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U.S. Investment Since the Tax Cuts and Jobs Act of 2017

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Abstract

There is no consensus on how strongly the Tax Cuts and Jobs Act (TCJA) has stimulated U.S. private fixed investment. Some argue that the business tax provisions spurred investment by cutting the cost of capital. Others see the TCJA primarily as a windfall for shareholders. We find that U.S. business investment since 2017 has grown strongly compared to pre-TCJA forecasts and that the overriding factor driving it has been the strength of expected aggregate demand. Investment has, so far, fallen short of predictions based on the postwar relation with tax cuts. Model simulations and firm-level data suggest that much of this weaker response reflects a lower sensitivity of investment to tax policy changes in the current environment of greater corporate market power. Economic policy uncertainty in 2018 also subdued investment growth, although to a lesser extent.

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The Tax Cuts and Jobs Act (TCJA) signed into law on December 22, 2017, made significant changes in the personal and business income tax systems.² A central objective of the law was to lower the tax burden on businesses and encourage them to increase investment. The TCJA permanently cut the statutory corporate income tax rate from 35 to 21 percent and introduced temporary capital expensing, allowing companies to fully deduct certain types of capital spending from their pre-tax earnings.³ It also introduced international tax provisions aimed at encouraging companies to repatriate foreign earnings and invest them in the United States. The cost of the TCJA is estimated at some US\$1.9 trillion over 10 years (Congressional Budget Office 2018).⁴

More than a year after the passage of the TCJA, there is no consensus on how strongly it has stimulated private fixed investment. Some argue that, by lowering the cost of capital, the TCJA's tax provisions have significantly increased business investment (Council of Economic Advisers 2019). Others argue that businesses have used only a small portion of the cash freed up by the TCJA to increase investment (Krugman 2018, for example). It may be that a full assessment of the effects of the TCJA will need to await availability of more data, including to reflect lags in the issuance of regulations for certain provisions of the law.

This paper presents a preliminary assessment, based on available data, of the performance of U.S. investment since the passage of the TCJA from three different angles. First, we take stock of how private investment has performed since 2017 compared to forecasts made before the TCJA. To put U.S. investment performance into international perspective, we also conduct this comparison for other advanced economies. We additionally examine whether U.S. investment growth has been broad-based or driven by specific investment categories or economic sectors. Second, we investigate how much of the investment growth in 2018 reflects the strength of aggregate demand. In particular, we assess how much of the rise in non-residential (business) investment compared with pre-TCJA forecasts is explained by the theoretical relationship between investment and expectations of future demand. Third, we assess the investment outturn against what could have been expected based on the empirical literature on how economic activity and investment respond to postwar U.S. changes in tax policy.

Our findings indicate that U.S. non-residential (business) investment growth since 2017 has been strong. As we report in Section I, the level of U.S. business investment reached by the end of 2018 was about 4.5 percent higher than forecasters had generally anticipated in the Fall of 2017, before the enactment of the TCJA. On a Q4/Q4 basis, business investment growth in 2018 was greater than had been anticipated by 3.5 percentage points. This overperformance was stronger than that seen in other advanced economies, where investment growth was broadly in line with

² The law's formal title is "HR1: An Act to provide for reconciliation pursuant to titles II and V of the concurrent resolution on the budget for fiscal year 2018."

³ The TCJA allows 100 percent expensing on new investments in assets with less than 20-year depreciable life through 2022, to be reduced by 20 percentage points per year thereafter. For an overview of the TCJA, see Chalk, Keen and Perry (2018).

⁴ This estimated cost incorporates macroeconomic feedback effects, as estimated by the CBO. Without these effects, the estimated static cost is about US\$2.3 trillion (CBO 2018).

or below expectations. Components of U.S. business investment that grew especially strongly compared to pre-TCJA forecasts were equipment and software, and intellectual property.

At the same time, the overall strength in aggregate demand appears to have been the primary driver of the rise in business investment since 2017. As Section II reports, the rise in business investment is consistent with a forward-looking accelerator model in which investment responds to expectations of future overall demand, as measured by private-sector forecasts of growth in the non-investment part of output. This suggests that factors that raised aggregate demand—including the rise in disposable income from the TCJA and higher government spending from the 2018 Bipartisan Budget Act (BBA)—encouraged companies to expand capacity to meet the incremental customer demand. There appears to be little unexplained component of business investment beyond the expected demand effect. Other factors, such as reductions in the cost of capital, thus appear to have played a relatively minor role. This result is consistent with surveys of both large and small companies, which show that only 10-25 percent of businesses attributed planned increases in investment to the 2017 changes in the tax code. Moreover, balance sheet data for listed (S&P500) firms suggest that only about 20 percent of the increase in corporate cash balances since the passage of the TCJA has been used for capital and R&D spending. Much of the remainder was used for share buybacks, dividend payouts, and other asset-liability planning and balance sheet adjustments.

In addition, we find that the investment response to the TCJA thus far has been smaller than would have been predicted based on the effects of previous U.S. tax cut episodes. As Section III explains, empirical studies based on postwar U.S. data suggest that the impact of tax cuts on GDP and investment typically peaks within the first year. When the estimates from these studies are calibrated to the scale of the TCJA tax cuts, following Mertens 2018, the predicted impact on GDP in 2018 averages 1.3 percentage points, and the predicted impact on business investment is 5.2 percentage points on a Q4/Q4 basis. The actual increases in GDP and investment growth since the passage of the TCJA compared with pre-TCJA forecasts have been below these predictions, at 0.7 and 3.5 percentage points, respectively.

In Section IV, we investigate two factors that may have dampened the output and investment response to the TCJA compared to previous postwar episodes of tax cuts: increased economic policy uncertainty and greater corporate market power.

A large literature finds a negative relation between policy uncertainty and business investment.⁵ We draw on this literature to quantify the impact of the rise in policy uncertainty indices since 2017, which has occurred in the context of growing uncertainty regarding trade and other policies in the United States and other countries. We find that policy uncertainty has played a role in subduing investment growth in 2018.

In a novel contribution, we investigate the role of market power in stunting the impact of the TCJA on business investment compared to previous postwar episodes of tax cuts. A growing

⁵ See, for example, Bernanke (1983); Bloom, Bond, and Van Reenen (2007); Handley and Limão (2015); Baker, Bloom, and Davis (2016).

literature documents a widespread rise in market power in advanced economies over the past several decades.⁶ To our knowledge, our paper is the first to investigate the link between the rise in market power and the potency of tax policy changes.^{7,8} We start by presenting simulation results from the IMF’s Global Integrated Monetary and Fiscal (GIMF) general equilibrium model, which show that a cut to the corporate tax rate theoretically produces a considerably smaller response in investment, output, employment, and real wages when corporate markups are high. Next, we investigate if this theoretical result is also borne out empirically using firm-level investment and employment data for 17 advanced economies, a narrative dataset of fiscal shocks (Guajardo, Leigh, and Pescatori 2014), and estimates of markups at the firm level (Díez, Leigh, and Tambunlertchai 2018). We find that the impact of tax changes on investment and employment is significantly smaller in firms with higher markups. Similar results hold when looking only at 2018 data for U.S. publicly listed companies. Firms with higher estimated markups increased investment (and investment growth) by less in 2018 than those firms who were pricing closer to marginal cost. Section V concludes.

I. HOW HAS U.S. PRIVATE INVESTMENT PERFORMED SINCE 2017?

To investigate the strength of investment since the passage of the TCJA, we compare the 2018 outturn in real private fixed investment with the forecast made before the TCJA was enacted. We use forecasts from the Fall 2017 vintage of the IMF’s *World Economic Outlook* (WEO) database, which were explicitly based on the assumption of unchanged U.S. fiscal policies.⁹ Projections from this vintage are in line with those made by other forecasters at around the same time, such as those available from *Consensus Economics* and the *Survey of Professional Forecasters*. To investigate the possibility that the Fall 2017 vintage of forecasts may have reflected positive anticipated effects of the TCJA, we check the evolution of forecasts for 2018 going back as far as 2015—well before the current administration took office and discussions of the TCJA were in the public domain—and find no systematic change in the forecasts of 2018 growth over that period (Figure 1). Actual investment outturns compared to forecasts made in the Fall of 2017 are thus likely to be informative regarding the causal effects of the TCJA, as well as of other major policy changes that occurred around the same time, such as passage of the BBA, which increased government spending.

Our results show that U.S. real private fixed investment in 2018 significantly outperformed pre-TCJA expectations. In addition, such a pickup in investment was not observed in other advanced

⁶ See De Loecker and Eeckhout (2017); Díez, Leigh, and Tambunlertchai (2018); De Loecker and Eeckhout (2018); and IMF (2019).

⁷ Krugman (2018) suggests that monopoly power is a factor that has diminished the impact of the TCJA on investment.

⁸ Higher market power may additionally affect the optimal level of investment even in the absence of tax policy changes (see Díez, Leigh, and Tambunlertchai 2018). However, in this paper, we investigate a separate issue—whether market power affects the effectiveness of tax policy changes in raising investment.

⁹ The Fall 2017 WEO explains (p. 13) that the forecasts were based on the assumption of unchanged U.S. fiscal policies. The Fall 2017 WEO was compiled on the basis of information available through September 18, 2017.

economies. Figure 2 shows comparisons of real private fixed investment outturns in 2018 against forecasts for the United States and other advanced economies. While total real private fixed investment in the other countries performed largely as expected or underperformed compared to forecasts, in the United States investment exceeded pre-TCJA expectations by 2.2 percent. Real private fixed investment in the United States already started outperforming forecasts in 2017Q4.¹⁰

The strong performance in real private fixed investment in 2018 was led by non-residential (business) investment, which overperformed pre-TCJA forecasts by 4.7 percent, as Figure 3 reports. On a Q4/Q4 basis, business investment growth in 2018 was greater than had been anticipated by 3.5 percentage points.¹¹ By contrast, residential investment fell below the pre-TCJA forecast in 2018. Growth in business (non-residential) investment was broad-based across categories of business investment. The equipment and software and IP categories saw the highest growth and accounted for most of the business investment deviation from the pre-TCJA forecast, as shown in Figure 4. Investment in structures started the year strongly, but then tapered and, overall, contributed little to the growth in business investment in 2018.¹²

The pickup in investment in 2018 also coincided with higher oil prices and a pickup domestic oil production. Accordingly, some have suggested that the strength of business investment growth in 2018 came primarily from the energy sector (Arnon 2018 and Smith 2018). Our own analysis of the oil sector's contribution to different types of investments is shown in Figure 5.¹³ We find that the oil sector accounts for virtually all of the growth in the structures category of investment in 2017 and 2018. Structures investment has moved closely with oil prices in previous years as well. However, the oil sector contributes little to non-structures (equipment, software, and IP) investment. We conclude that the oil sector's role in driving overall business investment growth in 2018 was relatively small.

¹⁰ CEA (2019) attributes the pickup in investment in 2017Q4 to firms already shifting forward their investment in reaction to news that full expensing for new equipment would be retroactive to September 2017.

¹¹ We use the National Income and Product Accounts data from the Bureau of Economic Analysis. Business investment (non-residential fixed investment) growth in 2018 was 7.0 percent on a Q4/Q4 basis. Using an alternative measure of business investment—the sum of private nonresidential fixed investment by (a) nonfinancial corporate business; (b) nonfinancial noncorporate business, and (c) financial institutions, based on the Distribution of Gross Domestic Product data from the Federal Reserve's Financial Accounts of the United States—real business investment growth in 2018 was 7.4 percent (Q4/Q4). For 2017, the rates of business investment growth based on the above two measures are, respectively, 6.3 and 6.4 percent on a Q4/Q4 basis.

¹² This small contribution also reflects the relatively small share of structures investment in total business investment (around 20 percent).

¹³ Our analysis is based on the National Income and Product Accounts statistics, which includes mining activity.

II. HOW MUCH OF THE HIGHER INVESTMENT REFLECTS THE STRENGTH OF AGGREGATE DEMAND?

To understand the role that the TCJA has played in raising investment, we first assess how much of the investment growth can be explained by the prevailing strength of aggregate demand. We do so by comparing the evolution of business investment with the predictions of a standard forward-looking accelerator model that links investment choices to expectations of future product demand.

The standard accelerator model of investment predicts that firms increase investment when opportunities for selling their products arise.¹⁴ Strong economic conditions that generate large current and expected future sales are therefore likely to spur new investments. The TCJA was widely expected to generate greater product demand as cuts to personal income taxation were deficit financed and raised households' disposable income. This demand boost was further strengthened by the increased government spending in the BBA that was signed into law on February 9, 2018. Taking this into account, companies would have planned to increase their investment in anticipation of future demand. This would have happened in addition to any response to changes in the user cost of capital.

The empirical specification of the forward-looking accelerator model we estimate uses real-time private-sector forecasts to capture expected demand growth. The equation we estimate is:

$$(1) \quad I_t = \alpha + \beta(L)E_t\Delta Y_{t+h} + \delta K_{t-1} + \epsilon_t$$

where I_t denotes real business investment in the IP and equipment and software categories, and $E_t\Delta Y_{t+h}$ denotes the forecast of growth over the next h quarters, taken from *Consensus Economics*. To address the fact that current investment may be related to future expected investment, which is part of expected output growth, we conduct the estimation using the *Consensus Economics* forecast of the non-investment part of output (GDP excluding investment). We use the 4-quarter-ahead *Consensus Economics* forecast of non-investment output growth (so $h = 4$ in equation 1). The sample spans 1983Q4-2016Q4. Based on the model estimates, we make out-of-sample predictions for 2017Q1-2018Q4. We exclude structures investment from our estimation to avoid introducing the afore-mentioned volatility induced by oil price fluctuations.

Our results suggest that U.S. investment growth since 2017 reflects expectations of strong aggregate demand. Figure 6 reports the actual and predicted values for business investment under the afore-mentioned accelerator model specification. The model provides a close fit with actual investment. The fact that there is little unexplained strength in investment since 2017 suggests

¹⁴ The standard accelerator model is derived as in Jorgenson and Siebert (1968). The empirical specification for the model typically follows Oliner, Rudebusch, and Sichel (1995): $I_t = \alpha + \sum_{i=0}^N \beta_i \Delta K_{t-i}^* + \delta K_{t-1} + \epsilon_t$, where I_t denotes real business investment and ΔK_t^* denotes the change in the desired capital stock, which, in turn, is assumed to be proportional to the change in output: $\Delta K_t^* = \sigma \Delta Y_t$. The analysis typically includes 12 lags of the changes in output ($N = 12$) and the equation is normalized by the lagged capital stock, K_{t-1} , to address potential nonstationarity.

that factors beyond expectations of aggregate demand—such as the lower user cost of capital associated with the reduced corporate tax rate and the full capital expensing—have played a relatively minor role in stimulating investment since 2017. Alternatively, it could be that the tax reform had a greater positive effect that was offset by other contemporaneous developments (as we discuss in Section IV).

The demand-based interpretation of the strength in business investment since 2017 is consistent with responses to company surveys. The Small Business Surveys conducted by the National Federation of Independent Business (NFIB), which covers over 2,000 firms with fewer than 100 employees across a broad range of sectors, show that the net percentage of firms expecting higher real sales over the next six months started to climb in 2017, signaling rising demand conditions. At the same time, and in line with our results, business surveys also suggest that only a small proportion of firms directly attribute increases in planned investment to the TCJA. In the quarterly Business Conditions Survey conducted by the National Association of Business Economics (NABE), only 11 percent of surveyed firms attributed the acceleration of their investment to the TCJA while only 4 percent reported redirecting investment or hiring to the United States as a result of the TCJA.¹⁵ Firms' responses by broad sectors are reported in Figure 7. The goods producing sector was the more likely to have accelerated or redirected business to the US in response to the TCJA while the service sector was the least likely to do either. An analysis by Hanlon, Hoopes, and Slemrod (2018) of earnings conference calls of S&P500 companies in 2018Q1 reveals that only 22 percent of firms mentioned planned increases in investment that were linked to the TCJA (with the retail sector being the most likely to make such an announcement). Similarly, a survey of the NFIB focusing on the TCJA, fielded between February and April 2018, reveals that only 24 percent of small business owners planned to use their tax savings to increase business investments.¹⁶

The relatively small share of firms attributing planned increases in investment to the TCJA contrasts with the large tax savings companies have received. Publicly available U.S. Treasury data indicated that corporate tax revenue in FY2018 fell by US\$92 billion—a 31 percent drop. Where then have firms put the incremental free cash from the TCJA? Figure 8 shows an analysis of the use of funds of S&P500 companies since end-2017. Only about 20 percent of the incremental cash outflow post-TCJA went towards capital expenditure or R&D while the rest went towards share buybacks, dividends, and other activities. While this use of cash does not directly lead to capital formation, it may indirectly affect consumption and investment as the cash is reallocated across the economy.

Overall, these results are consistent with earlier work that finds that expectations of product demand are a principal driver of business investment decisions. Similarly, earlier research (IMF

¹⁵ Following the passage of the TCJA at end-2017, the Business Conditions Survey conducted quarterly by the National Association of Business Economics began including the following question in 2018: Has your firm changed any hiring or investment decisions as a result of the 2017 Tax Cuts and Jobs Act? a) has your business accelerated investment?; and b) has your business redirected hiring/investment to the U.S.?

¹⁶ In the NFIB survey about the TCJA, 51 percent of small business owners expected to pay less in federal income tax in 2018. Of those, 47 percent reported planning to increase business investment with their tax savings.

2015, for example) found that the weak performance of business investment in the aftermath of the Great Recession primarily reflected the weakness of aggregate demand rather than other factors associated with changes in regulations or policy uncertainty.

III. HOW HAS INVESTMENT PERFORMED COMPARED WITH THE HISTORICAL RELATION BETWEEN TAX CUTS AND INVESTMENT?

A large literature assesses the macroeconomic effects of postwar U.S. tax changes.¹⁷ The principal methods to address the problem that tax revenue changes may be endogenous to economic conditions have been the structural vector autoregression (SVAR), as in the seminal work of Blanchard and Perotti (2002) or the narrative approach pioneered by Romer and Romer (2010), which uses historical policy documents to identify tax policy changes motivated by long-term considerations rather than a response to prospective economic conditions. More recently, Mertens and Ravn (2013) combine these two approaches to estimate the macroeconomic effects of personal and income tax changes. While the studies differ in methodologies and estimates of the tax multiplier, they all conclude that changes in taxes typically have substantial effects on output and investment, with the impact on growth peaking within the first year.

To obtain a prediction of the impact of the TCJA on real GDP and investment, we use the results of Mertens (2018) who applies estimates from existing studies of postwar U.S. tax policy changes to calibrate the impact of the individual, business, and international tax provisions of the TCJA. The studies are those of Blanchard and Perotti (2002), Caldara and Kamps (2017), Favero and Giavazzi (2012), Mertens and Ravn (2013), Mertens and Ravn (2014), Mertens and Ravn (2012), and Romer and Romer (2010). Mertens (2018) applies the results of these studies to the tax provisions of the TCJA, as described by the Joint Committee on Taxation (2017) and summarized in Table 1. Overall, Mertens (2018) estimates that the impact of the TCJA on real GDP growth in 2018 should have been in the range of 0.9 to 1.8 percentage points on a Q4/Q4 basis. To obtain the predicted impact on investment, we scale the GDP responses predicted by Mertens (2018) by the ratio of the business investment and GDP responses to changes in business and personal income taxes as estimated by Mertens and Ravn (2013). Overall, we calculate that the implied predicted rise in business investment would be between 3.4 and 7.2 percentage points on a Q4/Q4 basis.

The actual increases in real GDP and business investment in 2018 compared with pre-TCJA forecasts—0.7 and 3.5 percentage points, respectively—fall at the low end of the aforementioned estimated impacts based on historical tax changes. Figure 9 presents the various estimates of the effect on GDP and investment from the TCJA alongside the actual impact. We focus on the impact defined as the real outturn compared with the Fall 2017 WEO forecast. Results are similar compared to pre-TCJA forecasts from *Consensus Economics* and the *Survey*

¹⁷ See, for example, Blanchard and Perotti (2002); Romer and Romer (2010); Favero and Giavazzi (2012); and Mertens and Ravn (2013).

of *Professional Forecasters* (SPF).¹⁸ Overall, we conclude that investment has, so far, fallen short of predictions based on the postwar relation with tax cuts.

IV. WHAT MAY HAVE HELD BACK INVESTMENT?

We focus on two potential explanations for why investment may have fallen short of what could have been expected based on the U.S. postwar historical relation between tax changes and investment, albeit recognizing that other factors may simultaneously be at play.

The first is heightened economic policy uncertainty which may have caused firms to delay their investment plans. The other is that the rise in market power, as documented in a number of recent studies, may have rendered tax considerations less important in firms' investment decisions. Other countervailing factors may have been at work, including investment adjustment costs (although adjustment costs would have been present in previous postwar episodes of tax cuts as well) and the fact that a number of regulations are still being issued and aspects of the code may not yet be clear.

A. Policy Uncertainty

Economic theory suggests that when investment is irreversible, uncertainty about future conditions generates an option value of waiting for more information and thereby curbs investment (Bernanke 1983). The impact of uncertainty on investment may also occur through changes in the credit spread (Gilchrist and others 2014) or spending cutbacks by households (Baker and others 2016). The negative relationship between uncertainty and investment has been confirmed empirically. Panousi and Papanikolaou (2012) report that a rise in firm-specific uncertainty leads managers to underinvest, especially when they own a larger fraction of the firm. Baker and others (2016) find that economic policy uncertainty reduces investment rates among firms with exposure to government spending or shifts in regulatory policy.

After the TCJA was enacted at end-2017, trade disagreements increasingly made headlines, adding to economic policy uncertainty. Figure 10 shows the evolution over time of indices for trade policy uncertainty (TPU) and economic policy uncertainty (EPU) for the United States, as developed by Baker, Bloom, and Davis 2016. Both indices climbed substantially during 2018.

To quantify the impact of economic policy uncertainty on investment decisions in the United States, we estimate a VAR model on quarterly data over the period 1990Q1-2018Q2 to derive the impulse response of real business investment to shocks to the EPU Index for the United States over the sample period. In line with earlier studies, we find that economic policy uncertainty has a negative impact on business investment. As shown in Figure 11, increased uncertainty during 2018, as measured by the EPU index, is estimated to have cumulatively

¹⁸ The CEA (2019) calculates the actual impact of the TCJA on GDP at 1.4 percentage points. The non-TCJA baseline growth for 2018 consistent with such an impact on GDP would, given the CEA (2019) forecast for 2018 growth of 3.2 percent, be 1.8 percent. With GDP growth forecasts tracking well above 2 percent through much of 2017, such a low baseline for 2018 growth would be significantly below pre-TCJA forecast made in real time and difficult to reconcile with the strong economic conditions already prevailing.

reduced investment by about 0.4 percent. This impact is modest compared with the aforementioned predicted investment growth impact of 3.4 to 7.2 percentage points based on the historical relation with tax changes. Similarly, Altig and others (2019) estimate that effects from trade policy uncertainty on investment in 2018 have been modest, based on a Federal Reserve of Bank of Atlanta *Survey of Business Uncertainty* (SBU), which includes around 1,000 U.S. private companies. They estimate that policy uncertainty resulting from tariff hikes and trade policy tensions reduced capital investment in 2018 by 1.2 percent.¹⁹

B. The Role of Market Power

A growing literature suggest that, over the last few decades, corporate market power has increased in the United States and other advanced economies. Díez, Leigh, and Tambunlertchai (2018) document a rise in markups across advanced economies, with, for the United States, a sales-weighted average increase in corporate markups of 42 percent from 1980 to 2016 (Figure 12). Their findings are broadly consistent with those of De Loecker and Eeckhout (2017, 2018) and IMF (2019), based on different datasets.

The rise in markups has been associated with rising overall profitability at the firm level and greater concentration at the industry level, suggesting increased corporate market power and a rise in monopoly rents. A potential question regarding the increase in estimated markups is whether it is driven by firms recouping fixed costs of intangible investments rather than a rise in market power. However, as documented in the afore-mentioned studies, the rise in markups is strongly correlated with measures of overall profitability at the firm level, suggesting that the recouping of fixed costs is not driving the estimated rise in markups. Similarly, the finding of rising markups holds up when the estimation methodology controls for overhead cost at the firm level, which suggests that technological change associated with shifts in overhead costs is not driving the estimated rise in markups.

A larger share of monopoly rents in corporate profits would imply that corporate taxes are less distortionary, with tax incidence increasingly falling on rents rather than on the normal return to capital. In such an environment, a cut to the corporate income tax rate would increase post-tax monopoly profits but induce a smaller behavioral response in production and investment decisions. A tax cut today, therefore, could be expected to have a smaller impact than as documented in previous studies using U.S. postwar data purely due to the changing nature of the industrial structure in the United States This is the possibility we investigate.

Role of Market Power: Model Simulations

To investigate the role of market power in dampening the investment sensitivity to tax changes, we first use simulations of the Global Integrated Monetary and Fiscal Model (GIMF) model, a multi-region dynamic general equilibrium model developed by IMF staff for policy analysis.²⁰ In

¹⁹ Altig and others (2019) estimate that the negative impact on manufacturing capital investment was greater, at -4.2 percent, reflecting the greater sensitivity of the sector to international trade.

²⁰ See Kumhof, Laxton, Mursula, and Muir (2010) for an overview of the GIMF model's structure.

the GIMF model, greater market power is captured by the higher markups of price over marginal cost. The corporate income tax revenue-to-GDP ratio is defined by the following standard accounting identity:

$$(2) \quad \frac{T^{CIT}}{Y} = \tau^{CIT} \left[(R^K - \delta) \frac{K}{Y} + \left(1 - \frac{1}{\mu}\right) \right]$$

where τ^{CIT} is the effective corporate tax rate, R^K is the return to capital, δ is the depreciation rate, and K/Y capital stock to GDP. The parameter μ is the markup of price over marginal cost, thus $\left(1 - \frac{1}{\mu}\right)$ represents monopoly profit. The rental rate of capital covers the depreciation rate and, once the corporate tax has been paid, the cost of loanable funds. Therefore, distortions implied by the corporate income tax can be expressed by the following standard equation:

$$(3) \quad R^K - \delta = \frac{r}{(1-\tau^{CIT})}$$

where r is the risk-free rate. In equilibrium, the steady state share of investment in GDP is determined by the rental rate of capital, the weight of capital in the production function (α), the depreciation rate, and the markup, as follows:

$$(4) \quad \frac{I}{Y} = \frac{\delta\alpha}{\mu R^K}$$

Equation (4) illustrates the standard theoretical result that, in steady state, higher markups imply lower investment. Our focus, is, however, not on the steady-state relation between markups and investment but, instead, on the relation between markups and the responsiveness of investment to tax cuts.

In this context, the afore-mentioned theoretical link between market power and the investment response to a tax cuts applies. However, there is also an additional channel. Greater market power, with larger markups (μ) implies, other things equal, a larger corporate income tax-to-GDP ratio and, hence, that the same ex-ante cut to tax revenue requires a smaller decrease in the effective corporate tax rate. The smaller decrease in the effective tax rate in turn means a smaller reduction in distortions which diminishes the positive impact on investment. Higher markups also mean, as already mentioned, a lower steady-state investment ratio which, when coupled with the lower investment impact from the same reduction in tax revenue, a smaller increase in GDP.

To illustrate these effects, we simulate the macroeconomic impact of a corporate tax cut equivalent to 1 percent of GDP in three states of the world—one where firms have low markups of 10 percent, one with medium markups of 25 percent, and one with markups of 60 percent. These markup calibrations correspond, approximately, to the afore-mentioned estimates of U.S. markups in 1980, 1990, and in 2016. Simulation results confirm that the tax cut induces smaller responses in GDP, investment, wages, and employment when the level of markups is higher. Figure 13 summarizes the effects on these variables ten years after the tax cut. The increase in investment in the low markup world corresponding to markups at the level estimated for 1980 is

more than double the investment response in the high markup world corresponding to the level of markups estimated for 2016.²¹

Role of Market Power: Firm-Level Empirical Estimates

We next investigate whether the theoretical prediction that higher markups dampen firms' reactions to tax cuts holds up empirically by assessing how firm-level investment and employment have responded to changes in fiscal policy.

Evidence from fiscal shocks in OECD countries

We first estimate the effect of tax policy changes on corporate investment and employment for a panel of advanced economies by combining three datasets. For firm-level investment and employment data, we use the Thompson Reuters *Worldscope* dataset with a sample starting from 1980 for advanced economies. For firm-level markups, we use the estimates of Díez, Leigh, and Tambunlertchai (2018). For estimates of fiscal shocks, we use the narrative dataset of Guajardo, Leigh, and Pescatori (2014), which covers the 1978-2009 period for 17 OECD countries. To shed light on the effects of tax policy changes, we focus on the authors' series of tax-based fiscal shocks, where changes in taxation account for the majority of the budgetary impact. The authors construct the series of fiscal shocks based on the historical record and exclude fiscal policy changes that policy documents suggest were motivated by prospective cyclical conditions. They also present evidence that the identified fiscal shocks are orthogonal to news regarding economic conditions.

The equation we estimate has the firm's investment rate—capital expenditure as a share of the previous year's capital stock—as the dependent variable on the left-hand side.²² On the right-hand side, the main variable of interest is the interacted term between the fiscal shock and firm-level markups. The equation we estimate is:

$$(5) \quad Y_{ijkt} = \beta \Delta F_{kt} + \gamma (\Delta F_{kt} \times \ln \mu_{ijkt}) + \sum_x \theta_x x_{ijkt} + \sum_i \alpha_i + \sum_t \theta_t + \epsilon_{ijkt}$$

where Y_{ijkt} is the investment rate of the i th firm in the j th sector in country k in year t , ΔF_{kt} is the fiscal shock, and μ_{ijkt} the markup. The equation controls for firm (α_i) and time (θ_t) fixed effects. The inclusion of fixed effects allows us to isolate the relation with markups, after controlling for features of individual firms and broader macroeconomic developments. To shed light on how market power may influence firm-level employment behavior, we also re-estimate equation (5) with Y_{ijkt} denoting employment growth. The variable x denotes additional controls,

²¹ The 10-year horizon illustrated is chosen for illustrative purposes and the relative magnitudes of the responses are similar over shorter horizons.

²² The capital stock is measured by data for property, plant, and equipment available in *Worldscope*.

which, in the baseline specification includes the markup, μ_{ijkt} . A limitation of our focus on publicly traded firms is that their behavior may be different from that of privately held firms.²³

The estimation results, reported in Table 2, suggest that a tax-based fiscal expansion raises firm-level investment and employment, but that higher markups dampen the effect. To address the potential concern that the results are driven by sector-specific developments and factors, we also estimate equation (5) with additional controls, namely sector-time dummies, finding that the negative effect from the interaction term holds.

To illustrate the economic significance of the results, Figure 14 plots the investment and employment responses for the different levels of markups found in the sample. A rise in corporate markups 40 percent, roughly equivalent to the rise in markups in the United States between 1980 and 2016, as estimated by Díez, Leigh, and Tambunlertchai (2018), reduces the investment response to a 1 percent of GDP tax-based fiscal expansion by 45 percent. A more moderate rise in market power of 28 percent, equivalent to the difference between U.S. markups in 2016 and the post-war U.S. average, reduces the investment response by about 37 percent.²⁴ The estimated weakening in the impact of tax cuts on corporate investment and employment behavior as market power rises is broadly in line with the afore-mentioned GIMF simulation results.

Evidence for U.S. firms in 2018

To provide evidence linked more directly to the effects of the TCJA and the behavior of U.S. firms, we examine 2018 data available for S&P500 companies. We estimate an equation for the growth rate in firm-level capital expenditure in 2018, as well as for the change in the growth rate in firm-level capital expenditure, as follows:

$$(6) \quad Y_{ij} = \beta \ln \mu_{ij} + \sum_j \alpha_j + \epsilon_{ij}.$$

where Y_{ij} is the capital expenditure growth or the change in the capital expenditure growth, respectively, for company i in industry j as a function of the (log) markup (μ) of company i in 2016. Estimates of the company markups come, as before, from Díez, Leigh, and Tambunlertchai (2018). The equations estimated include industry-fixed effects to account for the fact that companies in different industries may have differed in how they responded to the TCJA

²³ At the same time, the firms in our sample account for a large share of national economic activity and thus cast light on macroeconomically relevant developments. For 2016, the U.S. firms in the sample have sales equivalent to 79 percent of U.S. GDP.

²⁴ To approximate the postwar U.S. level of market power, we assume that the level of markups in the 1950s through the 1970s is equal to the average level of markups in the 1980s. This assumption is consistent with the estimates of De Loecker and Eeckhout (2017) for the pre-1980 period. Combining this assumption with our estimates of markups for the 1980-2016 period implies a postwar average markup of 1.25 (25 percent). The estimated markup in 2016 is 1.60 (60 percent). Based on these markup levels and the coefficient estimates in Table 2 (column 1) implies that a rise in markups from the postwar average level to the 2016 level reduces the investment rate response to a 1 percent of GDP tax-based fiscal expansion from 0.92 percentage point to 0.58 percentage point, implying a reduction in the response of 37 percent $((0.58/0.92) - 1)$.

and may have responded differentially to other developments in 2018, such as, for example, shifts in oil prices.

We find that companies with higher markups in 2016 increased investment by less in 2018. The estimation results, reported in Table 2, imply that a 50 percent increase in markups reduces firm-level investment growth by 2.9 percentage points. In the second specification, we address the possibility that stronger market power could weaken investment growth in general (as suggested by IMF 2019 and Gutiérrez and Philippon 2018, for example) and not only following tax cuts. We investigate whether the *change* in capital expenditure growth in 2018 was related to the degree of market power. The results suggest that the change in capital expenditure growth was less positive for companies with greater markups in 2016. A 50 percent increase in markups reduces the change in capital expenditure growth by an estimated 7.4 percentage points.

These results hold up to a number of robustness checks. We address the possibility that firms with more market power and higher markups in 2016 may have systematically faced lower tax rates, and that this correlation affects the estimated coefficient on markups in equation (6). We re-estimate equation (6) while also controlling for the effective tax rate for firm i (defined as income tax paid in percent of pre-tax income) in 2016. The estimation results are very similar to those reported in Table 3 and the coefficient on the initial tax rate is statistically indistinguishable from zero. These results imply that the results are not being driven by any such relation and that the investment responses did not significantly vary with initial tax incidence. We also address the possibility that firms facing financing constraints and a negative shock in 2016, which potentially lowered markups in that year, may have cut investment in 2016 and then sought to catch up on their investment plans once economic conditions improved in 2017 and 2018. We allow for this possibility by controlling for investment growth and the change in investment growth in 2016, respectively, finding very similar results to those reported in Table 3, suggesting that this factor is not driving the results. In addition, we verify that the results are not driven by any given industry. We repeat the estimation of equation (6) while excluding each major industry from the sample, finding similar results.

Overall, our results suggest that market power has played a significant role in shaping the response of corporate investment to the TCJA. When combined with the observation that market power has increased in recent decades, the results help to explain why investment growth may have fallen short of predictions based on the historical relation between tax changes and investment.

C. Putting Things Together

The factors identified above help account for the apparent shortfall in the investment response compared with the historical relation with tax cuts. To summarize their respective contributions, Figure 15 shows the predicted and actual impact of the TCJA on business investment growth in 2018 along with a decomposition of the gap compared with the average impact identified in the literature on postwar U.S. tax changes.

In Figure 15, the predicted impact of the TCJA represents the average of the studies described in Section III. We also include the predicted additional boost to business investment coming from the BBA. To do this, we assume that the BBA had an effect on GDP of 0.2 percent, based on an

assumed government expenditure multiplier of one-half which is in the conservative range of the literature. A larger multiplier would further increase the gap between the predicted and actual response of investment. We translate this effect on GDP into an effect on business investment based on the range of estimates of the link between investment and output in the literature (as discussed in IMF 2015, for example). Together, based on these historical relations, the two pieces of legislation should have increased investment by 5.7 percentage points compared with the pre-TCJA baseline.

The actual impact is defined, as before, as the difference between the business investment growth outturn in 2018 and the forecast produced for the Fall 2017 IMF WEO, which, as already discussed, is 3.5 percentage points. The outturn thus fell short the predicted impact by 2.2 percentage points ($5.7 - 3.5$).

High corporate markups account for much of the gap between the predicted and actual response of investment. To approximate the contribution of greater market power to the observed gap, we use the difference between the level of markups estimated in 2016 and on average in the postwar period, the sample on which past studies of the effects of tax cuts are based. As already mentioned, a rise in markups from levels prevailing in the postwar period to the level estimated in 2016 significantly reduces the estimated response of investment and can, here, explain 1.3 percentage points of the 2.2 percentage point gap. The rise in corporate market power therefore offers an explanation for why investment has not been stronger. Our estimate from Section IV.A suggests that policy uncertainty can account for an additional 0.4 percentage point of the gap, leaving an unexplained residual of 0.5 percentage point.

D. Other Factors

In addition to policy uncertainty and market power, other factors may explain the shortfall in investment in 2018 compared to predictions based on the historical relation between tax cuts and investment.

First, the considerable complexity of the new tax regime, combined with the current lack of complete regulations on the changes to the tax code, especially its international aspects, could be a reason why some firms have not responded more strongly thus far. The new international tax provisions increase tax liabilities for multinational companies and may thus offset some of the benefits from the lower statutory rate and the full expensing of capital expenditure. The finding by Hanlon, Hoopes, and Slemrod (2018) that multinational firms were the less likely than other firms to make *ex ante* announcements about planned increases in investment lends some support for this explanation.

Second, the timing of the TCJA may have played a part in undercutting its potency. At the time of its passage, the U.S. economy was in the midst of an economic expansion. A number of empirical studies suggest that the macroeconomic effects of changes in fiscal policy are smaller during periods of economic expansion (Auerbach and Gorodnichenko 2012, and others based on government spending changes; for a dissenting view, see Owyang, Ramey, and Zubairy 2013). On the other hand, a corporate tax cut at a time when capacity constraints are closer to becoming binding could, at least in principle, have provided a stronger effect by amplifying project returns.

V. CONCLUSION

In the year following the passage of the TCJA, U.S. business investment grew strongly compared to pre-TCJA forecasts and outperformed investment growth in other major advanced economies.

Evidence suggests that the overriding factor supporting that growth has been the strength of U.S. aggregate demand, likely propelled by higher disposable household income or wealth gains due to the tax cuts and the government spending stimulus from the BBA which occurred simultaneously. While the increase in business investment is undoubtedly positive for economic activity as it increases capital stock and supports productive capacity, the aggregate demand boost could fade as the spending bill and personal income tax cuts expire.

Investment growth in 2018 was also below predictions based on the historical relation between tax cuts and investment as identified by a range of studies in the empirical literature. We estimate that policy uncertainty and, especially, the stronger corporate market power compared to previous postwar episodes of tax policy changes reduced the relative impact of the TCJA on business investment. The rise in corporate market power can account for a large part of the observed gap, offering a new explanation for why investment has not been stronger. Once these two factors are accounted for, other factors appear to have played a limited role (or their effects may have offset one another).

Our results suggest that in an environment of rising market power, corporate tax cuts become less effective at raising investment. They also support the notion that reducing economic policy uncertainty could result in further growth in business investment.

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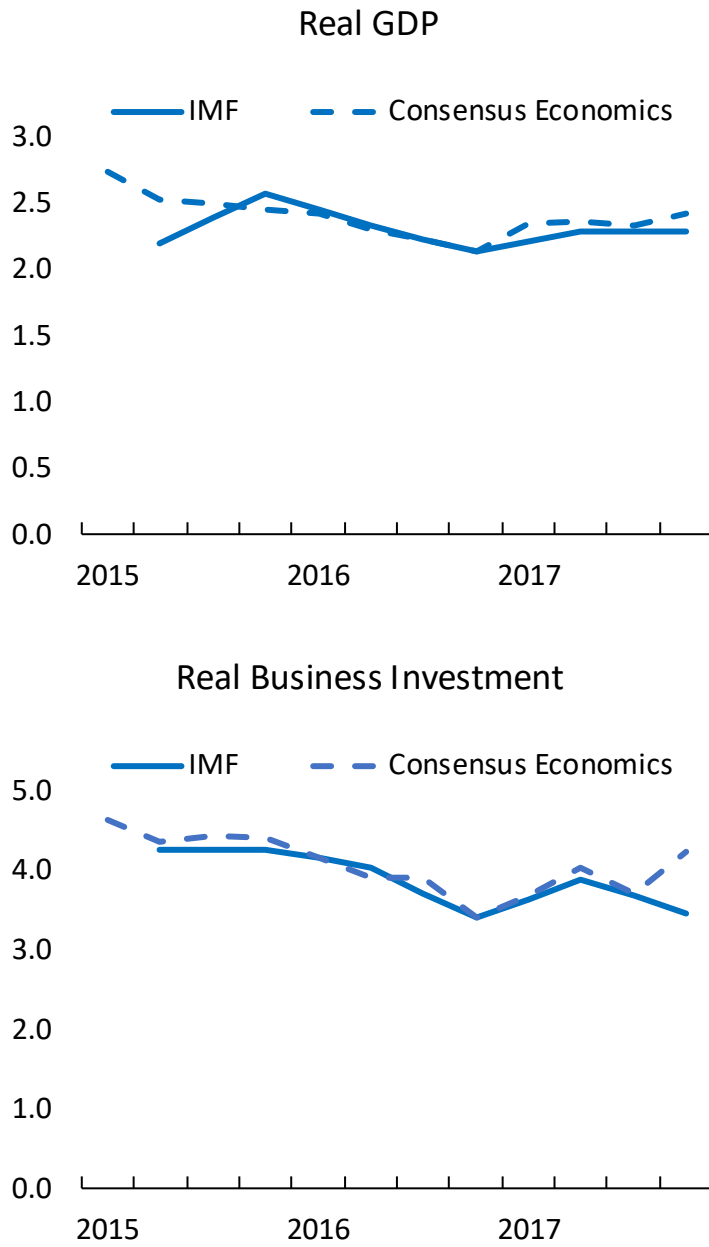
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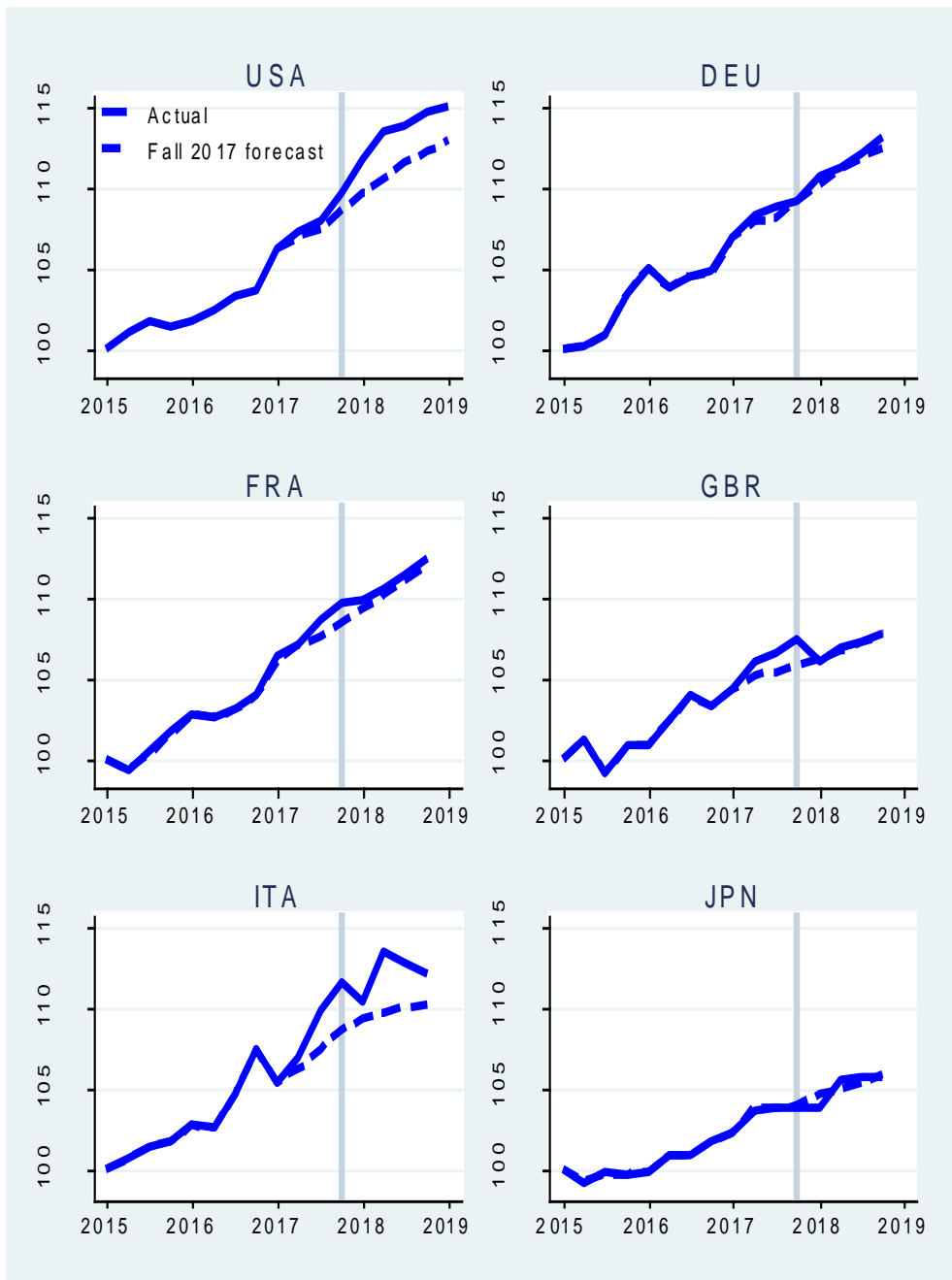
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Figure 1. Evolution of Forecasts of Growth for 2018
(Percent)



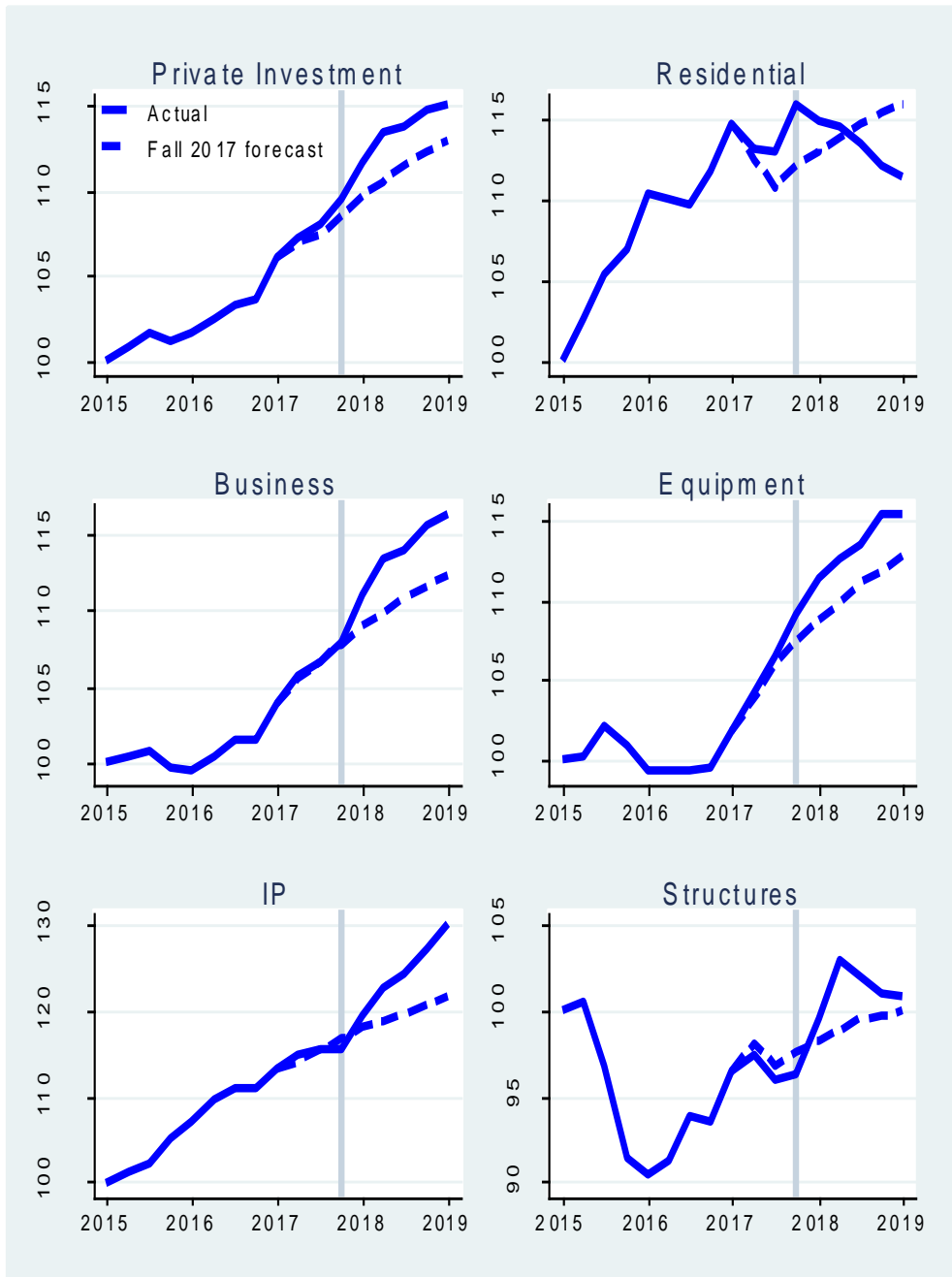
Source: Vintages of IMF staff and *Consensus Economics* forecasts of growth in 2018 from Spring 2015 to Fall 2017.

Figure 2. Real Private Fixed Investment: United States and Other Advanced Economies
(Index; 2015Q4 = 100)



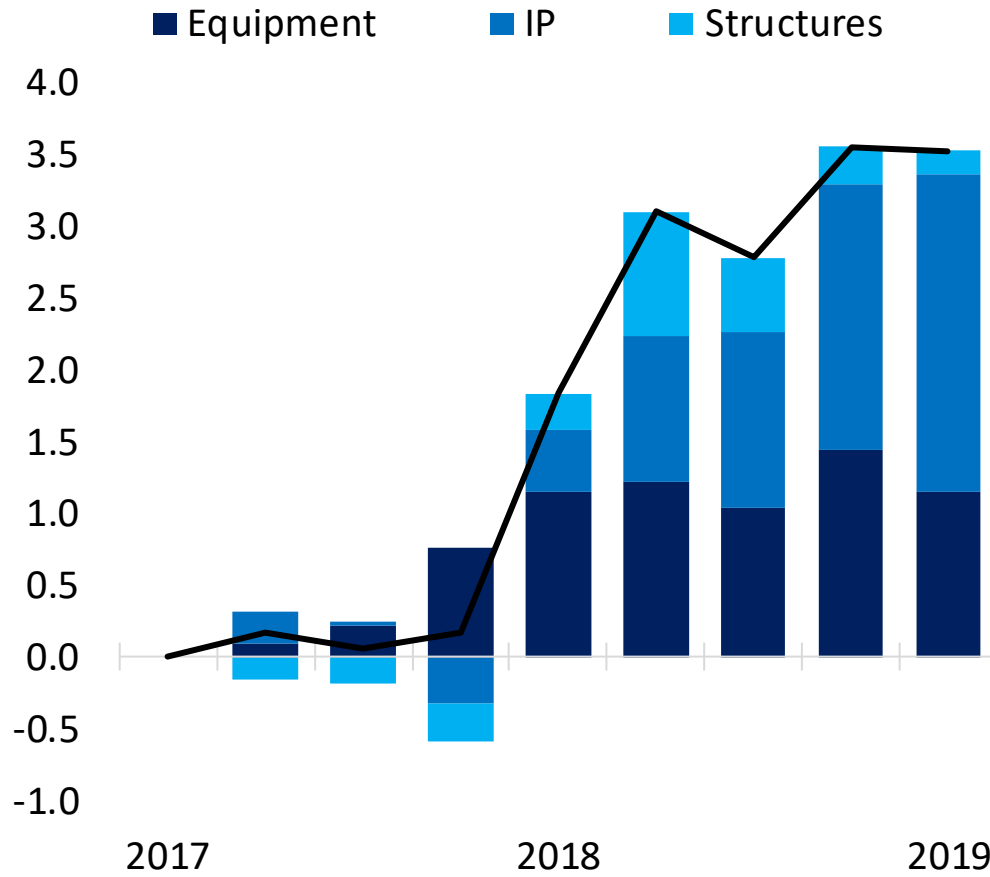
Source: IMF staff forecasts and national accounts data for actual outturns. Figure indicates economies using International Organization for Standardization (ISO) three-letter codes. Vertical line indicates 2017Q4.

Figure 3. U.S. Real Private Fixed Investment
(Index; 2015Q4 = 100)



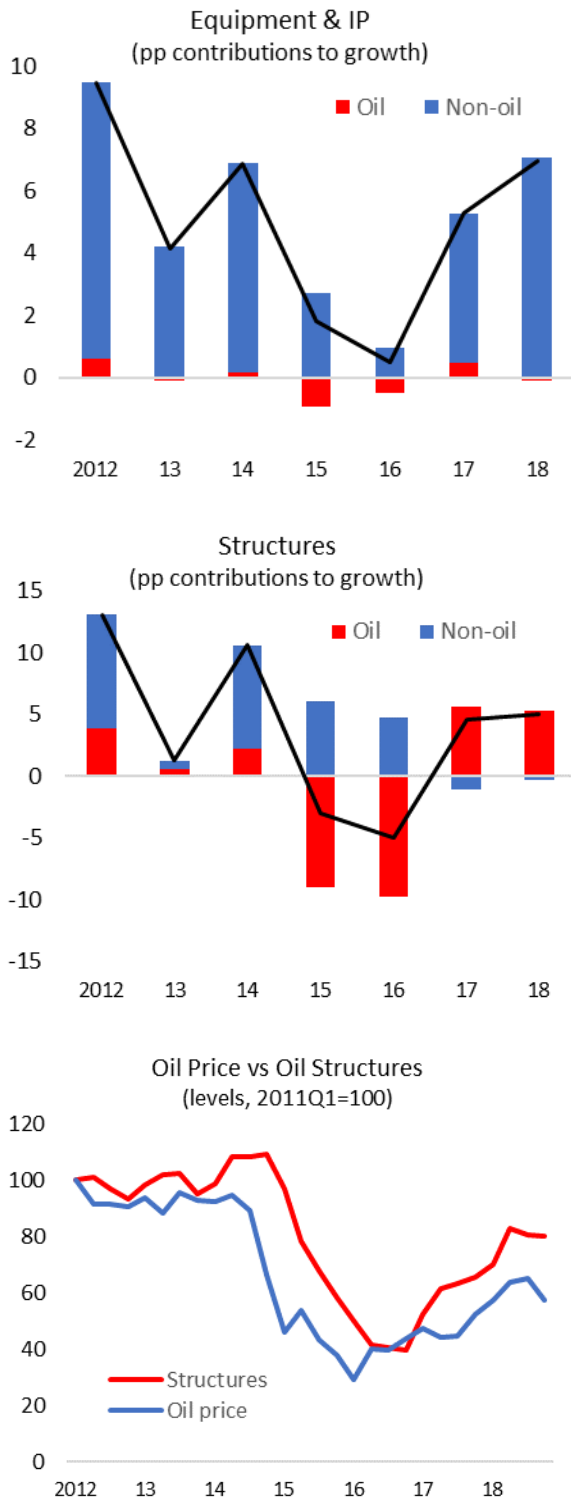
Source: IMF staff forecasts. Vertical line indicates 2017Q4.

Figure 4. Business Investment Level: Deviations from Forecast
 (Percentage point contributions to deviation from Fall 2017 cumulative growth forecast)



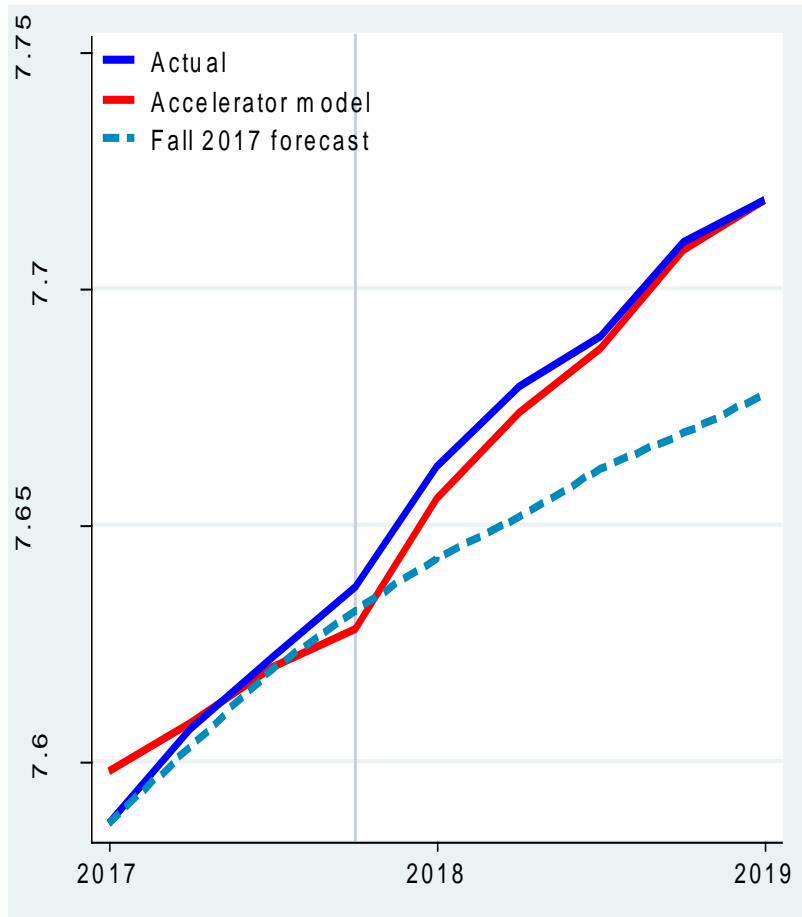
Source: National Income and Product Accounts and authors' calculations. Solid line indicates total business investment deviation from Fall 2017 WEO forecast. Bars indicate contributions to total.

Figure 5. Business Investment: Oil vs. Non-oil Sector



Source: National Income and Product Accounts and author calculations
 Note: Data for the oil sector includes mining activity.

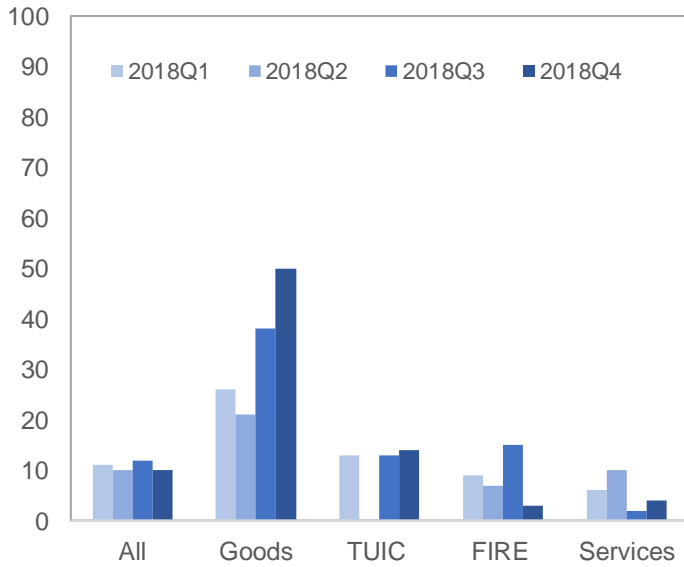
Figure 6. Accelerator Model: Real Business Investment
(Log index)



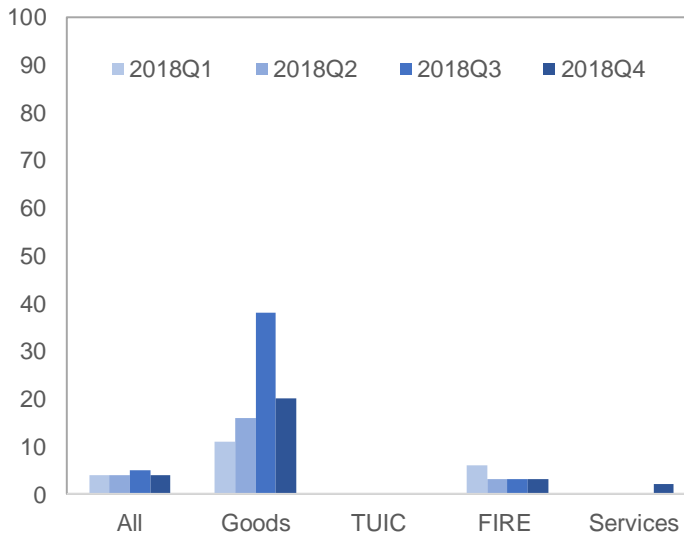
Note: Accelerator model predictions for equipment and IP investment obtained by multiplying the predicted value for the investment rate by the lagged capital stock. Vertical line indicates 2017Q4.

Figure 7. Firm Survey Responses

a. Accelerated investment as a result of TCJA?
(Percent responding “yes”)



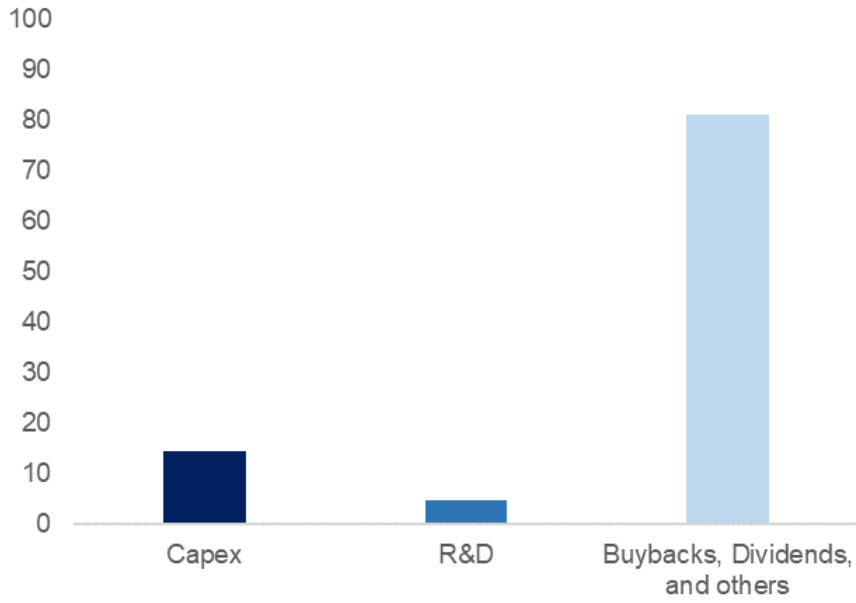
b. Redirected hiring/investment to US due to TCJA?
(Percent responding “yes”)



Source: National Association of Business Economics’ Business Conditions Survey

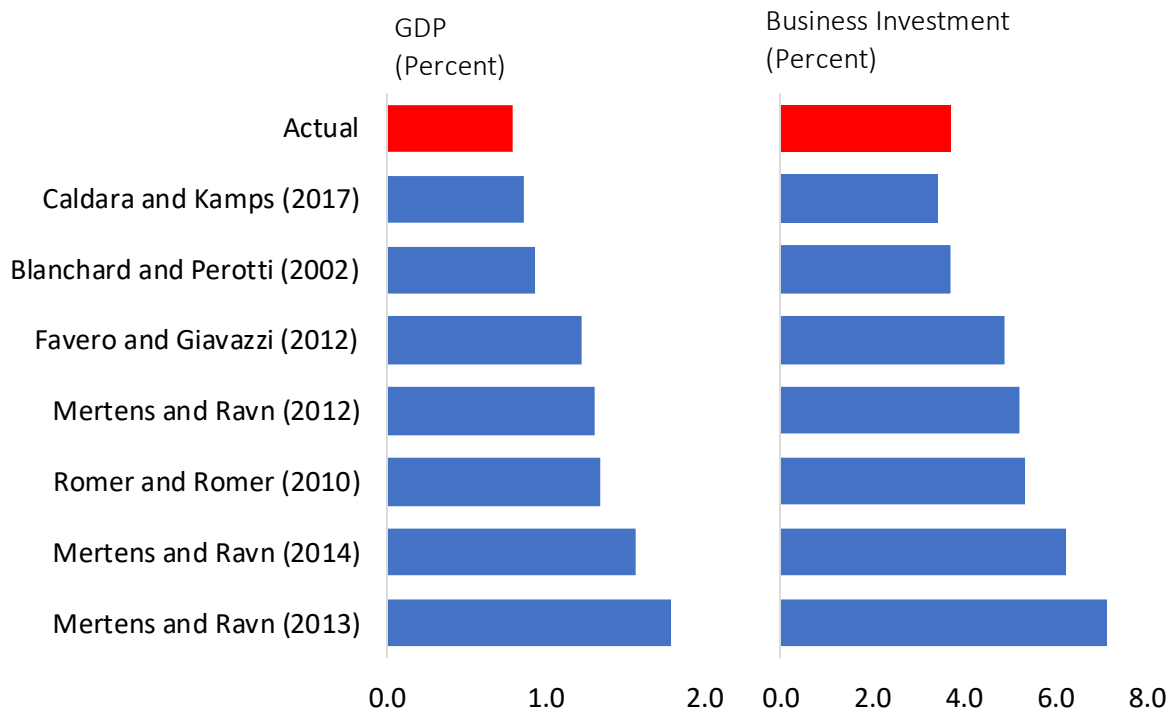
Note: TUIC = Transportation, Utilities, Information, and Communication; FIRE = Finance, Insurance, and Real Estate.

Figure 8. Use of Incremental Cash Since TCJA
(Percent of total)



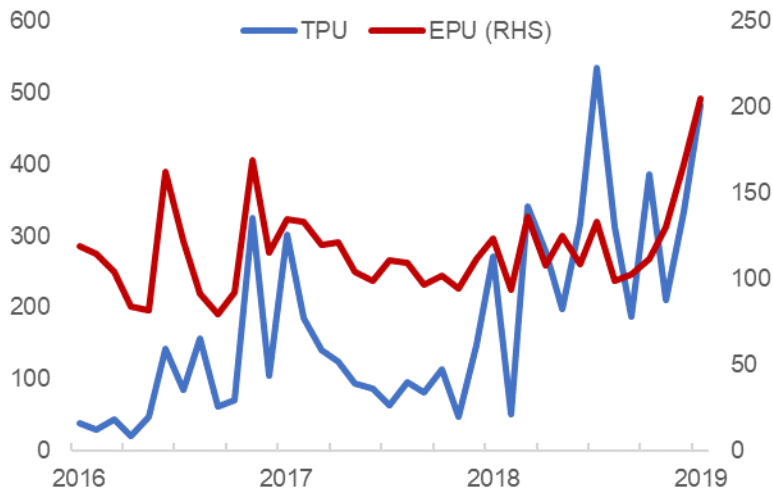
Source: *S&P Global* database and author calculations.

Figure 9. Impact of Tax Cuts and Jobs Act on 2018 Growth: Actual vs. Predicted Based on Existing Empirical Estimates
(Percent; Q4/Q4)



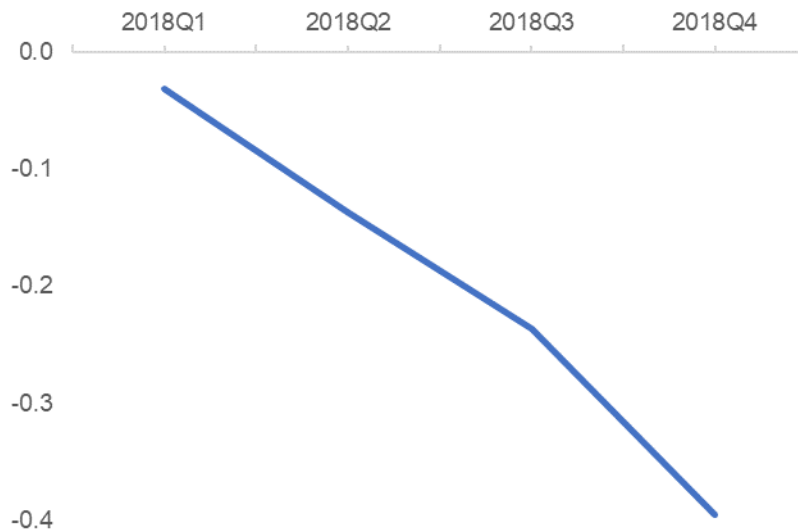
Source: Mertens (2018) and IMF staff forecasts. Consensus denotes *Consensus Economics*. SPF denotes *Survey of Professional Forecasters*.

Note: Actual impact denotes real outcome for GDP and business investment growth compared to IMF staff forecast made in Fall 2017, which was conditional on unchanged U.S. fiscal policy.

Figure 10. Trade Policy Uncertainty and Economic Policy Uncertainty

Source: Baker, Bloom, and Davis (www.PolicyUncertainty.com)

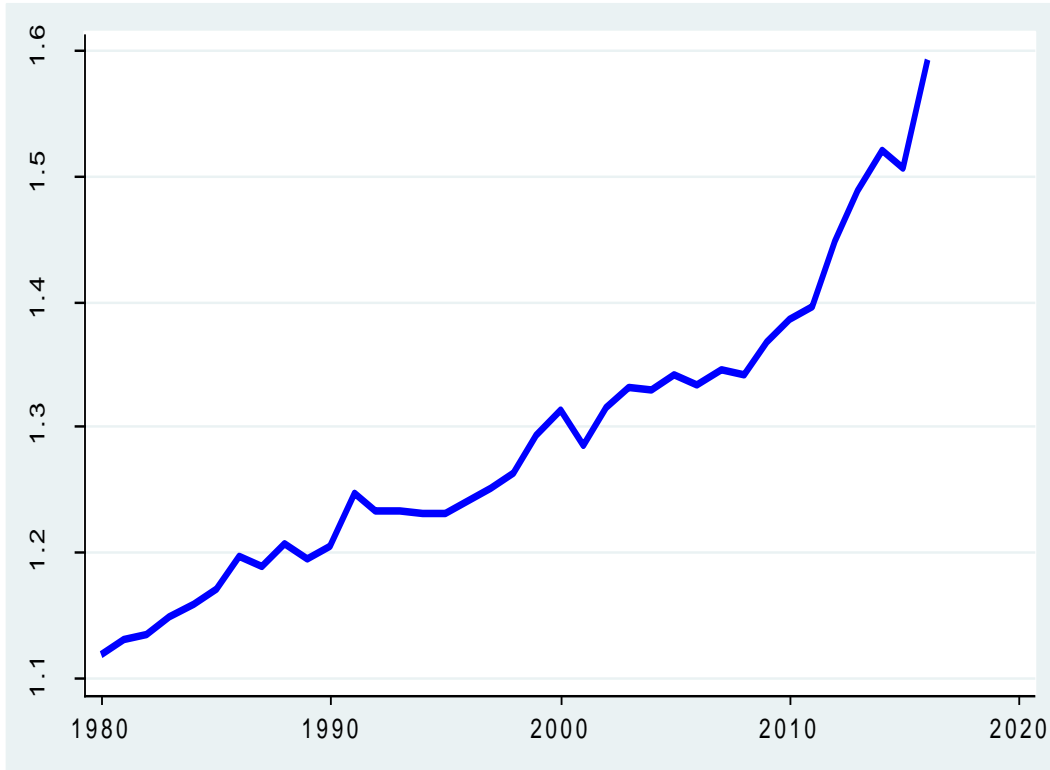
Note: EPU is a composite of news-based policy uncertainty index (10 newspapers), tax code expiration data, and economic forecaster disagreement. The news-based index is constructed from searches for articles containing the term 'uncertainty' or 'uncertain', the terms 'economic' or 'economy,' and one or more of the following terms: 'congress', 'legislation', 'white house', 'regulation', 'federal reserve', or 'deficit'. TPU is a news-based index (2,000+ newspapers) that satisfy economic policy uncertainty terms as well as a set of trade-related policy terms.

Figure 11. Estimated Effect of Economic Policy Uncertainty on Investment in 2018

Source: Baker, Bloom, and Davis (www.PolicyUncertainty.com), authors' calculations

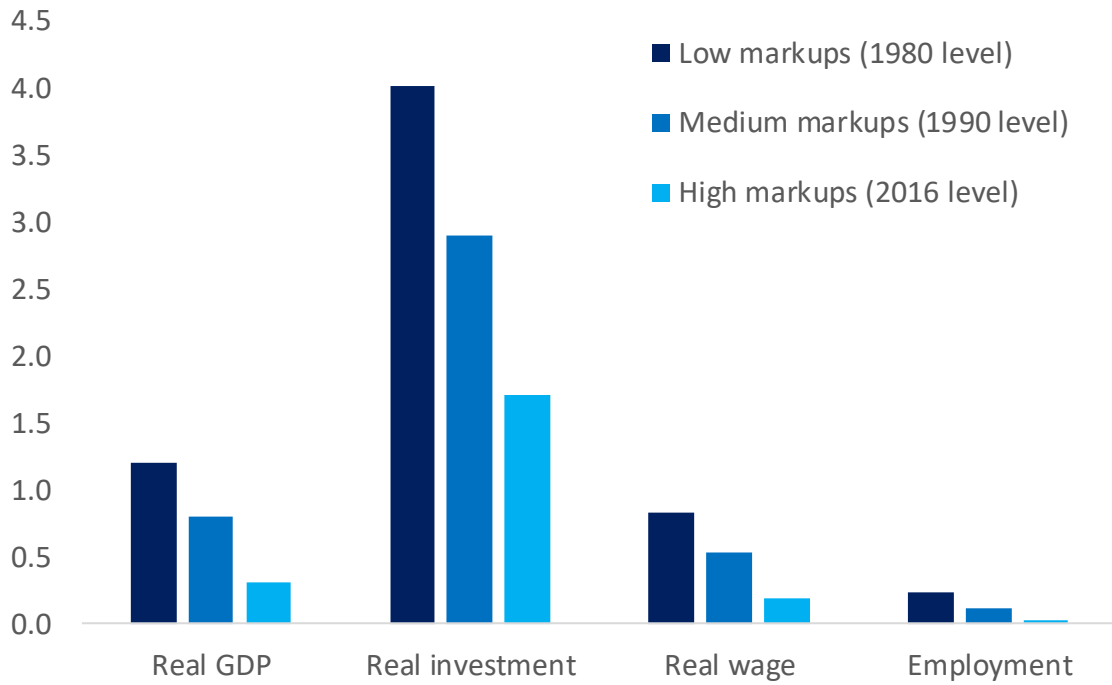
Note: The figure shows the cumulative impact of increased economic policy uncertainty on real business investment, estimated from a vector autoregression model.

Figure 12. United States: Evolution of Estimated Markups
(Sales-weighted mean for all publicly listed firms)

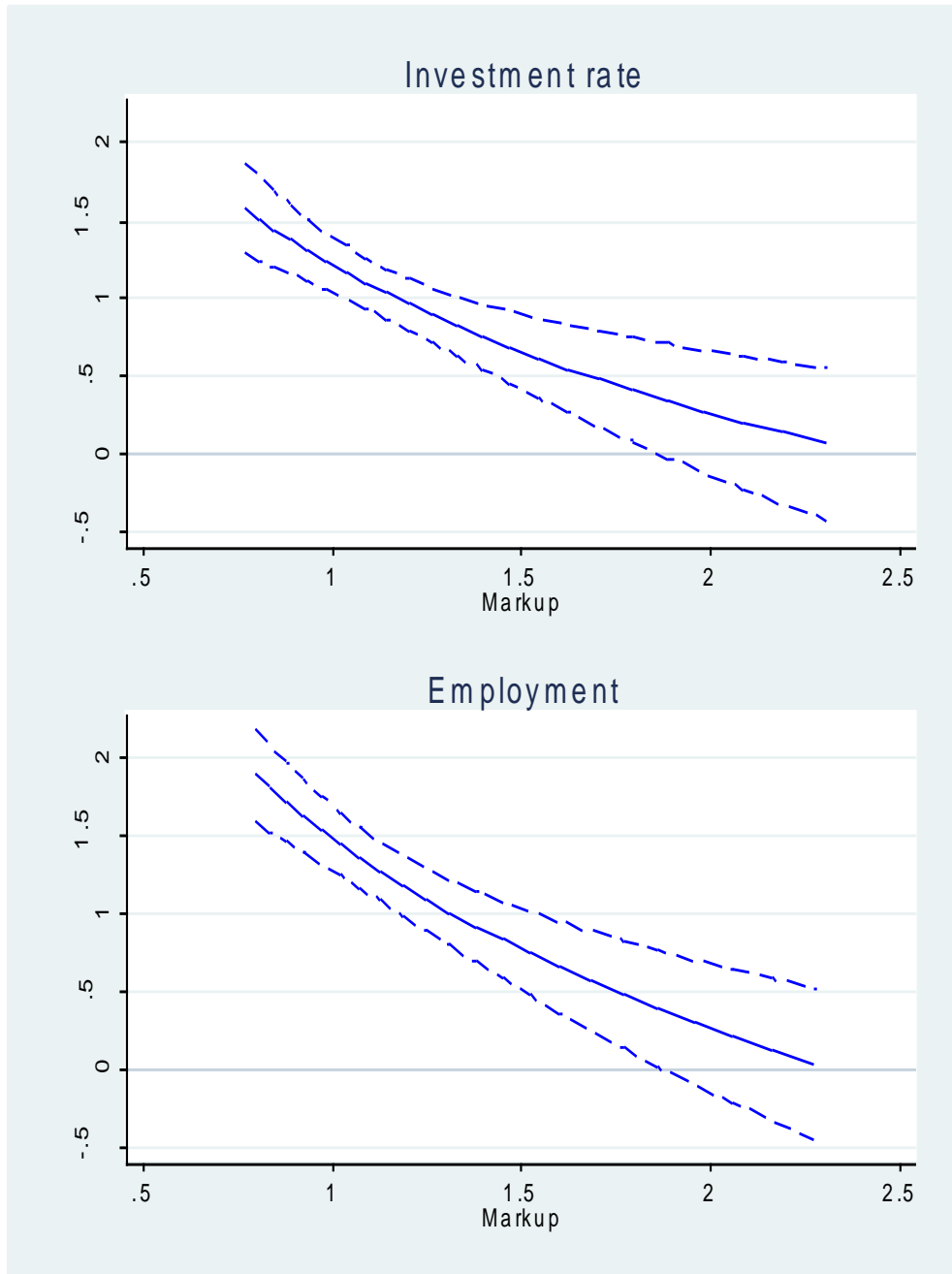


Source: [Díez, Leigh, and Tambunlertchai \(2018\)](#).

Figure 13. Macroeconomic Impact of 1 Percent of GDP Corporate Income Tax Cut
(Percent; Year $t = 10$)

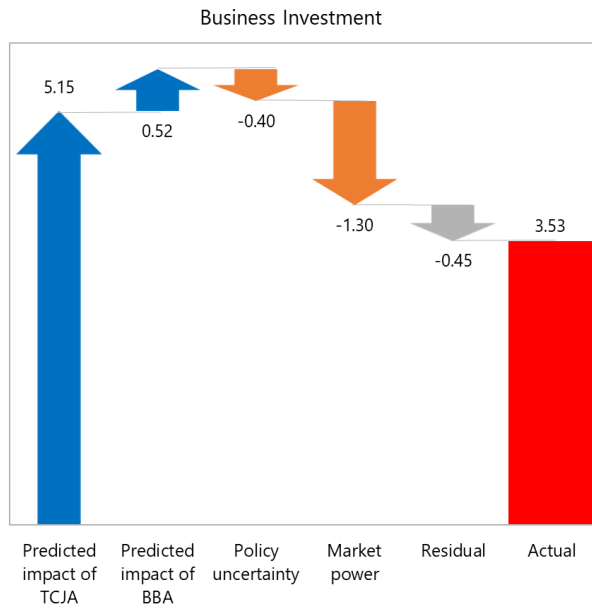


Sources: GIMF simulations. Calibration of markups based on estimates for the U.S. in Díez, Leigh, and Tambunlertchai (2018).

Figure 14. Estimated Effect of Tax-based Fiscal Expansion of 1 Percent of GDP vs. Markup

Note: Dashes indicate 90 percent confidence interval.

Figure 15. Predicted vs. Actual Growth of Business Investment in 2018
(Percentage points; deviation from pre-TCJA baseline)



Note: Predicted impact of TCJA denotes predicted impact of Tax Cuts and Jobs Act (TCJA) based on existing empirical studies of postwar U.S. tax changes (average of studies described in text). Predicted impact of Balance Budget Act (BBA) denotes estimated effect of rise in government spending associated with BBA approved in 2018. Policy uncertainty denotes estimated impact of rise in policy uncertainty in 2018. Market power denotes estimate of reduced effectiveness of TCJA compared with previous postwar episodes of tax changes due to higher level of market power in 2018 than during postwar period. Actual denotes difference between 2018 growth outcome and Fall 2017 forecast. Residual denotes other factors contributing to difference between predicted impact of TCJA and BBA and Actual.

Table 1. Budgetary Impact of the Tax Cuts and Jobs Act
(Percent of pre-TCJA projected GDP)

Provision	2018	2019	2020	2027
Total	-0.7	-1.4	-1.2	0.1
Individual Tax Reform	-0.4	-0.9	-0.8	0.3
Pass-through tax cut	-0.1	-0.2	-0.2	0.0
Other	-0.2	-0.7	-0.6	0.3
Business Tax Reform	-0.6	-0.6	-0.5	-0.2
Reduction in CIT rate (35% to 21%)	-0.5	-0.6	-0.6	-0.6
Expensing of capital spending	-0.2	-0.2	-0.1	0.0
Other	0.0	0.1	0.2	0.3
International Tax Reform	0.3	0.2	0.1	0.0
Memorandum				
Pass-through and CIT rate cut	-0.6	-0.8	-0.8	-0.6

Note: Table reports static budgetary impact estimates from Joint Committee on Taxation (2017) in percent of Congressional Budget Office (June 2017) fiscal year GDP projections.

Table 2. Estimated Effect of Tax-based Fiscal Expansion of 1 Percent of GDP on Firm Investment and Employment

(Percentage points)

$$\text{Equation estimated: } Y_{ijkt} = \beta \Delta F_{kt} + \gamma (\Delta F_{kt} \times \ln \mu_{ijkt}) + \sum_x \theta_x x_{ijkt} + \sum_i \alpha_i + \sum_t \theta_t + \epsilon_{ijkt}$$

	Investment rate			Employment growth		
	(1)	(2)	(3)	(4)	(5)	(6)
Fiscal shock	1.218*** (0.108)			1.487*** (0.126)		
Fiscal shock × markup	-1.374*** (0.389)	-1.117*** (0.420)	-1.406*** (0.416)	-1.756*** (0.392)	-0.700* (0.424)	-1.048** (0.429)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes			Yes		
Country × time FE		Yes	Yes		Yes	Yes
Industry × time FE			Yes			Yes
Number of observations	204,251	204,251	204,251	190,207	190,207	190,207
R-squared	0.074	0.093	0.114	0.035	0.062	0.073

Note: Clustered standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Equations estimated are for the investment rate (columns 1-3) and employment growth rate (columns 4-6) as the dependent variable (Y), respectively, for company i in industry j and country k . Explanatory variables are the country-level fiscal shock in year t , ΔF , the (log) markup (μ) of company i in year t , and the interaction of the two variables. Equations include the estimated (log) markup as an additional control, as well as firm- and year-fixed effects. Equations in columns (2) and (5) include country-time fixed effects. Equations in columns (2) and (5) include both country-time- and industry-time-fixed effects. Estimates of company markups come from Díez, Leigh and Tambunlertchai (2018). Data for the fiscal shocks come from Guajardo, Leigh, and Pescatori (2014).

Table 3. Cross-section Estimation Results: U.S. S&P 500 Companies in 2018Equation estimated: $Y_{ij} = \beta \ln \mu_{ij} + \sum_j \alpha_j + \epsilon_{ij}$.

	CapEx Growth in 2018	Δ CapEx Growth in 2018
Markup (log) in 2016	-0.057** (0.026)	-0.147*** (0.050)
Industry fixed effects	Yes	Yes
Observations	344	342
R-squared	0.098	0.056

Note: Clustered standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Equations estimated are for the growth rate in firm-level capital expenditure and the change in the growth rate in firm-level capital expenditure in 2018 as the dependent variable (Y), respectively, for company i in industry j as a function of the (log) markup (μ) of company i in 2016. Equations include industry-fixed effects. Estimates of the company markups come from Díez, Leigh and Tambunlertchai (2018).