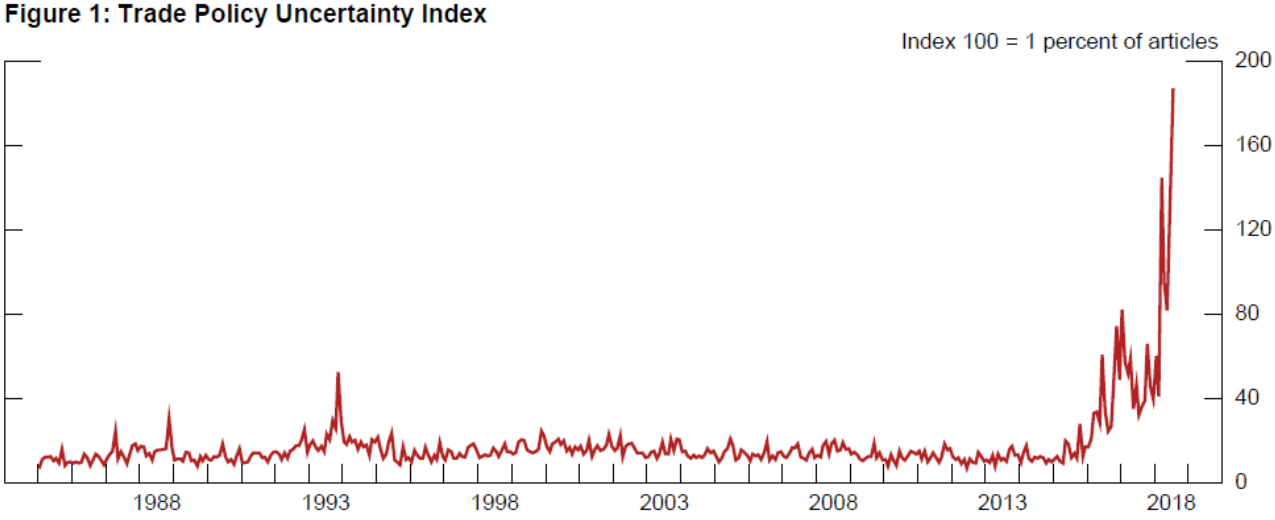
September 14, 2018

Trade Policy Uncertainty and the U.S. Economy[1]

Although recent tariff actions by the United States, and associated foreign retaliation, affect only a small fraction of U.S. trade, current Administration proposals for further action cover a considerable portion of U.S. imports. As such, the outlook for trade policy, and the tariff rates that both U.S. importers and exporters are likely to face, have become highly uncertain. The August Beige Book contained numerous references to trade policy, tariffs, or trade disputes, with the majority of occurrences citing increased uncertainty rather than the realized effect of enacted tariffs.[2] Some measures of trade policy uncertainty, such as the index of newspaper coverage shown in figure 1, show spikes in uncertainty that are nearly an order of magnitude larger than at any point in the previous three decades.[3]

Figure 1: Trade Policy Uncertainty Index



Note: Share of articles in major daily U.S., U.K., and Canadian newspapers that mention uncertainty and an additional trade-policy-related word.
Source: Staff calculations.

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[2] Likewise, the August ISM manufacturing survey reported that "respondents are again overwhelmingly concerned about tariff-related activity, including how reciprocal tariffs will affect company revenue and current manufacturing locations." The survey is available on the ISM website at https://www.instituteforsupplymanagement.org/ISMReport/MfgROB.cfm?SSO=1.

[3] The reported index is similar to the index of trade policy uncertainty reported by Baker, Bloom, and Davis (2016), though constructed over a slightly different sample of newspapers and using a modified set of key words. Compared with Baker, Bloom, and Davis (2016), our index has less of a bump in uncertainty around the passage of NAFTA and the completion of the Uruguay round in 1994, but both indexes are currently showing large spikes in uncertainty.

This heightened uncertainty has the potential to impede investment and hiring as firms delay decisions until the uncertainty is resolved. This memo first looks for signs that trade policy uncertainty is currently weighing on economic activity in the United States. We find little evidence of a significant effect to date. However, it may be that the negative effect of trade policy uncertainty has merely been delayed or is being obscured by other developments. Accordingly, we go on to calculate a range of plausible estimates of the extent to which increased trade policy uncertainty could depress activity by examining historical relationships between measures of uncertainty and economic activity. We find that the increase in trade policy uncertainty could reduce the level of aggregate investment by around 1 to 2 percent, which would imply a fairly small drag of up to ¼ percent on the level of overall U.S. GDP. However, the plausible range around this estimate is wide, encompassing both zero as well as significantly larger effects.[4] This wide range in part reflects that the potential changes to trade policy are unprecedented in the postwar period, making it very challenging to use historical evidence to gauge the effect of a persistent rise in trade policy uncertainty on investment, employment, and other aspects of economic activity.

It is worth noting that throughout this memo, our goal is to evaluate the implications of trade policy *uncertainty* rather than the effects of already implemented tariffs or the prospective effects of proposed tariffs.[5] However, as in the broader literature, our analysis is not able to completely isolate the effects of trade policy uncertainty (that is, the variance around expectations of future policy) from the effects of expectations of trade policy themselves.[6] Therefore, although we use the phrase "trade policy uncertainty" throughout this memo, it should be understood that it surely includes other channels through which changes in trade policy affect the economy.

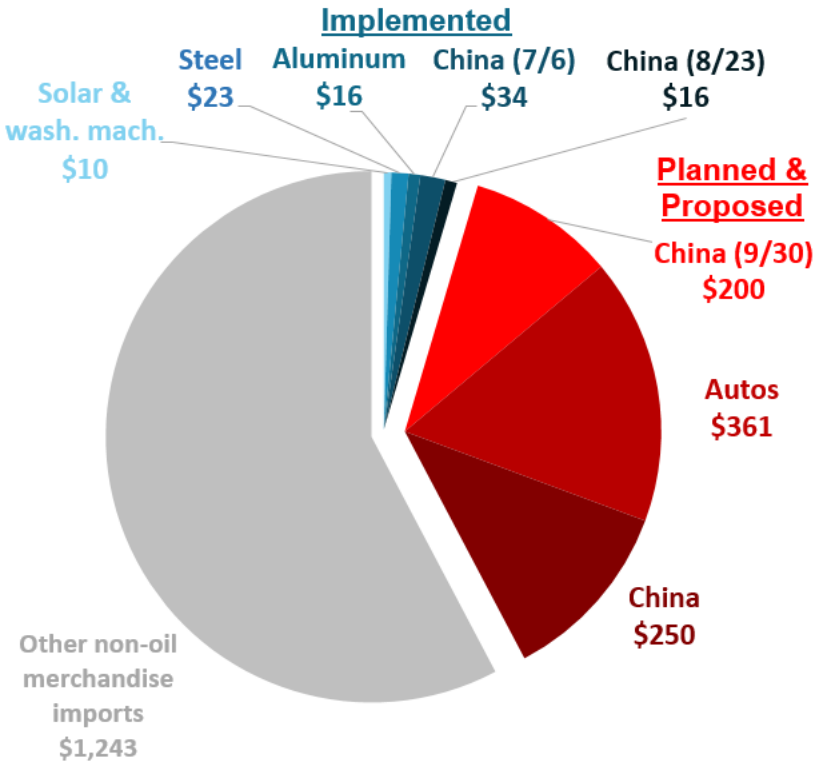
[4] Given the difficulty of pinning down these estimates with confidence, we have not incorporated trade policy uncertainty effects into the staff's baseline at this point.
[5] Staff models and rules of thumb suggest that recently imposed tariffs (including those on solar products, washing machines, steel, aluminum, and $50 billion of imports from China, as well as foreign retaliation) will lower U.S. GDP around 0.1 percent over the next two years. However, additional tariffs on all automotive imports and the remainder of imports from China—or about 40 percent of U.S. non-oil goods imports—could reduce GDP nearly one percent over the same two-year window. This estimate assumes that tariffs are set at rates averaging 18 percent (20 percent on automotive imports, and 10-25 percent on goods from China) and that foreign economies retaliate in kind. Of course, these estimates are very uncertain.
[6] In other words, our analysis is hard put to distinguish between the effects of first and second moments of trade policy.

Background

Although U.S. trade policy has been prominent in the news since the 2016 U.S. presidential campaign, few concrete trade actions were implemented through 2017 outside of a quick withdrawal from the Trans-Pacific Partnership. However, in 2018, activity ratcheted up. Between January and August, sizable tariffs were imposed on washing machines, solar panels, steel, aluminum, and $50 billion of imports from China, and these measures were met by similar-sized retaliatory measures on the part of the United States' trading partners. Still, the dollar value of goods subject to these tariffs remains quite small, totaling $99 billion, or less than 5 percent of the value of imported non-oil goods (as indicated by the blue portions in figure 2).

Figure 2: Import Coverage of Tariffs

Billions of dollars



Source: Staff calculations based on non-oil merchandise imports in 2017.

Notwithstanding the rather limited scope of the newly enacted tariffs, proposals for further action by the Administration would affect a considerably larger portion of U.S. trade (the red portions of figure 2) and could potentially be much more disruptive. Tariffs could be imposed on an additional $200 billion of imports from China before the end of this month, and the President has

also raised the possibility of extending tariffs to the full range of imports from China (about an additional $250 billion of imports). China has responded by proposing a list of an additional $60 billion of imports from the United States that would be subject to retaliation.[7] Although negotiations between the two countries have taken place, there is little clarity on how the dispute may eventually be resolved.

In addition, the United States began an investigation into the adverse effect on national security of imported automobile products and parts. With auto imports in 2017 valued at $361 billion, tariffs on autos could dramatically expand the extent of affected trade. Concerns about auto tariffs lessened somewhat as U.S.–EU tensions eased following the announcement on July 25 that the United States and the European Union would enter discussions aimed toward tariff-free industrial goods trade, although that agreement specifically excluded autos. More broadly, the use of a national security justification for tariffs on steel and aluminum (and potentially autos) is unprecedented, and the possibility that it could be invoked more frequently introduces further uncertainty into the outlook for the global trading system.

The Administration's efforts to renegotiate NAFTA, and threats to withdraw from the agreement if a satisfactory conclusion cannot be reached, also have the potential to disrupt a large segment of U.S. trade. Canada and Mexico account for about one-fourth of both U.S. exports and imports, with tightly woven supply chains tying together economic activity in all three countries. A potential agreement with Mexico was announced on August 27, and talks are now underway with Canada. However, there remains considerable uncertainty regarding the outcome of these discussions, as well as the Congress's willingness to support a trade pact that excludes Canada.

Uncertainty and Economic Activity: Theory

Even absent significant increases in tariffs, uncertainty regarding the future trajectory of trade policy could have real economic effects, particularly in regard to investment and hiring. Most standard models of business investment start with the assumption that firms evaluate the stream

[7] Combined with the previously announced $50 billion in retaliatory tariffs, China's imposition of tariffs on an additional $60 billion of U.S. goods would cover the bulk of U.S. exports to China (which totaled $130 billion in 2017). Even in this event, China could take further retaliatory measures by imposing higher tariffs rates, and/or increasing non-tariff barriers through, for example, making it more costly for U.S. goods to pass through customs or delaying the approval of business licenses.

of expected future profits flowing from a potential new project.[8] Therefore, the level of the *expected value* of the project will be a key determinant in investment decisions. However, the *uncertainty* surrounding the outcomes of a project—even holding constant the expected value of the project—could also be an important determinant of investment decisions.

The intuition for why uncertainty might damp investment is fairly straightforward. Consider a firm that is contemplating building a costly new plant to serve a market that might be affected by changes in trade policy, either positively or negatively. If policies relevant to that firm become more uncertain, the firm might prefer to wait and see how things turn out before making a decision.[9] A large theoretical literature has spelled out the effects of uncertainty whenever (a) investment is irreversible—that is, the firm cannot easily resell the new plant for its full value; and (b) investment can be delayed.[10] The theory suggests that uncertainty not only reduces the level of new investment (and other partially irreversible activities such as new hiring and rerouting supply chains), but it also makes these investments less sensitive to shocks to economic conditions.[11]

The Effect of Trade Policy Uncertainty on Economic Activity

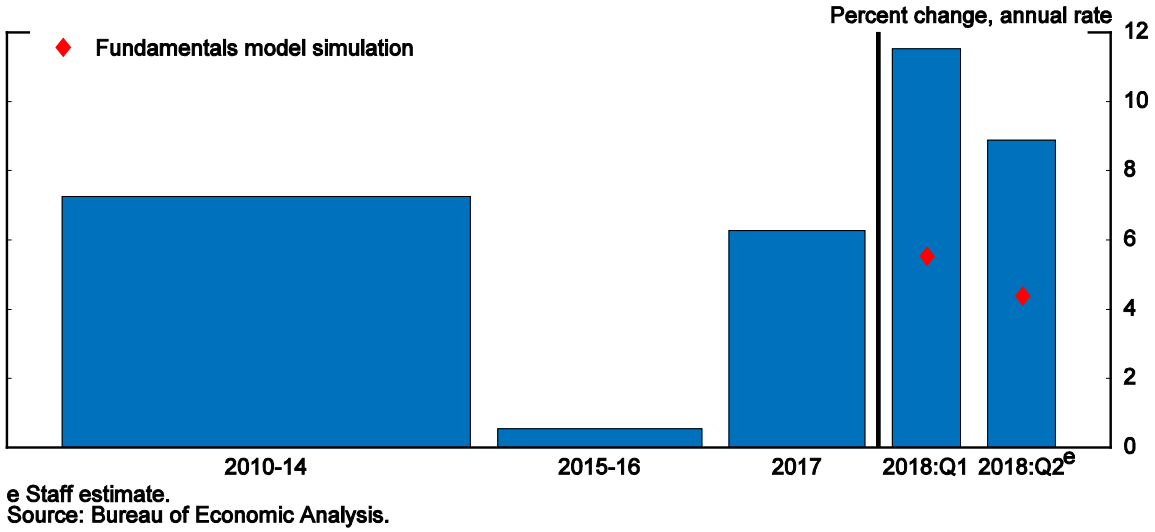
Evidence from Aggregate Investment Data

Despite the implications of theory and recent anecdotes about businesses delaying or canceling investments because of concerns about trade tensions, so far there is little evidence that such concerns are having noticeable effects on business investment at the aggregate level. After increasing around 6 percent in 2017, real business fixed investment increased at a pace close to 10 percent in the first half of 2018. This is a much faster clip than would be expected given the path of business output and the cost of capital (which includes the effect of recent tax changes).

[8] See, for example, Jorgenson (1967) and Tobin (1969).
[9] A common way to think about the effect of uncertainty on investment is to consider the decision to make capital expenditures or expand hiring as exercising a call option. As long as the firm delays, it continues to hold a valuable option to build.
[10] See, for instance, Bernanke (1983), Pindyck (1988), and Abel and Eberly (1994).
[11] There are other ways that uncertainty can depress macroeconomic outcomes by, for instance, increasing risk premiums and thus financing costs, lowering consumer confidence and/or increasing precautionary saving, or curtailing economic activity in our trading partners.

A model that incorporates these two variables points to an average growth rate of about 5 percent in the first half of this year (the red diamonds in figure 3).[12]

Figure 3: Real Business Fixed Investment



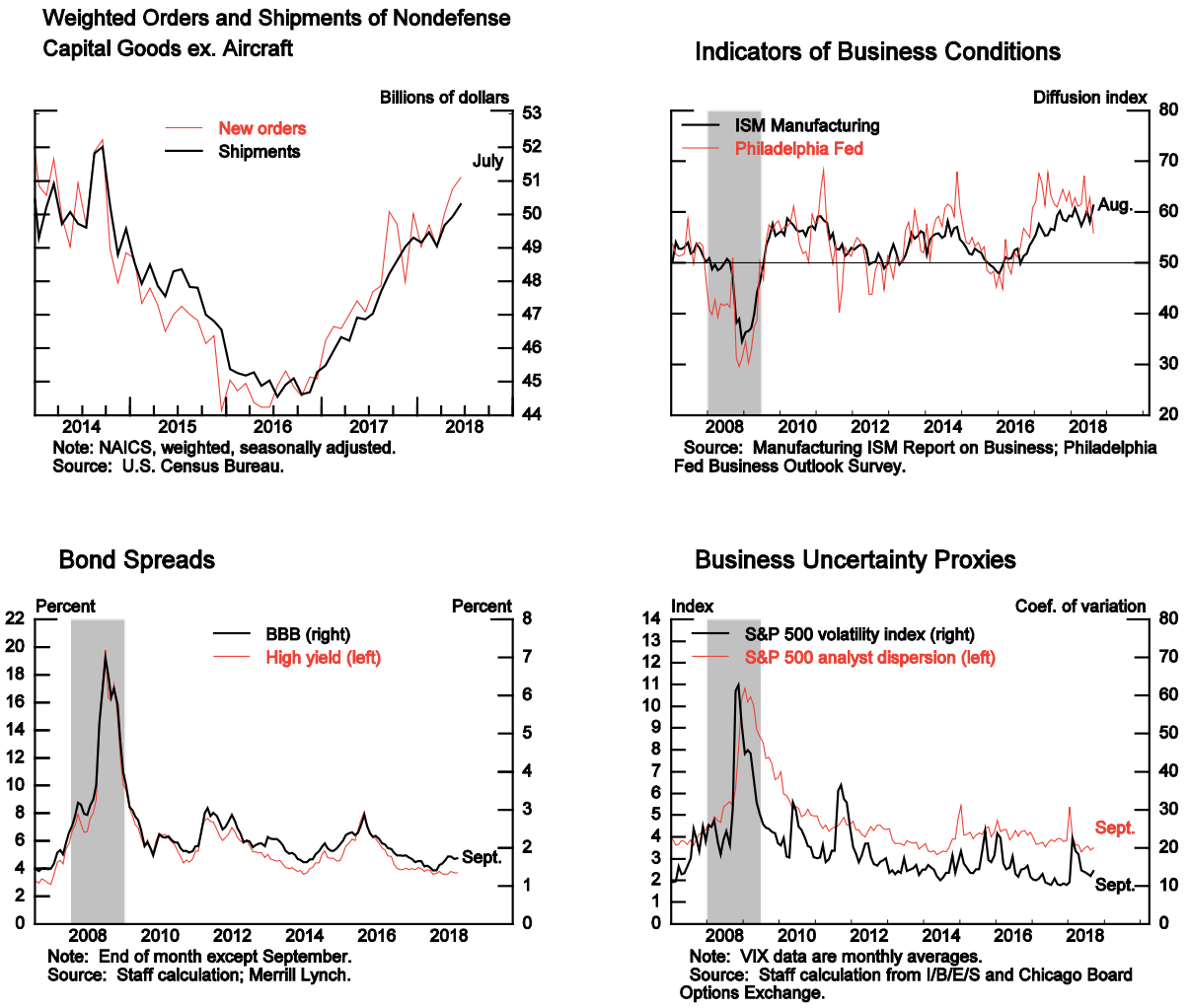
e Staff estimate.
Source: Bureau of Economic Analysis.

Of course, it is quite possible that any drag from higher uncertainty has not hit investment yet. However, at this point, the forward-looking indicators that we typically consult are also showing little sign of a slowdown (figure 4). Orders and shipments of nondefense capital goods, one of the most timely and cyclically sensitive indicators, have recently improved markedly after having softened early this year. In addition, indicators of business sentiment and conditions have remained favorable, and indicators of capital spending plans have also been elevated. Moreover, despite the apparent increase in trade policy uncertainty, most of the more aggregate uncertainty

[12] Some other models, such as an aggregate Q model or a model that includes analysts' longer-term expectations for profits growth, yield higher predictions for the first half of this year; however, even in those models, there is no sign that investment is underperforming.

proxies that we follow, such as the BBB or the high-yield bond spread, the VIX, and the dispersion of analysts' profit expectations, remain relatively low.

Figure 4: Forward-Looking Indicators of Investment



Recent survey data are one place where we may be seeing signs that firms are adjusting plans in response to trade policy. In a special question in the July 2018 NABE Business Conditions Survey and in the new Atlanta Fed Survey of Business Uncertainty, about 20 percent of the firms reported reassessing investment and/or hiring plans in some way in reaction to increased trade tensions. However, only about 6–10 percent reported delaying or dropping investment. Still, given the usual lumpiness of capital spending, this share of respondents could be associated with a relatively large share of investment spending. Because the NABE survey has only about 100

respondents and the Atlanta survey is new, it is hard to know how these numbers translate into aggregate data.[13]

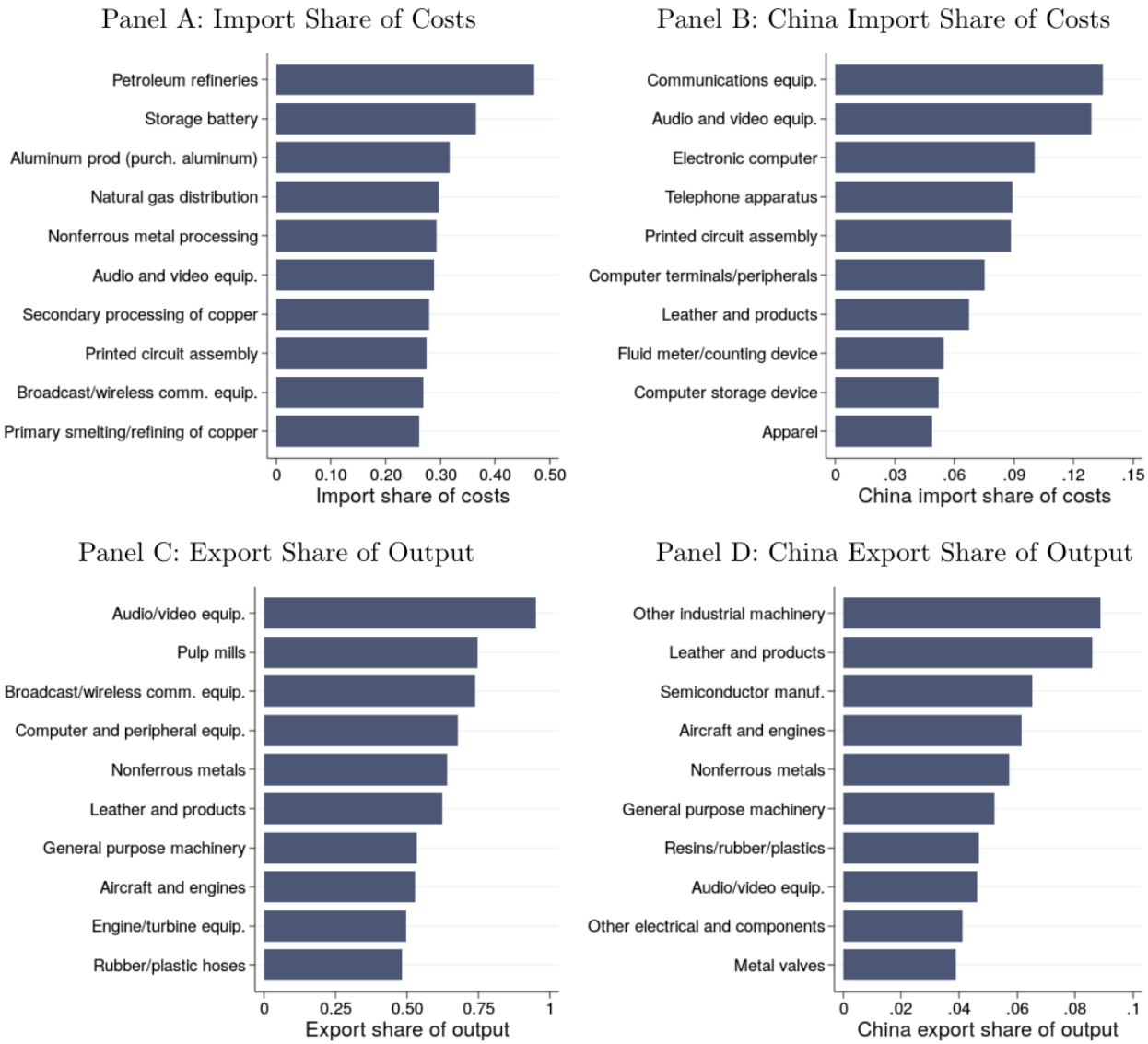
Evidence from a Cross Section of Industries

The rise of trade policy uncertainty has coincided with a period of increased expectations for, and subsequent passage of, large corporate tax cuts, which may be masking the effects of uncertainty in the aggregate data. To address this concern, we also investigate whether trade uncertainty effects are more discernible in industries that are especially exposed to trade. To measure trade exposure, we examine the cross section of industries ranked by the importance of exports as well as by the importance of imported intermediates to production.[14] Additionally, given the relatively heated rhetoric surrounding trade with China, we also consider rankings by exports to China and imported intermediates from China. Figure 5 reports the top 10 manufacturing industries in each of the rankings we consider.

[13] Among those reporting a reaction in the NABE survey, about one-half delayed investments, and one-fourth delayed hiring, but 10 percent accelerated investments. In the Atlanta Fed survey, of the 20 percent who reassessed their plans, about 30 percent delayed or dropped cap-ex plans, while around 15 percent actually accelerated or added cap-ex plans.

[14] We consider data for about 175 six-digit NAICS industries. For exports as a share of domestic production, we examine census data on exports and production data from the Annual Survey of Manufactures. To compute the imported intermediates as a proportion of total costs, we use the BEA's input-output "use" table. For each industry, the table breaks down the costs of production into labor plus the inputs of other commodities in 2007 (the most recent year of available data). For each commodity input, we calculate the 2016 share of imports to domestic use. Then we use these import shares to calculate the proportion of total industry costs (including labor) coming from imported intermediates, assuming that the cost structure of production is unchanged from 2007.

Figure 5: Top Ten Industries by Trade Exposure Measure

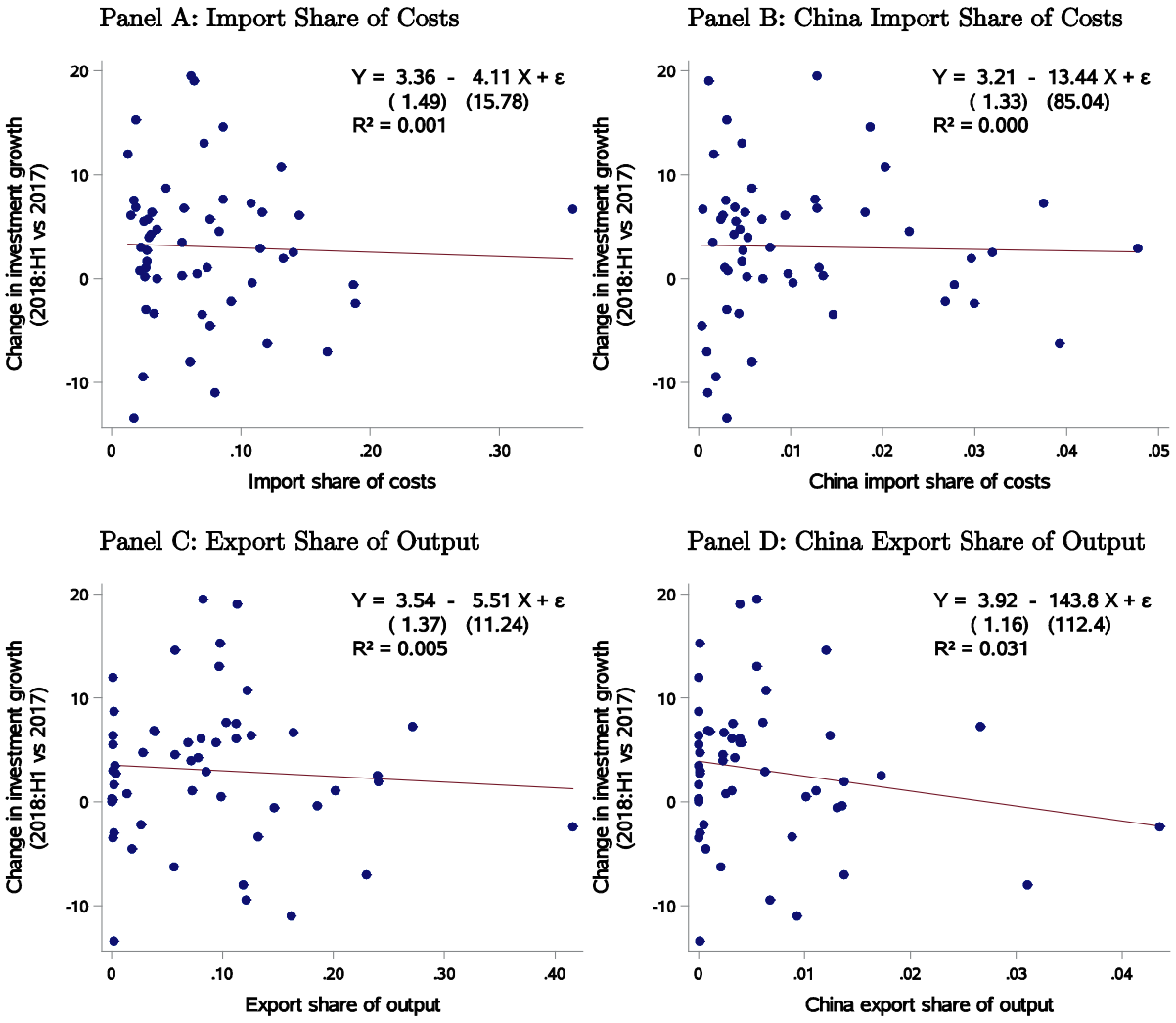


Source: Staff calculation from Bureau of Economic Analysis and U.S. Census Bureau.

We then look at the recent behavior of capital expenditures, employment, and prices across industries by trade exposure. Figure 6 correlates the change in the average growth rate of capital investment in the first half of this year compared with the average growth rate in 2017 for

disaggregated industries over the four rankings of trade exposure that we consider.[15] We find no systematic significant relationship between the two.[16]

Figure 6: Trade Exposure Measures and Investment Growth



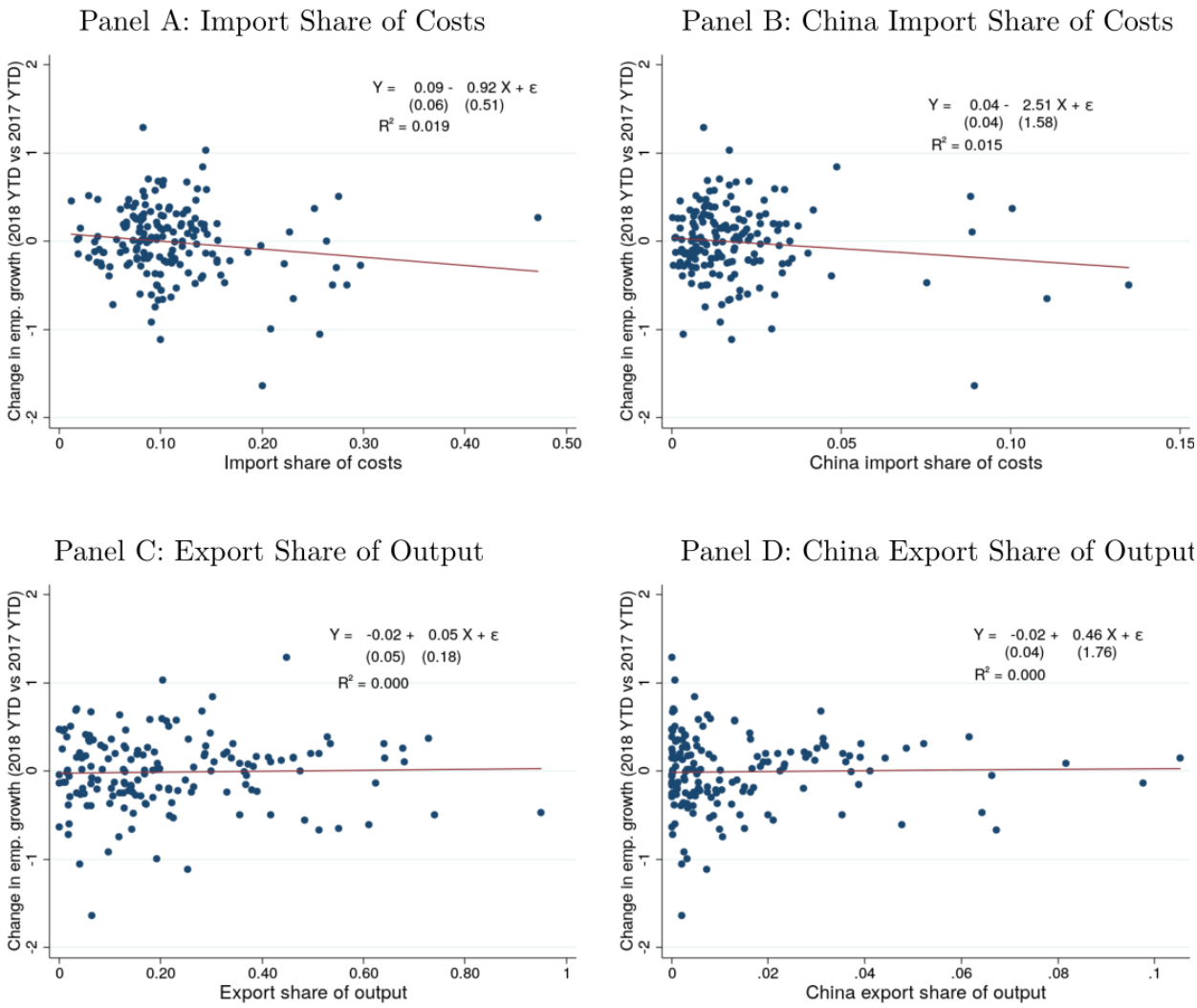
Source: Staff calculation from Compustat, Bureau of Economic Analysis, and U.S. Census Bureau.

[15] We aggregate firm-level quarterly investment data from Compustat and then seasonally adjust. Given the inherent volatility in the micro investment data, we perform the capital expenditures analysis for more broadly defined industries than in the case of employment and prices. This higher level of aggregation allows us to cover nearly all private sectors (and not just manufacturing) and to use more comprehensive data for 2016 in constructing the trade exposure measures. After dropping sectors with less than 10 firms in Compustat, we obtain data for 53 sectors at roughly the three-digit NAICS level used in the BEA's input-output summary tables.

[16] We also tried using investment growth on the vertical axis and alternative ways of measuring trade exposure on the horizontal axis. In addition, we ran a version where we weighted the observations by the industry's share in overall investment. None of these robustness checks led to materially different results. Standard errors are shown in parentheses beneath coefficients.

The scatterplots in figure 7 present a similar exercise looking at the change in employment growth so far this year through August compared with the same months in 2017. For the most part, there appears to be no relationship between the importance of trade and employment growth, although there is a slight negative drag to employment in sectors with a high imported input share of costs.

Figure 7: Trade Exposure Measures and Employment Growth

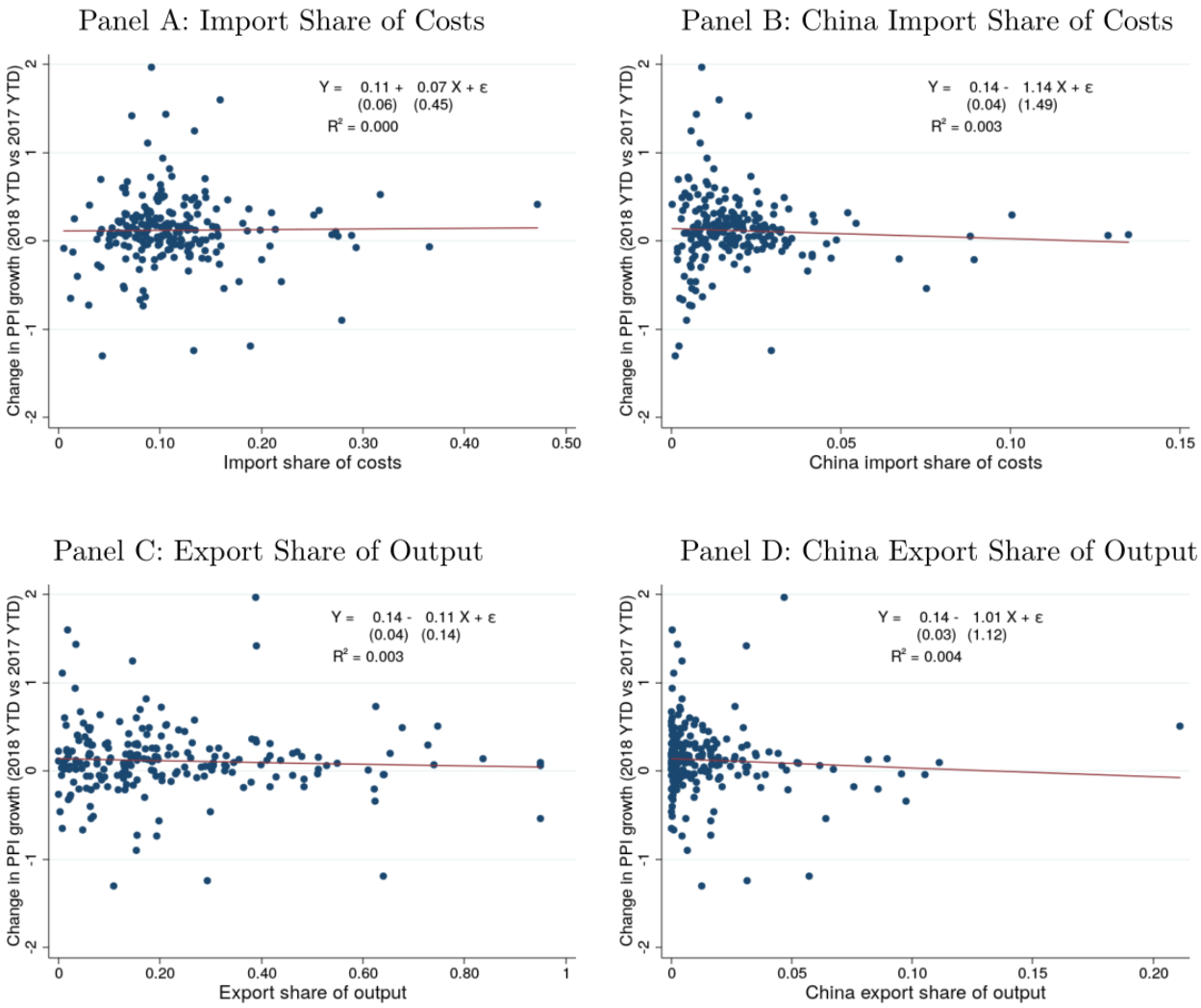


Note: Employment data through August.
Source: Staff calculation from Bureau of Economic Analysis, U.S. Census Bureau, and Bureau of Labor Statistics.

Finally, because prices might react more quickly than investment and employment, figure 8 looks for price effects by lining up these trade share measures with industry-level PPIs. Similar to the results above, we find no evidence that prices are increasing more rapidly in industries

with higher trade exposure.[17] In the months ahead, we will continue to update these charts of investment, employment, and prices to see if any trade-related patterns emerge.

Figure 8: Trade Exposure Measures and PPI Changes



Note: One outlier removed. PPI data through August.
Source: Staff calculation from Bureau of Economic Analysis, U.S. Census Bureau, and Bureau of Labor Statistics.

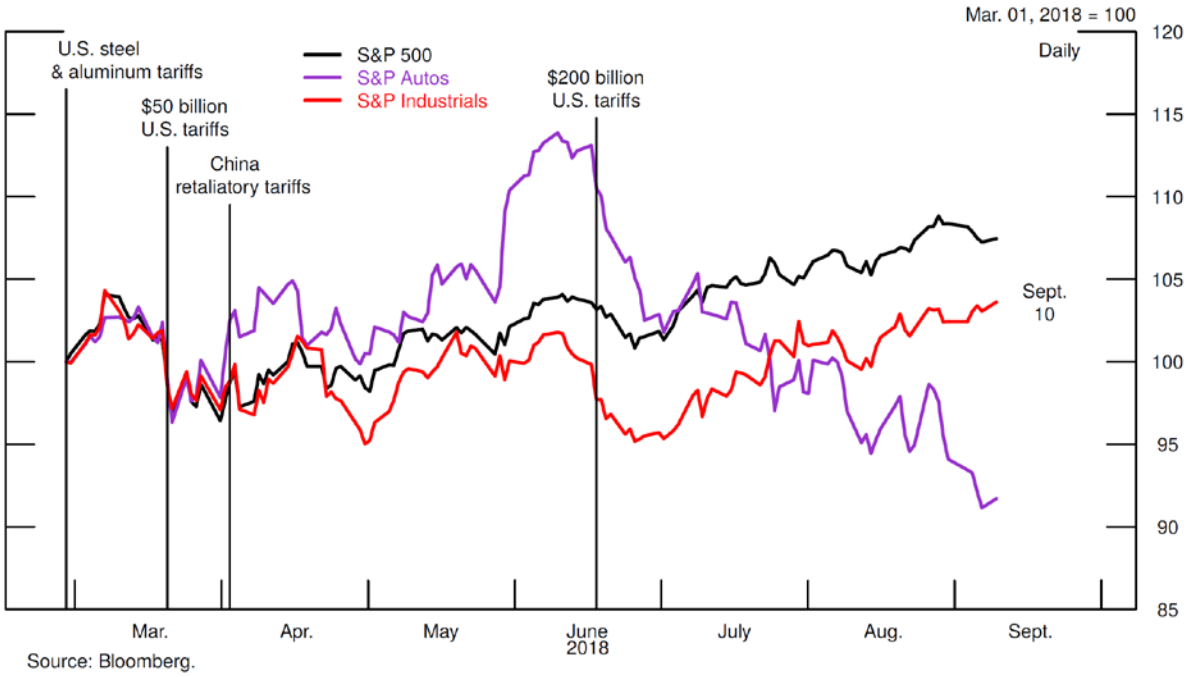
Evidence from Equity Prices

Because the trade uncertainty effects may still be ahead of us, we also look at more forward-looking measures like equity prices. Broad equity price indexes (the black line in figure 9)

[17] As with capital investment in figure 6, we subjected the correlations in figures 7 and 8 to a number of robustness checks regarding sample period and specification without any meaningful change in the results.

declined, on balance, in the days following major trade policy announcements signaling the escalation of trade tensions between the United States and its trading partners. However, the effect of trade concerns on broad stock market indexes has been overshadowed by the wave of better-than-expected earnings releases from U.S. firms since the beginning of the year and by Wall Street's earnings forecasts that have remained positive and stable for the near term. On net, since early March, when concrete trade disputes were triggered, the S&P 500 equity index has increased roughly 7.5 percent. To shed light on the effect of trade policy, we also look at stock indexes for trade-sensitive sectors, such as the S&P industrials and autos (the red and purple lines, respectively), both of which have underperformed the broader market. Thus, equity prices are one area where we may be seeing some differential effect across firms with different trade exposure. Of course, the differential effects may well be due to changes in the expected future value of these firms' profits rather than to the effects of uncertainty. Additionally, it is not clear what these changes in equity prices imply for future investment spending and employment.

Figure 9: S&P 500 Industry Indexes around Key Trade Policy Announcement Dates



Source: Bloomberg.

Estimating the Effects of Trade Policy Uncertainty from Historical Relationships

Given that the effects of trade policy uncertainty may be delayed or hidden by other developments, we next examine historical relationships between measures of uncertainty and

economic activity to estimate the effects of the recent upswing in trade policy uncertainty. Specifically, this section (1) considers how economy-wide measures of uncertainty affect aggregate activity, (2) uses firm-specific measures of trade policy uncertainty to estimate effects on investment, and (3) discusses the effects of large shifts in trade uncertainty during two key episodes (Brexit and China's accession to the WTO).

Historical Relationships between Uncertainty Measures and Economic Activity

The empirical literature on uncertainty, which extends back a few decades, generally finds negative effects of heightened uncertainty on investment and economic activity, though the significance of the effects varies considerably depending on the uncertainty proxy and econometric model used. (The appendix summarizes the studies and provides a table for reference.)

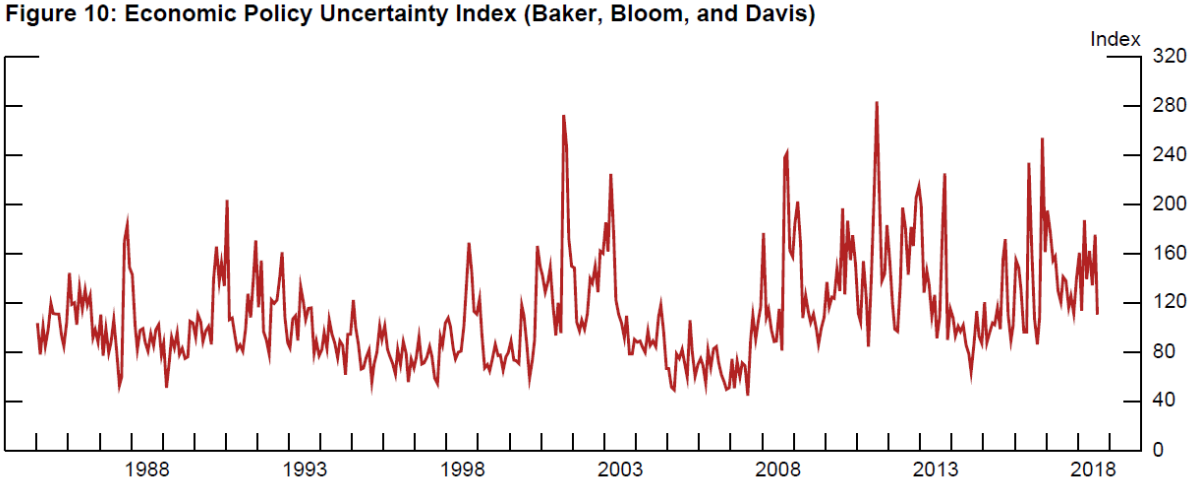
The innovative research of Baker, Bloom, and Davis (2016) provides an appealing way of measuring economic uncertainty and gauging its effects. These authors construct a broad-based measure of economic policy uncertainty (EPU)—shown in Figure 10—by tabulating articles in leading newspapers that mention many different forms of uncertainty, including about tax, regulatory, financial, and monetary policy. Because their index is updated daily, it has the practical advantage of allowing estimation of the effects of even recent changes in uncertainty.[18] Using a structural VAR model of the U.S. economy, Baker, Bloom, and Davis (2016) show that a rise in EPU reduces industrial production, employment, and investment. Their estimates suggest that the modest rise in their EPU index through August of this year—relative to its average level in 2014–15—will have small effects on investment, paring it about 1½ percent, and reduce employment only 0.1 percent.[19] These estimates come with a few caveats: The EPU measure (i) does not attempt to directly capture trade policy uncertainty (and does not contain any trade policy terms); (ii) includes, instead, terms related to fiscal and monetary policy (which

[18] The daily EPU index is available at www.policyuncertainty.com.

[19] Baker, Bloom, and Davis (2016) report that the run up in their index between 2007 and 2011 is associated with a 6 percent decline in business investment spending after about three quarters. As the recent increase in the index (measured as its average value over the past two years compared with its average value over 2014-2015) has been about a quarter as large, we scaled the investment response accordingly to arrive at our estimate of 1½ percent.

may not be particularly uncertain at present); and (iii) does not completely control for actual or anticipated policy changes (first-moment effects).[20]

Figure 10: Economic Policy Uncertainty Index (Baker, Bloom, and Davis)



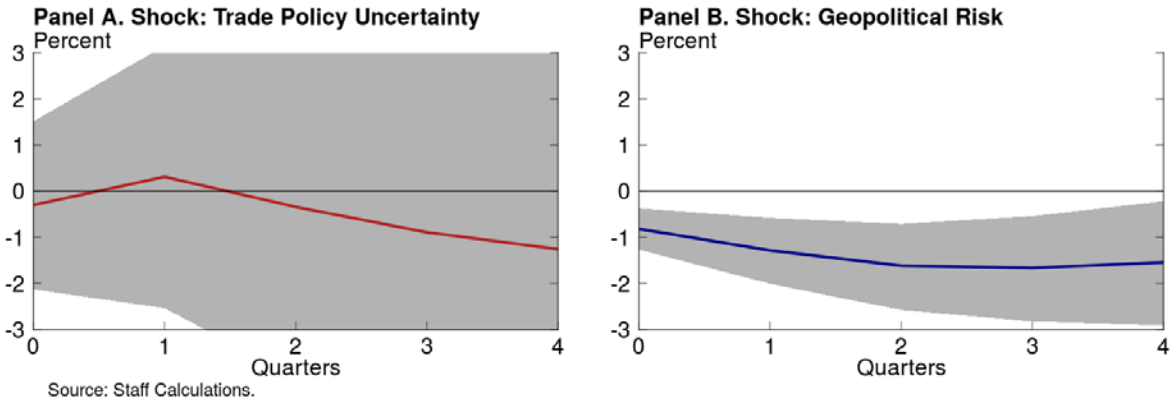
Note: This monthly index is normalized to an average value of 100 from January 1985 through December 2009.
Source: 'Measuring Economic Policy Uncertainty' by Scott Baker, Nicholas Bloom and Steven J. Davis at www.PolicyUncertainty.com.

To assess the effect of uncertainty specific to trade policy on investment, we applied the methodology of Baker, Bloom, and Davis (2016) to the news-based index of trade policy uncertainty in figure 1. However, as shown in panel A of figure 11, the estimated effect of trade policy uncertainty on investment is statistically insignificant. This result likely reflects that the lack of historical variation in the trade policy uncertainty index (which we call TPU) makes it difficult to derive statistically reliable estimates.[21]

[20] Baker, Bloom, and Davis (2016) include the S&P 500 stock market index in the VAR to allay this last concern, given that stock prices are forward looking and incorporate many sources of information. But they acknowledge that "the EPU index will likely embed first-moment information"—a potential concern with many news-based uncertainty measures.

[21] This is true whether we use the index plotted in figure 1 or whether we use the index of Baker, Bloom, and Davis (2016) described in note 3.

Figure 11: Response of Business Fixed Investment

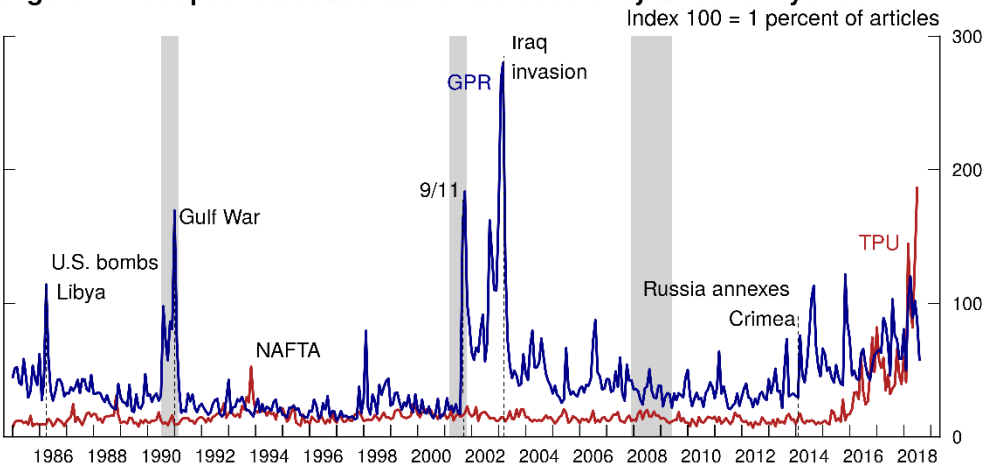


Source: Staff Calculations.
Note: Solid lines are median responses; Shaded areas are 68 percent confidence intervals.

Given this challenge, the estimates of Caldara and Iacoviello (2018) based on a related form of uncertainty—heightened geopolitical tensions—are also useful in helping gauge the economic effects of trade policy uncertainty. These authors construct a news-based measure of geopolitical risk (GPR), shown in figure 12, and then use a structural VAR (again as in Baker, Bloom, and Davis (2016)) to estimate the effects of shocks. Higher geopolitical risk likely affects the economy through many of the same transmission channels as TPU, with both types of uncertainty causing investment and hiring to decline, especially for firms with high trade exposures.[22] Their GPR measure varies substantially through time and is largely independent of the U.S. business cycle, features that are helpful in deriving good statistical estimates.

[22] For example, heightened geopolitical risk may cause firms to perceive a higher risk both of economic sanctions that restrict trade (as in the cases of Russia and Iran) and of disruptions to their global supply chains.

Figure 12: Geopolitical Risk Index and Trade Policy Uncertainty Index



Source: Caldara and Iacoviello (2018) and staff calculations. Indexes are normalized to a value of 100 for an article share of 1 percent. Shaded areas represent NBER recession periods.
Note: GPR is Geopolitical Risk; TPU is Trade Policy Uncertainty.

Drawing on Caldara and Iacoviello (2018), we estimate a structural VAR model on U.S. data from 1985 to 2017, with the model including both the GPR and TPU indexes plotted in figure 12 as well as eight U.S. macroeconomic and financial indicators.[23] Returning to figure 11 (panel B), the GPR shock lowers investment by a material and statistically significant amount. The shock to GPR is scaled to be equal to the increase in the TPU index between January and June of this year to illustrate how the recent rise in TPU would affect investment if (and this is a big if) TPU were to affect investment exactly like GPR: As seen in the figure, the recent increase in TPU could lower the level of investment by about 1½ percent.[24]

Firm-Level Estimates

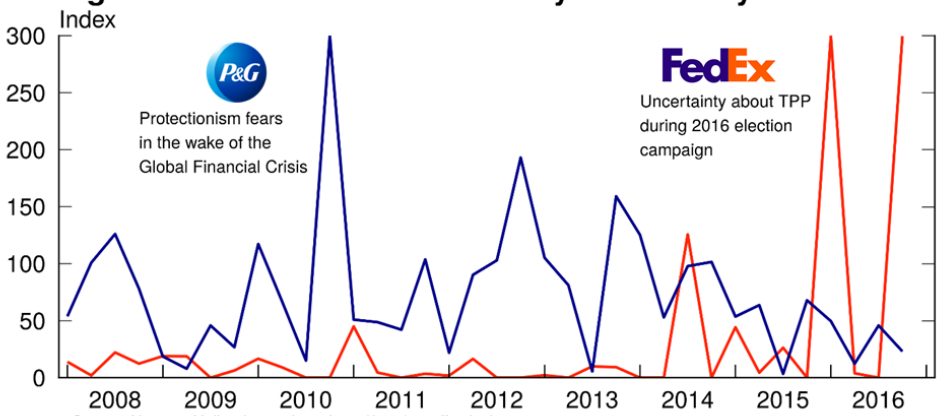
An alternative approach is to examine firm-level data, where the variation in trade policy uncertainty is more pronounced across time, as trade actions are often industry-specific and focused on narrow product categories. In our analysis, we use an index of firm-level TPU constructed by Hassan and others (2017). They construct this index by measuring how often

[23] The additional variables in the VAR include (1) the VIX, (2) the yield on two-year Treasury notes, (3) the log of the S&P 500 index divided by the consumer price index, (4) the Moody's seasoned Baa corporate bond yield relative to the yield on a 10-year Treasury note, (5) consumer sentiment from the University of Michigan Surveys of Consumers, (6) the log of the WTI price of crude oil divided by the consumer price index, (7) the log of real U.S. business fixed investment, and (8) the log of real U.S. GDP. The model includes two lags of the endogenous variables, a constant, and is estimated using Bayesian techniques.

[24] Thus, we assume that the percent response of investment to the 1 percentage point rise in the share of newspaper articles discussing trade policy uncertainty in the first half of this year is identical to the VAR estimate of the investment response to an equally sized rise in the share of newspaper articles highlighting GPR.

firms discussed trade-related risks and uncertainties during quarterly earnings calls with analysts. For instance, figure 13 shows firm-level TPU for two major U.S. corporations, highlighting the substantial amount of variation in TPU across firms and over time.

Figure 13: Firm-Level Trade Policy Uncertainty



Source: Hassan, Hollander, and van Lent (2017); staff calculations.
Note: Index is trimmed so that 0 corresponds to the lowest value and 300 to the highest value; TPP is the Trans-Pacific Partnership.

To quantify the effect of TPU on firm-level investment, we regress the firm-level investment rate on the firm-level measure of TPU.[25] An increase of one standard deviation in firm-level TPU is estimated to reduce firm-level investment by 0.3 percent. A straight read of our estimates suggests that the sharp increase in trade policy uncertainty observed in 2018, which is equivalent to a whopping increase of seven standard deviations, would depress aggregate investment just 2.1 percent, corresponding to a reduction in GDP of about ¼ percent.[26]

Our firm-level evidence should be regarded as suggestive rather than precise, and many caveats apply. Translating the regression estimates into effects on aggregate investment (or output) is not entirely straightforward, in part because the firm-level estimates do not account for general equilibrium forces that could either mitigate or intensify the effects. In addition, this estimate again captures the "total effect" of trade policy changes on investment and thus does not entirely

[25] The dependent variable is the one-year-ahead firm-level investment rate, defined as capital expenditures over the stock of property, plant, and equipment. Data are at a quarterly frequency from Compustat and cover the period from 2002 to 2016. The regression includes firm fixed effects, quarterly time dummies, one lag of the investment rate, and firm cash flow.
[26] We use the aggregate TPU index discussed earlier to measure the rise in trade policy uncertainty that materialized in 2018.

isolate the effects of higher trade uncertainty from first-moment effects.[27] Notably, the trade uncertainty captured by the firm-level analysis over our historical sample period captures not only downside shocks, but also substantial upside shocks—for example, the possibility that trade barriers might be removed more quickly than expected. Insofar as the recent escalation in trade policy uncertainty appears more driven by downside risks, our firm-level estimates could well understate the adverse economic effects.

Specific Periods of Changing Trade Policy Uncertainty

Another avenue for gauging the possible economic effects of trade policy uncertainty is to examine specific episodes of major shifts in aggregate trade policy uncertainty. We focus on two periods—Brexit and China's 2001 entry into the WTO.

Turning first to Brexit, Governor Carney suggested in a recent speech that the anticipation of Brexit (both the expectation of a reduction in openness and the uncertainty around it) could be holding back investment and consumption enough to reduce the current level of U.K. GDP by nearly 2 percent.[28] Likewise, Board staff analysis using a structural VAR to assess the effects of Brexit-related concerns suggests a hit to U.K. GDP in the range of 1 to 2 percent. Of course, the effect of Brexit on the United Kingdom is likely to be much larger than current trade policy uncertainty in the United States, given that the United Kingdom is a relatively more open economy with heavy ties to the EU, and Brexit has far-reaching effects beyond merchandise trade, including for financial services, migration, and FDI flows.

The second case study focuses on the period before China's accession to the WTO in 2001. With its entry into the WTO, China gained permanent most favored nation (MFN) trading status, thereby ending an extended period of uncertain annual renewals, the failure of which would have resulted in a return to the very high tariff levels set by the Smoot-Hawley Act. The reduction of trade policy uncertainty led Chinese firms to markedly expand investment in export-oriented industries, with the effects especially pronounced in sectors that would have faced the highest

[27] We found that including Tobin's Q—which ought to capture any response of equity prices to news about trade policy—increases the regression *R*-squared but diminishes both the magnitude and statistical precision of the estimated coefficient on TPU, likely reflecting that Q and our TPU variable are capturing some of the same movements.
[28] See Carney (2018).

tariff increases had the downside risk of a return to Smoot-Hawley been realized.[29] China's exports surged as Chinese firms already exporting to the United States were willing to sell goods at lower prices (including due to scale economies and the prospect of longer-term relationships with U.S. purchasers), and as the expectation that trade barriers would remain low encouraged new entry of Chinese firms into the U.S. export market. An increase in trade policy uncertainty – if commensurate in magnitude – would play out through similar channels, but would likely precipitate sharp declines in China's investment and exports.

These episodes highlight how very substantial changes in trade policy uncertainty can potentially have sizeable effects on an economy. However, we underscore that we do not consider the recent shift in U.S. trade policy uncertainty to be nearly as large as in these cases.

Conclusion

Despite numerous anecdotes about the possible delays in investment and hiring because of the elevated level of trade policy uncertainty, there is currently little evidence that trade policy uncertainty is affecting investment or hiring either in the aggregate or for sets of industries most likely to be exposed to concerns about trade policy. Still, the effects may merely be delayed or masked by other developments, so we have calibrated some possible effects based on historical relationships. Our estimates point to fairly small effects, in the range of 1–2 percentage points on business fixed investment growth, or less than ¼ percent on the level of GDP. However, as the current situation is historically unprecedented, the actual effects could be negligible or could well be larger than we have estimated, especially if uncertainty were to intensify or encompass an even broader segment of trade or if the uncertainty is prolonged. Moreover, while this memo has focused exclusively on domestic developments, trade policy uncertainty is likely affecting foreign economies as well, with the potential for significant adverse feedback to the United States through an array of channels, including dollar appreciation, weaker foreign activity, and possibly tighter financial conditions. At this point, the staff has not incorporated trade policy uncertainty effects in the baseline projection, but we will continue to monitor ongoing

[29] See Handley and Limão (2017) for a discussion. These authors also develop a stylized model of trade policy uncertainty that they calibrate to this episode, and find that the reduction in trade policy uncertainty had economic effects akin to large reduction in the U.S. tariff rate on Chinese exports.

developments, including the high-frequency panel of indicators described in the memo, for signs of more pronounced effects.

Appendix: Summary of Empirical Evidence of Uncertainty on Economic Activity

The research on the effects of uncertainty on the economy stretch back (at least) 25 years and, with only a few exceptions, find uncertainty holds down investment. Ferderer (1993) finds that a higher dispersion of macro forecasts is associated with lower aggregate investment spending after controlling for the usual investment fundamentals (Tobin's Q, GDP, and real interest rates). Guiso and Parigi (1999) and Bloom, Bond, and van Reenen (2007) conclude that uncertainty shocks reduce the sensitivity of firm-level investment to demand. And Bloom (2009) finds that shocks to a VIX measure of stock market volatility generate a short-run drop in production, investment, and employment, lasting for about 6 months followed by a rebound and overshooting.

Many of the contributions following Bloom (2009) involved devising alternative proxies for various types of uncertainty and presenting some interesting nuances. Pinto (2010) finds that the increase in the dispersion of analysts' firm-level profits expectations during 2008–09 could explain a drop in investment growth of nearly 10 percentage points, with some evidence for a subsequent rebound. Bachmann, Elstner, and Sims (2013) construct firm dispersion measures implied by diffusion indexes in the manufacturing Philadelphia Fed survey and obtain similar uncertainty effects to Bloom (2009), but their effects tend to persist and show little rebound. Jurado, Ludvigson, and Ng (2015) propose a more robust uncertainty proxy based on the volatility of unforecastable errors in a broad set of macro variables. This measure shows only three significant high-uncertainty episodes (1973–74, 1981–82, and 2007–09) and implies more persistent and larger uncertainty effects than in Bloom (2009). Scotti (2016) constructs an uncertainty proxy based on squared (ex post) surprises from a set of data releases and finds slightly smaller effects than in Bloom (2009).

Many recent contributions have been centered on developing proxies for narrower uncertainty factors based on textual search techniques. As noted in the text, Baker, Bloom, and Davis (2016) construct an index of economic policy uncertainty (EPU) based on the frequency of articles with related words in a set of U.S. newspapers, and find that increases in EPU depress investment, industrial production, and employment. Hassan and others (2017) create a firm-level measure of political risk, based on the textual search of earnings calls transcripts, and conclude that political risk shocks are mostly driven by firm-specific factors and reduce firm-level investment and

employment. As also discussed in the text, Caldara and Iacoviello (2018) construct a news-based measure of geopolitical risk and show that heightened geopolitical risk causes investment and employment to decline.

Appendix Table A: Review of Empirical Literature on Economic Effects of Uncertainty

Source	Uncertainty Proxy	Model	Results
Bloom (2009)	Stock-market-implied volatility, similar to VIX (1962–2008)	VAR model with macrodata on output, labor markets, prices, and stock market	1.65 s.d. volatility shock reduces production/employment by 1% in six months, followed by rebound
Pinto (2010)	Dispersion of IBES analysts' profits forecasts for capital goods producers (1989–2009)	Reduced-form macro investment growth model based on mean and dispersion of profit expectations	1 s.d. increase in dispersion lowers investment growth by 3½ percentage points
Bachmann, Elstner, and Sims (2013)	Diffusion index dispersion in Philadelphia Fed manufacturing survey (1968–2011)	VAR model with manufacturing data on production, employment, and hours	As in Bloom (2009), but uncertainty effects persist with no rebound, similar to a first-moment shock
Jurado, Ludvigson, and Ng (2015)	Volatility of unforecastable errors in broad set of macro variables	VAR model similar to Bloom (2009)	More persistent and larger effects than in Bloom (2009), with no overshooting
Scotti (2016)	Squared (ex post) surprises from a set of data releases (2003–16)	VAR model with macrodata on employment	Slightly smaller effects than VIX measure in Bloom (2009)
Baker, Bloom, and Davis (2016)	Frequency of articles related to economic policy uncertainty in U.S. newspapers (1985–2014)	VAR model similar to Bloom (2009)	Increase in EPU during Great Recession implies decline of 6% in investment and 1% in industrial production
Hassan and others (2017)	Share of transcript of earnings conference calls related to political risk (2002–16)	Reduced-form model for firm-level investment rate and employment growth	Increase in firm-level political risk lowers investment rate and employment growth. Firm-level political risk variation correlated with macro EPU index.
Caldara and Iacoviello (2018)	Frequency of articles on geopolitical risk (GPR) in leading English language newspapers (1985–2016)	VAR model similar to Bloom (2009)	Decline in production and employment from an average GPR shock is persistent, reflecting lingering GPR threats

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