

ANALYSIS

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Pride and Protectionism: U.S. Trade Policy and Its Impact on Asia

Introduction

Many of the Trump administration's trade policies are aimed at addressing the perceived adverse impact of trade on U.S. manufacturing employment and improving trade deals the president sees as not being in U.S. interests. These appear to be worthwhile goals, but crafting trade policy to address them is difficult. If not done correctly the policy could do more harm than good for manufacturing and the broader economy, particularly if more protectionist policies are implemented by the U.S. or if its trading partners retaliate.

Pride and Protectionism: U.S. Trade Policy and Its Impact on Asia

BY MARK ZANDI, STEVEN G. COCHRANE, RYAN SWEET, RUTH STROPPIANA, AND KATRINA ELL

Many of the Trump administration's trade policies are aimed at addressing the perceived adverse impact of trade on U.S. manufacturing employment and improving trade deals the president sees as not being in U.S. interests. These appear to be worthwhile goals, but crafting trade policy to address them is difficult. If not done correctly the policy could do more harm than good for manufacturing and the broader economy, particularly if more protectionist policies are implemented by the U.S. or if its trading partners retaliate.

Free trade versus...

Support for free trade is grounded in the idea that each country should specialize in producing the goods and services in which it has a comparative advantage, increasing the total available to consume and increasing the consumer and producer surplus.

In 1960, Harry Johnson formulated the extent of these gains, G , as

$$G = (1/2 \tau^2) \eta V$$

where V is the ratio of imports to domestic spending, η is the ease with which consumers substitute domestic for imported goods, and τ is the average tariff rate. Today, V in the U.S. is 15% and most estimates for η are between 1 and 2. The Trump administration's tariffs will increase τ , reducing G .

A country enjoys a comparative advantage if that good or service can be produced at lower cost in terms of other goods or services. If steel, for example, can be produced at a lower price in countries outside of the U.S., those countries have a comparative advantage. This would lower the global price of steel as U.S. production declines. This would appear to be unfair to the U.S., but the reduction in U.S. steel production frees up factors of production to be allocated elsewhere.

The benefits of trade suggest that a good or service is not imported unless its net price to buyers is below the net price of its domestically produced alternative. Therefore, trading countries end up paying less for a good or service while consuming more. In other words, it is a win-win; "Made in America" does not always make economic sense.

...Protectionism

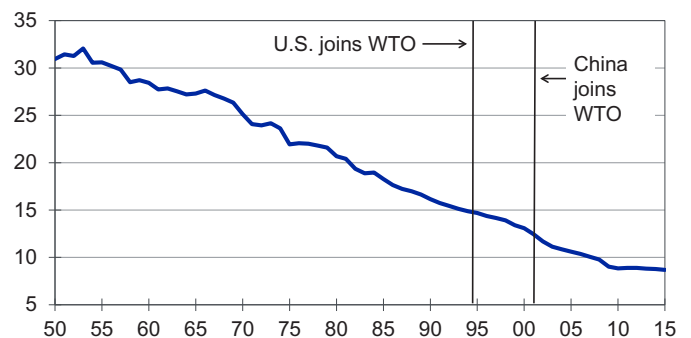
Support for protectionism is often rooted in the idea that it saves domestic jobs. There is no denying that when the U.S. imports goods, domestic production suffers and jobs are lost. However, the counterargument is that these laid-off workers could be re-employed elsewhere in the economy. This still comes with a cost, since these workers may need to be retrained or need to relocate to another part of the country. These social costs should not be ignored, but fiscal policy can

help by investing in education and job re-training that can help individuals and economies reinvent themselves.

There are a number of ways to assess trade's impact on U.S. manufacturing employment, but sticking with Occam's razor—the principle that simplest explanations are likely correct—the industry's share of total employment is telling. This share has been steadily declining since the 1950s, well before the North American Free Trade Agreement was created in 1994, the U.S. joined the World Trade Organization in 1995, or China joined the WTO in 2001 (see Chart 1).

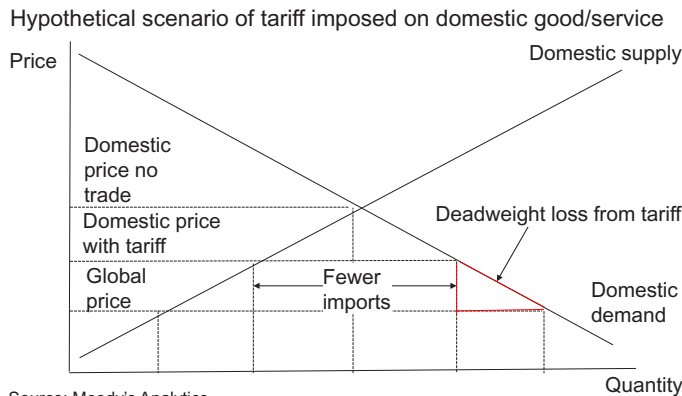
Chart 1: Trade Not the Primary Factor

Manufacturing's share of total employment, U.S., %



Sources: BLS, Moody's Analytics

Chart 2: Tariffs Lead to Inefficiencies



Manufacturing's share of employment was falling, on average, by 38 basis points per year in the 10 years before NAFTA and WTO. Since then, the average annual decline has slowed to 30 basis points per year. Also, on average, the annual rate of decline did not change appreciably leading up to China entering the WTO and has not since. The most encouraging news is that manufacturing's share of employment appears to have begun to stabilize over the past few years.

The loss of manufacturing jobs because of trade is an overdone notion. The bigger culprits are technology and automation, which have made many factory jobs obsolete. Over the past several decades, manufacturers have invested heavily in capital, allowing them to produce more with fewer workers. Also, the manufacturing workforce has shifted as the share of workers with a bachelor's degree or higher has risen while the share of those with some college or less has declined. Therefore, job retraining would be more beneficial in helping manufacturing and the broader economy than tariffs or ripping up trade agreements. Protectionist policies may help the few at the expense of the many.

Another argument for protectionism is national security. This argument has been made frequently by the U.S. steel industry. The argument has validity but applies to a small number of industries. Protectionism also prevents dependency. In other words, a country could be too dependent on trading partners for too many goods and services. This applies to small economies but not to

the U.S. Other supports for protectionist policies are that they protect emerging domestic industries that are unable to compete globally. There are examples of where such policies were successful and others where they backfired.

For example, heavy subsidization of Australia's auto plants, Japan's rice farmers, and Malaysia's car manufacturers delayed the inevitable decline of those industries because producers did not have a comparative advantage and because subsidies directed government funds away from potential longer-term growth drivers, where there was a comparative advantage.

The argument against tariffs

Tariffs usually make more political sense than economic sense. Donald Trump is not the first president to use tariffs and will not be the last. Still, most economists view tariffs as a bad idea, because they prevent a country from reaping the benefits of specialization, disrupt the movement of goods and services, and lead to a misallocation of resources. Also, consumers and producers often pay higher prices when tariffs are implemented.

We take a simple approach to highlight why economists generally do not favor tariffs. For this example, the supply and demand of a domestic good is used. Without trade, the market clearing price occurs where quantity supplied equals quantity demanded. If this good is produced globally and countries have a comparative advantage in the production, the price is lower. Domestic producers will have to charge the lower price, increasing domestic demand and reducing quantity supplied. The difference between quantity demanded and supplied is imported (see Chart 2).

Next, assume a tariff is imposed on this good. This would raise the global price,

reducing the quantity demanded domestically while increasing quantity supplied. This reduces imports. The government imposing the tariff receives increased revenues, but there is a loss of efficiency, or deadweight loss. For one, consumers pay a higher price than they otherwise would. Also, domestic marginal producers of this good are pulled into this market, pulling resources from other goods.

Temporary use of tariffs can have both short- and long-run implications of resource allocation, with the cost more significant in the long run. Devoting more resources to industries that have no comparative advantage can be consistent with a cyclical expansion in the short term. However, prolonged and aggressive use of tariffs can cause the longer-run misallocations in the use of resources, reducing the standard of living. Therefore, while it is difficult to notice the impact of President Trump's use of tariffs on aggregate measures of U.S. economic activity, including employment, GDP, and producer and consumer prices, the longer-term implications are uncertain and potentially costly.

Imports also matter

The Trump administration appears to be taking aim at improving the U.S. trade deficit by focusing mostly on imports. However, imports are critical to the manufacturing supply chain and any disruption would have negative implications for factory production and the broader economy.

From 1974 to 2016, the correlation coefficient between growth in real goods imports and manufacturing industrial production is 0.91. This is larger than the 0.57 correlation between growth in real goods exports and industrial production. A Granger causality test reveals that both real imports and exports Granger-cause changes in industrial production (see Chart 3).

Therefore, reducing imports would have unintended consequences. To test the importance of imports, we model manufacturing industrial production using an ordinary least squares regression. Independent variables include U.S. GDP, the unemployment rate, real trade-weighted

Chart 3: Imports Matter

Share of nominal U.S. GDP, %



Sources: BEA, Moody's Analytics

dollar, real imports, real exports, and a lag of the dependent variable. The lag dependent was included because of the assumption that growth in manufacturing production demonstrates persistence.

Our a priori expectation is that the sign on the coefficients on real GDP, real goods imports, real goods exports, and the lag dependent would be positive. The coefficients on the unemployment rate and trade-weighted dollar were expected to be negative.

The results were in line with our expectation; all the coefficients had the expected sign. All were statistically significant save for real exports, and the regression had an adjusted R-squared of 0.84. The regression was re-estimated, but the dependent variable was changed from manufacturing production to real manufacturing output. This did not change the results significantly.

The results suggest that an increase in real imports boosts manufacturing industrial production. Therefore, policies aimed at reducing imports could damage domestic manufacturing.

Currency implications

The use of tariffs should cause the U.S. dollar to appreciate, all else being equal. However, that is not always the case. Trade is a two-way street, and trading partners retaliate by putting tariffs on U.S. exports. Retaliation reduces U.S. exports, weighs on GDP growth, and implies less inflation and lower interest rates, which puts downward pressure on the U.S. dollar. This occurred

when George W. Bush imposed tariffs on U.S. steel in 2002 and 2003; the U.S. dollar depreciated.

The economy does benefit from a depreciation in the dollar. This is a short-term boost, however, since the underlying terms of trade do not change. The immediate implications of a de-

preciation in the dollar for inflation are modest, but they build. The dollar affects inflation with a lag and a significant depreciation in the dollar would be inflationary, implying the need for tighter monetary policy.

NAFTA redo

The Trump administration likely views tariffs as a negotiating tool. Though this may appear to be true, the trade deals struck on NAFTA, for example, were more symbolic than substantive.

Although the new agreement changes the name of the North American Free Trade Agreement to the U.S.-Mexico-Canada Agreement, or USMCA, the new deal does not alter the existing framework for trade and investment. Therefore, it will not meaningfully alter the macroeconomic outlook for the three countries.

Although updates to NAFTA are mostly cosmetic, the new deal will preserve tariff-free access for most goods, underpinning trade and investment in the world's second-largest trade bloc. Given the sharp escalation in trade and diplomatic tensions between the U.S. and fellow NAFTA members over the past year, news of the new agreement is much welcome. We simulated several outcomes of a NAFTA breakup using our global model and found the negative impact in terms of jobs and lost output to be worrisome.

The NAFTA negotiations squared a U.S. administration deeply skeptical of trade with Mexican and Canadian leaders intent on keeping the pact mostly intact.

With arguments over trade imbalances and regional content rules occupying negotiators' agendas, the outcome of the talks—a new agreement with modest changes to intellectual property rights and energy markets—comes as little surprise. However, the preservation of the existing trade and investment framework is worthy of celebration, given the welfare and productivity gains arising from the tripartite pact. With \$1.2 trillion in trilateral trade among its three members, the USMCA will rank second only to the European Union in inter-bloc trade flows.

Agreement on the new pact involved concessions from all sides. Mexico and Canada agreed to stricter rules for North American content in the auto industry, while Canada opened more of its dairy market to U.S. producers. In return, U.S. negotiators agreed to keep NAFTA's rules for resolving trade disputes intact, and scaled back demands for the three sides to renegotiate the agreement every five years. The U.S. also provided Mexico and Canada with a written agreement that USMCA countries would be exempt from any future auto tariffs. Because Mexico and Canada account for a third of U.S. auto imports, the exemption could lessen the blow of future auto tariffs for U.S. consumers while maximizing the economic pain for third parties.

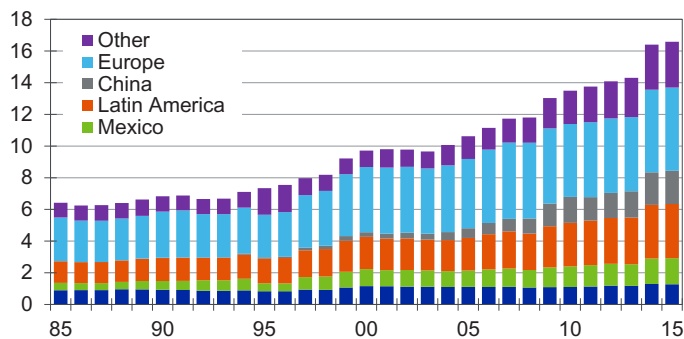
The USMCA will mean stricter rules for regional trade in autos, although changes will be introduced gradually and will do little to disrupt regional supply chains. Under the new pact, North American automakers will have to use more parts produced in the region while ensuring that 40% of all parts and assembly work is done by workers earning an hourly wage of at least \$16. This is little more than a euphemism for shifting production to the U.S., but the largest automakers already incorporate significant North American content and would not face significant adjustment costs.

Should the new rules prove more restrictive than expected, automakers are more likely to take a page out of Volkswagen's book and simply pay the 2.5% tariff levied by the U.S. on auto imports.

In exchange for the U.S. concession to preserve NAFTA's bilateral dispute-resolution

Chart 4: Big U.S. Operations Overseas

Employment at foreign operations of U.S. businesses, mil



Sources: BEA, Moody's Analytics

panels, Canada has relaxed its rules for dairy imports. Previously, Canada charged a modest tariff on dairy imports below a certain quantity, with additional imports facing tariffs up to 30 times higher. Under the USMCA, the quantity of imports facing the lower tariff will be raised. However, the marginal impact for U.S. dairy producers will likely be small. U.S. dairy and egg exports to Canada are already twice as large as imports, and gains in market share will be small compared with existing U.S. production.

Although the USMCA does not chart new ground, its continuity with NAFTA will ease trade tensions and soothe investors wary of the region's viability as a base for global exports. The new pact may also bring significant benefits for Mexico and Canada, which have been hit particularly hard by U.S. steel and aluminum tariffs.

Bull's-eye now on China

Given the rise in U.S. equity prices following the announced new NAFTA deal, it is clear that trade policy has been weighing on equity markets; stocks would be even higher, and there would be less downside risk to our U.S. economic outlook if trade tensions subsided further still. But the new NAFTA has mixed implications for this happening.

First the good news: In addition to the agreement exempting Mexico and Canada if the U.S. moves forward with auto tariffs, the U.S. separately is in trade talks with the European Union and Japan with the understanding that it would not impose auto tariffs on them during the discussions. So, the most likely sce-

nario now is that U.S. auto tariffs are used for the negotiation of voluntary export restraints or quotas similar to those the Trump administration reached with some trading partners on steel. A reduction or elimination of auto tariffs could also be used as part of a broader agreement.

Therefore, odds are rising that the U.S. will threaten but not impose auto tariffs.

The new NAFTA could escalate tensions with China. For example, recent trade agreements could lead the Trump administration to pursue additional tariffs on China, arguing that other tariffs have been successful in yielding trade deals. Odds are high that the next round of tariffs on \$267 billion in Chinese imported goods will be implemented. China would likely retaliate with non-tariff measures. Also, the outcome of the U.S. midterm elections could have implications for U.S. trade policy. For example, if the Democrats win a House majority and Republicans hold onto their Senate majority, political brinkmanship would likely ensue. Little legislation would get through and the Trump administration would likely focus on tariffs, which do not require congressional approval.

Different model

President Trump's trade strategy also fails to recognize that exports and imports are not the only way U.S. businesses engage with the rest of the world. Arguably more important is their direct investment overseas. Historically, U.S. companies have aggressively expanded operations in the countries where they sell their wares. They may export less to these countries, but they hire and produce more in them. U.S. companies have stakes in overseas operations that employ close to 17 million workers, including about 2 million in Canada and Mexico, more than 2 million in China, and about 5 million in Europe (see Chart 4).

This is a different business model than is generally pursued by export powerhouses such as China, Japan and Germany, but it has been highly successful. Not only do U.S. multinationals dominate global commerce, but they also have been instrumental in supporting U.S. so-called soft power—spreading American culture and political and economic mores to the rest of the world. Simply focusing on trade as a barometer of success misses, and if it means higher tariffs, it will almost surely undermine this deeper global relationship.

Expected Tariff scenario (50% probability)

It is easier to craft scenarios where trade tensions escalate rather than ease. Therefore, scenarios are constructed using the Moody's Analytics Global Macro Model, which covers more than 70 countries linked via trade flows, foreign direct investment, and financial markets.

The most recent salvo in the trade war is the president's decision to up the ante on the amount of Chinese imports to the U.S. subject to higher tariffs. The U.S. has imposed tariffs on \$311 billion in imported goods. Under this scenario, the assumption is that this is the extent of the tariffs the U.S. imposes and that there is no further retaliation and only \$134 billion in U.S. exports are slapped with tariffs.

If this is the extent of the tariff increases, then while not good for the U.S. and global economies, they will be able to largely shrug it off. Based on a simulation of the Global Macro Model, U.S. real GDP will be reduced by just more than 0.13 percentage point at the peak of the impact a year from now. More than 200,000 jobs will be lost over the period. The economic impacts outside of the U.S. will be comparable.

How this escalating trade war will play out is increasingly difficult to gauge. Trump appears set on increasing tariffs on a widening range of imports until U.S. trade partners blink and agree to help reduce the U.S. trade deficit, and in the case of the Chinese, protect intellectual property of U.S. companies and more fully open up their markets. However, China is digging in and is unlikely

Chart 5: Higher Tariffs Mean Higher Prices

CPI for laundry equipment, annualized % change over 6 mo



Sources: BLS, Moody's Analytics

to back down. This brinkmanship seems set to continue until global financial markets crack. Equity markets have been eerily calm in the face of the rising trade tensions, and as long as this remains the case, the trade war will escalate.

While there is no telling when global investors will fully appreciate the stakes and markets start to sell off, the most likely scenario is that this will happen well before all of the announced tariff increases are fully implemented.

Cushioning the impact of the higher tariffs on the U.S. economy is the massive fiscal stimulus—deficit-financed tax cuts and government spending increases—that will pump up growth through at least the middle of next year. For context, this stimulus is expected to add 0.4 percentage point to real GDP growth this year, and a like amount in 2019.

Mapping the economic consequences

Higher tariffs hurt the economy most directly and quickly through higher prices for imported goods. For example, the price of laundry equipment to U.S. consumers has jumped. The CPI for laundry equipment was up 42% annualized in August over the prior six months (see Chart 5). The tariffs act much like a tax increase, weakening the purchasing power of households; if households need to spend more on imported goods, they have less income to spend on other things.

Of course, exports also suffer as the tit-for-tat tariffs imposed by trading partners cause consumers and businesses to purchase

what they need domestically or from competing nations that can now provide the goods more cheaply. Chinese authorities have significant control over the economy, and in previous trade tiffs with Korea and Japan have strongly recommended to their citizens not to buy the prod-

ucts of those countries. China has not gone down this path with the U.S. yet, but it is a credible possibility.

The higher tariffs also weigh on the profitability of multinationals and their stock prices. This occurs via weaker overseas sales, and for U.S. companies a somewhat stronger U.S. dollar as the trade tensions create a risk-off environment in global financial markets. The resulting flight-to-quality lifts the dollar's value. U.S. stock prices have already suffered as a result of the trade tensions, losing an estimated near 2% of their value (all else being equal) since the trade war began.

In the longer run, the reduction in trade weighs on productivity growth, as the benefits of comparative advantage—when nations specialize in what they are especially good at producing—and global competition are diminished.

More broadly across Asia, the impacts also would be modest.¹ In this scenario China's GDP growth is reduced by 0.03 percentage point in 2018 to 6.67%, and the brunt of the tariff impact is felt in 2019 with GDP 0.09 percentage point below the no-tariffs baseline to 6.28%.

The tariff increases translate to lower demand for Chinese exports from the North American market. Exports remain a critical growth driver, making up 20% of GDP. Reduced export revenues translate to lower manufacturing output, flowing through to weaker employment growth.

The unemployment rate holds at baseline levels through 2023, but the relative stability masks weakness that sees consumption soften and drives down house price growth by 0.14 percentage point in 2019 to 2.76%.

China's stock market is the most sensitive metric examined under this scenario and reflects investors' rising concern about the implications of a trade war on China's economy. While the stock market is not highly correlated with GDP, it is viewed as a decent barometer of sentiment. The rise in the FTSE Xinhua is 1.16 percentage points lower at 4.62% in 2019. There is some recovery in 2020 with annual growth picking up to 6.26%, stronger than the 5.39% rise under the no-tariffs baseline.

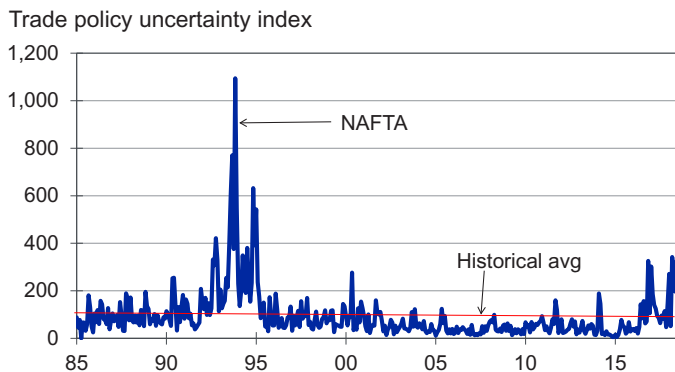
If this is the extent of the tariff increases, economies in Asia will not be immune to the trade skirmish between the U.S. and China, but the hit to GDP growth is negligible and forecast variables stay close to baseline levels. Based on a simulation of the Moody's Analytics global model, which covers 68 countries linked via trade flows, foreign direct investment, and financial markets, real GDP growth in Asia is reduced by only 0.08 percentage point by 2019, with an even more negligible impact of around 0.02 percentage point in 2018. The hit to GDP growth largely comes from the export channel, as Asia is an important provider of inputs into Chinese manufactured goods, particularly for tech producers Malaysia, Singapore, Taiwan and Hong Kong where tech products make up a sizable, if not the largest, share of exports.

Reduced global trade flows drag on commodity prices and have a pronounced impact on commodity export-oriented countries such as Australia and Indonesia. China's softer GDP path hurts prices of iron ore, which remains Australia's largest export, with China the largest export destination. Indonesia's important commodity exports to China include coal, petroleum gas and crude petroleum.

A slowdown in regional demand will also hurt India's petroleum-related exports. While India is a net oil importer, exports of refined petroleum products still account for a large part of export values. As regional demand slows, demand for refined products such as

¹ Detailed tables of the impact on Asian economies can be requested from steve.cochrane@moody.com

Chart 6: Trade Uncertainty Rising...



diesel, oils or other fuels is likely to drop. Moreover, chemical product and engineering goods exports will decelerate as demand in major export destinations such as the EU is likely to be lower.

Monetary policy paths stay close to the baseline under this scenario, with additional stimulus not coming into view. Central banks throughout the region are acutely aware of the capital outflow pressure emerging markets are facing in 2018 so are reluctant to stoke capital outflows with interest rate cuts, particularly given GDP paths are only a fraction weaker than the baseline. Indeed, Indonesia, India and Malaysia have already increased interest rates this year to assist with capital outflow pressure and are not expected to reverse under this scenario.

Model limitations

The economic consequences on the U.S. economy of heightened trade tensions go well beyond the dollars and cents captured by the direct economic costs of the tariffs, and the model may not fully capture them. It is especially difficult to gauge the impact of uncertainty on business decisions (see Chart 6). Until there is clarity around the tariffs, businesses could be less likely to make significant investment decisions. U.S. investment growth has held its own this year, but this is increasingly disappointing given the large corporate tax cuts and expensing provisions in the tax legislation passed at the end of last year.

Tariff uncertainty could cause businesses to cut capital expenditures and production,

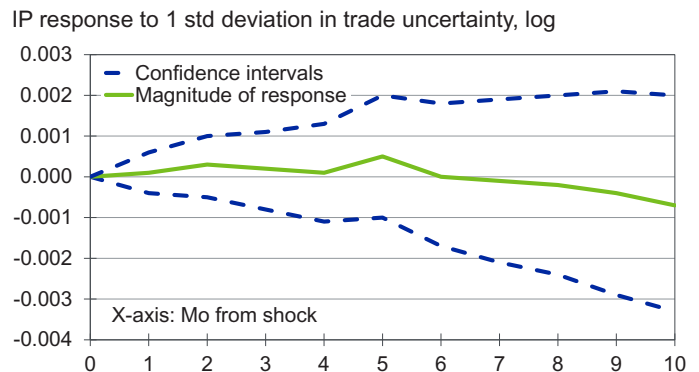
but it is difficult to quantify. We attempt to quantify how trade uncertainty affects the economy. A vector autoregression model is used because this allows us to estimate the response of economic activity to an unexpected increase in trade policy uncertainty.

This approach has many caveats, leading to significant uncertainty in the estimates. For one, measuring trade policy is extremely difficult, as one is measuring something that is not directly observable. For this exercise we use the trade policy index created by Baker, Bloom and Davis at Northwestern, Stanford University, and the University of Chicago. Their index captures important but rare periods of heightened trade policy since 1985, including NAFTA in the 1990s.

To estimate the impact, we leaned on our past work on the economic costs of uncertainty. We used the same VAR but swapped out the total policy uncertainty index for the trade uncertainty index. Other variables included in our VAR are the Standard & Poor's 500, the three-month Treasury yield, total nonfarm employment, industrial production, and the consumer price index. The VAR uses monthly data from January 1985 to May 2018. Altering the order in the VAR did not significantly change the results.

We focused on industrial production, and the impulse response was extremely small (see Chart 7). Next we replaced industrial production with core capital goods orders in an effort to gauge whether trade policy uncertainty hurts orders. The impulse response was similar to that for industrial production. Though there does not appear to be a sig-

Chart 7: ...But Impact on IP Appears Tiny



nificant hit to either industrial production or core capital goods orders from trade policy uncertainty, it is difficult to have full confidence, as trade policy uncertainty may be measured incorrectly or there are insufficient instances of policy uncertainty to accurately quantify the impact. Therefore, measures of capital expenditure plans, industrial production, and core capital goods orders warrant close watch.

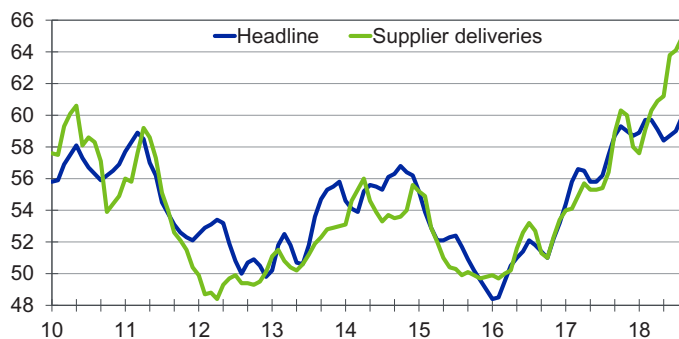
There are a couple of possible explanations for a very small impulse response. First, a more granular approach is needed, including looking at firm-level data. The reasoning is that some firms are more immune to tariffs than others, which would affect production and capital spending. Also, firms that would find it costly to resell their physical capital and therefore have difficulties reversing their investment decisions should be hurt more by trade policy uncertainty.

Another possible explanation is that the impulse response to investment from a sudden increase in policy uncertainty is based on actual investment rather than planned expenditures. Therefore, uncertainty could have a greater impact on planned expenditures rather than actual. For example, the correlation coefficients between capital expenditure plans in regional Fed manufacturing surveys and policy uncertainty were negative.

However, capital expenditure plans are not set in stone. Therefore, as policy uncertainty fades or uncertainty becomes certainty, businesses can adjust their plans. Therefore, the hit to actual investment is likely not as significant as it is to capital expenditure

Chart 8: Bigger Issue Is Supply Chains

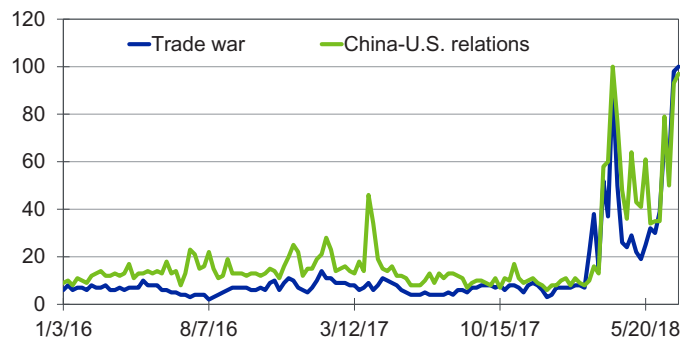
ISM manufacturing survey, diffusion index, 3-mo MA



Sources: ISM, Moody's Analytics

Chart 9: Tensions Garnering Attention

Google Trends, search terms, 100=peak interest



Sources: Google, Moody's Analytics

plans, particularly if the shock to uncertainty is temporary.

Uncertainty aside, disruptions to the supply chain may not be accurately captured by the model. The ISM supplier deliveries index has jumped recently (see Chart 8). An increase in supplier deliveries signals slowing, and the index is at its highest since 2004. The rise reflects more respondents are reporting slower deliveries than faster deliveries. The supplier delivery index normally increases when the economy is doing well and the increase in activity causes delays in delivery times. Other factors can cause a rise in supplier deliveries, including weather. However, this is not the main catalyst for the recent jump. We believe solid domestic economic growth, trade tensions, and transportation issues are the primary catalysts.

Misguided

It is misplaced to think that, since it will be costlier to produce in countries hit by the higher tariffs, this will quickly prompt multinationals to invest more in the U.S. The problem is that these global companies have no idea how long the tariffs will remain in place. And even if they conclude the tariffs will remain in place, the U.S. will likely not be the beneficiary, as there are many other places in the world not subject to higher tariffs, where it is cheaper to make most of these goods.

The reworking of the global supply chain, when it occurs, will be highly disruptive, and is only partially picked up in our model. The manufacture of many goods involves multiple cross-border movements. Indeed, the

U.S. trade deficit with China is significantly inflated, because China is simply where final assembly of many components produced in Japan and elsewhere in Asia occurs. Higher tariffs change the economics of the supply chain. If the tariffs remain in place long enough, they will cause the chain to shift.

In the U.S., businesses could shift the production of imports subject to tariffs from abroad to domestically. Manufacturing capacity utilization is below its prior peak, but a significant shift to U.S. factories is complicated by the age of manufacturing's capital stock. The average age of private manufacturing equipment was 7.4 years in 2015, a touch higher than the prior 10-year average but above its historical average of 5.9 years. Typically, older equipment is less efficient and runs the risk of breaking down. In other words, the U.S. capital stock may not be suited to being reconfigured quickly to shift production domestically to avoid tariffs.

Within manufacturing, the current age of private equipment is lower than its prior 10-year average only for wood products, motor vehicles, other transportation equipment, and petroleum/coal products. Businesses could invest in new equipment. This takes time, but that is not the only issue with the capital stock. Private manufacturing structures have continued to age. Investment in structures is a long-term commitment and may not happen until businesses are convinced that the tariffs will stick. Therefore, the capital stock would suggest that businesses are unlikely going to re-shore manufacturing.

Collective psyche

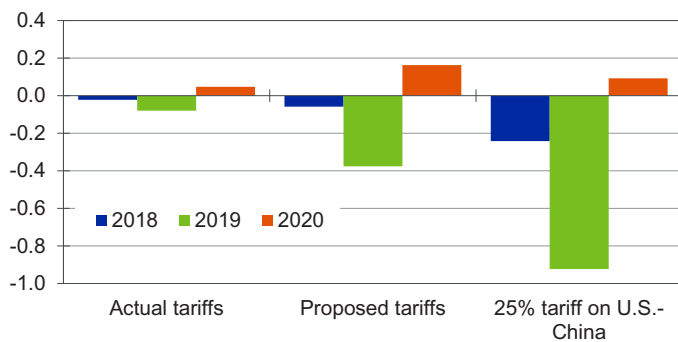
The global model also fails to adequately account for the fallout on businesses' and investors' confidence, which would surely be substantial as they contemplate the broader geopolitical implications of the trade war. Sentiment is fickle; it is fine, until it is not. There is no telling when sentiment will swing significantly, but when it does, the economic pain will intensify quickly.

We used Google Trends as an alternate way to gauge how consuming the trade frictions are to the global environment. Google Trends provides total searches for a term relative to the total number of searches done on Google over time; changes and spikes can be a useful barometer of the current state of play. Google Trends adjusts search data to make comparisons between terms easier. To do this, each datapoint is divided by the total searches of the geography and time range it represents, to compare relative popularity. The resulting numbers are then scaled to a range of 0 to 100. The assumption is that an increase in relative search popularity would imply that it is on consumers' minds and affecting sentiment.

Google searches for "trade war" and "China-United States relations" worldwide have spiked in 2018 (see Chart 9). As of mid-July, these search terms are hovering near or at their peak level of interest over the past five years, a testament to the level of strain that arguably the world's most important bilateral economic relationship is under and the broader concern it is generating globally.

Chart 10: Asia Caught Up in the Trade War

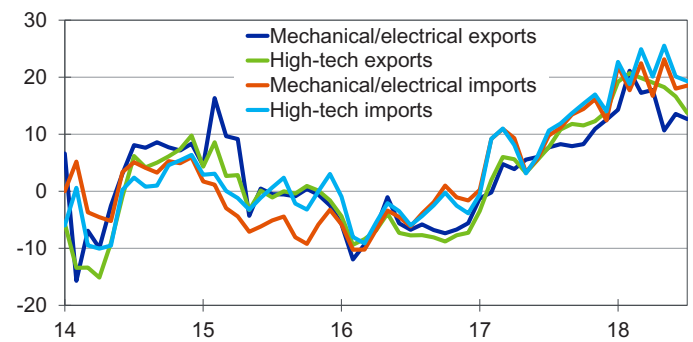
Difference in Asia's real GDP compared with no-tariff scenario, %



Sources: National statistical agencies, Moody's Analytics

Chart 11: Tech Upswing May Fall Victim

China tech trade, % change yr ago, 3-mo MA



Sources: China National Bureau of Statistics, Moody's Analytics

Threatened Tariff scenario (40% probability)

It appears increasingly likely that the trade war will escalate given the rhetoric and lack of a clear path to resolution. This scenario assumes that all tariffs that President Trump has threatened are implemented, including a 15% average tariff on \$800 billion in U.S. imports, including \$275 billion in vehicle imports subject to a 25% tariff. This scenario also assumes a 15% tariff on an additional \$475 billion of U.S. exports. If actually implemented, close to one-third of all imported goods into the U.S. would be subject to higher tariffs.

Assuming that impacted U.S. trading partners respond with in-kind tariffs on U.S. goods, the macroeconomic consequences would be more serious. Using our global model, such an escalation would reduce real GDP by 0.5 percentage point and employment by 700,000 jobs at its peak. This is still not enough to derail the fiscal-stimulus-fueled economic expansion, but it would be enough to be felt, particularly in the nation's agricultural and manufacturing industries.

Although odds of such an escalation are low and falling given the new NAFTA deal, trade tensions continue to ebb and flow. The Trump administration wants China to respect the intellectual property of U.S. companies and to more fully open its markets. The president also appears fixated on reducing the size of the U.S. trade deficit. Getting China to play by the rules is a laudable goal, but focusing on the trade deficit makes little

economic sense, and both goals are unlikely to be achieved, at least not soon.

It is also increasingly hard to see U.S. trading partners backing down and purchasing more U.S. goods and services. Even if they were inclined, it is unclear how they would do this. Given Trump's claim that he is imposing the higher tariffs largely on national security grounds, which is clearly not the case for our allies, they appear offended and thus not inclined.

In this trade war scenario, real GDP growth in Asia is reduced by around 0.06 percentage point in 2018 and 0.38 percentage point in 2019 before recovering in 2020 (see Chart 10). China's GDP growth falls by 0.07 percentage point in 2018 to 6.62% and is 0.42 percentage point below the no-tariffs baseline in 2019 to 5.95%. Annual GDP growth improves by 2020 with growth coming in 0.24 percentage point above the projected no-tariffs baseline growth rate at 6.07%.

The tariffs are like a hefty import tax, reducing demand for Chinese goods in the U.S. Other important markets, including Europe and Asia, are not able to sufficiently pick up the slack from weaker U.S. export demand. Tech products are an important focus of the U.S. tariffs on Chinese goods imports, and this takes the wind out of the global tech upswing that China has benefited from for over a year (see Chart 11).

Weaker manufacturing output culminates in reduced hiring and lower wage growth, pronounced through 2019. A weaker labor market means that retail spending and annual house price growth trough at 0.3%

in 2019, weaker than the 1.05% in the no-tariffs baseline.

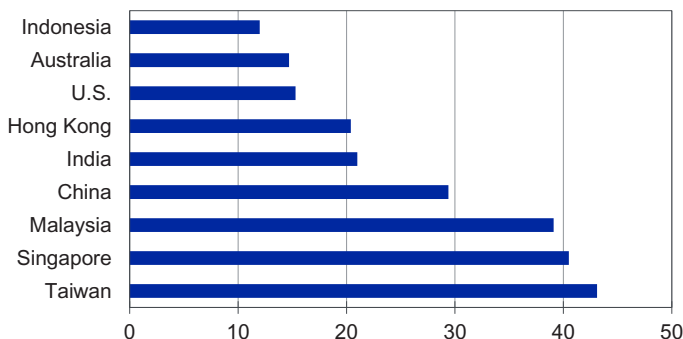
The Chinese government increases fiscal and monetary stimulus that has already stepped up since the trade war escalated in the June quarter, but these additional measures are not sufficient to absorb the direct hit to GDP growth. Investors run for cover under this scenario, as reflected in the equity market being 5.29 percentage points below the no-tariffs baseline in 2019 at just 0.49%, before partially recovering and rising 8.59% in 2020, 3.2 percentage points stronger than the baseline. Capital outflows are expected to accelerate under this scenario, but efforts surge to keep the yuan broadly steady through the brunt of the scenario in 2019.

Under this scenario, Asia's important integrated supply chains are strained, and this is where the hit to GDP growth largely comes from for remaining countries since they are not directly subject to the U.S. tariffs.

Examining the import content of exports illuminates the extent to which a country is a user of foreign inputs and for most economies in Asia this is relatively high (see Chart 12). Value-added trade data from the Brookings Institution confirm that in the case of the "computer, electronic equipment" category, there is more foreign value-added than domestic value-added in Chinese exports to the U.S. (see Chart 13). In other words, tech intermediaries play a greater role in producing goods in this category that are shipped to the U.S. than China does. This is important because it means that those economies that are important tech hubs throughout Asia,

Chart 12: Integrated Supply Chains

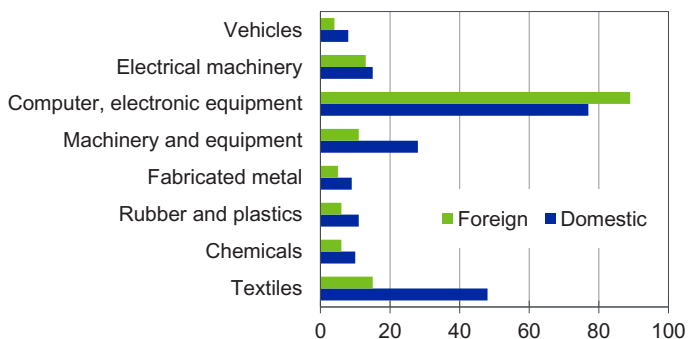
Import content of select country exports, % of total exports, 2014



Sources: OECD, Moody's Analytics

Chart 13: China in the Supply Chain

Value-added U.S. imports from China, \$ bil



Sources: Brookings Institution, Moody's Analytics

including Taiwan, Malaysia, Hong Kong and Singapore, inevitably suffer from tariffs on Chinese tech imports to the U.S. simply because of their role in the supply chain.

Under this scenario, the worst of the hit to GDP growth occurs in 2019. Hong Kong's GDP growth is reduced by 0.62 percentage point below baseline levels to 0.92% in 2019. Singapore's GDP growth hits 1.69% in 2019, 0.23 percentage point below the baseline. Malaysia endures a similar magnitude slump with annual GDP growth hitting 3.95% under the scenario.

Some Chinese parts that are currently shipped directly to the U.S. could be redirected via Southeast Asia to avoid tariffs, but whether this would be a boon for Southeast Asia in the near term is unlikely, given that manufacturing is still taking place in China. In the medium to longer term, China could accelerate offshoring to Southeast Asia, where labour and operating costs are lower in some parts, but this would not be enough to offset the direct hit from lower trade flows. GDP growth in export-dependent Taiwan is expected to cool to 2.14% in 2019, 0.35 percentage point below the no-tariffs baseline as its heavy exposure to electronics makes it particularly vulnerable to this protectionist stance.

The marked reduction in global trade flows sees commodity prices take a hit, with Brent oil falling to around \$60 per barrel by the end of 2019. Weaker commodity prices flow through to weaker export receipts for Australia and Indonesia. Australia's GDP growth is reduced by 0.23 percentage point

in 2019 to 2.48%, before returning to near the no-tariffs baseline growth rate in 2020. Indonesia's GDP growth is 0.15 percentage point lower in 2019 at 4.62%, but by 2020 comes in at 4.98%, 0.41 percentage point above baseline.

Exchange rates in all countries except Hong Kong and Singapore act as a partial shock absorber, but are not able to completely absorb the hit to exports. Modest monetary easing comes into view for these Asian countries from 2018 with policy rates not returning to no-tariff baseline levels until after 2023.

Trade Conflagration scenario (10% probability)

It would take a lot to derail the expansion, yet an across-the-board hike in tariffs on U.S.-China trade could do it. The U.S.-China trade relationship is the largest in the world, with Chinese exports to the U.S. running at more than \$520 billion per year—more than one-fifth of total U.S. imports. U.S. exports to China total more than \$130 billion—close to one-tenth of total U.S. exports.

A scenario that includes a 25% tariff on all this trade, coupled with Chinese "qualitative" measures that complicate doing

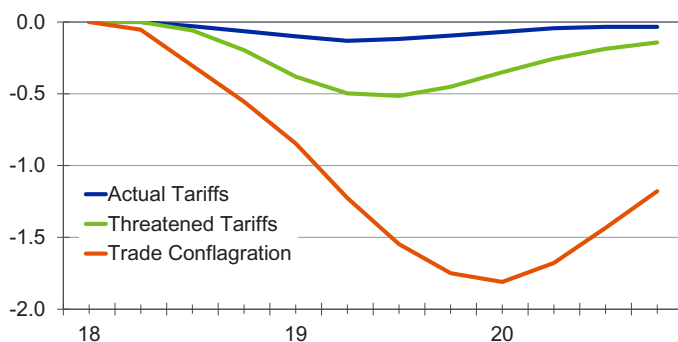
business in China for American companies, would overwhelm the global economic expansion. China could take a range of qualitative steps, from more aggressive inspections of U.S. imports to stiffer visa requirements for visiting American workers, to ensure that they match the economic pain created by the U.S. tariffs on their products.

In this scenario, the U.S. economy descends into recession by the second half of 2019 (see Chart 14). The increase in import prices and accelerating inflation and decline in exports would overwhelm the U.S. expansion, particularly since the entire global economy and financial markets would also be reeling. Real GDP is cut by 1.8 percentage points at the economy's nadir at the start of 2020, costing the economy almost 2.6 million jobs. Unemployment rises to well over 5%.

The rest of the global economy suffers, although a stronger U.S. dollar moderates the blow somewhat (see Chart 15). The eco-

Chart 14: Trump Trade War Is Bad Policy

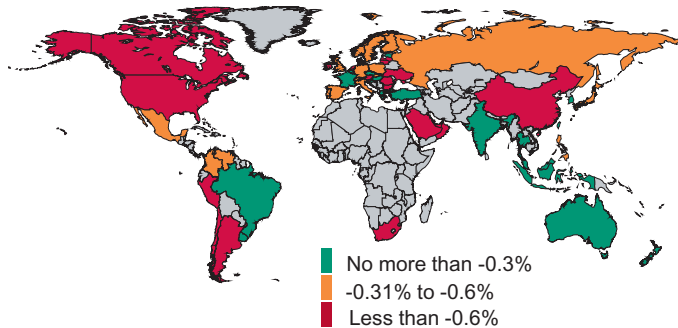
% difference in U.S. real GDP, compared with No-Tariff scenario



Source: Moody's Analytics

Chart 15: All Suffer in a Trade War

Diff in real GDP growth, 2018Q2-2020Q2, baseline vs. trade war



Source: Moody's Analytics

conomic and political turmoil created by the trade war causes a selloff in global financial markets and a risk-off environment. Global investors flock to the safety of U.S. Treasury bonds, resulting in an appreciation of the U.S. dollar against most other currencies, most notably vis-à-vis the euro and Chinese yuan. Therefore, the Chinese economy ironically weathers the trade war storms more gracefully than the U.S.

In this trade war scenario, real GDP growth in Asia is reduced by around 0.24 percentage point in 2018 and 0.92 percentage point in 2019 before recovering modestly in 2020. In this scenario, China's GDP growth drops by 1.19 percentage point to 5.18% in 2019 and 0.19 percentage point to 5.64% in 2020. The marked deterioration through 2020 causes significant reduction in manufacturing output, spilling over to weaker employment and income growth. Government stimulus steps up on both a fiscal and monetary front but is unable to materially help the economy get back on track, and GDP growth stays below the no-tariffs baseline level until 2021.

China's stock market falls sharply in this scenario, declining by 9.4% in 2019, and the yuan remains below baseline levels through 2023, troughing at 6.53 per U.S. dollar in 2021. The weaker yuan forces the current account surplus to narrow, acting as a secondary channel by which investors turn more bearish on China as they question the health of key economic metrics.

Asia is swept up in the dire situation and important supply chains come under severe

strain. Reduced global demand, coupled with the heightened inability to source key components, means that Asia's tech producers have their otherwise upbeat growth trajectories knocked off course. Similar to the proposed tariff scenario, the worst of the hit to GDP growth occurs in 2019. Hong Kong's GDP growth is reduced by 1.26 percentage point to 0.28% in 2019. Singapore's GDP growth slows to 1.69% in 2019, 0.36 percentage point below baseline. Malaysia endures a similar magnitude slump with annual GDP growth slowing by 0.33 percentage point to 3.85% in 2019. Annual growth in Hong Kong and Singapore remains below the no-tariffs baseline rate until 2021, while Malaysia returns to near baseline growth rates in 2020.

In all these Asian countries, China is their largest export partner, ensuring a high vulnerability to this scenario. An added hit comes from higher policy uncertainty, causing businesses to delay hiring and investment and raising the cost of capital. The resulting slump in wages weighs heavily on consumption.

Commodity producers are also not immune. Markedly reduced global demand drives down commodity prices, weakening an important source of income for Australia and Indonesia. In this Trade Conflagration scenario, Brent oil falls to around \$51 per barrel by the end of 2019. Firms abandon investment plans and cut employment to try to stay afloat through the turmoil. The unemployment rate in Australia peaks at 5.34% in 2019. Indonesia's unemployment rate rises to 5.21% in 2019, modestly higher than the baseline.

Australia's annual house price growth slumps to 2.36% in 2019, weaker than the no-tariffs baseline projection of 3.48% with the resulting weaker wealth effects providing a further hit to consumption.

A broad-based slowdown in trade will cause India's foreign direct investment to fall. FDI remains a key source of funding for various Indian companies, and a slowdown in foreign flows means investment is likely to decelerate. Overall investment in India already remains low, and a further slowdown will adversely impact the capital expenditure cycle. Less capital inflows will likely see the rupee depreciate, as the currency remains vulnerable to capital flight due to India's high reliance on external funding.

Although large unilateral trade sanctions are unlikely against India, there is risk that India itself could turn more protectionist. For example, India recently retaliated with its own tariffs against U.S. products in response to President Trump's import duties on steel and aluminum. This will likely lower Indian imports, which could hinder the capital expenditure cycle.

Equity markets are a decent barometer of the risk aversion that has swept through global financial markets, and large falls are recorded across all markets. Stock markets across the Asia-Pacific region endure steep double-digit declines in 2019. Currencies fare similarly but are unable to fully absorb the hit to exports.

Retaliation and negative feedback loops

The U.S. has been in the driver's seat, but trading partners are retaliating with the primary tool being tariffs. For example, China has been retaliating just enough to match the U.S. tariffs, rather than escalating the situation itself.

China holds important bargaining chips in this high-stakes game that it has not yet played. So far, China has proposed tariffs only on U.S. goods imports, but targeting the services sector is where the economic pain could be felt long term. The U.S. services trade surplus with China was \$38 billion in 2016, up from \$16.5 billion in 2011. Although this still pales in comparison with the \$370 billion deficit in goods, global demand is shifting from goods to services. This trend is well entrenched in China as the drivers change from urbanization and basic manufactured goods to consumption and more complex services. Well-established expertise

in various industries means that the U.S. is in good stead to meet the rising needs of China so long as Beijing remains open to it. In particular, China could restrict enrollments into U.S. universities or restrict tourist flows, both important income streams for the U.S. Tourism represented 63% of U.S. services exports to China in 2015.

Since the trade tensions have intensified, anecdotal evidence suggests that U.S. firms are finding it more difficult to obtain regulatory approval for various business activities, and that their goods have taken longer to clear customs in recent months. China has used this under-the-radar approach in the past. For instance, when the South Korean-Japanese conglomerate Lotte Group agreed to sell land to the South Korean government for the purposes of a U.S. missile defense system, operations at several of the company's stores in China were suspended for alleged fire safety violations. The firm has since pulled out of China, but is still incurring losses due to an inability to sell all its units. A backlash was felt in other areas, including Chinese consumers shunning Korean automobiles and cancelling planned tourism to South Korea. The Bank of Korea estimated that the incident shaved 0.4 percentage point from South Korea's GDP growth in 2017.

Another strategy could be to devalue the yuan. A lower exchange rate would help competitiveness across all markets and could partially absorb some of the tariffs' impact on goods shipped to the U.S. It would also fan U.S. frustrations, as the U.S. government has threatened to label China a "currency manipulator" in the past.

Restricting aircraft imports is another option. Aerospace exports to China were \$16.3 billion in 2017, according to Teal Group. Boeing is the largest exporter to China and would be hurt if China pushed ahead with the proposed 25% tariff on some aircraft. In November, Boeing announced it had signed

an agreement to sell 300 planes to China worth \$37 billion, but it is not clear how much of this represented new business; the company had previously noted that 25% of new jetliners were being delivered to Chinese customers. This would not benefit China since substitution of airliners is not easy. But it is still an option.

A less likely bargaining chip is that Beijing could sell some of its holdings of Treasuries. In theory, this could tighten U.S. financial conditions beyond what is already occurring via monetary policy. China is the largest holder of U.S. Treasuries. Back in January, unnamed Chinese officials reportedly threatened to stop or slow U.S. Treasury purchases, and financial markets took the whispers seriously, causing bonds yields to increase even though the claim was later debunked by China's foreign exchange regulator. In practice, China does not have a lot of options to substantially diversify away from otherwise desirable U.S. Treasuries.

Assumptions in the global model about retaliation were made, but they could differ from reality. Also, the negative feedback loops from the trade tensions could be more significant, primarily through financial market conditions. China's stock market has been the most obvious casualty from the trade tensions. The Shanghai Composite has fallen 16% since the beginning of the year through September, by far the worst of its emerging market neighbors in Asia.

In many economies, the performance of the stock market is a barometer for the health of the real economy. However, the performance of the stock market is not always closely correlated with the real economy. This is especially so in China, where the link between the stock market and GDP performance is weak.

China's equity market does not mirror the economy's performance as a normal stock market does. China's crackdown on shadow

banking and various stock market corrections on the back of concerns around debt sustainability have increased stock market volatility in the past decade while China's GDP growth has been steady. Indeed, the correlation between the Shanghai Composite and China's nominal GDP growth was 0.01 from 2008 to 2018.

China's equity market is under the close purview of the government, and it has a wide array of tools to influence equity performance. For example, in 2016 the government wanted to stop short-selling, so it prohibited large shareholders from selling and forced a \$250 billion injection into the market.

Retail investors are hefty holders of Chinese stocks, tending to buy and sell based disproportionately on speculation rather than fundamentals. Given this, the Shanghai Composite is relatively volatile. If equity prices rise, retail investors tend to jump in, further adding to the spike and vice versa.

Reliable data on equity ownership are hard to come by, but the 2015 China Household Finance Survey shows that 8.8% of households participated in the equity market, rising from 4.1% in 2014. Equities remain a relatively small proportion of total household wealth, with real estate typically making up the lion's share.

China's wealthiest 20% of households accounted for 92% of total household equity ownership in 2013. We expect that figure has been reduced a little since, but the story does not materially change. The bottom line is that while equity ownership is not important for the average household, it is for some of the wealthiest households, which could mean that the government will not allow the slump to deepen materially further. In short: Unequal exposure to the equity market means that the limited impact on the average household, and therefore economy, from the 2018 slump is not likely to have a broad economic impact.

Appendix: The Moody's Analytics Global Macro Model

The Moody's Analytics Global Macro Model is a structural model (see Chart 16). Wherever possible, theory is applied strictly, with the specific functional forms motivated as the first order solution to some optimization problem, and with the equation parameters having a clear structural interpretation. In other cases, theory is applied in a much broader sense, by employing first order Taylor rule expansions to generate log-linear regression specifications between dependent and independent variables, or specifying equations according to empirically validated rules of thumb, such as Okun's law, or a professional consensus in the field, such as the so-called Taylor rule for central bank interest rate setting.

In each case, parameters are estimated econometrically based on the observable historical covariation over the equation's macroeconomic time series. Below are descriptions of important methodological considerations in specifying and estimating these equations:

Specification searches. Typically, theoretical macroeconomic models describe either static relationships (for example, the textbook IS curve) or involve some type of dynamic relationship over a nonspecific time period (for example, asset pricing equations). In either case, applying a theoretical relationship to the data and implementing it practically in a forecast setting typically requires some type of specification search. Theory places structure on the data, but the data are also used to discover empirical facts about relevant lag lengths and periodicity. These facts can differ across countries, as can data quality, volatility and economic significance. For example, stock market valuations may play a more important role in business investment decisions in some economies than others. Thus, for a given variable, the same specification is used initially for each country, but the final specification for that concept may vary across countries. This variation may be for empirical reasons—shocks propagate more slowly in some countries, requiring longer lag lengths. Or it

may be for practical reasons—an explanatory variable may appear in one country where there is a long historical times series available, but be dropped from an equation where its inclusion would significantly reduce the sample size.

Equation parsimony. In theory, everything in the world is endogenous. In practice, the Global Macro Model was built to function as an effective tool for addressing a wide array of possible use. This requires maximum flexibility in terms of cross-variable linkages and associations and directions of causality among variables. However, in a model with 10,000 equations and unknowns, some structure is required to ensure tractability and stability. For this reason, equations are generally specified in a way to include whatever variables are deemed most necessary, in whatever transformation of that variable makes it appear most significant, while excluding extraneous variables or those with low levels of statistical significance (high p -values). In general, though, theoretical and practical considerations always trump statistical ones. A variable that is theoretically relevant or represents an important linkage for ensuring proper shock propagation may be included in an equation even if it has a higher p -value (implied by a low t -statistic) than another, less theoretically important variable with a more significant p -value that is ultimately excluded for reasons of parsimony.

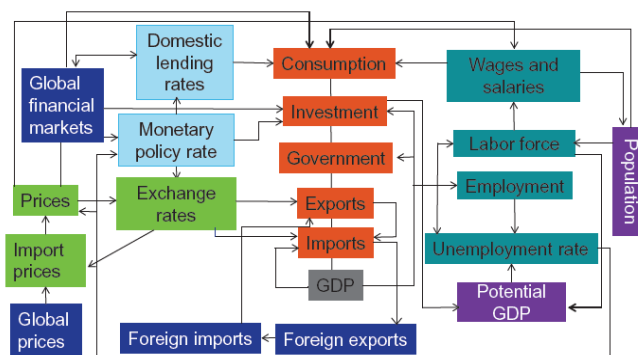
Linkage parsimony. Just as parsimony in equations helps to alleviate problems of collinearity that can produce volatile and possibly inaccurate coefficient estimates, parsimony in the extent of cross-country linkages helps to reduce the size of the simultaneous model "core," which increases stability of the solutions and reduces iteration counts, and thus the required time

to solve. Several approaches to linkage parsimony are taken:

Use of proxies versus aggregates. In theory, each country both determines and is influenced by world prices and interest rates. However, world prices and interest rates are not a primitive forecast with a stochastic equation. Rather, they are an aggregate that depends on the forecasts for all covered countries. For this reason, including just a few instances of "world prices" (or interest rates or GDP growth) in the simultaneous core of one country would actually imply the addition of many thousands of variables in the core, slowing convergence times considerably. This is why the model often uses just a given value for the U.S., and/or another large regional economic superpower such as the euro zone, Japan or China as a proxy for the equivalent global aggregate concept. Ergo, U.S. CPI is used in place of "global prices" as a driver for a country's export and import price deflators, the U.S. Standard & Poor's 500 stock market index is used as a proxy for average global stock prices, and the U.S. Treasury yield curve is used as a proxy for the maturity spread on global risk-free debt, over which foreign yields are marked up in line with their domestic monetary policies and perceived default risks.

Top-down versus bottom-up. In theory, French GDP is the sum of final goods market expenditure in France, and euro zone GDP is the sum of GDP across all of the euro zone

Chart 16: Structural Forecast Model



Source: Moody's Analytics

countries. However, investment in France may be determined in part by growth in euro zone GDP. In theory, a model solution may be computed with a consistent path for French investment given euro zone GDP and euro zone GDP given French investment, but a large number of iterations may be required to compute this solution, slowing the model solve speed and potentially creating instability should a shock be delivered into this simultaneous system of equations. To avoid such problems, we employ a number of "ex ante/ex post" concepts, in which a top-level variable representing some aggregate outcome is determined, which then drives lower-level forecasts, which are summed to produce an aggregate that mirrors, if not exactly equals, the initial forecast.

The use of event dummy variables

One type of dummy variable plays an important role in the global model: those "event" dummies indicating a discrete periodic in conditions such as a recession, a financial crisis, or a cycle of hyperinflation. These variables are important in several respects.

First, they provide a natural lever with which to introduce the concept of an "exogenous shock." Most economic models operate by inputting values for exogenous variables and having the model return values for endogenous variables. In this case, one can construct alternative outputs simply by altering the exogenous inputs. In the global macroeconomic setting, however, there are few truly exogenous variables. GDP, income, prices, interest rates, exchange rates, trade balance, stock prices and house prices all depend on one another. Although one can produce a recession in a country by, for example, lowering consumption spending dramatically, to a large extent you have then simply assumed your conclusion. The goal of the dummy is to avoid exogenizing variables of interest that we want the model to tell us about. "Turning on" a country's recession dummy in a downside scenario avoids the need to overlay the model output with an assumption about consumption or investment spending, is more transparent in tracing back forecast output to inputs, and preserves the

model's ability to transmit shocks by keeping key series endogenous.

Second, the use of recession and financial dummies in estimation helps to reduce omitted variable bias. When estimating a structural relationship across time series, there are often structural breaks (temporary or permanent) where the relationship shifts in some way. A recession could trigger a sudden temporary increase in fiscal stimulus spending, a widening of credit spreads, a pullback on house purchases, or big-ticket durables spending. Not controlling for these factors may bias the coefficient estimates on included regressors, if the values of those regressors are correlated with the episodes of structural change. Evidence of such omitted effects can often be seen by examination of the residuals. The use of time dummies, a common option in econometric estimation, allows for structural breaks. Not accounting for this may conflate differing effects over time into a single coefficient. However, in the context of forecasting, a time dummy approach wastes information. The period 2007-2009 will never occur again. Yet, the relevant events of that period very well could recur. Creating an event dummy variable, such as DUM_RECESS, is econometrically equivalent to using a time dummy during the quarters of a recession, but it has an additional practical advantage; alternative forecasts for the event dummy can be set explicitly to motivate, in a transparent fashion, the construction of alternative scenarios in the forecast.

Third, dummies help capture the impacts of latent or nonquantifiable (that is, qualitative) factors such as investor psychology. Dummy variables are useful for quantifying the impact of an unknown latent factor that cannot be easily identified or measured. If the omitted variable bias in the regression was being generated simply by the existence of recessionary conditions, such as a high unemployment rate, then the optimal approach would not be to include that omitted variable directly. The problem with this arises when the variable under consideration (that is, the unemployment rate) does not have a clear structural relationship justifying its inclusion in the equation. In this case forecast

problems can be introduced by changes in the proxy variable independent of changes in the "true" underlying latent factor inducing spurious changes in the forecast. For this reason, where the omitted variable is believed to be qualitative or nonobservable, the dummy variable method is preferable to the proxy method. For example, the sudden emergence of fears of recession might spark a drop in equity prices. A recession is also associated with a rise in unemployment. However, the level of unemployment may not be structurally related to stock prices. Higher unemployment may be generally associated with higher stock prices, out of a belief that the central bank will keep future interest rates lower than it otherwise might.

Fourth, the dummy variables help to generate more realistic dynamics. Another concern with using a proxy such as the unemployment rate in a stock price equation would be that the unemployment rate tends to rise and fall much more gradually than changes in equity prices. Using a recession dummy in an equity, investment or durables spending equation can help to produce a sudden, sharp movement in a forecast series in a downside scenario, matching the empirical dynamics commonly observed during recessions. By contrast, equations tied to variables that adjust gradually, or enter with some lag, produce much more slowly moving responses in which GDP, unemployment, inflation, equity prices and other variables drift away from the baseline in a recession scenario rather than sharply dropping away from it in a manner consistent with past experience for most countries.

Finally, incorporation of event dummies helps to reproduce empirically observable asymmetries. A final use of recession dummies is to help introduce asymmetries that are also evident in the data. An example would be Okun's law: a strong empirical (negative) correlation between the size of the output gap and the unemployment rate. Roughly speaking, across much of the OECD, the unemployment rate moves by about -0.4 times the percentage point difference in the growth rates of real GDP and its potential rate. This amounts to a trend line that fits the data quite well but also implies

a symmetry between faster growth lowering the unemployment rate and slower growth raising it. On an incremental basis this symmetry does exist, but with more extreme swings we generally see unemployment rising sharply much more during the onset of

recessions than we see it falling during boom periods. There is a natural floor for the unemployment rate but no equivalent ceiling, reflecting in part that it is easier to engage in sudden, mass layoffs than sudden, mass hiring. Augmenting the Okun's relationship with

a recession dummy helps to improve the equation fit by addressing this asymmetry in the data, and more accurately reproduce the shock properties and severities observed in the unemployment rate data during prior periods of stress.

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Mark Zandi is chief economist of Moody's Analytics, where he directs economic research. Moody's Analytics, a subsidiary of Moody's Corp., is a leading provider of economic research, data and analytical tools. Dr. Zandi is a cofounder of Economy.com, which Moody's purchased in 2005.

Dr. Zandi's broad research interests encompass macroeconomics, financial markets and public policy. His recent research has focused on mortgage finance reform and the determinants of mortgage foreclosure and personal bankruptcy. He has analyzed the economic impact of various tax and government spending policies and assessed the appropriate monetary policy response to bubbles in asset markets.

A trusted adviser to policymakers and an influential source of economic analysis for businesses, journalists and the public, Dr. Zandi frequently testifies before Congress on topics including the economic outlook, the nation's daunting fiscal challenges, the merits of fiscal stimulus, financial regulatory reform, and foreclosure mitigation.

Dr. Zandi conducts regular briefings on the economy for corporate boards, trade associations and policymakers at all levels. He is on the board of directors of MGIC, the nation's largest private mortgage insurance company, and The Reinvestment Fund, a large CDFI that makes investments in disadvantaged neighborhoods. He is often quoted in national and global publications and interviewed by major news media outlets, and is a frequent guest on CNBC, NPR, Meet the Press, CNN, and various other national networks and news programs.

Dr. Zandi is the author of *Paying the Price: Ending the Great Recession and Beginning a New American Century*, which provides an assessment of the monetary and fiscal policy response to the Great Recession. His other book, *Financial Shock: A 360° Look at the Subprime Mortgage Implosion, and How to Avoid the Next Financial Crisis*, is described by the New York Times as the "clearest guide" to the financial crisis.

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