereby

[25] When data is available, we also measure fiscal policy using cyclically adjusted variables. In this case, the cyclicality of fiscal policy results more directly from discretionary policy. Put differently, cyclicality stemming from automatic stabilizers is purged out. Unreported results -available upon request- are very similar to the case where fiscal policy indicators are not cyclically adjusted.

[26] Results presented in this paper are based on the simple fiscal policy counter-cyclicality specification (2). Using specification (3) does not modify the main conclusions of the paper and are vailbable upon request to the authors.

industry growth outside the US could affect external financial dependence or asset tangibility of industries in the US, seems quite implausible. Moreover, in some of our regressions the LHS variable is measured over a post 1990 time period whereas the financial dependence indicator is always measured on a pre 1990 period, which further reduces the possibility of reverse causality. Second, fiscal policy cyclicality is measured at a macro level whereas the LHS growth variable is measured at industry level, which again reduces the scope for reverse causality as long as each individual sector represents a small share of total output in the domestic economy. Yet, as an additional exogeneity test, we produce additional regressions where we instrument for fiscal policy cyclicality.[27]

Our data sample focuses on 15 industrialized OECD countries plus the US. In particular, we do not include Central and Eastern European countries and other emerging market economies. Industry-level data for this country sample are available for the period 1980-2005 while R&D data are only available for the period 1988-2005.[28] Our data come from four different sources. Industry level real value added and labour productivity data are drawn from the EU KLEMS dataset while Industry level R&D data is drawn from OECD STAN database.[29] The primary source of data for measuring industry financial dependence, is Compustat which gathers balance sheets and income statements for US listed firms. We draw on Rajan and Zingales (1998) and Raddatz (2006) to compute the industry level indicators for financial dependence.[30] We draw on Braun and Larrain (2005) to compute industry level indicators for asset tangibility. Finally, macroeconomic fiscal and other control variables are drawn from the OECD Economic Outlook dataset and from the World Bank Financial Development and Structure database.[31]

[27] Our tables show a large degree of similarity between OLS and IV estimations, thereby confirming that our basic empirical strategy properly addresses the endogeneity issue, even though it uses OLS estimations.

[28] We present here the empirical results related to the 1980-2005 period. Estimations on sub-samples with shorter time span are available upon request. Cf. the Appendix for more details on the data and country sample.

[29] These data are available respectively from: http://www.euklems.net/data/08i/all_countries_08I.txt and http://stats.oecd.org/Index.aspx

[30] Rajan and Zingales data is accessible at: http://faculty.chicagogsb.edu/luigi.zingales/research/financing.htm

[31] The OECD Economic Outlook dataset is accessible at: http://titania.sourceoecd.org. The World Bank Financial Development and Structure database is accessible at: http://siteresources.worldbank.org

4 Results

4.1 Main estimations

We first estimate our main regression equation (1), with real value added growth as LHS variable, using financial dependence or asset tangibility as industry-specific interactors (table 1) . Fiscal policy cyclicality is estimated using alternatively the ratio of total or primary fiscal balance to actual or potential GDP as LHS fiscal policy indicator in regression (2). The difference between these total and primary fiscal balance is that the latter does not include net interest repayments to/from the government.

Insert table 1 here

As announced above, we consider three different time periods, and for each time period the fiscal policy cyclicality is derived from estimating (2) over the same time period. The empirical results show that real value added growth is significantly and positively correlated with the interaction of external financial dependence or of asset tangibility with fiscal policy countercyclicality: a larger sensitivity to the output gap of total fiscal balance to GDP (actual or potential) raises industry real valued added growth the more so for industries with higher financial dependence or for industries with lower asset tangibility.

The results are qualitatively similar when using primary fiscal balance: industries with larger financial dependence and/or lower asset tangibility tend to benefit more from a more countercyclical fiscal policy in the sense of a larger sensitivity of the primary fiscal balance to variations in the output gap. Estimated coefficients are however smaller in absolute value when fiscal policy is measured through primary fiscal balance. This is related to the fact that the cross-country dispersion in the cyclicality of primary fiscal balance is larger than the cross-country dispersion in the cyclicality of total fiscal balance, over any of the three time periods we consider.

Three remarks are worth making at this point. First, the estimated coefficients are highly significant -in spite of the relatively conservative standard errors estimates which we cluster at the country level- and also they are relatively stable across different time periods. Second, the pairwise correlation between industry financial dependence and industry asset tangibility is around -0.6 which is significantly below -1. In other words, these two variables are far from being perfectly correlated, which in turn implies that the regressions with financial dependence as the industry specific characteristic are not just mirroring regressions where asset tangibility is the industry specific characteristic. Instead these two set of regressions convey complementary information. Finally, the estimated coefficients remain essentially the same whether the LHS variable in equation (2) is taken as a ratio of actual or potential GDP, so that the correlations between $\left(fpc_k^{t,t+n}\right)$ and industry growth indeed capture the effect of fiscal policy rather than just the effect of changes in actual GDP.

We now repeat the same estimation exercise, but taking labour productivity as the LHS variable in our main estimation equation (1). Comparing the results from this new set of regressions with the previous tables, in turn will allow us to decompose the overall effect of fiscal policy countercyclicality on industry value added growth into employment growth and productivity growth.

Insert table 2 here

As is shown in table 2, labour productivity growth is significantly affected by the interaction between financial dependence/asset tangibility and fiscal policy cyclicality: a larger sensitivity to the output gap of -total or primary- fiscal balance to -actual or potential- GDP raises industry labour productivity growth the more so for industries with higher financial dependence or lower asset tangibility. Decomposing real value added growth into labour productivity growth and employment growth, regressions with external financial dependence as the industry interactor show that about 75% of the effect of fiscal countercyclicality on value added growth is driven by productivity growth, the remaining 25% corresponding to employment growth.

4.2 Magnitude of the effects

How large are the effects implied by the above regressions? To get a sense of the magnitudes involved in these regressions, we compute the difference in growth gains Δ between an industry in the top quartile (75% percentile) and an industry in the bottom quartile (25% percentile) with regard to financial dependence when the country increases the countercycliclality of its fiscal policy from the 25% to the 75% percentile. Then, we redo the same, but replacing financial dependence by asset tangibility (which moves from the 75% to the 25% percentile of the corresponding distribution).[32] As shown in Table 3 below, the difference Δ when growth is measured by real value added growth, is between 1.7 and a 2.7 percentage points per year; whereas Δ is between 1.2 and 2.6 percentage points per year when growth is measured by productivity growth.

Insert table 3 here

These magnitudes are fairly large especially when compared to the corresponding figures in Rajan and Zingales (1998). According to their results, the difference Δ from moving from the 25% to the 75% percentile in the level of financial development, is roughly equal to 1 percentage point per year.

However, the following considerations are worth pointing out here. First, these are diff-and-diff (cross-country/cross industry) effects, which are not directly interpretable as country-wide effects. Second, we are just looking at manufacturing sectors, which represent no more than 40% of total GDP of countries in our sample. Third, there is a high degree of dispersion in fiscal policy cyclicality across countries in our sample. Hence moving from the 25% to the 75% percentile in the countercyclicality of total or primary fiscal balance relative to GDP, corresponds to a dramatic change in the design of fiscal policy along the cycle, which in turn is unlikely to take place in any individual country over a short period of time. Fourth, this simple computation does not take into account the possible costs associated with the transition from a steady state with low fiscal countercyclicality to a steady state with high fiscal countercyclicality. Yet, the above exercise suggests that differences in the cyclicality of fiscal policy is an important driver of the observed cross-country/cross-industry differences in value added and productivity growth.[33]

[32] 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 fiscal policy cyclical pattern for a given industry or conversely the effect of a change in industry characteristics (financial dependence or asset tangibility) in a country with a given cyclical pattern of fiscal policy. Both these effects are absorbed with our country and industry dummies.

[33] Yet another limit is related to the relatively small number of countries in our sample. Because we focus exclusively on developed countries and abstract from emerging and developing countries, the sample on which we estimate the distribution quantiles for fiscal policy counter-cyclicality is relatively small. Hence quantiles of the cross-country are relatively unprecisely estimated.

5 Robustness tests

How robust is the effect of countercyclical fiscal policy on industry growth,? To what extent our results may be driven by particular choices in the econometric methodology, related to sample selection or due to ommited variables? We investigate in this section the relevance of these hypotheses.[34]

5.1 Alternative auxiliary regression

Here we check the robustness of our results to replacing our auxiliary equation (2) by the alternative specification (3) where, on the RHS of the equation, we add the one-period lagged fiscal policy indicator to control for possible auto-correlation as well as the ratio of government liabilities to potential GDP on the RHS to control for debt stabilization motives, either considered on gross or net bases. On the LHS of (3), we consider both total and primary fiscal balance as a ratio of potential GDP. Finally in the main specification (1), we consider alternatively real value added growth or labor productivity growth as our dependent variable. Results show that in spite of relatively lower levels of statistical significance -which we attribute to the smaller data sample for estimating this alternative specification-, the estimated coefficients are quite close to those obtained when using the benchmark auxiliary equation (2). Also interestingly, we find no significant difference between the estimated coefficients for total and primary fiscal balance countercyclicality.

Insert table 4 here

Insert table 5 here

[34] We do not mention in this paragraph the test designed to find out whether outliers are indeed driving the results. These regressions consist in removing countries one by one from the data sample and examine if the interaction coefficient looses significance when a particular country is removed from estimation sample. Evidence available upon request shows not only that this case never arises but also that the interaction coefficients remain relatively stable across all regressions, which confirms that no particular country in the sample is driving the results, neither in their statistical significance nor their economic magnitude. This result should not come as a surprise given the relatively homogeneity of the set of countries in our sample.

5.2 Positive versus negative external financial dependence

A further robustness test is to account for the existence of industries with negative financial dependence. These are industries for which capital expenditures have been lower than internally generated funds over the 1980-1990 period in the US, thus industries which face low or no credit constraints at all. According to our model, a more countercyclical fiscal policy should not have any impact for industries with no credit constraints. However a positive value of the estimated interaction coefficient for a sector with negative financial dependence, would imply that a more countercyclical fiscal policy is growth reducing, not growth enhancing. To check this, we decompose the interaction term in two components: an interaction term between financial dependence and fiscal policy countercyclicality for industries with positive external financial dependence and an interaction term for industries with negative external financial dependence. If a more countercyclical fiscal policy is growth enhancing for industries with tighter credit constraints, then we should observe a positive and significant interaction coefficient when financial dependence is positive but a negative or non-significant interaction coefficient when financial dependence is negative.

Insert table 6

Table 6 essentially shows that once we split the interaction term in two components, respectively for sectors with positive and negative financial dependence, the interaction term is positive and significant only for sectors with positive external financial dependence, whereas it is negative and hardly significant for industries with negative financial dependence when the dependent variable is industry real value added growth. Note however that when labor productivity growth is the dependent variable, the interaction coefficient is significant and negative for industries with negative financial dependence. A more counter-cyclical fiscal policy therfore has a more positive impact on industry productivity growth the less negative is financial dependence.

5.3 Competing stories and ommited variables

To what extent are we picking up other factors or stories when looking at the correlation between industry growth and the cyclicality of fiscal policy? In this subsection, we choose to focus on a few potentially relevant alternative explanations.

5.3.1 Financial development

First, a more countercyclical fiscal policy could reflect a higher degree of financial development in the country.[35] And financial development in turn is known to have a positive effect on growth, particularly for industries that are more dependent on external finance (Rajan and Zingales (1998)). To disentangle the effects of countercyclical fiscal policy from the effects of financial development, in the RHS of the main estimation equation (1) we control for financial development and its interaction with external financial dependence. Columns 1-3 in Tables 7; 8; 9; and 10 below show that controlling for financial development and its interaction with financial dependence or asset tangibility - where financial development is measured either by the ratio of private credit to GDP, or by the ratio of financial system deposits to GDP, or by the real long term interest rate[36]- does not affect nor the significance nor the magnitude of the interaction coefficients between financial dependence/asset tangibility and the cyclicality of fiscal policy. In other words, the effect of fiscal policy cyclicality on industry growth, remains unaffected both qualitatively and quantitatively once financial development is controlled for. Moreover, these estimations suggest that financial development is a significant determinant of industry real value added growth but only when measured through the volume of financial system deposits: the more funds are made available by the financial system, the faster value added will grow in industries with higher financial dependence or lower asset tangibility. However, the level of private credit to GDP interacted with financial dependence or asset tangibility does not appear to have a significant and robust effect on value added or labour productivity growth once we control for the cyclicality of fiscal policy and its interaction with financial dependence or asset tangibility.

[35] For example Aghion and Marisnecu (2007) point to a positive correlation between fiscal policy counter-cyclicality and financial development.

[36] The first two indicators measure the availability of external capital, the third one measures its cost.

5.3.2 Inflation

Second, inflation may also impact on the effect of fiscal policy particularly in more financially dependent sectors. In particular, inflation is widely perceived as having a negative impact on the allocative efficiency of capital across sectors, the idea being that higher inflation makes it more difficult for outside investors to identify high productivity projects: then, the higher the inflation rate, the less efficiently should the financial system allocate capital across sectors. And to the extent that the sectors that should suffer more from capital misallocation are the more financially dependent sectors, inflation is more likely to have a negative effect on value added/productivity growth for industries with more reliance on external finance. In contrast, in industries with no or low financial dependence, this negative effect of inflation is less likely to hold.[37] Columns 4-5 in Tables 7; 8; 9; and 10 indeed show that the interaction of inflation and financial dependence is never a significant determinant of industry real value added or labour productivity growth. The same applies to the interaction between inflation and industry asset tangibility. Finally, we investigate whether this absence of any significant effect of inflation could be related to the level of central bank policy rates, given that central banks tend to determine their policy rates depending on inflation. However, we find that even after controlling for central bank policy rates the interaction between fiscal policy cyclicality and industry financial dependence remains significant. This suggests that the positive effect on industry growth of stabilizing fiscal policies is largely unrelated to average inflation in a country: for given inflation rate, raising the counter-cyclical pattern of fiscal policy raises growth more in industries with higher financial dependence or with lower asset tangibility. These results however do not imply that high average inflation is not costly: in particular, a higher level of inflation is likely to affect the local government's ability to carry out a stabilizing fiscal policy.

[37] A reinforcing consideration is that increases in short term interest rates by central banks in response to higher inflation or higher expected inflation, should also have a negative effect on industry value added and productivity growth that is larger for industries with higher financial dependence or lower asset tangibility.

5.3.3 Fiscal discipline and size of government

Third, if the cyclical component of fiscal policy does significantly affect industry value added growth or labour productivity growth, it is also likely that the structural component of fiscal policy should play a similar role. In fact it could be the case that countercyclical fiscal policy is positively correlated with industry growth not so much because countercyclicality per se is growth-enhancing but rather because a more countercyclical fiscal policy simply reflects better designed fiscal policy or higher fiscal discipline over the cycle. In the same vein, the cyclicality of fiscal policy might be a proxy for the relative size of government: thus, for example, it could just be that larger governments are less countercyclical by nature, in which case our empirical results would simply reflect the view that a smaller government is good for growth and the more so in industries with lower asset tangibility or higher financial dependence. To address this potential objection, we consider three different measures of fiscal institutions: average fiscal balance, average government expenditures, average government revenues. The first measure captures fiscal discipline, the second and third measures capture the relative size of government. Columns 6 to 8 in Tables 7; 8; 9; and 10 below show that in the horse race between the cyclicality of fiscal policy and those three measures of structural fiscal policy, countercyclicality in primary fiscal balance is a significant determinant of industry growth irrespective of the average primary fiscal balance. Moreover, the ratio of average primary fiscal balance to GDP does not appear to carry any significant explanatory power of its own in the growth regressions. This does not imply that fiscal discipline, for example as reflected through a moderate average fiscal deficit, does not matter for industry growth: tighter fiscal discipline should actually make it easier for a government to implement a more countercyclical fiscal policy whereas large average fiscal deficits should make it harder for any government to stabilize the economy in downturns, particularly if the government, as any other agent in the economy, also faces a borrowing constraint.

Insert table 7 here

Insert table 8 here

Insert table 9 here

Insert table 10 here

5.4 Instrumental variable estimation

An important limitation to the empirical analysis carried out in this paper, is that the countercyclicality of macroeconomic policies cannot be directly observed: instead, it can only be inferred through an auxiliary regression. This in turn raises a number of problems. Among those lies the fact that countercyclicality is measured with a standard error, so that our OLS estimations suffer from the fact that we do not observe the "true" value of countercyclicality but only a "noisy" signal of this value. One approach to deal with this problem, is to perform instrumental variable estimations.[38] Thus here we instrument fiscal policy countercyclicality using a set of instrumental variables which share two basic characteristics. First, these variables are directly observed, none of them is inferred from another model or regression. Second, these variables are all predetermined: that is, the period over which the instrumental variables are observed, is anterior to the time periods over which the auxiliary regressions that determine our countercyclicality measure, are run.

More precisely, we carry out two alternative sets of IV estimations. In the first set of IV estimations we use "economic variables" as instruments, for example GDP per worker, the ratio of imports to GDP, CPI inflation, nominal long term interest rate, nominal short term interest rate, private credit to GDP, financial system deposits to GDP. In the second set of IV estimations, we use legal and political variables

[38] In other words, the instrumental variable estimations we perform in this subsection are meant to rule out the possibility that our above findings about the interaction between financial dependence and fiscal policy counter-cyclicality being a significant determinant of industry level growth, might simply reflect the fact that the standard errors around the estimates of fiscal policy counter-cyclicality have not been properly taken into account in the estimations.

as instruments: legal origin (English, French, German, Scandinavian), district magnitudes and an index for government centralization (ratio of central to general government expenditures).

Insert table 11 here

Insert table 12 here

Table 11 (resp. table 12) shows our IV estimations results when real value added growth (resp. labour productivity growth) is the LHS variable while fiscal policy countercyclicality is instrumented using economic variables. Three main results emerge from this exercise. First, whatever the underlying fiscal policy indicator considered, a more countercyclical fiscal policy has a significant disproportionate positive effect on industry growth the larger the degree of industry external financial dependence or the lower industry asset tangibility, in the IV regressions. Second, the effects implied by the IV estimations, are of comparable magnitude to those implied by the above OLS regressions: the interaction coefficients are at least as large and often larger (in absolute value) in the IV estimations than in the OLS estimations. Finally, the Hansen test for instrument validity is always accepted at the 10% level.

Next, we consider the case where fiscal policy cyclicality is instrumented using legal and political variables. Tables 13 (resp. 14) show the IV estimations results when real value added growth (resp. labour productivity growth) is the LHS variable. Again, we find that the instrumentation does not affect the significance or the magnitude of the interaction coefficients between external dependence (or asset tangibility) and fiscal policy countercyclicality in the growth regressions.

Insert table 13 here

Insert table 14 here

Moreover, as in the case with "economic" variables, legal and political instruments always pass the Hansen test, confirming the validity of our instruments. A further characteristics of IV estimations that should be highlighted is the large degree of concordance in the magnitude of the estimated coefficients. Instrumentation with "economic" or "legal and political " variables tend to provide very similar results in terms of economic magnitude for the effect of fiscal policy counter-cyclicality on industry growth. Finally as in the case of instrumentation with economic variables, interaction coefficients happen to be as large or larger than those estimated in the OLS regressions especially when fiscal policy is captured through primary fiscal balance.

6 Opening the fiscal policy box: expenditures and revenues

In this section, we go one step further by investigating the relative importance of the government expenditure and the government revenue components of fiscal policy in the overall effect of a more countercyclical fiscal policy on industry growth. For this purpose, we replace the baseline equation (1) by one in which, on the RHS, we interact industry financial dependence or asset tangibility with both, the countercyclicality in government revenues and the countercyclicality in government expenditures.[39][40] More precisely, we focus separately on total and primary government revenues and expenditures. Columns 1 and 3 in tables 15 and 16 show that there is hardly any difference both in the significance and the magnitude of the interaction coefficients when fiscal policy is decomposed into total government expenditures and total government revenues. The result is different when fiscal policy is decomposed into on primary government expenditures and primary government revenues, i.e. when we abstract from government interest payments and government interest revenues: Indeed columns 2 and 4 in tables 15 and 16 show that the interactions of financial dependence or asset tangibility with both, primary expenditures and primary revenues, come out significant. However, the impact of countercyclicality in primary government expenditures is on average about twice as large as that

[39] From a statistical point of view, this decomposition boils down to relaxing the assumption that estimated coefficients for expenditures and revenues should be equal in absolute value since fiscal balance is simply the difference between revenues and expenditures.

[40] Following the OECD decomposition for government accounts, government expenditures are the sum of government consumption, government investment, net capital transfers, property income, government subsidies, social security expenditures and other expenditures. Government revenues are the sum of total direct taxes, indirect taxes, social security revenues, property income and other current revenues.

of countercyclicality in primary government revenues.[41]

Insert table 15 here

Overall, these findings suggest that the positive effect on industry growth of fiscal balance countercyclicality, involves both the expenditure and the revenue sides of fiscal policy. That the estimated interaction coefficient for primary expenditures be twice as large as the interaction coefficient for primary revenues, is consistent with the notion that fiscal policy over the cycle affects industry growth at least partly through a market size effect: indeed, the cyclicality in government expenditures has a more direct effect on the demand for firms' products than the cyclicality in government revenues which affects demand only indirectly through its impact on agents' budget constraints. This intuition is reinforced by our finding of more significant interaction coefficients between financial dependence and the countercyclicality of government expenditures when looking at primary expenditures instead of total expenditures. Total expenditures embed interest payments from the government, which have no direct impact on aggregate demand. In the model developed in Section 2, countercyclical government expenditures have a stabilizing effect on the returns to productivity enhancing investments by stabilizing market size over the cycle. Anticipating this, entrepreneurs raise their investments in long term productivity enhancing projects. In contrast, the potential effect of countercyclical government revenues operates only indirectly through tightening or relaxing agents' credit constraints.

7 R&D spending and fiscal policy countercyclicality

Recall that in our model a more countercyclical fiscal policy has a positive growth effects on more credit-constrained firms because it provides incentives to pursue long-term innovative investments. In this sub-

[41] Note however that this result does not seem to hold exactly for labour productivity growth when primary fiscal revenues and expenditures are interacted with industry financial dependence as the estimated coefficient for primary expenditures counter-cyclicality is approximately 75% larger than the coefficient for primary revenues counter-cyclicality. It should also be noted that it is not possible from a statistical point of view to claim that the effect of primary government expenditures counter-cyclicality is significantly larger than that of primary government revenues counter-cyclicality seems standard errors are too large to make such a claim without a significant type I error. It is however - to the best of our knowledge- a novel finding that, *on average*, the impact of counter-cyclical primary government expenditures is larger -in our regression twice as large- than that of counter-cyclical primary government revenues. Indeed this claim seems to be confirmed by the empirical evidence on industry R&D spending developed below.

section we look at whether a more counter-cyclical fiscal policy has a positive impact on R&D spending at industry level over the estimation period 1988-2005 . To this end we run the regression

$$\ln\left(\frac{1}{n}\sum_{1\leq h\leq n} RD_{jk}^{t+h}\right) = \alpha_j + \beta_k + \gamma\left(ic_j\right)\times\left(fpc_k^{t,t+n}\right) + \delta\ln\left(RD_{jk}^{t}\right) + \varepsilon_{jk} \qquad (4)$$

where RD_{jk}^{t} is the volume of R&D spending at time t in country k and industry j, other variables being similar to specification (1). We first look at the impact of a more counter-cyclical fiscal balance on the average industry R&D spending; and then decompose fiscal policy into fiscal revenues and expenditures.

We obtain two main findings. First, columns 1-4 in tables 17 and 18 show that the countercyclicality in fiscal balance has a significant effect on the average R&D spending. This conclusion holds irrespective of whether we look at total or primary fiscal balance and wether we consider it as ratio to actual or to potential GDP. Second, when decomposing fiscal balance between expenditures and revenues (columns 5-8 in tables 17 and 18), we find that the positive effect of a more countercyclical fiscal balance on industry R&D is mostly driven by the countercyclical pattern of government expenditures, not so much by that of government revenues whose estimated coefficient is not significantly different from zero when considering primary government revenues. This we see as further evidence of a market size channel lying behind the positive impact of countercyclical fiscal policy on industry R&D and thereby on industry growth.

Insert table 17 here

Insert table 18 here

8 Conclusions

In this paper, we have analyzed the extent to which macroeconomic policy over the business cycle can affect industry growth, focusing on fiscal policy. Following the Rajan-Zingales (1998) methodology, we have interacted credit constraints (measured either by external financial dependence or by the negative of asset tangibility in US industries) and the cyclicality of fiscal policy at country level, and assessed the impact of this interaction on value added or productivity growth at industry level. Using this methodology which helps address potential endogeneity issues, we provided evidence to the effect that a more countercyclical fiscal policy enhances output and productivity growth more in more financially constrained industries, i.e in industries whose US counterparts are more dependent on external finance or display lower asset tangibility. This result appears to survive a number of robustness tests, in particular the inclusion of structural macroeconomic variables such as financial development, inflation, average fiscal deficits, to which one could also add openness to trade or the net current account position.[42] This in turn suggests, either that the growth impact of the cyclical pattern of fiscal policy is of comparable (or even greater) importance to that of more structural features, or that the effect of these structural features operates at least partly through their own effects on the cyclicality of fiscal policy.

The results suggests at least three avenues for future research. A first avenue is to engage in a more systematic assessment of the interactions that exist between growth and the business cycle, particularly those operating through the financial channel. A second question that emerges naturally from the analysis in this paper, is whether the above analysis of the effects of fiscal policy countercyclicality on industry growth, can be transposed from the fiscal to the monetary sphere of the economy. A positive answer to this question would be all the more important that presumably monetary policy can be more easily modified over time than fiscal policy, although transmission lags may be larger for monetary policy than for fiscal policy. Finally, comes the question of the determinants of countercyclical fiscal policy and especially the institutional features or arrangements that foster or prevent countercyclicality. Answering this question will shed new light on the ongoing debate about the relationship between growth and institutions.

References

[1] Acemoglu, D., Johnson, S., Robinson, J., and Y. Thaicharoen (2003), "Institutional Causes, Macroeconomic Symptoms: Volatility, Crises, and Growth", *Journal of Monetary Economics*, 50, 49-123.

[42] The corresponding regressions can be provided upon request to the authors.

[2] Aghion, P., Angeletos, M., Banerjee, A, and K. Manova (2008), "Volatility and Growth: Credit Constraints and Productivity-Enhancing Investment", NBER Working Paper No 11349.

[3] Aghion, P., Bacchetta, P., Ranciere, R., and K. Rogoff (2006), "Exchange Rate Volatility and Productivity Growth: The Role of Financial Development", NBER Working Paper No 12117.

[4] Aghion, P. and A. Barnerjee (2005), "Volatility and Growth.", Clarendon Lectures in Economics. Oxford, UK: Oxford University Press.

[5] Aghion, P., Banerjee, A. and T. Piketty (1999), "Dualism and Macroeconomic Volatility", *The Quaterly Journal of Economics,* vol.114(4), 1359-1397.

[6] Aghion, P., and P. Howitt (2009) *The Economics of Growth*, MIT Press, Cambridge, MA

[7] Aghion, P., and I. Marinescu (2007), "Cyclical Budgetary Policy and Economic Growth: What Do We Learn from OECD Panel Data," NBER Macro Annual, forthcoming.

[8] Alesina, A., Ardagna, S., Perotti, R., and F. Schiantarelli (2002), "Fiscal Policy, Profits and Investment", *The American Economic Review*, vol. 92(3), 571-589

[9] Alesina, A., Campante, F. and G. Tabellini (2008). "Why is Fiscal Policy Often Procyclical?" *Journal of the European Economic Association*, vol. 6(5), 1006-1036

[10] Alesina, A., and R. Perotti. (1996), "Fiscal Adjustments in OECD Countries: Composition and Macroeconomic Effects", NBER Working Paper No 5730.

[11] Andres, J., R. Domenech and A. Fatas (2008), "The stabilizing role of government size," *Journal of Economic Dynamics and Control*, Elsevier, vol. 32(2), 571-593.

[12] Barlevy, G. (2004) "On the Timing of Innovation in Stochastic Schumpeterian Growth Models," NBER Working Papers 10741.

[13] Barlevy, G. (2004). "The Cost of Business Cycles and the Benefits of Stabilization: A Survey", NBER Working Paper 10926.

[14] Barro, R. (1979), “On the Determination of Public Debt”, *Journal of Political Economy*, 87, 940-971.

[15] Barro, R. (1981), "Output Effects of Government Purchases", *Journal of Political Economy*, vol. 89(6), 1086-1121

[16] Barro, R. (1990), "Government Spending in a Simple Model of Endogeneous Growth", *Journal of Political Economy,* vol. 98(5), 103-126.

[17] Beck, T., A. Demirgüç-Kunt and R. Levine (2000), "A New Database on Financial Development and Structure," *World Bank Economic Review* 14, 597-605.

[18] Blanchard, O., and R. Perotti (2002). “An Empirical Characterization of the Dynamic Effects of Changes in Government Spending and Taxes on Output”, *The Quarterly Journal of Economics, vol.* 117(4), 1329-1368.

[19] Braun, M. and B. Larrain (2005), "Finance and the Business Cycle: International, Inter-Industry Evidence", *The Jounral of Finance,* vol. 60(3), 1097-1128

[20] Bruno, M. (1993), *Crisis, Stabilization, and Reform: Therapy by Consensus*, Oxford University Press, Oxford

[21] Calderon, C., Duncan, R., and K. Schmidt-Hebbel (2004), “Institutions and Cyclical Properties of Macroeconomic Policies”, Central: Bank of Chile Working Papers No 285.

[22] Cogan, J., Cwik, T., Taylor, J., and V. Wieland (2009), "New Keynesian versus Old Keynesian Government Spending Multipliers", Rock Center for Corporate Governance at Stanford University Working Paper No. 47

[23] Darby, J. and J. Melitz (2007). “Labour Market Adjustment, Social Spending and the Automatic Stabilizers in the OECD”, CEPR Discussion Paper 6230.

[24] DeLong, J. and L. Summers (1986) "The Changing Cyclical Variability of Economic Activity in the United States", NBER Working Paper No.1450

[25] Easterly, W. (2005), "National Policies and Economic Growth: A Reappraisal", Chapter 15 in *Handbook of Economic Growth*, P. Aghion and S. Durlauf eds.

[26] Epaulard, A. and A. Pommeret. (2003). "Recursive Utility, Endogenous Growth, and the Welfare Cost of Volatility", *Review of Economic Dynamics*, 6(3), 672-684.

[27] Fatás, A. and I. Mihov (2001), "Government Size and Automatic Stabilizers", *Journal of International Economics*, 55, 3-28.

[28] Fatás, A. and I. Mihov (2001), "The Effects of Fiscal Policy on Consumption and Employment: Theory and Evidence", CEPR Discussion Paper No. 2760

[29] Fatás, A. and I. Mihov (2003), "The Case For Restricting Fiscal Policy Discretion," *The Quarterly Journal of Economics*, MIT Press, vol. 118(4), 1419-1447, November.

[30] Fatás, A. and I. Mihov (2005), "Policy Volatility, Institutions and Economic Growth," CEPR Discussion Paper 5388.

[31] Fiorito, R. (1997), "Stylized Facts of Government Finance in the G-7", IMF Working Paper 97/142.

[32] Gali, J. (1994), "Government Size and Macroeconomic Stability", *European Economic Review*, 38 (1), 117-32.

[33] Gali, J. (2005). "Modern perspective of fiscal stabilization policies", *CESifo Economic Studies*, 51(4), 587-599.

[34] Gali, J., Gertler, M. and J. López-Salido (2007), "Markips, Gaps, and the Welfare Costs of Business Fluctuations", *The Review of Economics and Statistics*, vol. 89(1), 44-59.

[35] Gali, J., Lopez Salido, J. and J. Valles (2007), "Understanding the Effects of Government Spending on Consumption", Journal of the European Economic Associaltion, vol. 5(1), 227-270

[36] Gali, J., and R. Perotti (2003), "Fiscal Policy and Monetary Integration in Europe", *Economic Policy*, 533-572.

[37] Gavin, M., and R. Hausman (1996), "The Roots Banking Crises: The Macroeconomic Context", Inter-American Development Bank Working Paper 318, mimeo.

[38] Hallerberg, M. and R. Strauch (2002), "On the Cyclicality of Fiscal Policy in Europe", *Empirica*, 29, 183-207.

[39] Hallerberg M., Strauch R. and J. von Hagen (2004), "The design of fiscal rules and forms of governance in European Union countries," Working Paper Series 419, European Central Bank.

[40] Holmstrom B. and J. Tirole (1998), "Private and Public Supply of liquidity" *Journal of Political Economy*, vol. 106(1), 1-40.

[41] Imbs, J. (2007), "Growth and volatility", *Journal of Monetary Economics*, 54 (7), 1848-1862

[42] Kaminski, G., C. Reinhart, and C. Végh, (2004) "When it Rains it Pours: Procyclical Capital Flows and Macroeconomic Policies," NBER Macroeconomics Annual.

[43] Lane, P. (2003), "The Cyclical Behavior of Fiscal Policy: Evidence from the OECD", *Journal of Public Economics*, 87, 2661-2675.

[44] Lane, P., and A. Tornell (1998), "Why Aren't Latin American Savings Rates Procyclical?, *Journal of Development Economics*, 57, 185-200.

[45] La Porta, R., Lopez de Silanes, F., Shleifer, A. and R. Vishny, (1998), "The Quality of Government", *Journal of Law, Economics and Organization*, 15 (1), 222-279.

[46] La Porta, R., Lopez de Silanes, F., Shleifer, A. and R. Vishny, (1998), "Law and Finance", *Journal of Political Economy*, 106, 1113-1155.

[47] Lucas, R. (1987), *Models of business cycles*, Yrjo Jahnsson Lectures, Oxford, England: Basil Blackwell.

[48] Mountford, A. and H. Uhlig (2008), "What are the Effects of Fiscal Policy Shocks?", NBER Working Paper No. 14551

[49] OECD (1995), “Estimating Potential Output, Output Gaps and Structural Budget Balances”, by C. Giorno, P. Richardson, D. Roseveare and P. van den Noord, OECD Economics Department Working Paper No. 152.

[50] Perotti, R. (1999), “Fiscal Policy in Good Times and Bad” *The Quarterly Journal of Economics*, vol. 114 (4), 1399–1436. S

[51] Perotti, R. (2005), "Estimating the effects of fiscal policy in OECD countries", CEPR Discussion paper (2005) No. 4842

[52] Raddatz, C. (2006), “Liquidity needs and vulnerability to financial underdevelopment,” *Journal of Financial Economics* vol. 80, 677-722.

[53] Rajan, R. and L. Zingales (1998), “Financial dependence and Growth” *American Economic Review*, vol. 88, 559-586.

[54] Ramey, G. and V. Ramey (1995), “Cross-Country Evidence on the Link between Volatility and Growth”, *American Economic Review,* 85 (5), 1138-51

[55] Ramey, V. (2008), “Identifying Government Spending Shocks: It’s All in the Timing", mimeo

[56] Romer, C. and D. Romer (2007), "The macroeconomic effects of tax changes: estimates based on a new measure of fiscal shocks", NBER Working Paper No. 13264

[57] Shleifer, A. (1986), "Implementation Cycles", *Journal of Political Economy*, vol. 94(6), 1163-1190

[58] Smets, F. and R. Wouters (2007) "Shocks and Frictions in U.S. Business Cycles: A Bayesian DSGE Approach", *American Economic Review,* vol. 97(3), 506–606.

[59] Sorensen, B., Wu, L. and O. Yosha (2001). “Output fluctuations and fiscal policy: U.S. state and local governments 1978–1994”, *European Economic Review,* 45, 1271-310.

[60] Persson, T. and G. Tabellini (1999), "The size and scope of government:: Comparative politics with rational politicians," *European Economic Review*, vol. 43(4-6), 699-735.

[61] Persson, T. and G. Tabellini (2002), "Do Constitution Cause Large Governments? Quasi-experimental evidence" *European Economic Review*, vol. 46(4), 908-918.

[62] Tagkalakis, A. (2008), “The Effects of Fiscal Policy on Consumption in Recessions and Expansions,” *Journal of Public Economics*, vol. 92 (5-6), 1486–1508

[63] Talvi, E., and C. Vegh (2005), “Tax Base Variability and Procyclical Fiscal Policy”, *Journal of Economic Development*, 78 (1), 156-190.

Appendix

Industries in the value added/R&D sample

15t16	FOOD , BEVERAGES AND TOBACCO
15	Food and beverages
16	Tobacco
17t19	TEXTILES, TEXTILE , LEATHER AND FOOTWEAR
17t18	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
21t22	PULP, PAPER, PAPER , PRINTING AND PUBLISHING
21	Pulp, paper and paper
22	Printing, publishing and reproduction
221	Publishing
22x	Printing and reproduction
23t25	CHEMICAL, RUBBER, PLASTICS AND FUEL
23	Coke, refined petroleum and nuclear fuel
24	Chemicals and chemical
244	Pharmaceuticals
24x	Chemicals excluding pharmaceuticals
25	Rubber and plastics
26	OTHER NON-METALLIC MINERAL
27t28	BASIC METALS AND FABRICATED METAL
27	Basic metals
28	Fabricated metal
29	MACHINERY, NEC
30t33	ELECTRICAL AND OPTICAL EQUIPMENT
30	Office, accounting and computing machinery
31t32	Electrical engineering
31	Electrical machinery and apparatus, nec
313	Insulated wire
31x	Other electrical machinery and apparatus nec
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
331t3	Scientific instruments
334t5	Other instruments
34t35	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
35x	Railroad equipment and transport equipment nec
36t37	MANUFACTURING NEC; RECYCLING
36	Manufacturing nec
37	Recycling

Sample Countries

Countries in the value added sample	Countries in the R&D sample
Australia	Australia
Austria	Belgium
Belgium	Canada
Denmark	Denmark
Spain	Spain
Finland	Finland
France	France
Great Britain	Great Britain
Greece	Greece
Ireland	Ireland
Italy	Iceland
Japan	Japan
Netherlands	Netherlands
Portugal	Norway
Sweden	New-Zealand
	Portugal
	Sweden

Data Sources

Variable	Source
Industry Real Value Added	EU KLEMS
Industry Labour Productivity	EU KLEMS
Industry R&D spending	OECD STAN
External Financial Dependence	Compustat
Asset Tangibility	Compustat
Output Gap	OECD Economic Outlook
Total Fiscal Balance	OECD Economic Outlook
Primary Fiscal Balance	OECD Economic Outlook
Total Government Expenditures	OECD Economic Outlook
Total Government Revenues	OECD Economic Outlook
Primary Government Expenditures	OECD Economic Outlook
Primary Government Revenues	OECD Economic Outlook
CPI Inflation	OECD Economic Outlook
Nominal Long Term Interest Rate	OECD Economic Outlook
Nominal Short Term Interest Rate	OECD Economic Outlook
Private Credit	WB Financial Structure and Development
Financial System Deposits	WB Financial Structure and Development
Legal Origin	La Porta et al. (1998)
Average district magnitude	Persson and Tabellini (1999)
Federal Political System	Persson and Tabellini (2002)
Index for civil liberties	Persson and Tabellini (2002)

Table 1

Dependent variable: Real Value Added Growth	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
Log of Initial Share in Manufacturing Value Added	**-0.797****	**-0.808****	**-0.809*****	**-0.811*****	**-0.528**	**-0.530**	**-0.508**	**-0.510**
	(0.280)	*(0.278)*	*(0.246)*	*(0.247)*	*(0.350)*	*(0.350)*	*(0.351)*	*(0.352)*
Interaction (Financial Dependence and Total Fiscal Balance to GDP Counter-Cyclicality)	**6.687*****							
	(1.510)							
Interaction (Financial Dependence and Total Fiscal Balance to potential GDP Counter-Cyclicality)		**6.701*****						
		(1.419)						
Interaction (Financial Dependence and Total Fiscal Balance to GDP Counter-Cyclicality)			**4.661*****					
			(0.878)					
Interaction (Financial Dependence and Total Fiscal Balance to potential GDP Counter-Cyclicality)				**4.680*****				
				(0.860)				
Interaction (Asset Tangibility and Total Fiscal Balance to GDP Counter-Cyclicality)					**-13.30*****			
					(4.406)			
Interaction (Asset Tangibility and Total Fiscal Balance to potential GDP Counter-Cyclicality)						**-13.24*****		
						(4.251)		
Interaction (Asset Tangibility and Total Fiscal Balance to GDP Counter-Cyclicality)							**-8.942*****	
							(2.895)	
Interaction (Asset Tangibility and Total Fiscal Balance to potential GDP Counter-Cyclicality)								**-9.039*****
								(2.830)
Observations	528	528	528	528	528	528	528	528
R-squared	0.579	0.581	0.579	0.579	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. Financial Dependence is the fraction of capital expenditures not financed with internal funds for US firms in the same industry for the period 1980-1990. Asset Tangibility is the fraction of assets represented by net property, plant and equipment for US firms in the same industry for the period 1980-1990. Total Fiscal Balance to (resp. potential) GDP Counter-Cyclicality is the coefficient of the output gap when total fiscal balance to (resp. potential) GDP is regressed on a constant and the output gap for each country. Primary Fiscal Balance to (resp. potential) GDP Counter-Cyclicality is the coefficient of the output gap when primary fiscal balance to (resp. 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)	(v)	(vi)	(vii)	(viii)
Log of Initial Relative Labor Productivity	**-2.549***** *(0.512)*	**-2.541***** *(0.513)*	**-2.539***** *(0.557)*	**-2.537***** *(0.556)*	**-2.512***** *(0.503)*	**-2.510***** *(0.503)*	**-2.505***** *(0.533)*	**-2.502***** *(0.533)*
Interaction (Financial Dependence and Total Fiscal Balance to GDP Counter-Cyclicality)	**5.005***** *(0.773)*							
Interaction (Financial Dependence and Total Fiscal Balance to potential GDP Counter-Cyclicality)		**4.957***** *(0.718)*						
Interaction (Financial Dependence and Primary Fiscal Balance to GDP Counter-Cyclicality)			**3.403***** *(0.498)*					
Interaction (Financial Dependence and Primary Fiscal Balance to potential GDP Counter-Cyclicality)				**3.408***** *(0.496)*				
Interaction (Asset Tangibility and Total Fiscal Balance to GDP Counter-Cyclicality)					**-13.03***** *(4.011)*			
Interaction (Asset Tangibility and Total Fiscal Balance to potential GDP Counter-Cyclicality)						**-12.81***** *(3.971)*		
Interaction (Asset Tangibility and Primary Fiscal Balance to GDP Counter-Cyclicality)							**-8.118***** *(2.656)*	
Interaction (Financial Dependence and Primary Fiscal Balance to potential GDP Counter-Cyclicality)								**-8.220***** *(2.642)*
Observations	523	523	523	523	523	523	523	523
R-squared	0.548	0.548	0.546	0.547	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. Financial Dependence is the fraction of capital expenditures not financed with internal funds for US firms in the same industry for the period 1980-1990. Asset Tangibility is the fraction of assets represented by net property, plant and equipment for US firms in the same industry for the period 1980-1990. Total Fiscal Balance to (resp. potential) GDP Counter-Cyclicality is the coefficient of the output gap when total fiscal balance to (resp. potential) GDP is regressed on a constant and the output gap for each country. Primary Fiscal Balance to (resp. potential) GDP Counter-Cyclicality is the coefficient of the output gap when primary fiscal balance to (resp. 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
Growth gain (in %) from a change in fiscal policy counter-cyclicality and industry characteristics

	Real Value Added Growth		Labour Productivity Growth	
	Financial Dependence	Asset Tangibility	Financial Dependence	Asset Tangibility
Total Fiscal Balance to potential GDP	2,384	2,660	1,764	2,574
Primary Fiscal Balance to potential GDP	1,730	2,110	1,263	1,915

Table 4

Dependent variable: Real Value Added Growth	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
Log of Initial Share in Manufacturing Value Added	**-0.500**	**-0.484**	**-0.481**	**-0.449**	**-0.387**	**-0.372**	**-0.367**	**-0.363**
	(0.539)	*(0.532)*	*(0.534)*	*(0.530)*	*(0.509)*	*(0.509)*	*(0.512)*	*(0.512)*
Interaction (Financial Dependence and Total Fiscal Balance to potential GDP Counter-Cyclicality (gross liabilities))	**5.766****							
	(2.477)							
Interaction (Financial Dependence and Total Fiscal Balance to potential GDP Counter-Cyclicality (net liabilities))		**6.058****						
		(2.484)						
Interaction (Financial Dependence and Primary Fiscal Balance to potential GDP Counter-Cyclicality (gross liabilities))			**5.897***					
			(2.751)					
Interaction (Financial Dependence and Primary Fiscal Balance to potential GDP Counter-Cyclicality (net liabilities))				**5.631***				
				(2.962)				
Interaction (Asset Tangibility and Total Fiscal Balance to potential GDP Counter-Cyclicality (gross liabilities))					**-15.20****			
					(5.887)			
Interaction (Asset Tangibility and Total Fiscal Balance to potential GDP Counter-Cyclicality (net liabilities))						**-15.55****		
						(5.778)		
Interaction (Asset Tangibility and Primary Fiscal Balance to potential GDP Counter-Cyclicality (gross liabilities))							**-14.29****	
							(6.301)	
Interaction (Asset Tangibility and Primary Fiscal Balance to potential GDP Counter-Cyclicality (net liabilities))								**-14.32***
								(6.723)
Observations	349	349	349	349	349	349	349	349
R-squared	0.535	0.537	0.535	0.533	0.529	0.530	0.528	0.527

Note: The dependent variable is the average annual growth rate in labor productivity for the period 1980-2005 for each country in each industry. Initial Relative Labor Productivity is the ratio of industry labor productivity to total manufacturing labor productivity in 1980. Financial Dependence is the fraction of capital expenditures not financed with internal funds for US firms in the same industry for the period 1980-1990. Asset Tangibility is the fraction of assets represented by net property, plant and equipment for US firms in the same industry for the period 1980-1990. Total (resp. Primary) Fiscal Balance to GDP Counter-Cyclicality (gross liabilities) is the regression coefficient of the output gap when total (resp. primary) fiscal balance to GDP is regressed for each country on a constant and the output gap, controlling for lagged total (resp. primary) fiscal balance to GDP and lagged gross government liabilities to GDP for each country. Total (resp. Primary) Fiscal Balance to GDP Counter-Cyclicality (net liabilities) is the regression coefficient of the output gap when total (resp. primary) fiscal balance to GDP is regressed for each country on a constant and the output gap, controlling for lagged total (resp. primary) fiscal balance to GDP and lagged net government liabilities to GDP 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 5

Dependent variable: Labor Productivity Growth								
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
Log of Initial Relative Labor Productivity	**-1.957***	**-1.952***	**-1.980****	**-1.977****	**-1.865***	**-1.855***	**-1.864***	**-1.859***
	(0.880)	*(0.877)*	*(0.873)*	*(0.866)*	*(0.866)*	*(0.866)*	*(0.867)*	*(0.860)*
Interaction (Financial Dependence and Total Fiscal Balance to potential GDP Counter-Cyclicality (gross liabilities))	**5.338****							
	(1.709)							
Interaction (Financial Dependence and Total Fiscal Balance to potential GDP Counter-Cyclicality (net liabilities))		**5.494****						
		(1.725)						
Interaction (Financial Dependence and Primary Fiscal Balance to potential GDP Counter-Cyclicality (gross liabilities))			**5.541****					
			(1.849)					
Interaction (Financial Dependence and Primary Fiscal Balance to potential GDP Counter-Cyclicality (net liabilities))				**5.452****				
				(2.071)				
Interaction (Asset Tangibility and Total Fiscal Balance to potential GDP Counter-Cyclicality (gross liabilities))					**-15.18****			
					(4.778)			
Interaction (Asset Tangibility and Total Fiscal Balance to potential GDP Counter-Cyclicality (net liabilities))						**-15.22****		
						(4.979)		
Interaction (Asset Tangibility and Primary Fiscal Balance to potential GDP Counter-Cyclicality (gross liabilities))							**-14.41****	
							(5.105)	
Interaction (Asset Tangibility and Primary Fiscal Balance to potential GDP Counter-Cyclicality (net liabilities))								**-14.83****
								(5.359)
Observations	347	347	347	347	347	347	347	347
R-squared	0.459	0.460	0.460	0.458	0.454	0.454	0.453	0.453

Note: The dependent variable is the average annual growth rate in labor productivity for the period 1980-2005 for each country in each industry. Initial Relative Labor Productivity is the ratio of industry labor productivity to total manufacturing labor productivity in 1980. Financial Dependence is the fraction of capital expenditures not financed with internal funds for US firms in the same industry for the period 1980-1990. Asset Tangibility is the fraction of assets represented by net property, plant and equipment for US firms in the same industry for the period 1980-1990. Total (resp. Primary) Fiscal Balance to GDP Counter-Cyclicality (gross liabilities) is the regression coefficient of the output gap when total (resp. primary) fiscal balance to GDP is regressed for each country on a constant and the output gap, controlling for lagged total (resp. primary) fiscal balance to GDP and lagged gross government liabilities to GDP for each country. Total (resp. Primary) Fiscal Balance to GDP Counter-Cyclicality (net liabilities) is the regression coefficient of the output gap when total (resp. primary) fiscal balance to GDP is regressed for each country on a constant and the output gap, controlling for lagged total (resp. primary) fiscal balance to GDP and lagged net government liabilities to GDP 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 6

Dependent variable	Real Value Added Growth				Labor Productivity Growth			
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
Log of Initial Share in Manufacturing Value Added	**-0.826**** *(0.278)*	**-0.838***** *(0.276)*	**-0.826***** *(0.240)*	**-0.828***** *(0.241)*				
Log of Initial Relative Labor Productivity					**-2.580***** *(0.482)*	**-2.577***** *(0.479)*	**-2.581***** *(0.530)*	**-2.579***** *(0.529)*
Interaction (Positive Financial Dependence and Total Fiscal Balance to GDP Counter-Cyclicality)	**7.394***** *(1.693)*				**6.245***** *(1.008)*			
Interaction (Negative Financial Dependence and Total Fiscal Balance to GDP Counter-Cyclicality)	**-2.454** *(3.409)*				**-11.85*** *(6.532)*			
Interaction (Positive Financial Dependence and Total Fiscal Balance to potential GDP Counter-Cyclicality)		**7.419***** *(1.599)*				**6.201***** *(0.961)*		
Interaction (Negative Financial Dependence and Total Fiscal Balance to potential GDP Counter-Cyclicality)		**-2.590** *(3.361)*				**-11.99*** *(6.494)*		
Interaction (Positive Financial Dependence and Primary Fiscal Balance to GDP Counter-Cyclicality)			**5.115***** *(1.013)*				**4.295***** *(0.516)*	
Interaction (Negative Financial Dependence and Primary Fiscal Balance to GDP Counter-Cyclicality)			**-0.589** *(1.267)*				**-7.295**** *(2.971)*	
Interaction (Positive Financial Dependence and Primary Fiscal Balance to potential GDP Counter-Cyclicality)				**5.153***** *(0.985)*				**4.311***** *(0.515)*
Interaction (Negative Financial Dependence and Primary Fiscal Balance to potential GDP Counter-Cyclicality)				**-0.731** *(1.241)*				**-7.312**** *(3.004)*
Observations	528	528	528	528	523	523	523	523
R-squared	0.580	0.582	0.580	0.580	0.554	0.555	0.552	0.552

Note: The dependent variable is alternatively the average annual growth rate in real value added or labor productivity 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. Initial Relative Labor Productivity is the ratio of industry labor productivity to total manufacturing labor productivity in 1980. Positive (resp. Negative) Financial Dependence is the fraction of capital expenditures not financed with internal funds for US firms in the same industry for the period 1980-1990 when this fraction is positive (resp. negative) and is zero otherwise. Total Fiscal Balance to (resp. potential) GDP Counter-Cyclicality is the coefficient of the output gap when total fiscal balance to (resp. potential) GDP is regressed on a constant and the output gap for each country. Primary Fiscal Balance to (resp. potential) GDP Counter-Cyclicality is the coefficient of the output gap when primary fiscal balance to (resp. 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 7

Dependent variable: Real Value Added Growth								
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
Log of Initial Share in Manufacturing Value Added	**-0.866*****	**-0.850*****	**-0.955*****	**-0.869*****	**-0.712****	**-0.775*****	**-0.795*****	**-0.847*****
	(0.220)	*(0.235)*	*(0.264)*	*(0.222)*	*(0.277)*	*(0.259)*	*(0.262)*	*(0.229)*
Interaction (Financial Dependence and Primary Fiscal Balance to potential GDP Counter-Cyclicality)	**4.405*****	**4.758*****	**4.390*****	**3.599*****	**4.449*****	**5.089*****	**5.049*****	**4.935*****
	(0.799)	*(0.782)*	*(1.101)*	*(1.062)*	*(0.570)*	*(0.918)*	*(1.091)*	*(1.119)*
Interaction (Financial Dependence and Average Private Credit to GDP)	**2.668**							
	(3.004)							
Interaction (Financial Dependence and Average Financial System Deposits to GDP)		**3.164****						
		(1.092)						
Interaction (Financial Dependence and Average Real long term interest rate)			**-2.059***					
			(1.157)					
Interaction (Financial Dependence and Average CPI Inflation)				**-0.506**				
				(0.335)				
Interaction (Financial Dependence and Average Short term Nominal Policy interest rate)					**-0.420**			
					(0.291)			
Interaction (Financial Dependence and Average Total Government Expenditures to GDP)						**-0.111**		
						(0.118)		
Interaction (Financial Dependence Average and Total Government Revenues to GDP)							**-0.0614**	
							(0.119)	
Interaction (Financial Dependence and Average Primary Fiscal Balance to potential GDP)								**-0.438**
								(0.890)
Observations	528	528	495	528	487	528	528	528
R-squared	0.581	0.582	0.577	0.582	0.531	0.581	0.580	0.580

Note: The dependent variable is the average annual growth rate in real value added for the period 1985-2005 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. Financial Dependence is the fraction of capital expenditures not financed with internal funds for US firms in the same industry for the period 1980-1990. Primary Fiscal Balance to GDP Counter-Cyclicality is the regression coefficient of the output gap when primary fiscal balance to GDP is regressed on a constant and the output gap for each country. Averages of control variables are computed over the estimation period 1980-2005. Interaction variables are 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 8

Dependent variable: Real Value Added Growth	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
Log of Initial Share in Manufacturing Value Added	**-0.527**	**-0.524**	**-0.781****	**-0.519**	**-0.268**	**-0.491**	**-0.498**	**-0.505**
	(0.350)	*(0.351)*	*(0.307)*	*(0.347)*	*(0.351)*	*(0.355)*	*(0.356)*	*(0.353)*
Interaction (Asset Tangibility and Primary Fiscal Balance to potential GDP Counter-Cyclicality)	**-8.479****	**-9.168*****	**-7.636****	**-8.276****	**-10.40*****	**-10.48*****	**-11.09*****	**-8.850****
	(2.965)	*(2.838)*	*(3.438)*	*(3.286)*	*(2.648)*	*(3.383)*	*(3.695)*	*(3.065)*
Interaction (Asset Tangibility and Average Private Credit to GDP)	**-4.839**							
	(5.951)							
Interaction (Asset Tangibility and Average Financial System Deposits to GDP)		**-6.091****						
		(2.431)						
Interaction (Asset Tangibility and Average Real long term interest rate)			**3.938**					
			(4.534)					
Interaction (Asset Tangibility and Average CPI Inflation)				**0.359**				
				(0.843)				
Interaction (Asset Tangibility and Average Short term Nominal Policy interest rate)					**0.111**			
					(0.842)			
Interaction (Asset Tangibility and Average Total Government Expenditures to GDP)						**0.367**		
						(0.276)		
Interaction (Asset Tangibility and Average Total Government Revenues to GDP)							**0.328**	
							(0.257)	
Interaction (Asset Tangibility and Average Primary Fiscal Balance to potential GDP)								**-0.374**
								(2.328)
Observations	528	528	495	528	487	528	528	528
R-squared	0.560	0.561	0.567	0.560	0.498	0.561	0.561	0.560

Note: The dependent variable is the average annual growth rate in real value added for the period 1985-2005 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 1980-1990. Primary Fiscal Balance to potential GDP Counter-Cyclicality is the regression coefficient of the output gap when primary fiscal balance to potential GDP is regressed on a constant and the output gap for each country. Averages of control variables are computed over the estimation period 1980-2005. Interaction variables are 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 9

Dependent variable: Labor Productivity Growth	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
Log of Initial Relative Labor Productivity	**-2.533***** *(0.572)*	**-2.524***** *(0.577)*	**-2.621***** *(0.654)*	**-2.549***** *(0.583)*	**-2.016***** *(0.610)*	**-2.543***** *(0.573)*	**-2.546***** *(0.569)*	**-2.554***** *(0.565)*
Interaction (Financial Dependence and Primary Fiscal Balance to potential GDP Counter-Cyclicality)	**3.370***** *(0.536)*	**3.426***** *(0.530)*	**3.698***** *(0.716)*	**3.578***** *(0.851)*	**3.728***** *(0.606)*	**3.350***** *(0.597)*	**3.225***** *(0.766)*	**3.637***** *(0.552)*
Interaction (Financial Dependence and Average Private Credit to GDP)	**0.337** *(2.483)*							
Interaction (Financial Dependence and Average Financial System Deposits to GDP)		**0.949** *(1.360)*						
Interaction (Financial Dependence and Average Real long term interest rate)			**-0.427** *(0.836)*					
Interaction (Financial Dependence and Average CPI Inflation)				**0.0779** *(0.315)*				
Interaction (Financial Dependence and Average Short term Policy interest rate)					**-0.0302** *(0.327)*			
Interaction (Financial Dependence and Average Government Expenditures to GDP)						**0.0147** *(0.0953)*		
Interaction (Financial Dependence and Average Government Revenues to GDP)							**0.0292** *(0.0942)*	
Interaction (Financial Dependence and Average Primary Fiscal Balance to potential GDP)								**-0.450** *(0.422)*
Observations	523	523	490	523	482	523	523	523
R-squared	0.547	0.547	0.533	0.547	0.475	0.547	0.547	0.548

Note: The dependent variable is the average annual growth rate in labor productivity for the period 1985-2005 for each industry in each country. Initial Relative Labor Productivity is the ratio of industry labor productivity to total manufacturing labor productivity in 1980. Financial Dependence is the fraction of capital expenditures not financed with internal funds for US firms in the same industry for the period 1980-1990. Primary Fiscal Balance to potential GDP Counter-Cyclicality is the regression coefficient of the output gap when primary fiscal balance to potential GDP is regressed on a constant and the output gap for each country. Averages of control variables are computed over the estimation period 1980-2005. Interaction variables are 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 10

Dependent variable: Labor Productivity Growth	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
Log of Initial Relative Labor Productivity	**-2.503***	**-2.501***	**-2.544***	**-2.501***	**-2.009***	**-2.500***	**-2.499***	**-2.492***
	(0.533)	*(0.533)*	*(0.603)*	*(0.538)*	*(0.540)*	*(0.537)*	*(0.536)*	*(0.525)*
Interaction (Asset Tangibility and Primary Fiscal Balance to potential GDP Counter-Cyclicality)	**-7.834**	**-8.278***	**-8.441***	**-8.085**	**-9.772***	**-8.321**	**-8.639**	**-7.986***
	(2.905)	*(2.735)*	*(3.963)*	*(3.259)*	*(2.960)*	*(3.133)*	*(3.579)*	*(2.673)*
Interaction (Asset Tangibility and Average Private Credit to GDP)	**-3.356**							
	(4.317)							
Interaction (Asset Tangibility and Average Financial System Deposits to GDP)		**-2.673**						
		(2.653)						
Interaction (Asset Tangibility and Average Real long term interest rate)			**2.388**					
			(3.783)					
Interaction (Asset Tangibility and Average CPI Inflation)				**0.0639**				
				(0.709)				
Interaction (Asset Tangibility and Average Short term Policy interest rate)					**-0.00838**			
					(0.704)			
Interaction (Asset Tangibility and Average Government Expenditures to GDP)						**0.0253**		
						(0.268)		
Interaction (Asset Tangibility and Average Government Revenues to GDP)							**0.0663**	
							(0.269)	
Interaction (Asset Tangibility and Average Primary Fiscal Balance to potential GDP)								**-0.488**
								(1.477)
Observations	523	523	490	523	482	523	523	523
R-squared	0.535	0.535	0.524	0.535	0.460	0.535	0.535	0.535

Note: The dependent variable is the average annual growth rate in labor productivity for the period 1985-2005 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 1980-1990. Primary Fiscal Balance to potential GDP Counter-Cyclicality is the regression coefficient of the output gap when primary fiscal balance to potential GDP is regressed on a constant and the output gap for each country. Averages of control variables are computed over the estimation period 1980-2005. Interaction variables are 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 11

Dependent variable: Real Value Added Growth	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
Log of Initial Share in Manufacturing Valued Added	**-0.631****	**-0.641****	**-0.563***	**-0.571***	**-0.570***	**-0.573***	**-0.531***	**-0.536***
	(0.314)	*(0.314)*	*(0.305)*	*(0.305)*	*(0.318)*	*(0.318)*	*(0.316)*	*(0.316)*
Interaction (Financial Dependence and Total Fiscal Balance to GDP Counter-Cyclicality)	**5.309****							
	(2.070)							
Interaction (Financial Dependence and Total Fiscal Balance to potential GDP Counter-Cyclicality)		**5.475*****						
		(1.972)						
Interaction (Financial Dependence and Primary Fiscal Balance to GDP Counter-Cyclicality)			**5.276*****					
			(1.504)					
Interaction (Financial Dependence and Primary Fiscal Balance to potential GDP Counter-Cyclicality)				**5.230*****				
				(1.492)				
Interaction (Asset Tangibility and Total Fiscal Balance to GDP Counter-Cyclicality)					**-13.91***			
					(7.237)			
Interaction (Asset Tangibility and Total Fiscal Balance to potential GDP Counter-Cyclicality)						**-13.84****		
						(6.979)		
Interaction (Asset Tangibility and Primary Fiscal Balance to GDP Counter-Cyclicality)							**-12.21****	
							(5.969)	
Interaction (Financial Dependence and Primary Fiscal Balance to potential GDP Counter-Cyclicality)								**-12.15****
								(5.906)
Hansen J. Stat	**9.138**	**8.692**	**7.628**	**7.616**	**7.383**	**7.237**	**7.027**	**6.914**
p. value	*0.166*	*0.192*	*0.267*	*0.268*	*0.390*	*0.405*	*0.426*	*0.438*
Observations	422	422	422	422	422	422	422	422
R-squared	0.044	0.047	0.055	0.055	0.023	0.024	0.025	0.025

Note: The dependent variable is the average annual growth rate in real value added for the period 1985-2005 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. Financial Dependence is the fraction of capital expenditures not financed with internal funds for US firms in the same industry for the period 1980-1990. Asset Tangibility is the fraction of assets represented by net property, plant and equipment for US firms in the same industry for the period 1980-1990. Total Fiscal Balance to (resp. potential) GDP Counter-Cyclicality is the coefficient of the output gap when total fiscal balance to (resp. potential) GDP is regressed on a constant and the output gap for each country. Primary Fiscal Balance to (resp. potential) GDP Counter-Cyclicality is the coefficient of the output gap when primary fiscal balance to (resp. potential) GDP is regressed on a constant and the output gap for each country. Set of instruments for estimations (i)-(iv): GDP per capita, Total Government Expenditures to GDP, Imports to GDP, CPI inflation, nominal long term interest rate, nominal short term interest rate, private credit to GDP. Set of instruments for estimations (v)-(viii): GDP per capita, total fiscal balance to GDP, primary fiscal balance to GDP imports to GDP, real long term interest rate, real short term interest rate, private credit to GDP, financial system deposits to GDP. All instruments are averages over the period 1976-1980 except GDP per capita for which the 1980 value is considered. 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 sector dummies. Significance at the 1% (resp. 5%; 10%) level is indicated by *** (resp. **; *).

Table 12

Dependent variable: Labor Productivity Growth	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
Log of Initial Relative Labor Productivity	**-2.024*****	**-2.017*****	**-1.980*****	**-1.984*****	**-1.957*****	**-1.957*****	**-1.942*****	**-1.942*****
	(0.568)	*(0.568)*	*(0.559)*	*(0.559)*	*(0.525)*	*(0.525)*	*(0.527)*	*(0.526)*
Interaction (Financial Dependence and Total Fiscal Balance to GDP Counter-Cyclicality)	**4.237****							
	(1.927)							
Interaction (Financial Dependence and Total Fiscal Balance to potential GDP Counter-Cyclicality)		**4.312****						
		(1.852)						
Interaction (Financial Dependence and Primary Fiscal Balance to GDP Counter-Cyclicality)			**4.027*****					
			(1.495)					
Interaction (Financial Dependence and Primary Fiscal Balance to potential GDP Counter-Cyclicality)				**4.019*****				
				(1.484)				
Interaction (Asset Tangibility and Total Fiscal Balance to GDP Counter-Cyclicality)					**-16.09****			
					(6.888)			
Interaction (Asset Tangibility and Total Fiscal Balance to potential GDP Counter-Cyclicality)						**-15.73****		
						(6.662)		
Interaction (Asset Tangibility and Primary Fiscal Balance to GDP Counter-Cyclicality)							**-12.26****	
							(5.837)	
Interaction (Financial Dependence and Primary Fiscal Balance to potential GDP Counter-Cyclicality)								**-12.34****
								(5.782)
Hansen J. Stat	**6.177**	**5.968**	**5.236**	**5.127**	**7.337**	**7.116**	**8.259**	**7.923**
p. value	*0.404*	*0.427*	*0.514*	*0.528*	*0.395*	*0.417*	*0.310*	*0.339*
Observations	417	417	417	417	417	417	417	417
R-squared	0.091	0.093	0.096	0.097	0.085	0.086	0.081	0.082

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. Financial Dependence is the fraction of capital expenditures not financed with internal funds for US firms in the same industry for the period 1980-1990. Asset Tangibility is the fraction of assets represented by net property, plant and equipment for US firms in the same industry for the period 1980-1990. Total Fiscal Balance to (resp. potential) GDP Counter-Cyclicality is the coefficient of the output gap when total fiscal balance to (resp. potential) GDP is regressed on a constant and the output gap for each country. Primary Fiscal Balance to (resp. potential) GDP Counter-Cyclicality is the coefficient of the output gap when primary fiscal balance to (resp. potential) GDP is regressed on a constant and the output gap for each country. Set of instruments for estimations (i)-(iv): GDP per capita, Total Government Expenditures to GDP, Imports to GDP, CPI inflation, nominal long term interest rate, nominal short term interest rate, private credit to GDP. Set of instruments for estimations (v)-(viii): GDP per capita, Total Fiscal Balance to GDP, Primary Fiscal Balance to GDP, Imports to GDP, CPI inflation, real long term interest rate, real short term interest rate, private credit to GDP, financial system deposits to GDP. All instruments are averages over the period 1976-1980 except GDP per capita for which the 1980 value is considered. 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 sector dummies. Significance at the 1% (resp. 5%; 10%) level is by *** (resp. **; *).

Table 13

Dependent variable: Real Value Added Growth	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
Log of Initial Share in Manufacturing Valued Added	**-0.790*** **	**-0.794*** **	**-0.830*** **	**-0.831*** **	**-0.537** **	**-0.538** **	**-0.512* **	**-0.514* **
	(0.262)	*(0.261)*	*(0.266)*	*(0.266)*	*(0.265)*	*(0.265)*	*(0.267)*	*(0.267)*
Interaction (Financial Dependence and Total Fiscal Balance to GDP Counter-Cyclicality)	**6.522** **							
	(2.610)							
Interaction (Financial Dependence and Total Fiscal Balance to potential GDP Counter-Cyclicality)		**6.407** **						
		(2.535)						
Interaction (Financial Dependence and Primary Fiscal Balance to GDP Counter-Cyclicality)			**4.974*** **					
			(1.859)					
Interaction (Financial Dependence and Primary Fiscal Balance to potential GDP Counter-Cyclicality)				**4.986*** **				
				(1.862)				
Interaction (Asset Tangibility and Total Fiscal Balance to GDP Counter-Cyclicality)					**-17.26** **			
					(6.930)			
Interaction (Asset Tangibility and Total Fiscal Balance to potential GDP Counter-Cyclicality)						**-16.84** **		
						(6.783)		
Interaction (Asset Tangibility and Primary Fiscal Balance to GDP Counter-Cyclicality)							**-12.91*** **	
							(4.782)	
Interaction (Financial Dependence and Primary Fiscal Balance to potential GDP Counter-Cyclicality)								**-12.96*** **
								(4.785)
Hansen J. Stat	**4.505**	**4.338**	**3.671**	**3.707**	**5.453**	**5.587**	**4.452**	**4.420**
p. value	*0.212*	*0.227*	*0.299*	*0.295*	*0.244*	*0.232*	*0.348*	*0.352*
Observations	528	528	528	528	528	528	528	528
R-squared	0.074	0.077	0.073	0.074	0.030	0.032	0.026	0.027

Note: The dependent variable is the average annual growth rate in real value added for the period 1985-2005 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. Financial Dependence is the fraction of capital expenditures not financed with internal funds for US firms in the same industry for the period 1980-1990. Asset Tangibility is the fraction of assets represented by net property, plant and equipment for US firms in the same industry for the period 1980-1990. Total Fiscal Balance to (resp. potential) GDP Counter-Cyclicality is the coefficient of the output gap when total fiscal balance to (resp. potential) GDP is regressed on a constant and the output gap for each country. Primary Fiscal Balance to (resp. potential) GDP Counter-Cyclicality is the coefficient of the output gap when primary fiscal balance to (resp. potential) GDP is regressed on a constant and the output gap for each country. Set of instruments for estimations (i)-(iv): Legal origin (German, Scandinavian), District Magnitude, dummy for Federal Political System. Set of instruments for estimations (v)-(viii): Legal origin (German, Scandinavian), District Magnitude, dummy for Federal Political System, index for civil liberties. 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 sector dummies. Significance at the 1% (resp. 5%; 10%) level is indicated by *** (resp. **; *).

Table 14

Dependent variable: Labor Productivity Growth	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
Log of Initial Relative Labor Productivity	**-2.529***** *(0.365)*	**-2.523***** *(0.364)*	**-2.503***** *(0.368)*	**-2.500***** *(0.368)*	**-2.499***** *(0.341)*	**-2.498***** *(0.340)*	**-2.474***** *(0.343)*	**-2.472***** *(0.343)*
Interaction (Financial Dependence and Total Fiscal Balance to GDP Counter-Cyclicality)	**6.006***** *(2.022)*							
Interaction (Financial Dependence and Total Fiscal Balance to potential GDP Counter-Cyclicality)		**5.829***** *(1.948)*						
Interaction (Financial Dependence and Primary Fiscal Balance to GDP Counter-Cyclicality)			**4.527***** *(1.558)*					
Interaction (Financial Dependence and Primary Fiscal Balance to potential GDP Counter-Cyclicality)				**4.534***** *(1.554)*				
Interaction (Asset Tangibility and Total Fiscal Balance to GDP Counter-Cyclicality)					**-14.29**** *(6.146)*			
Interaction (Asset Tangibility and Total Fiscal Balance to potential GDP Counter-Cyclicality)						**-13.96**** *(6.025)*		
Interaction (Asset Tangibility and Primary Fiscal Balance to GDP Counter-Cyclicality)							**-9.880**** *(4.282)*	
Interaction (Financial Dependence and Primary Fiscal Balance to potential GDP Counter-Cyclicality)								**-9.913**** *(4.288)*
Hansen J. Stat	**2.443**	**2.405**	**4.637**	**4.559**	**1.739**	**1.853**	**2.799**	**2.787**
p. value	*0.655*	*0.662*	*0.327*	*0.336*	*0.784*	*0.763*	*0.592*	*0.594*
Observations	523	523	523	523	523	523	523	523
R-squared	0.185	0.186	0.180	0.180	0.168	0.169	0.162	0.163

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. Financial Dependence is the fraction of capital expenditures not financed with internal funds for US firms in the same industry for the period 1980-1990. Asset Tangibility is the fraction of assets represented by net property, plant and equipment for US firms in the same industry for the period 1980-1990. Total Fiscal Balance to (resp. potential) GDP Counter-Cyclicality is the coefficient of the output gap when total fiscal balance to (resp. potential) GDP is regressed on a constant and the output gap for each country. Primary Fiscal Balance to (resp. potential) GDP Counter-Cyclicality is the coefficient of the output gap when primary fiscal balance to (resp. potential) GDP is regressed on a constant and the output gap for each country. Set of instruments for estimations (i)-(iv): Legal origin (English, French, German, Scandinavian), District Magnitude, dummy for federal government. Set of instruments for estimations (v)-(viii): Legal origin (German, Scandinavian), District Magnitude, dummy for federal government, index for civil liberties. 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 sector dummies. Significance at the 1% (resp. 5%; 10%) level is by *** (resp. **; *).

Table 15

Dependent variable	Real Value Added Growth				Labor Productivity Growth			
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
Log of Initial Share in Manufacturing Value Added	**-0.808****	**-0.903*****	**-0.527**	**-0.562**				
	(0.278)	*(0.237)*	*(0.380)*	*(0.373)*				
Log of Initial Relative Labor Productivity					**-2.540*****	**-2.441*****	**-2.524*****	**-2.488*****
					(0.528)	(0.536)	(0.507)	(0.497)
Interaction (Financial Dependence and Total Government Revenues to potential GDP Counter-Cyclicality)	**6.878*****				**5.152*****			
	(1.484)				(0.592)			
Interaction (Financial Dependence and Total Government Expenditures to potential GDP Counter-Cyclicality)	**-6.176*****				**-4.361*****			
	(1.888)				(1.100)			
Interaction (Financial Dependence and Primary Government Revenues to potential GDP Counter-Cyclicality)		**5.522*****				**4.036*****		
		(0.986)				(0.633)		
Interaction (Financial Dependence and Primary Government Expenditures to potential GDP Counter-Cyclicality)		**-9.302*****				**-5.404*****		
		(2.167)				(1.326)		
Interaction (Asset Tangibility and Total Government Revenues to potential GDP Counter-Cyclicality)			**-13.34****				**-12.37****	
			(4.707)				(4.359)	
Interaction (Asset Tangibility and Total Government Expenditures to potential GDP Counter-Cyclicality)			**12.86****				**14.36*****	
			(5.386)				(4.174)	
Interaction (Asset Tangibility and Primary Government Revenues to potential GDP Counter-Cyclicality)				**-9.930****				**-8.188****
				(3.859)				(3.109)
Interaction (Asset Tangibility and Primary Government Expenditures to potential GDP Counter-Cyclicality)				**18.44****				**16.46*****
				(6.479)				(3.948)
Observations	528	528	528	528	523	523	523	523
R-squared	0.581	0.593	0.561	0.564	0.549	0.550	0.538	0.538

Note: The dependent variable is alternatively the average annual growth rate in real value added or labor productivity 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. Initial Relative Labor Productivity is the ratio of industry labor productivity to total manufacturing labor productivity in 1980. Financial Dependence is the fraction of capital expenditures not financed with internal funds for US firms in the same industry for the period 1980-1990. Asset Tangibility is the fraction of assets represented by net property, plant and equipment for US firms in the same industry for the period 1980-1990. Total/Primary Government Revenues to potential GDP Counter-Cyclicality (resp. Total/Primary Government Expenditures to potential GDP Pro-cyclicality) is the coefficient of the output gap when total/primary government revenues to potential GDP (resp. total/primary expenditures 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 17

Dependent Variable: Log of Average R&D Spending								
	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
Log of initial R&D spending	**0.53*****	**0.53*****	**0.53*****	**0.53*****	**0.52*****	**0.53*****	**0.52*****	**0.52*****
	(0.0611)	*(0.0610)*	*(0.0601)*	*(0.0602)*	*(0.0677)*	*(0.0671)*	*(0.0700)*	*(0.0691)*
Interaction (Financial Dependence and Total Fiscal Balance to GDP Counter-Cyclicality))	**0.78*****							
	(0.192)							
Interaction (Financial Dependence and Total Fiscal Balance to potential GDP Counter-Cyclicality)		**0.75*****						
		(0.189)						
Interaction (Financial Dependence and Primary Fiscal Balance to GDP Counter-Cyclicality)			**0.53*****					
			(0.121)					
Interaction (Financial Dependence and Primary Fiscal Balance to potential GDP Counter-Cyclicality)				**0.53*****				
				(0.121)				
Interaction (Financial Dependence and Fiscal Expenditures to GDP Pro-Cyclicality)					**-1.51*****			
					(0.337)			
Interaction (Financial Dependence and Fiscal Revenues to GDP Counter-Cyclicality)					**0.56****			
					(0.236)			
Interaction (Financial Dependence and Fiscal Expenditures to potential GDP Pro-Cyclicality)						**-1.49*****		
						(0.345)		
Interaction (Financial Dependence and Fiscal Revenues to potential GDP Counter-Cyclicality)						**0.54****		
						(0.248)		
Interaction (Financial Dependence and Primary Fiscal Expenditures to GDP Pro-Cyclicality)							**-1.44*****	
							(0.240)	
Interaction (Financial Dependence and Fiscal Revenues to GDP Counter-Cyclicality)							**-0.21**	
							(0.203)	
Interaction (Financial Dependence and Primary Fiscal Expenditures to potential GDP Pro-Cyclicality)								**-1.43*****
								(0.256)
Interaction (Financial Dependence and Fiscal Revenues to potential GDP Counter-Cyclicality)								**-0.13**
								(0.224)
Observations	395	395	395	395	395	395	395	395

Note: The dependent variable is the log of average annual R&D spending for the period 1988-2005 for each industry in each country. Initial R&D spending is the value of R&D spending in 1988. Financial Dependence is the fraction of assets represented by net property, plant and equipment for US firms in the same industry for the period 1980-1990. Total (resp. Primary) Fiscal Balance to (resp. potential) GDP Counter-Cyclicality) is the coefficient of the output gap when total (resp. primary) fiscal balance to (resp. potential) GDP is regressed on a constant and the output gap for each country. Total (resp. Primary) Government Revenues (resp. Expenditures) to (resp. potential) GDP Counter-Cyclicality is the coefficient of the output gap when total (resp. primary) government revenues (resp. expenditures) to (resp. potential) GDP are 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 18

Dependent Variable: Log of Average R&D Spending	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)
Log of initial R&D spending	**0.53***** (0.0602)	**0.53***** (0.0602)	**0.54***** (0.0598)	**0.54***** (0.0598)	**0.53***** (0.0625)	**0.54***** (0.0624)	**0.54***** (0.0627)	**0.54***** (0.0624)
Interaction (Asset Tangibility and Total Fiscal Balance to GDP Counter-Cyclicality))	**-1.28**** (0.591)							
Interaction (Asset Tangibility and Total Fiscal Balance to potential GDP Counter-Cyclicality)		**-1.22*** (0.588)						
Interaction (Asset Tangibility and Primary Fiscal Balance to GDP Counter-Cyclicality)			**-0.89*** (0.447)					
Interaction (Asset Tangibility and Primary Fiscal Balance to potential GDP Counter-Cyclicality)				**-0.90*** (0.451)				
Interaction (Asset Tangibility and Fiscal Expenditures to GDP Pro-Cyclicality)					**3.83***** (1.047)			
Interaction (Asset Tangibility and Fiscal Revenues to GDP Counter-Cyclicality)					**-0.41** (0.993)			
Interaction (Asset Tangibility and Fiscal Expenditures to potential GDP Pro-Cyclicality)						**3.80***** (1.048)		
Interaction (Asset Tangibility and Fiscal Revenues to potential GDP Counter-Cyclicality)						**-0.46** (0.948)		
Interaction (Asset Tangibility and Primary Fiscal Expenditures to GDP Pro-Cyclicality)							**3.87***** (0.511)	
Interaction (Asset Tangibility and Fiscal Revenues to GDP Counter-Cyclicality)							**1.51*** (0.800)	
Interaction (Asset Tangibility and Primary Fiscal Expenditures to potential GDP Pro-Cyclicality)								**3.74***** (0.665)
Interaction (Asset Tangibility and Fiscal Revenues to potential GDP Counter-Cyclicality)								**1.10** (0.739)
Observations	395	395	395	395	395	395	395	395

Note: The dependent variable is the log of average annual R&D spending for the period 1988-2005 for each industry in each country. Initial R&D spending is the value of R&D spending in 1988. Asset Tangibility is the fraction of assets represented by net property, plant and equipment for US firms in the same industry for the period 1980-1990. Total (resp. Primary) Fiscal Balance to (resp. potential) GDP Counter-Cyclicality) is the coefficient of the output gap when total (resp. primary) fiscal balance to (resp. potential) GDP is regressed on a constant and the output gap for each country. Total (resp. Primary) Government Revenues (resp. Expenditures) to (resp. potential) GDP Counter-Cyclicality is the coefficient of the output gap when total (resp. primary) government revenues (resp. expenditures) to (resp. potential) GDP are 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. **; *).