Fiscal Stabilization and Growth: Evidence from Industry-level Data for Advanced and Developing Economies*

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Sangyup Choi[×] Davide Furceri[•] João Tovar Jalles[$]

Abstract

Medium-term growth can be enhanced by fiscal stabilization. However, to date, no systematic effort has been made to study the specific channels through which fiscal stabilization affects growth. This paper examines the effect of fiscal stabilization on industrial growth and how this effect depends on different technological characteristics. It does so by applying a difference-in-difference approach to an unbalanced panel of 22 manufacturing industries for 55 advanced and developing economies over the period 1970-2014. The results suggest that fiscal stabilization fosters growth in industries with: i) higher external financial dependence and lower asset fixity; ii) higher degree of labor intensity; iii) higher investment lumpiness and relationship-specific input usage. These effects tend to be larger during economic recessions. The results are robust to different measures of fiscal stabilization and the inclusion of various interactions between a broad set of macroeconomic variables and production technologies.

Keywords: industry-level data, fiscal stabilization; time varying coefficients; growth, technologies of production.

JEL codes: E62; H50; H60.

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× School of Economics, Yonsei University, 50 Yonsei-ro, Seodaemun-gu, Seoul 03722, South Korea. Email address: sangyupchoi@gmail.com.

• International Monetary Fund. Research Department, 700 19th street NW, 20431 Washington DC. Email address: dfurceri@imf.org.

$ International Monetary Fund, Fiscal Affairs Department, 700 19th street NW, 20431 Washington DC. Email address: jjalles@imf.org.

I. Introduction

Since the Global Financial Crisis, medium-term growth has been declining in both advanced and developing economies (IMF, 2017). At the same time, fiscal policy has become increasingly constrained due to high debt-to-GDP ratios. Against this background, there has been a renewed interest in examining how fiscal stabilization policies can spur medium-term growth.[1] In principle, fiscal stabilization can enhance medium-term growth by reducing the volatility of the aggregate economy. This is not surprising given that most empirical evidence has suggested a negative relationship between volatility and growth (see e.g. Ramey and Ramey, 1995; Martin and Rogers, 2000).

As far as a specific mechanism is concerned, Aghion et al. (2010) propose a channel of credit constraints through which fiscal policy counter-cyclicality affects medium-term growth. In their theoretical framework, firms can invest either in short-term projects facing an aggregate productivity shock or in productivity-enhancing long-term projects that are subject to a liquidity risk. If credit constraints bind only during periods of contractions, reducing the volatility of aggregate shocks increases the likelihood that long-term projects survive liquidity shocks in bad states without affecting what happens in good states (when credit constraints are not binding). Thus, the higher the fraction of credit constrained firms, the larger the positive effect of reducing aggregate volatility. This mechanism suggests that a countercyclical fiscal policy that reduces aggregate volatility would have larger effects on high-productive investment in more credit-constrained industries, particularly in bad times—when financing constraints are more likely to bind.

Aghion et al. (2014) and Furceri and Jalles (2017) test these predictions using the Rajan and Zingales' (1998) difference-in-difference methodology and find that fiscal stabilization increases growth and productivity-enhancing investment in industries that are more credit

[1] Throughout our baseline analysis, we do not differentiate discretionary fiscal policy from automatic stabilizers, as our benchmark measure of fiscal stabilization encompasses both. For robustness checks, however, we also construct a measure of fiscal stabilization based on cyclically-adjusted fiscal balance, which controls for the influence of automatic stabilizers. For example, see Eichenbaum (1997) and Taylor (2009) for further discussions on this issue.

constrained. Choi et al. (2017) further confirm these results by showing that an increase in aggregate uncertainty reduces total factor productivity growth more in industries that depend heavily on external finance.

This paper builds on such stream of work, but it extends the literature in several important ways. First, it considers additional channels through which fiscal stabilization can affect industrial growth. As discussed by Samaniego and Sun (2016), if industries' technological characteristics interact systematically with output volatility, then fiscal stabilization can have differential growth effects across industries depending on the differences in production technologies. Second, compared to Aghion et al. (2014), our measure of fiscal stabilization varies over time for each country in our sample. In previous studies, the cyclicality of fiscal policy has typically been captured by a unique time-invariant parameter, making difficult to discern the effects of fiscal stabilization from unobserved cross-country heterogeneity. In contrast, our empirical framework allows us to consider a three-dimensional (country-sector-year) panel.

Third, compared to Aghion and Marinescu (2008), our alternative measure of fiscal stabilization based on the cyclically-adjusted fiscal balance isolates the component of discretionary fiscal policy from automatic stabilizers. This decomposition allows for more meaningful evaluation of the growth effect of fiscal policy. Fourth, it extends the analysis to developing economies. Given that fiscal policy in many developing economies has escaped from the procyclicality trap and became countercyclical recently (Frankel et al., 2013), a study of these economies provides yet an extra opportunity to learn about the causal link between fiscal stabilization and growth. Fifth, it examines the mechanisms through which fiscal stabilization affects industrial growth by further investigating the effects on labor, capital and productivity growth.

Specifically, this paper applies Rajan and Zingales' (1998) difference-in-difference methodology to an unbalanced panel of 22 manufacturing industries for 55 advanced and developing economies over the period 1970-2014.[2] The advantages of having a three-dimensional (*i* industries, *c* countries and *t* time periods) dataset are twofold:

- First, it allows to control for aggregate and country-sector shocks by including country-time (*c*, *t*), industry-country (*i*, *c*) and industry-time (*i*, *t*) fixed effects. The inclusion of the country-time (*c*, *t*) fixed effect is particularly important as it allows to control for any unobserved cross-country heterogeneity in the macroeconomic shocks that affect countries' growth. In a pure cross-country analysis, this control would not be possible, leaving open the possibility that the impact attributed to fiscal stabilization would be due to other unobserved macro shocks.

- Second, it mitigates concerns about reverse causality. While it is typically difficult to identify causal effects using aggregate data, it is much more likely that fiscal stabilization affects industry-level outcomes than the other way around. It is because when controlling for country-time fixed effects—and therefore aggregate growth—reverse causality implies that differences in growth across sectors influence fiscal stabilization at the aggregate level. Moreover, our main independent variable is the interaction between fiscal stabilization and industry-specific technological characteristics obtained from the U.S. firm-level data; it makes it even less plausible that causality runs from industry-level growth to this composite variable.

The main findings of our paper are that fiscal stabilization fosters industrial growth through several channels, including i) external financial dependence and asset fixity; ii) labor intensity; iii) investment lumpiness and relationship-specific input usage. In other words, industries that are dependent more on external finance or have less tangible assets as collateral (or a higher labor share) benefit more from fiscal stabilization. This finding is consistent with the cross-country evidence from Aghion et al. (2014). Similarly, industries that are dependent more on a specific type of investment grow faster under fiscal stabilization, suggesting the role of fiscal stabilization in reducing firms' adjustment costs. Among them, the most robust channels are asset fixity and labor intensity. The effects of fiscal stabilization are typically

[2] Industry-level data from most developing economies are only available from 1990.

larger in developing economies, but more precisely estimated in advanced economies—possibly due to better data quality and longer data availability in the latter. The differential effect of fiscal stabilization tends to be larger during recessions—this is particularly the case for those in industries with higher credit constraints Finally, our results are robust to different measures of industrial growth and fiscal stabilization and the inclusion of various interactions between macroeconomic variables and industrial characteristics.

The remainder of the paper is organized as follows. Section II outlines the channels through which fiscal stabilization can affect growth. Section III describes the underlying data used in the empirical analysis. Section IV develops the econometric methodology. Section V presents the main results and a battery of robustness exercises. The last section concludes and provides some policy implications.

II. Fiscal Stabilization and Growth: Channels

What are the channels through which fiscal stabilization affects industry growth? Aghion et al. (2014) argue that stabilizing fiscal policy has a positive effect on industry growth and it is likely to operate through a credit constraint channel. However, the credit constraint (or external financial dependence) channel is not the only mechanism through which fiscal stabilization can affect growth. To the extent to which a certain industry-level technological characteristic interacts with uncertainty or volatility, fiscal stabilization can affect growth via the same channel.[3] For example, Samaniego and Sun (2016) run a horse race of several mechanisms suggested in the theoretical literature through which uncertainty affects growth and find the mixed results depending on the types of uncertainty shocks. To have implications for the conduct of fiscal policy, however, we should find a robust and consistent channel through which fiscal stabilization affects growth given that uncertainty can not only hamper but also enhance growth. Therefore, we pay special attention to the internal consistency among the proposed channels when we present our empirical results.

[3] Throughout the paper, we use “uncertainty” and “volatility” interchangeably.

Volatility can enhance growth via growth options (Kraft et al., 2013) or Oi-Hartman-Abel effect. Both mechanisms assume that the rescaling of the existing stocks of capital and labor is costless. If firms can readily respond to booms (downturns) by increasing (decreasing) their inputs of production, they can benefit from a more volatile economic environment. Thus, firms act as if they are risk-lovers. If these mechanisms are the main channels through which uncertainty affects growth, fiscal stabilization is expected to reduce medium-term growth, especially so for industries with larger adjustment costs.

In contrast, the real options theory (e.g., Bernanke, 1983 and Dixit and Pindyck, 1994) and the risk aversion channel predict a negative relationship between uncertainty (or volatility) and growth.[4] The real options theory relies on the irreversibility in firms' investment or hiring decisions. When economic conditions are more uncertain or volatile, firms become cautious and pursue wait-and-see strategies by letting the economic environment unfold before making decisions. In this case, fiscal stabilization—by making the future economic environment more predictable—can enhance growth by encouraging firms to take timely investment or hiring actions. Moreover, greater uncertainty increases the cost of borrowing via an increase in risk premium (Christiano et al., 2014; Choi, 2016). This mechanism implies that fiscal stabilization would increase growth, particularly so for industries that are financially constrained.

Although studies often predict contrasting effects of fiscal policy on growth (see Zagler and Durnecker, 2003 and Gemmell (2004) for recent surveys), empirical evidence examining the credit constraint channel tends to provide support for the positive effects of fiscal stabilization on growth (Aghion et al., 2014; Furceri and Jalles, 2017). Therefore, setting a strong prior on this channel is useful in checking the internal consistency among potential mechanisms. Given that our sample covers not only advanced but also developing economies (which have less developed financial markets), the credit constraint channel serves as a natural benchmark. For example, if fiscal stabilization fosters growth by favoring industries that are more dependent on external finance, one must find a similar differential effect of fiscal stabilization on industries that have less collateral for external financing because these two

[4] See Bloom (2014) for a detailed survey of these mechanisms.

characteristics often go hand in hand at the industry-level. Therefore, it is crucial to find consistent mechanisms to support the role of countercyclical fiscal policy in fostering growth. Below, we begin by laying out various industry characteristics that are expected to interact with fiscal stabilization and their empirical measures used in the analysis.

External financial dependence (EFD)

The external financial dependence channel of fiscal stabilization is the channel already studied in the existing literature, thereby serving as a benchmark to test the relevance of our empirical design. Following Rajan and Zingales (1998), dependence on external finance in each industry is measured as the median across all U.S. firms, in each industry, of the ratio of total capital expenditures minus the current cash flow to total capital expenditures.[5] Based on the previous empirical evidence, we expect a positive sign on the interaction term between the degree of external finance and the measure of time-varying fiscal stabilization.

Capital depreciation (DEP)

Choi et al. (2017) find that an increase in uncertainty leads firms to switch the composition of investment by reducing the share of ICT investment, which is known to be more productivity-enhancing than non-ICT investment. It is because ICT investment is more subject to liquidity risks due to its lower resale values or higher depreciation rate. Therefore, industries that are characterized by higher rates of depreciation would also benefit more from fiscal stabilization.

However, this is not the only channel through which fiscal stabilization favors industries with higher depreciation rate. Samaniego and Sun (2016) argue that the option value theory would give the same prediction. The real options theory suggests that when investment is subject to fixed costs, higher uncertainty leads firms to postpone their investment, and this delay will be costlier if the existing capital depreciates faster. In both cases, we expect a positive sign on the interaction term between the degree of capital depreciation and time-

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[5] The updated data have been kindly provided by Hui Tong. For details, see Tong and Wei (2011).

varying fiscal stabilization. We adopt the industry-level values from Samaniego and Sun (2016) who use the BEA industry-level capital flow tables.[6]

Investment-specific technological change (ISTC)

Investment-specific technological change has a similar implication on fiscal stabilization to the capital depreciation channel because it captures economic depreciation of capital goods due to technological obsolescence. Thus, we would expect a positive effect of the interaction between investment-specific technological change and fiscal stabilization on industrial growth. Investment-specific technological change is measured by the rate of decline in the quality-adjusted price of capital goods used by each industry relative to the price of consumption and services. Here, we adopt the industry-level investment-specific technical progress indices from Samaniego and Sun (2016).

R&D intensity (RND)

The effect of the interaction between fiscal stabilization and R&D intensity on growth can be either positive or negative. If the growth option or Oi-Hartman-Abel effect is a dominant force in this relationship, we may expect a negative sign on the interaction term. However, to the extent that credit constraints negatively affect R&D investment, we should expect that fiscal stabilization would have positively larger effects on growth in industries that are more R&D intensive (Furceri and Jalles, 2017). This prediction is also consistent with most of the empirical evidence suggesting a negative relationship between uncertainty and R&D investment (Goel and Ram, 2001; Czarnitzki and Toole, 2011; Stein and Stone, 2013). We adopt the industry-level values from Samaniego and Sun (2016) who measure R&D intensity as R&D expenditures over total capital expenditure using the Compustat data.

Asset fixity (FIX)

To the extent that fiscal stabilization increases industrial growth through external financial dependence, we should expect that fiscal stabilization increases growth in industries with lower asset fixity. It is because non-fixed assets are typically intangible, so it is harder to

[6] Both physical and economic depreciation are considered.

use them as collateral (Hart and Moore, 1994). Thus, an industry with low asset fixity has difficulty in raising external funds; thereby fiscal stabilization would be more beneficial to such an industry. Aghion et al. (2014) indeed find that this is a relevant channel through which fiscal stabilization affects growth. We take industry-level asset fixity values from Samaniego and Sun (2016) who extend the values in Braun and Larrain (2005) and Ilyina and Samaniego (2011) that are measured by the ratio of fixed assets to total assets using the Compustat data.

Labor intensity (LAB)

Fiscal stabilization can have more beneficiary effects on labor intensive industries if the dispersion of Harrod-neutral productivity shocks is a key source of changes in uncertainty of the economy. Following the same logic from the asset fixity channel, fiscal stabilization will be more beneficial for labor intensive industries to the extent that credit constraints bind more in recessions—as labor input is not useful as collateral. Moreover, if workers improve their productivity via learning-by-doing over time, the countercyclical fiscal policy can further enhance the growth of industries relying more on the labor input by minimizing the adverse effects of recessions on learning-by-doing processes (Martin and Rogers, 1997).

However, the positive interaction effect is not necessarily the only possible outcome. To the extent that labor is a more variable input than capital, highly labor intensive industries can be more flexible in exploiting the larger volatility of underlying shocks. Theoretical work by Lee and Shin (2000) notes that "when the labor share is large, the opposite occurs: as uncertainty increases, the convexity effect due to labor eventually dominates the option-value effect so that increased uncertainty raises the level of the optimal investment from zero to a positive value." Therefore, determining whether labor intensity reduces or amplifies the effect of fiscal stabilization on growth is ultimately an empirical question. We take the industry-level values from Samaniego and Sun (2016) who measure labor intensity as the ratio of total wages and salaries over the total value added in the U.S., using UNIDO data

Input specificity: investment lumpiness and relationship-specific input and (LMP and SPEC)

To the extent to which a given industry relies on specific inputs, it will be costlier for firms to adjust when economic conditions are volatile over time. Thus, fiscal stabilization would be more beneficial to industries that are characterized by a greater relationship-specific input usage or higher adjustment costs—measured by lumpiness of investment. In both cases, we expect a positive sign on the interaction term. Nunn (2007) measures the relationship-specific input usage with the proportion of inputs that are not sold on an organized exchange nor reference-priced in a trade publication. The fewer inputs are sold on an organized exchange, the more important is a relationship between certain buyers and sellers. The lumpiness of investment is defined as the average number of investment spikes per firm during a decade in each industry, computed using Compustat data. The industry-level values of both indices are taken from Samaniego and Sun (2016).

III. Data

A. Fiscal Stabilization

Measuring the stabilizing effect of fiscal policy requires assessing how fiscal policy affects aggregate demand. As discussed by Blanchard (1993), in a static setting, the budget balance-to-GDP ratio is an appropriate proxy for the aggregate demand's effect of fiscal policy in each year. It implies that the response of the budget balance to changes in economic activity gives a good approximation of the stabilizing effects of fiscal policy: (i) the more countercyclical government spending is, the higher the effect of fiscal stabilization—a relatively high level of government spending when private demand is low will stabilize aggregate demand; (ii) the more progressive taxes are, the higher fiscal stabilization will be—if taxes fall more than output, when output falls, then taxes contribute to stabilize household's disposable income.[7]

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[7] In principle, one should adjust the budget balance and taxes by the marginal propensity to consume out of disposable income, which is typically less than one. Moreover, in a dynamic setting, measuring the impact of fiscal policy on aggregate demand requires looking not only at current budget balance but also at future anticipated deficits and at the level of the stock of public debt (Blanchard and Summers, 1984 and Blanchard, 1985). Therefore, to assess the overall fiscal stabilization, requires examining how future anticipated deficits respond to changes in economic activity today.

Within this conceptual framework, assessing the degree of fiscal stabilization in each country *i* implies estimating the following regression:

$$b_i = \alpha_i + FS_i \Delta y_i + \varepsilon_i \tag{1}$$

where *b* is the budget balance-to-GDP ratio, *Δy* is GDP growth (or a measure of the output gap) and FS measures the degree of fiscal stabilization or fiscal counter-cyclicality, with larger values of the coefficient denoting higher stabilization.

We generalize the equation (1) by introducing the assumption that the regression coefficients (*FS*) may vary over time. Time-varying measures of fiscal stabilization ($FS_{i,t}$) are then estimated as:

$$b_{i,t} = \alpha_{i,t} + FS_{i,t} \Delta y_{i,t} + \varepsilon_{i,t} \tag{2}$$

The coefficient FS is assumed to change slowly and unsystematically over time, with its expected being equal to its past value. The change of the coefficient is denoted by $v_{i,t}$, which is assumed to be normally distributed with expectation zero and variance σ_i^2:

$$FS_{i,t} = FS_{i,t-1} + v_{i,t} \tag{3}$$

Equation (2) and (3) are jointly estimated using the Varying-Coefficient model proposed by Schlicht (1985, 1988). In this approach the variances σ_i^2 are calculated by a method-of-moments estimator that coincides with the maximum-likelihood estimator for large samples (see Schlicht, 1985, 1988 for more details). The model described in equation (2) and (3) generalizes equation (1), which is obtained as a special case when the variance of the disturbances in the coefficients approaches to zero.

As discussed by Aghion and Marinescu (2008), this method has several advantages compared to other methods to compute time-varying coefficients such as rolling windows and

Gaussian methods. First, it allows using all observations in the sample to estimate the degree of fiscal stabilization in each year—which by construction it is not possible in the rolling windows approach. Second, changes in the degree of fiscal stabilization in each year come from innovations in the same year, rather than from shocks occurring in neighboring years. Third, the methodology accounts for the fact that changes in policy are slows and depends on the immediate past. Fourth, it reduces reverse causality problems when fiscal stabilization is used as an explanatory variable as the degree of fiscal stabilization depends on the past.

In Figure 1, we first present the average level and the time path of the coefficient of fiscal stabilization estimated in equation (2) and (3) for the entire sample of 69 countries, for which we have estimates of fiscal stabilization for at least 23 years—that is, between 1994 and 2016.[8] As a first observation, it is worth noting that the time-average fiscal stabilization coefficient is positive (about 0.25-0.30), which is consistent with the fact that the budget balance is generally counter-cyclical (Lane, 2003; Aghion and Marinescu, 2008).

[insert Figure 1]

Second, the degree of fiscal stabilization has increased over time, particularly in advanced and emerging market economies, but to less so in low-income countries or those that export oil (see Figure 2). For the latter two groups, the mid-1990s level is roughly the same as today, likely due to a weak institutional environment (Lane and Tornell, 1998).

[insert Figure 2]

Supporting the growth-enhancing effect of fiscal stabilization by Aghion and Marinescu (2008) and Aghion et al. (2014), greater fiscal stabilization is associated with low output volatility, on average. Figure 3 shows a strong negative relationship between the average of our time-varying fiscal stabilization measure and the standard deviation of real GDP growth. Although it is useful to evaluate the role of fiscal stabilization in explaining cross-country differences in output volatility, it does not say anything about its role in explaining

[8] Details on the individual country-specific fiscal stabilization charts are available from the authors upon request.

output volatility over time. To provide statistics that are more conceptually aligned with our main question, we also provide a correlation between the 5-year non-overlapping average of our fiscal stabilization measure and the 5-year non-overlapping standard deviation of real GDP growth. Both measures are purged by country- and time-fixed effects to capture the relevant within-country variation over time. Figure 4 shows that fiscal stabilization is negatively related to output volatility not only across countries but also over time.

[insert Figure 3]

[insert Figure 4]

B. UNIDO data

Industry-level variables are taken from the United Nations Industrial Development Organization (UNIDO) database. While Aghion et al. (2014) use the KLEMS database in their analysis of advanced economies, UNIDO database allows us to study not only advanced but also developing economies.[9] The extension of the analysis towards developing economies is particularly meaningful for the econometric setup in our analysis. Although our three-dimensional panel dataset with pairs of fixed effects substantially mitigates the endogeneity issues raised in Aghion et al. (2014), by controlling for unobserved heterogeneity and reducing the chance of reverse causality, successful identification critically hinges on variations in the measure of fiscal stabilization over time. Given that fiscal policy in many developing economies has become countercyclical in recent times (Frankel et al., 2013), a study of these economies provides an extra opportunity to learn the causal link from fiscal stabilization to growth.

We measure industry growth by value added growth.[10] To further shed light on a specific channel through which fiscal stabilization affects growth, we also study growth in labor, capital, and productivity at the industry-level, respectively. All nominal variables are

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[9] In addition to the increase in country coverage, UNIDO provides information on more disaggregated manufacturing industries compared to KLEMS.

[10] Similar results are obtained using gross output growth. See the sub-section on robustness checks.

deflated by the country-level Consumer Price Index of the local currency taken from the World Economic Outlook database. All these variables are reported for 22 manufacturing industries based on the INDSTAT2 2016, ISIC Revision 3.[11]

C. Industry-level characteristics

In this section, we report the measures of industry characteristics described earlier for 22 manufacturing industries that are constructed from the U.S. firm-level data. INDSTAT2 industry classification is similar to that of INDSTAT3 used in the earlier literature (Braun and Larrain, 2005; Ilyina and Samaniego, 2011), with a minor exception.[12] For example, whereas "manufacture of food products and beverages" (ISIC 16) is the first industry in the INDSTAT2 dataset, the INDSTAT3 dataset disaggregates them into "manufacture of food products" (ISIC 311) and "manufacture of beverages" (ISIC 313). In this case, we take the average of the industry characteristics for ISIC 311 and ISIC 313 to obtain the value for ISIC 16. If two datasets share the same industry, we simply use the values of INDSTAT3. Table A.1 in Appendix compares the industry classification between INDSTAT2 and INDSTAT3.

Table 1 reports the measures of industry characteristics and Table 2 shows the correlation matrix amongst these variables. The correlations amongst industry characteristics measures are intuitive and consistent with what existing theories would predict. For example, as described in Choi et al. (2017), an industry that relies more heavily on external finance also tends to have higher rates of depreciation and lower asset fixity. Similarly, an industry with a higher R&D intensity is also the one with a lower asset fixity.

[insert Table 1]

[insert Table 2]

[11] While the original INDSTAT 2 database includes 23 manufacturing industries, exclude the "manufacture of recycling" industry due to insufficient observations.

[12] There are 28 manufacturing industries in INDSTAT3.

Our final sample comprises of an unbalanced panel of 55 countries, among which 21 are advanced, and 34 are developing countries. While the advanced country sample typically starts between the late 1970s and the mid-1980s, the developing country sample mostly starts between the late 1980s and the early 1990s. Table 3 summarizes the final country coverage and the number of observations used in the analysis. We do not include the United States in the final sample, as the industrial characteristics are measured by the U.S. firm-level data. To the extent that U.S. fiscal policies influence U.S. firms from different industries in a systemic way, the inclusion of the U.S. would bias the result.

[insert Table 3]

IV. METHODOLOGY

To assess the effect of fiscal stabilization, the analysis follows the methodology proposed by Rajan and Zingales (1998). The following specification is estimated for an unbalanced panel of 55 countries and 22 manufacturing industries over the period 1970-2014:

$$Y_{i,c,t} = \alpha_{i,c} + \gamma_{i,t} + \delta_{c,t} + \beta X_i FS_{c,t} + \varepsilon_{i,c,t}, \tag{4}$$

where *i* denotes industries, *c* countries, and *t* years. *Y* is a measure of industry growth; *X* is a measure of an industry characteristic for an industry *i*; *FS* is our time-varying measure of fiscal stabilization for each country *c*; $\alpha_{i,c}$, $\gamma_{i,t}$, and $\delta_{c,t}$ are industry-country, industry-time and country-time fixed effects, respectively.

The inclusion of these three types of fixed effects provides important advantages compared to the cross-country analysis: (i) industry-country fixed effects allow controlling for industry-specific factors, including for instance cross-country differences in the growth of certain sectors that could arise from differences in comparative advantages; (ii) industry-time fixed effects allow controlling for any global-level variation common to each industry, such as an industry-specific demand shock; and (iii) country-time fixed effects allow controlling for any variation that is common to all sectors of a country's economy, including macroeconomic shocks.

As discussed in the previous section, most of our industry characteristics are measured using only U.S. firm-level data. One potential problem with this approach is that U.S. industry characteristics may not be representative of the whole sample—that is, U.S. measures may be affected by U.S.-specific regulations or sectoral patterns. While this issue is unlikely to be important when restricting the analysis to other advanced economies, extending it to developing economies requires caution.[13]

Equation (4) is estimated using OLS—and standard errors are clustered at the industry-country level—as the inclusion of three-way fixed effects is likely to address the endogeneity concerns related to omitted variable bias. In addition, reverse causality issues are unlikely. First, related to the measures of industry characteristics, it is hard to conceive that sectoral growth in other countries can influence the U.S. industry's characteristics. Second, it is very unlikely that growth at sectoral level can influence aggregate measures of fiscal stabilization. While, in principle, this could be the case if output growth would co-move across all sectors, we address this concern by including industry-country fixed effects. In other words, claiming reverse causality is equivalent to arguing that differences in growth across sectors lead to changes in the degree of fiscal countercyclicality—which we believe to be unlikely.

However, a remaining possible concern in estimating equation (4) with OLS is that other macroeconomic variables could affect sector output growth when interacted with industries' certain characteristics. This concern could be the case for the credit-to-GDP ratio—the original variable assessed by Rajan and Zingales (1998)—but also for inflation as well as

[13] Nevertheless, using country-specific industry's characteristics, even if such measures are available, does not necessarily improve identification. For example, it is much more likely that growth in the textile industry in China affects the characteristics of its own than it affects the characteristics of the U.S. textile industry. Thus, using country-specific characteristics would not address reverse causality.

for measures capturing the degree of uncertainty (Choi et al., 2017). This issue is addressed in the subsection devoted to robustness checks.

V. RESULTS

A. Baseline results

The first three columns of Table 4 present the results obtained by estimating equation (4) for the full sample of advanced and developing economies. They report the interaction effects of fiscal stabilization and the eight different channels on growth. The signs of the other interaction terms are broadly consistent with what theories predicted (Table 5). We find that fiscal stabilization increases growth for industries with: i) higher external financial dependence and lower asset fixity; ii) higher investment adjustment costs (capital depreciation, investment lumpiness and input-specific technological change); and iii) higher labor intensity.

[insert Table 4]

[insert Table 5]

To gauge the magnitude of each channel, we measure differential growth gains from an increase in fiscal stabilization from the 25th to the 75th percentile of the distribution for an industry with a relatively low value of each characteristic (at the 25th percentile of the distribution) compared to an industry with a relatively high value of each characteristic (at the 75th percentile). The magnitude of the effects of fiscal stabilization ranges from 0.8 to 3.0 percentage points. For example, the results suggest that the differential growth gains are 0.8 percentage point from an increase in fiscal stabilization from the 25th to the 75th percentile of the distribution for an industry with relatively low external financial dependence compared to an industry with relatively high external financial dependence.

The full sample results may mask potential heterogeneity between advanced economies and developing economies. The way fiscal stabilization affects output is not necessarily the same for countries with different level of economic development. Moreover, to the extent that most measures of industry characteristics are constructed from the U.S. firm-level data, extending them to developing economies can be subject to larger measurement errors. The assumption that differences in industry-specific factors are common across countries may be valid only among advanced economies. Whereas cross-country differences are likely to persist in the sample of advanced economies given the slow growth convergence process in advanced economies, it may not necessarily be the case for developing economies. Therefore, we re-estimate equation (4) by splitting the sample into advanced economies (21 countries) and developing economies (34 countries).

The results of this analysis are reported in the fourth to the ninth column in Table 4. The interaction effects are typically larger for developing economies but more precisely estimated for advanced economies—presumably due to larger measurement errors in the data from developing economies. The results confirm the findings of Aghion et al. (2014) that industries with a relatively heavier reliance on external finance or lower asset tangibility tend to grow faster in countries that implement fiscal policies that are more countercyclical: when interacting with fiscal stabilization, the external financial dependence and asset fixity channels are highly statistically significant for a group of advanced economies. While the external financial dependence channel is not statistically significant for developing economies, the asset fixity channel is highly statistically significant even for developing economies. Other robust interaction variables for advanced and developing economies are labor intensity, investment lumpiness, and input specificity.

The magnitude of the effect via external financial dependence is economically significant, but smaller than the one found by Aghion et al. (2014) using country-sectoral data—that is, not allowing for time variation in fiscal stabilization and sectoral growth. In the analysis of 15 advanced economies, Aghion et al. (2014) find, on average, a growth differential of the external financial dependence channel of about 1.5 percentage points. For the sample of advanced economies, our differential effect of the same channel ranges between 0.5 and 0.9 percentage point—it is not surprising given that we only capture within-variation due to the inclusion of fixed effects. Nevertheless, it is worth noting that increasing fiscal stabilization from the 25th to the 75th percentile of the distribution corresponds to a dramatic change in the design of fiscal policy over the cycle, and—as illustrated in Figure 1 and 2—changes in fiscal stabilization within countries are typically small and occur only gradually over time.

B. Robustness checks

Lagged specification

Our baseline estimation is based on a static equation (4). Although the inclusion of three-way fixed effects (especially the country-time fixed effect) alleviates the omitted variable bias problem, one may still argue that this specification cannot fully disentangle the causal effect of fiscal stabilization on growth from the short-term demand side interpretation. This is because fiscal policy often takes time to ameliorate firms' constraints. To mitigate this concern, we use a lag of our fiscal stabilization variable in the interaction term. Table 6 shows that our findings hardly change, suggesting that our static framework—when applied to the three-dimensional panel—is an appropriate tool to investigate the effect of fiscal stabilization on medium-term sectoral growth.

[insert Table 6]

Alternative growth measure

While value added measures an industry's ability to generate income and contribute to GDP, gross output principally measures overall production at market prices. The difference between gross output and value added of an industry is intermediate inputs. To the extent that the intensity of intermediate inputs varies across countries within the same industry, our growth measure based on value added might not necessarily give us the same picture as a gross output measure. To check this possibility, we repeat our analysis using industry's growth of gross output. Gross output is also deflated using the CPI to obtain real values.

Table 7 confirms that the sign, size, and statistical significance of the interaction effects using gross output are similar to those using value added, lending support to our baseline results. The only difference is that the capital depreciation channel is no longer statistically significant using gross output.

[insert Table 7]

Uncertainty in fiscal stabilization estimates

A possible limitation of the analysis is that our measure of fiscal stabilization is estimated and not directly observable. It implies that the above findings could just reflect that the standard errors around the fiscal stabilization estimates are not properly considered. To address this limitation, we re-estimate equation (4) using Weighted Least Squares (WLS), with weights given by the inverse of the standard deviation of the fiscal stabilization estimated coefficients. The results of this exercise are reported in Table 8. The estimated parameters are similar and not statistically different from those obtained using OLS, suggesting that baseline results appear not to be biased using a generated regressor.

[insert Table 8]

Alternative fiscal stabilization estimates

While using the budget balance-to-GDP ratio has the main advantage to be available for a larger number of countries over an extended period, its main short coming is that may not truly capture the degree of fiscal counter-cyclicality. As discussed by Kaminsky, Reinhart, and Vegh (2002), the reason is that such a ratio could change upwards or downwards even if government spending or tax policy (say effective tax rates) do not change. It could be due to change in the interest payment over the business cycle or changes in the budget due to automatic stabilizers—that is, automatic changes in the budget due to changes in economic conditions. To address this issue and further check the robustness of the results, we have re-estimated equation (2) and (3) using the primary balance-to-GDP ratio—that is, net of interest payments—and the cyclically-adjusted balance to GDP ratio that is net of automatic changes in the budget.[14] While the measure constructed using primary balance (cyclically-adjusted balance) is positively correlated with the baseline measure in most countries--the average correlation is 0.74 (0.36), they are negatively correlated in few cases, implying that they may capture different dimensions in fiscal stabilization.

The results obtained by estimating equation (4) with these alternative measures of fiscal stabilization are reported in Table 9. They confirm a statistically significant impact of fiscal

[14] Data on the primary balance-to-GDP ratio and the cyclically-adjusted balanced-to-GDP ratio are taken from the IMF FAD database.

stabilization on industrial growth through asset fixity and labor intensity channels, consistent with the results from the baseline specification and other sensitivity tests.

[insert Table 9]

Different factors and omitted variable bias

As discussed before, a possible concern in estimating equation (4) is that results could be biased due to the omission of macroeconomic variables affecting industry growth through the specific channel that is, at the same time, correlated with our measure of fiscal stabilization. For example, Braun and Larrain (2005) find that industries that are more dependent on external finance are hit harder during recessions. This implies that—to the extent that governments respond to periods of low growth by increasing spending—our fiscal stabilization measure might simply capture the well-known recession channel instead. However, if anything, this bias only plays against finding our results.

Nevertheless, we augment equation (4) by interacting each additional country-specific variable $Z_{c,t}$ with industry characteristics to check whether the inclusion of other variables alters the effect of fiscal stabilization on industry growth. The parameter θ in equation (5) aims to capture this additional interaction effect.

$$Y_{i,c,t} = \alpha_{i,c} + \gamma_{i,t} + \delta_{c,t} + \beta X_i FS_{c,t} + \theta X_i Z_{c,t} + \varepsilon_{i,c,t}. \quad (5)$$

The first obvious candidate to consider is the economy-wide GDP growth. To the extent that fiscal policies affect GDP by boosting aggregate demand, the interaction effect we found earlier might simply capture different elasticities of industry growth to aggregate growth. Second, we also control for the size of governments, which are known to be correlated with output volatility and growth (Fátas and Mihov, 2001; Debrun et al., 2008; Afonso and Furceri, 2010). We measure the government size by the ratio of government expenditure to GDP. The third one is the level of financial development, the variable originally used by Rajan and Zingales (1998) in their approach. Due to the lack of financial depth, emerging and developing economies are often forced to run procyclical fiscal policy (Caballero and Krishnamurthy, 2004). To the extent to which our measure of fiscal stabilization increases with financial depth over time, controlling for the level of financial development corrects this upward bias in our estimates. We use the ratio of bank credit to the private sector to GDP (the main variable used in Rajan and Zingales, 1998).

Another potential variable that may affect industry growth through fiscal stabilization is inflation. Inflation may lead to capital misallocation (Fischer and Modigliani, 1978; Modino et al., 1996) and to the extent that some industries are more vulnerable to capital misallocation, it may have larger negative effects on these industries. An important concern in the literature is that volatility may be affected by growth and vice-versa and our sample includes the period of the Great Moderation, during which our measure of fiscal stabilization, on average, also increases. The inclusion of inflation addresses this concern by controlling for the interaction between the industry-level characteristics and the Great Moderation.

An additional variable that may affect TFP growth through credit constraints is the degree of uncertainty. Choi et al. (2017) find that an increase in a country's degree of uncertainty dampens productivity growth the more so for industries with higher external financial dependence. We use the stock market volatility as a measure of uncertainty. Stock market volatility data for a large group of countries are retrieved from Baker and Bloom (2013).

Table 10 shows that the significant interaction effect of fiscal stabilization and channels of asset fixity and labor intensity remain significant. In an unreported analysis, we find that the external finance channel remains statistically significant for advanced economies. The disappearance of significance when a measure of uncertainty interacts with the degree of fiscal stabilization is mostly driven by a substantial reduction in the sample due to the limitation on stock market data. In the analysis of advanced economies only, external financial dependence, asset fixity, and labor intensity channels remain still significant.

[insert Table 10]

C. Decomposition of industry growth

So far, we have studied the channel through which fiscal stabilization affects industry growth, based on two measures of output. In this section, we try to shed light on mechanisms through which fiscal stabilization affects industrial growth by examining the effects on labor, capital and productivity, respectively. Based on a standard neoclassical production function, our new dependent variables are the growth rate of industry-level employment, gross fixed capital formation, and productivity. Similar to the value added and gross output variables, we deflate the gross fixed capital formation by using a country-level CPI. Due to large measurement errors in estimating total factor productivity, we use labor productivity instead. Labor productivity is defined as the ratio of real value added to the number of employees.

Table 11 shows the results of using labor, capital, and productivity as a dependent variable. Overall results on the three different dependent variables are consistent with the value-added growth regarding the sign on the interaction variables. However, differential effects on employment growth are typically larger and more statistically significant than capital growth and labor productivity growth, suggesting that fiscal stabilization seems to affect industry growth mainly through employment. Nevertheless, we cannot rule out that the insignificant interaction effects on capital growth are driven by larger measurement errors due to the absence of capital good price deflators—deflating gross fixed capital formation by CPI is more problematic than deflating value added or gross output by CPI. Indeed, Furceri and Jalles (2017), focusing on a sample of advanced economies, find a positive effect of fiscal stabilization on ICT capital based on EU-KLEMS and sector-specific capital deflators.

[insert Table 11]

D. Recessions vs. expansions

To assess whether the effect of fiscal stabilization on industry growth is different between good and bad times, we adopt a nonlinear approach of the smooth transition approach proposed by Auerbach and Gorodnichenko (2012) and estimate the following regression:

$$Y_{i,c,t} = \alpha_{i,c} + \gamma_{i,t} + \delta_{c,t} + \beta^L X_i F(d_{c,t}) FS_{c,t} + \beta^H X_i \big(1 - F(d_{c,t})\big) FS_{c,t} + \varepsilon_{i,c,t} \quad (6)$$

with $F\big(d_{c,t}\big) = \frac{\exp(-\theta d_{c,t})}{1+\exp(-dc_{i,t})}, \quad \theta > 0,$

where d is an indicator of the state of the economy normalized to have zero mean and unit variance, and $F(d_{c,t})$ is the corresponding smooth transition function between the states. Our analysis uses contemporaneous GDP growth as a measure of the state of the economy.

This approach is equivalent to the smooth transition autoregressive model developed by Granger and Terasvirta (1993). The advantage of this approach is twofold. First, compared with a model in which the fiscal stabilization variable interacts with business cycle proxies, this approach tests directly whether the effect of stabilization varies across different regimes such as recessions and expansions. Second, compared with estimating structural vector autoregressions for each regime, it allows the effects of fiscal stabilization to change smoothly between recessions and expansions by considering a continuum of states to compute the impact, thus making the resulting estimate more precise. Following Auerbach and Gorodnichenko (2012), we use $\theta = 1.5$ for the analysis of recessions and expansions. Periods of very low(high) growth identified in this analysis also correspond to periods of large negative (positive) output gaps.

The results reported in Table 12 suggest that the effects of fiscal stabilization on industrial growth vary across economic regimes. In particular, we find that fiscal stabilization has larger effects on industrial growth in recessionary periods—that is when credit conditions are likely to be more binding—for industries that are more credit constrained (with higher external financial dependence and lower asset fixity) and with higher investment adjustment costs (investment lumpiness). In contrast, the effect is larger during economic expansions for industries that are more labor intensive.

[insert Table 12]

E. Robust channels

The results suggest that several factors can amplify the effect of fiscal stabilization on industrial growth. However, given that these variables are correlated with each other, an interesting question is which of these channels survive when all the significant variables are included simultaneously in the regression. The results for this horse race using value added growth as an indicator of industry growth are presented in Table 13 and suggest that asset fixity is the most robust determinant for both advanced and developing economies. To the extent that asset fixity captures the ability to raise external funds, our finding supports the importance of financial constraints suggested by Aghion et al. (2014).

[insert Table 13]

VI. Conclusion

Fiscal stabilization can enhance medium-term growth by reducing the volatility of the aggregate economy. However, to date, no systematic effort has been made to study the specific channels through which fiscal stabilization affects growth. This paper examines the effect of fiscal stabilization on industrial growth and how this effect depends on different production function technologies. It does so by using a difference-in-difference approach to an unbalanced panel of 22 manufacturing industries for 55 advanced and developing economies over the period 1970-2014. The advantages of this approach are that it allows controlling for any unobserved cross-country heterogeneity in the macroeconomic shocks that affect countries' growth and to mitigate concerns about reverse causality.

The main findings of our paper are that fiscal stabilization fosters industrial growth through several channels, including i) external financial dependence and asset fixity; ii) labor intensity; iii) investment lumpiness and relationship-specific input usage. Among them, the most robust channels are asset fixity and labor intensity. The effects of fiscal stabilization are typically larger in developing economies, but more precisely estimated in advanced economies—possibly due to better data quality and longer data availability in the latter. The effect of fiscal stabilization tends to be larger during recessions—this is particularly the case for those in industries with higher credit constraints. Finally, our results are robust to different measures of industrial growth and fiscal stabilization and to the inclusion of various interactions between macroeconomic variables and production technologies.

Identifying policies that could lift medium-term growth is crucial at this juncture. The results of the paper suggest that in addition to structural reforms, fiscal counter-cyclicality can also play an important role. An important avenue for further research is therefore to investigate what are the determinants of fiscal counter-cyclicality and which components of fiscal policy can deliver higher stabilization. Another avenue for future research is to extend the analysis to firm-level data for a large set of advanced and developing economies.

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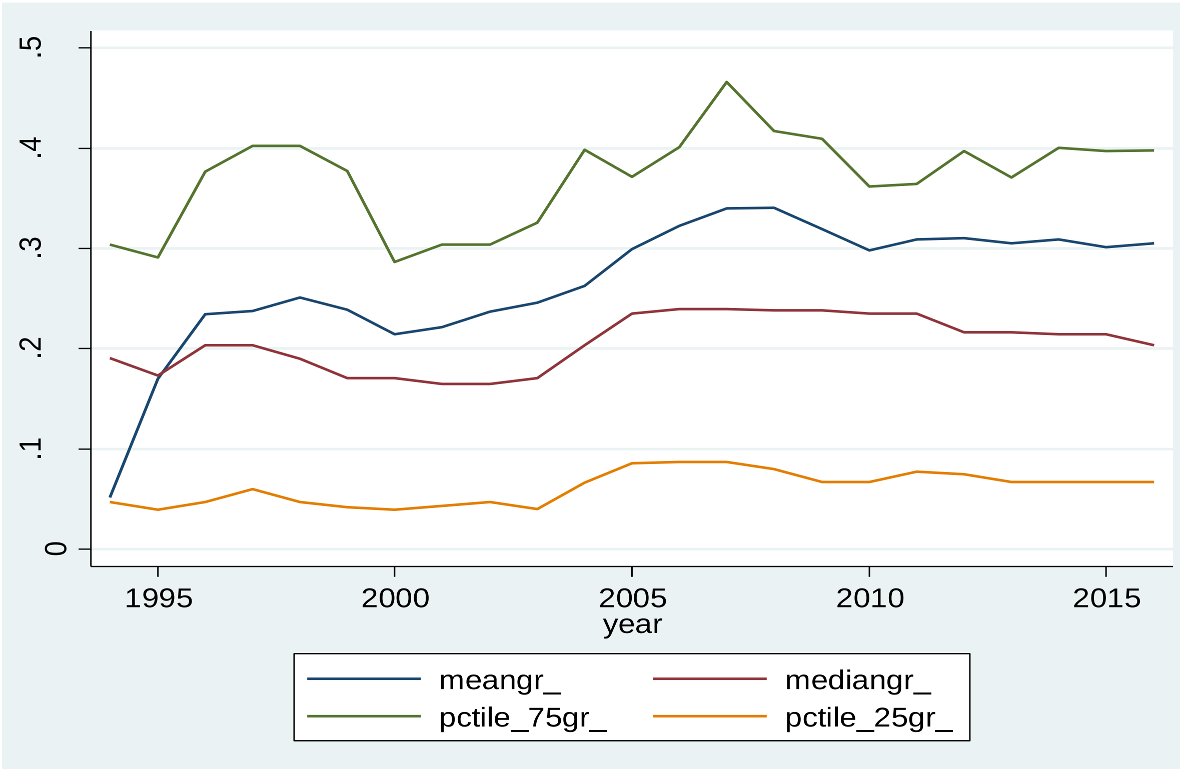
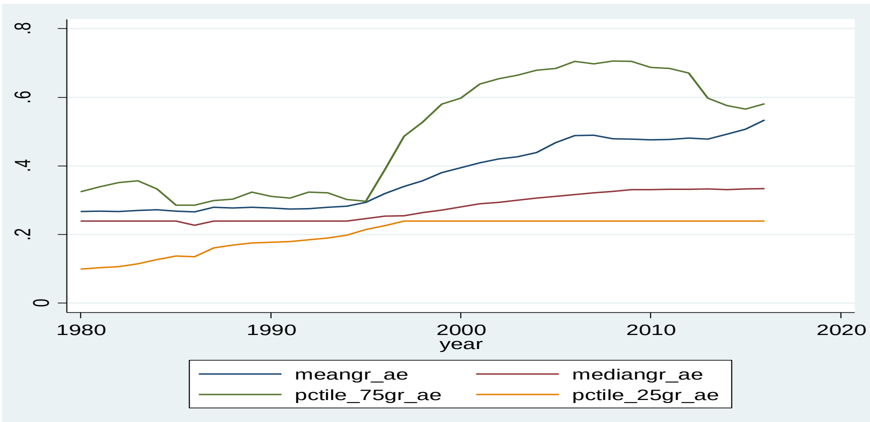
Figure 1. Fiscal stabilization over time, all countries, 1994-2016



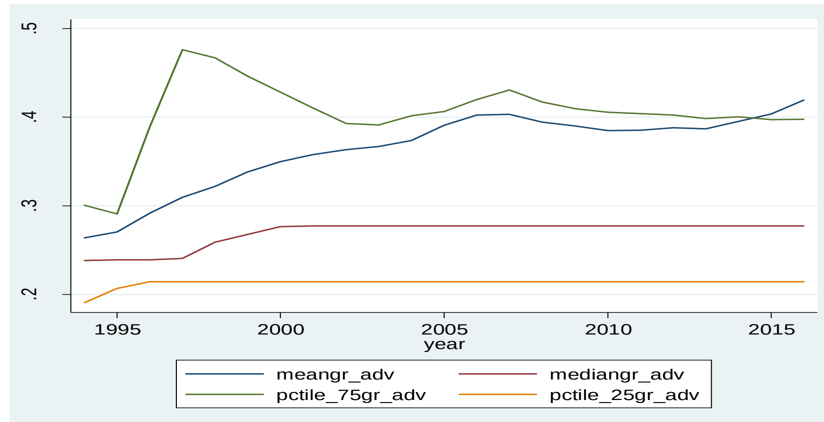
Note: Figure displays the time profile of the TVC coefficient estimates for the entire sample. It includes 69 countries with at least 23 observations.

Figure 2. Fiscal stabilization over time—within sample inter-quartile ranges

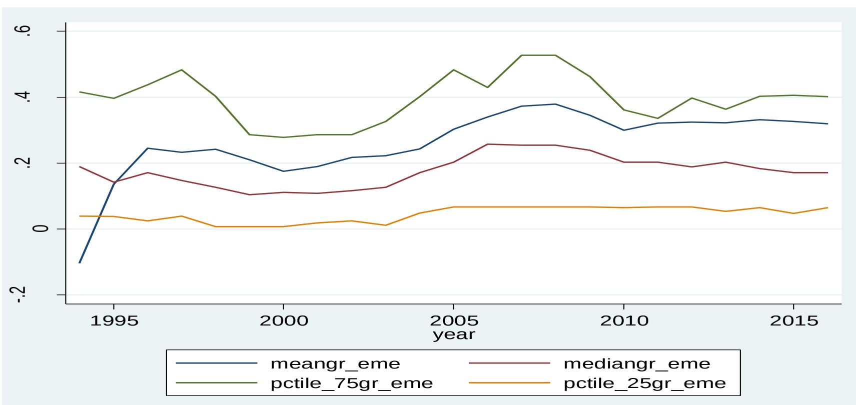
a) Advanced Economies, 1980-2016



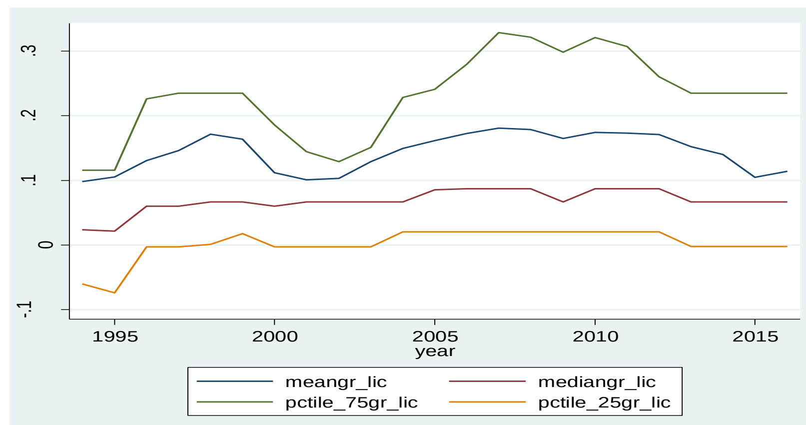
b) Advanced Economies, 1994-2016



c) Emerging Market Economies, 1994-2016

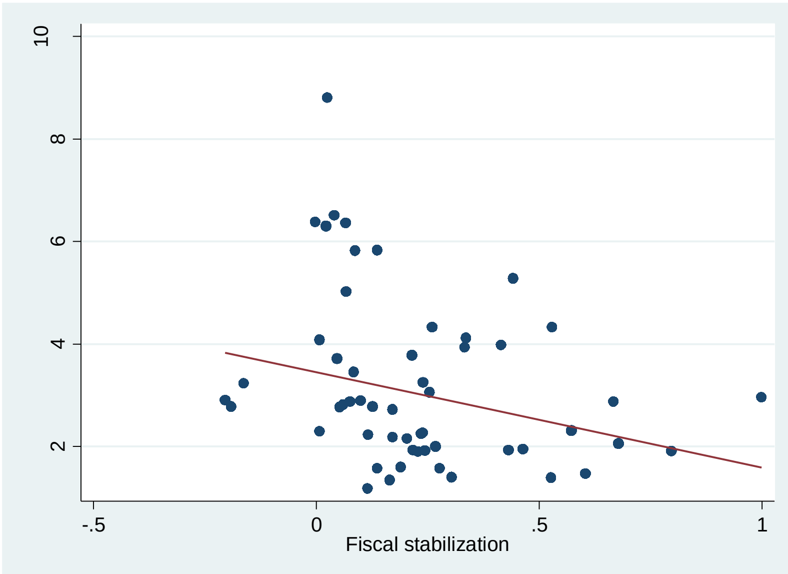


d) Low Income Countries, 1994-2016



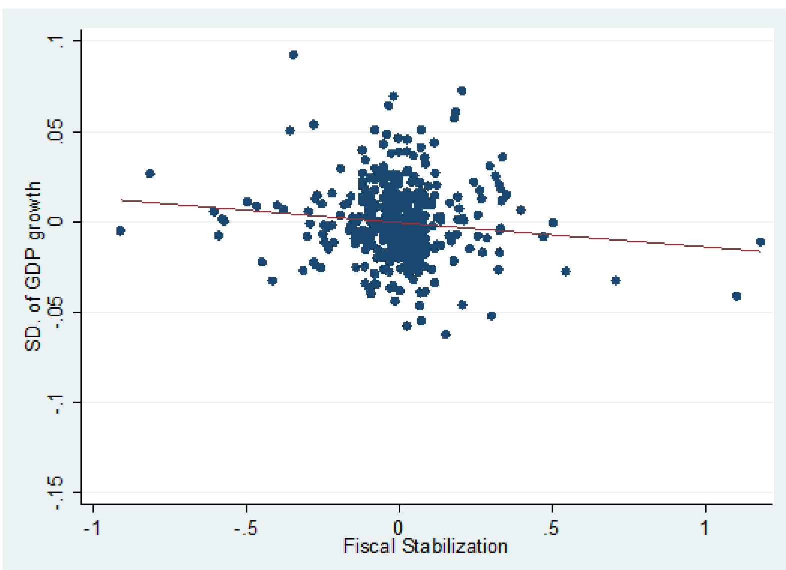
Note: Figure displays the interquartile and mean evolution of the TVC coefficient estimates for the entire sample, and 4 groups, Advanced, Emerging Market and Low Income Economies but also Oil Exporting Countries. Panel a) includes 12 countries with at least 36 observations; panel b) contains 21 countries with at least 23 observations; panel c) contains 33 countries with at least 23 observations; panel d) contains 15 countries with at least 23 observations.

Figure 3. Fiscal stabilization and output volatility: Evidence across countries



Note: Figure displays the correlation between the average of our fiscal stabilization measure and the standard deviation of real GDP growth.

Figure 4. Fiscal stabilization and output volatility: Evidence over time



Note: Figure displays the correlation between the 5-year non-overlapping average of our fiscal stabilization measure and the 5-year non-overlapping standard deviation of real GDP growth. Both measures are purged by country- and time-fixed effects.

Table 1. Industry-specific characteristics

ISIC code	Industry	EFD	DEP	ISTC	R&D	FIX	LAB	LMP	SPEC
15	Food products and beverages	0.11	7.09	3.96	0.06	0.37	0.26	1.24	0.75
16	Tobacco products	-0.45	5.25	3.98	0.22	0.19	0.12	0.82	0.48
17	Textiles	0.19	7.67	3.91	0.14	0.35	0.46	1.23	0.82
18	Wearing apparel; dressing and dyeing of fur	0.03	6.44	4.37	0.02	0.13	0.45	2.00	0.98
19	Tanning and dressing of leather	-0.14	8.80	4.03	0.18	0.15	0.45	2.08	0.89
20	Wood and of products of wood and cork, except furniture	0.28	9.53	3.93	0.03	0.31	0.47	1.72	0.67
21	Paper and paper products	0.17	8.63	3.25	0.08	0.47	0.36	0.90	0.89
22	Publishing, printing and reproduction of recorded media	0.20	9.75	4.41	0.10	0.26	0.41	1.67	1.00
23	Coke, refined petroleum products and nuclear fuel	0.04	6.78	3.96	0.12	0.48	0.24	0.90	0.83
24	Chemicals and chemical products	0.50	8.27	4.64	1.11	0.29	0.23	1.74	0.92
25	Rubber and plastics products	0.69	10.07	3.17	0.18	0.35	0.41	1.33	0.95
26	Other non-metallic mineral products	0.06	8.23	4.75	0.10	0.48	0.39	0.99	0.96
27	Basic metals	0.05	5.99	3.44	0.08	0.40	0.45	1.10	0.64
28	Fabricated metal products, except machinery and equipment	0.24	7.04	3.42	0.15	0.27	0.46	1.37	0.95
29	Machinery and equipment n.e.c.	0.60	8.83	5.15	0.93	0.20	0.43	2.69	0.98
30	Office, accounting and computing machinery	0.96	9.21	4.46	1.19	0.18	0.38	2.79	0.98
31	Electrical machinery and apparatus n.e.c.	0.95	9.38	4.31	0.81	0.21	0.41	2.70	0.96
32	Radio, television and communication equipment and apparatus	0.96	9.21	4.46	1.19	0.18	0.38	2.79	0.98
33	Medical, precision and optical instruments, watches and clocks	0.96	9.21	4.46	1.19	0.18	0.38	2.79	0.98
34	Motor vehicles, trailers and semi-trailers	0.36	10.56	3.85	0.32	0.26	0.44	1.61	0.99
35	Other transport equipment	0.36	10.56	3.85	0.32	0.26	0.44	1.61	0.99
36	Furniture; manufacturing n.e.c.	0.37	8.31	4.05	0.16	0.28	0.49	1.38	0.91

Table 2. Correlation matrix of industry-specific characteristics

	EFD	DEP	ISTC	R&D	FIX	LAB	LMP	SPEC
EFD	1							
DEP	0.61*	1						
ISTC	0.29	0.10	1					
R&D	0.78*	0.32	0.57*	1				
FIX	-0.29	-0.16	-0.40	-0.48*	1			
LAB	0.27	0.44*	-0.10	-0.13	-0.15	1		
LMP	0.76*	0.45*	0.58*	0.79*	-0.73*	0.28*	1	
SPEC	0.60*	0.64*	0.33	0.38	-0.21	0.45*	0.52*	1

Note: * indicates statistical significance at the 5 percent level. EFD= external financial dependence; DEP= capital depreciation; ISTC=investment specific technological change; RND=R&D intensity; FIX= asset fixity; LAB= labor intensity; LMP=investment lumpiness; SPEC= relation-specific investment.

Table 3. Country coverage

Advanced economies				Developing economies			
Country	IFS code	Number of observation	Maximum coverage	Country	IFS code	Number of observation	Maximum coverage
Australia	193	378	1988-2013	Algeria	612	56	1990-1996
Austria	122	545	1988-2014	Bahrain	419	25	2001-2005
Belgium	124	623	1980-2014	Bangladesh	513	318	1980-2011
Canada	156	733	1979-2014	Bolivia	218	405	1981-2010
Denmark	128	700	1979-2014	Chile	228	306	1990-2013
Finland	172	722	1979-2014	China	924	493	1982-2007
France	132	699	1980-2014	Colombia	233	602	1982-2012
Greece	174	669	1976-2013	Costa Rica	238	244	1990-2003
Hong Kong	532	460	1984-2014	El Salvador	253	104	1993-1998
Iceland	176	237	1980-1996	Ethiopia	644	420	1990-2014
Italy	136	577	1988-2014	Gabon	646	56	1991-1995
Japan	158	797	1970-2010	Ghana	652	178	1980-2003
Netherlands	138	651	1981-2014	Honduras	268	107	1990-1995
New Zealand	196	187	1985-2012	India	534	550	1988-2014
Norway	142	723	1978-2014	Iran	429	554	1990-2014
Portugal	182	580	1986-2014	Jamaica	343	63	1990-1996
Singapore	576	532	1990-2014	Jordan	439	554	1985-2013
Spain	184	722	1980-2014	Kenya	664	315	1982-2013
Sweden	144	711	1980-2014	Kuwait	443	430	1990-2013
Switzerland	146	316	1986-2013	Lebanon	446	39	1998-2007
United Kingdom	112	716	1978-2013	Madagascar	674	172	1980-2006
				Malaysia	548	429	1990-2012
				Mexico	273	348	1990-2013
				Mongolia	948	345	1990-2011
				Morocco	686	458	1990-2013
				Oman	449	437	1993-2014
				Paraguay	288	55	2001-2010
				Philippines	566	389	1989-2012
				Qatar	453	330	1990-2013
				Romania	968	469	1990-2013
				Sri Lanka	524	369	1990-2012
				Swaziland	734	155	1980-2011
				Trinidad and Tobago	369	236	1988-2003
				Venezuela	299	188	1988-1998

Table 4. The effect of fiscal stabilization on industry growth: Value added

	All economies (N=20786)			Advanced economies (N=11744)			Developing economies (N=9042)		
Channel	Coef	s.e	Differential effect (%)	Coef	s.e	Differential effect (%)	Coef	s.e	Differential effect (%)
EFD	6.80	4.67	0.79	5.45**	2.63	0.64	6.43	8.53	0.75
DEP	1.89*	1.14	2.64	0.64	0.65	0.90	2.73	2.05	3.80
ISTC	3.39	2.93	2.32	-0.88	1.30	-0.61	5.98	4.91	4.09
RND	1.16	4.88	0.09	1.80	1.92	0.14	-1.49	8.61	-0.12
FIX	-52.77***	14.69	-2.15	-19.46**	9.78	-0.79	-73.07***	25.67	-2.97
LAB	44.80**	19.25	2.98	31.90**	13.21	2.13	54.00*	32.09	3.59
LMP	6.08**	2.78	1.29	2.77*	1.47	0.59	7.83*	4.77	1.68
SPEC	22.69**	11.57	3.14	11.24*	6.52	1.56	34.74*	20.92	4.80

Note: estimates based on equation (4). T-statistics based on clustered standard errors at the industry-country level are reported in parenthesis. *, **, *** denote significance at 10, 5 and 1 percent, respectively. Differential in the dependent variable computed for an industry whose characteristics would increase from the 25th percentile to the 75th percentile of the financial dependence distribution when fiscal stabilization would increase from the 25th to the 75th percentile. EFD= external financial dependence; DEP= capital depreciation; ISTC=investment specific technological change; RND=R&D intensity; FIX= asset fixity; LAB= labor intensity; LMP=investment lumpiness; SPEC= relation-specific investment.

Table 5. The effect of fiscal stabilization on industry growth: Theories vs. findings

	Theories	Findings		
Channel		Full sample	Advanced economies	Developing economies
EFD	+	+	++	+
DEP	+	++	+	+
ISTC	+	+	–	+
RND	+	+	+	–
FIX	–	– –	– –	– –
LAB	+ (or –)	++	++	++
LMP	+	++	++	+
SPEC	+	++	++	++

Note: + (–) in theory column indicates positive (negative) interaction effects from existing theories. + + (– –) sign in findings column indicates statistically significant positive (negative) interaction effects, whereas + (–) sign indicates positive (negative), but insignificant interaction effects. EFD= external financial dependence; DEP= capital depreciation; ISTC=investment specific technological change; RND=R&D intensity; FIX= asset fixity; LAB= labor intensity; LMP=investment lumpiness; SPEC= relation-specific investment.

Table 6. The effect of fiscal stabilization on industry growth: Value added (lagged specification)

	All economies (N=20786)			Advanced economies (N=11744)			Developing economies (N=9042)		
Channel	Coef	s.e	Differential effect (%)	Coef	s.e	Differential effect (%)	Coef	s.e	Differential effect (%)
EFD	7.28*	4.42	0.85	5.40**	2.75	0.63	8.79	9.19	1.02
DEP	1.78*	1.07	2.48	0.36*	0.59	0.50	2.96*	1.84	4.12
ISTC	-0.96	3.02	-0.65	-0.98	1.25	-0.67	-1.25	5.26	-0.86
RND	0.05	4.91	0.00	3.76*	2.16	0.29	-3.57	9.45	-0.28
FIX	-32.59**	15.44	-1.33	-17.30**	8.11	-0.70	-41.46*	26.14	-1.69
LAB	48.31**	19.21	3.22	15.64*	9.12	1.04	72.05**	30.43	4.80
LMP	3.85	2.82	0.82	2.74*	1.51	0.58	4.55	5.57	0.96
SPEC	6.41	9.24	0.89	5.65	5.58	0.78	9.08	16.62	1.26

Note: estimates based on equation (4). T-statistics based on clustered standard errors at the industry-country level are reported in parenthesis. *, **, *** denote significance at 10, 5 and 1 percent, respectively. Differential in the dependent variable computed for an industry whose characteristics would increase from the 25th percentile to the 75th percentile of the financial dependence distribution when fiscal stabilization would increase from the 25th to the 75th percentile. EFD= external financial dependence; DEP= capital depreciation; ISTC=investment specific technological change; RND=R&D intensity; FIX= asset fixity; LAB= labor intensity; LMP=investment lumpiness; SPEC= relation-specific investment.

Table 7. The effect of fiscal stabilization on industry growth: Gross output

	Value added (N=20786)			Gross output (N=20816)		
Channel	Coef	s.e	Differential effect (%)	Coef	s.e	differential effect (%)
EFD	6.80	4.67	0.79	5.68	4.55	0.66
DEP	1.89*	1.14	2.64	1.34	0.91	1.88
ISTC	3.39	2.93	2.32	2.97	2.90	2.03
RND	1.16	4.88	0.09	0.27	4.82	0.02
FIX	-52.77***	14.69	-2.15	-35.23***	13.92	-2.35
LAB	44.80**	19.25	2.98	41.39**	17.18	1.69
LMP	6.08**	2.78	1.29	4.71*	2.78	1.00
SPEC	22.69**	11.57	3.14	20.66**	9.58	2.86

Note: estimates based on equation (4). T-statistics based on clustered standard errors at the industry-country level are reported in parenthesis. *, **, *** denote significance at 10, 5 and 1 percent, respectively. Differential in the dependent variable computed for an industry whose characteristics would increase from the 25th percentile to the 75th percentile of the financial dependence distribution when fiscal stabilization would increase from the 25th to the 75th percentile. EFD= external financial dependence; DEP= capital depreciation; ISTC=investment specific technological change; RND=R&D intensity; FIX= asset fixity; LAB= labor intensity; LMP=investment lumpiness; SPEC= relation-specific investment.

Table 8. The effect of fiscal stabilization on industry growth: WLS

	All economies (N=20786)			Advanced economies (N=11744)			Developing economies (N=9042)		
Channel	Coef	s.e	Differential effect (%)	Coef	s.e	Differential effect (%)	Coef	s.e	Differential effect (%)
EFD	7.45	6.28	0.87	5.87*	3.19	0.68	6.45	10.16	0.75
DEP	2.78*	1.70	3.87	1.00	0.74	1.40	3.39	2.60	4.72
ISTC	4.96	3.77	3.39	-1.20	1.48	-0.83	7.09	5.70	4.85
RND	2.98	5.76	0.23	1.43	2.34	0.11	1.30	9.29	0.10
FIX	-66.08***	17.74	-2.69	-20.01*	11.52	-0.81	-82.62***	27.93	-3.36
LAB	32.60**	16.75	2.17	36.73**	15.41	2.45	30.79	26.55	2.05
LMP	7.74**	3.67	1.64	2.86*	1.76	0.61	9.21*	5.46	1.95
SPEC	36.32**	17.52	5.03	14.41*	7.72	2.00	47.63*	27.59	6.59

Note: estimates based on equation (4). T-statistics based on clustered standard errors at the industry-country level are reported in parenthesis. *, **, *** denote significance at 10, 5 and 1 percent, respectively. Differential in the dependent variable computed for an industry whose characteristics would increase from the 25th percentile to the 75th percentile of the financial dependence distribution when fiscal stabilization would increase from the 25th to the 75th percentile. EFD= external financial dependence; DEP= capital depreciation; ISTC=investment specific technological change; RND=R&D intensity; FIX= asset fixity; LAB= labor intensity; LMP=investment lumpiness; SPEC= relation-specific investment.

Table 9. The effect of fiscal stabilization on industry growth: Alternative measures of fiscal stabilization

	Primary balance to GDP (N=19158)			Cyclically-adjusted balance to GDP (N=12001)		
Channel	Coef	s.e	differential effect (%)	Coef	s.e	differential effect (%)
EFD	3.47	2.54	0.40	1.55	7.04	0.18
DEP	0.46	0.58	0.63	1.94*	1.15	2.70
ISTC	0.65	1.43	0.45	-0.78	2.26	-0.53
RND	0.41	2.57	0.03	-2.72	5.52	-0.21
FIX	-13.53*	8.32	-0.55	-34.01**	17.30	-1.38
LAB	19.38**	9.97	1.29	43.61**	19.11	2.91
LMP	1.85	1.52	0.39	3.74	3.78	0.79
SPEC	8.51*	5.10	1.18	11.38	11.23	1.57

Note: estimates based on equation (4). T-statistics based on clustered standard errors at the industry-country level are reported in parenthesis. *, **, *** denote significance at 10, 5 and 1 percent, respectively. Differential in the dependent variable computed for an industry whose characteristics would increase from the 25th percentile to the 75th percentile of the financial dependence distribution when fiscal stabilization would increase from the 25th to the 75th percentile. EFD= external financial dependence; DEP= capital depreciation; ISTC=investment specific technological change; RND=R&D intensity; FIX= asset fixity; LAB= labor intensity; LMP=investment lumpiness; SPEC= relation-specific investment.

Table 10. The effect of fiscal stabilization on industry growth: Omitted variable bias

	Baseline (N=20786)			Real GDP growth (N=20786)			Government expenditure/GDP (N=20786)		
Channel	Coef	s.e	differential effect (%)	Coef	s.e	differential effect (%)	Coef	s.e	differential effect (%)
EFD	6.80	4.67	0.79	7.11	4.65	0.83	6.34	4.57	0.74
DEP	1.89*	1.14	2.64	2.18**	1.12	3.03	1.45	0.93	2.01
ISTC	3.39	2.93	2.32	3.16	2.80	2.16	1.95	2.62	1.33
RND	1.16	4.88	0.09	1.08	4.83	0.08	0.53	4.74	0.04
FIX	-52.77***	14.69	-2.15	-53.22***	14.62	-2.17	-44.84***	13.98	-1.83
LAB	44.80**	19.25	2.98	49.91***	19.27	3.32	45.34***	19.29	3.02
LMP	6.08**	2.78	1.29	6.16**	2.78	1.31	5.13*	2.65	1.09
SPEC	22.69**	11.57	3.14	24.12**	10.81	3.34	16.53*	9.42	2.29
	Private credit/GDP (N=19573)			Inflation (N=20786)			Uncertainty (N=13983)		
Channel	Coef	s.e	differential effect (%)	Coef	s.e	differential effect (%)	Coef	s.e	differential effect (%)
EFD	6.43	4.93	0.75	6.84	4.68	0.80	4.72	4.80	0.55
DEP	2.15*	1.20	2.99	1.91*	1.14	2.66	0.86	0.73	1.20
ISTC	3.19	3.06	2.18	3.38	2.93	2.31	-0.08	1.77	-0.05
RND	0.00	5.09	0.00	1.16	4.89	0.09	2.33	4.20	0.18
FIX	-54.56***	15.76	-2.22	-53.23***	14.69	-2.17	-31.93***	11.66	-1.30
LAB	51.81***	20.76	3.45	45.16***	19.29	3.01	12.19	11.66	0.81
LMP	5.92**	2.93	1.26	6.09**	2.79	1.29	3.80	2.65	0.81
SPEC	23.28**	11.92	3.22	22.79**	11.58	3.16	6.93	7.73	0.96

Note: estimates based on equation (5). T-statistics based on clustered standard errors at the industry-country level are reported in parenthesis. *, **, *** denote significance at 10, 5 and 1 percent, respectively. Differential in the dependent variable computed for an industry whose characteristics would increase from the 25th percentile to the 75th percentile of the financial dependence distribution when fiscal stabilization would increase from the 25th to the 75th percentile. EFD= external financial dependence; DEP= capital depreciation; ISTC=investment specific technological change; RND=R&D intensity; FIX= asset fixity; LAB= labor intensity; LMP=investment lumpiness; SPEC= relation-specific investment.

Table 11. The effect of fiscal stabilization on industry growth: Labor, capital, productivity

	Employment growth (N=20650)			Capital growth (N=15675)			Labor productivity growth (N=20650)		
Channel	Coef	s.e	differential effect (%)	Coef	s.e	differential effect (%)	Coef	s.e	differential effect (%)
EFD	6.72**	3.17	0.78	18.04*	10.60	2.10	0.99	2.97	0.12
DEP	1.49**	0.69	2.08	4.73	3.95	6.58	0.71	0.84	0.99
ISTC	0.40	1.95	0.28	10.33	7.40	7.06	3.16*	1.87	2.16
RND	1.63	3.53	0.13	14.98	10.97	1.17	0.51	2.43	0.04
FIX	-27.47***	9.41	-1.12	-52.32	41.22	-2.13	-25.72***	9.90	-1.05
LAB	36.29***	12.47	2.42	28.35	42.40	1.89	8.63	11.39	0.57
LMP	3.95**	1.92	0.84	9.64	7.18	2.04	2.44	1.74	0.52
SPEC	17.43***	5.85	2.41	72.92**	30.55	10.09	5.52	9.27	0.76

Note: estimates based on equation (4). T-statistics based on clustered standard errors at the industry-country level are reported in parenthesis. *, **, *** denote significance at 10, 5 and 1 percent, respectively. Differential in the dependent variable computed for an industry whose characteristics would increase from the 25th percentile to the 75th percentile of the financial dependence distribution when fiscal stabilization would increase from the 25th to the 75th percentile. EFD= external financial dependence; DEP= capital depreciation; ISTC=investment specific technological change; RND=R&D intensity; FIX= asset fixity; LAB= labor intensity; LMP=investment lumpiness; SPEC= relation-specific investment.

Table 12. The effect of fiscal stabilization on industry growth: Recessions vs. expansions

	Value added growth (N=20779)					
	Recession			Expansion		
Channel	Coef	s.e	differential effect (%)	Coef	s.e	differential effect (%)
EFD	13.48**	6.98	1.57	-1.22	6.44	-0.14
DEP	1.97	1.75	2.74	1.79	1.58	2.49
ISTC	4.39	3.50	3.00	1.98	4.18	1.35
RND	9.95	6.83	0.78	-9.48*	5.76	-0.74
FIX	-77.90***	21.42	-3.17	-19.83	18.96	-0.81
LAB	13.27	25.25	0.88	83.35****	25.77	5.55
LMP	9.07***	3.72	1.92	2.29	3.94	0.49
SPEC	20.73	16.95	2.87	25.38	16.14	3.51

Note: estimates based on equation (6). T-statistics based on clustered standard errors at the industry-country level are reported in parenthesis. *, **, *** denote significance at 10, 5 and 1 percent, respectively. Differential in the dependent variable computed for an industry whose characteristics would increase from the 25th percentile to the 75th percentile of the financial dependence distribution when fiscal stabilization would increase from the 25th to the 75th percentile. EFD= external financial dependence; DEP= capital depreciation; ISTC=investment specific technological change; RND=R&D intensity; FIX= asset fixity; LAB= labor intensity; LMP=investment lumpiness; SPEC= relation-specific investment.

Table 13. The effect of fiscal stabilization on industry growth: Horse race

	All economies (N=20786)			Advanced economies (N=11744)			Developing economies (N=9042)		
Channel	Coef	s.e	differential effect (%)	Coef	s.e	differential effect (%)	Coef	s.e	differential effect (%)
EFD	5.99	8.34	0.70	7.97*	4.32	0.93	3.79	12.71	0.44
FIX	-75.61***	29.36	-3.08	-34.42**	16.84	-1.34	-107.16**	46.08	-4.36
LAB	31.45	21.19	2.09	28.33***	10.83	1.89	24.26	37.59	1.62
LMP	-8.55	7.18	-1.81	-5.76*	3.50	-1.22	-11.43	10.72	-2.42
SPEC	12.25	14.72	1.70	-0.27	7.06	-0.04	27.91	25.40	3.86

Note: estimates based on equation (4) by including EFD, FIX, LAB, LMP, and SPEC channels altogether. T-statistics based on clustered standard errors at the industry-country level are reported in parenthesis. *, **, *** denote significance at 10, 5 and 1 percent, respectively. Differential in the dependent variable computed for an industry whose characteristics would increase from the 25th percentile to the 75th percentile of the financial dependence distribution when fiscal stabilization would increase from the 25th to the 75th percentile. EFD= external financial dependence; FIX= asset fixity; LAB= labor intensity; LMP=investment lumpiness; SPEC= relation-specific investment.

Appendix

Table A.1. Industry classification: INDSTAT2 vs. INDSTAT3

INDSTAT2		INDSTAT3	
ISIC	Industry	ISIC	Industry
15	Food products and beverages	311	Food
16	Tobacco products	313	Beverages
17	Textiles	314	Tobacco
18	Wearing apparel; dressing and dyeing of fur	321	Textiles
19	Tanning and dressing of leather	322	Apparel
20	Wood and of products of wood and cork, except furniture	323	Leather
21	Paper and paper products	324	Footwear
22	Publishing, printing and reproduction of recorded media	331	Wood products
23	Coke, refined petroleum products and nuclear fuel	332	Furniture, except metal
24	Chemicals and chemical products	341	Paper and products
25	Rubber and plastics products	342	Printing and publishing
26	Other non-metallic mineral products	351	Industrial chemicals
27	Basic metals	352	Other chemicals
28	Fabricated metal products, except machinery and equipment	353	Petroleum refineries
29	Machinery and equipment n.e.c.	354	Misc. pet. And coal products
30	Office, accounting and computing machinery	355	Rubber products
31	Electrical machinery and apparatus n.e.c.	356	Plastic products
32	Radio, television and communication equipment and apparatus	361	Pottery, china, earthenware
33	Medical, precision and optical instruments, watches and clocks	362	Glass and products
34	Motor vehicles, trailers and semi-trailers	369	Other nonmetallic mineral products
35	Other transport equipment	371	Iron and steel
36	Furniture; manufacturing n.e.c.	372	Nonferrous metals
		381	Fabricated metal products
		382	Machinery, except electrical
		383	Machinery, electric
		384	Transport equipment
		385	Prof. and sci. equip.
		390	Other manufactured products