Globalization and Prosperity Lab | UC San Diego SCHOOL OF SOCIAL SCIENCES Department of Economics

St.Gallen Endowment for Prosperity through Trade

cBrief 4: Game On

Executing Trump's campaign pledges on tariffs won't restore manufacturing in the Rust Belt—or elsewhere for that matter

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Many American politicians contend that Chinese imports delivered a blow to manufacturing jobs, especially in the Rust Belt states. President Trump wants to fix the employment loss by raising import tariffs. Simulating the job, wage, and inflation effects of his three most prominent campaign pledges for tariffs on the politically sensitive manufacturing sector reveals clear policy trade-offs. Hitting Chinese imports with 60% tariffs achieves most of the intended manufacturing job creation but the employment gains come at the expense of considerable inflation-adjusted household losses. Targeting Canadian and Mexican imports in addition creates few new manufacturing jobs and reduces inflation-adjusted wages much more. Many manufacturing firms use foreign parts and components, so subjecting all U.S. imports to higher tariffs yields no extra jobs but does raise the cost of living further. Swing-state Rust Belt locations realize little benefit following each tariff hike.

To campaign is to promise. To govern is to decide. Now back in the White House, President Donald J. Trump must choose which of his campaign pledges on tariff increases to take forward, if any. The Trump administration can test the conjecture, advanced by the President's prospective counselor for trade and manufacturing Peter Navarro, that higher import tariffs will revitalise U.S. manufacturing jobs and bring back the jobs said to be lost during the China Shock (see Figure 1). Yet, given the unpopularity of inflation, the President may be mindful of the consequences that raised import tariffs have for the cost of living.

In this cBrief we simulate the consequences of implementing three of the President's tariff pledges for the global economy and for labor-market outcomes at the U.S. state level. Doing so allows us to hone in on the impact of these tariffs for four Rust Belt swing states. We use the cModel, a computational model of the world and U.S. economy that has cutting-edge microeconomic foundations and takes account of each industry's procurement of supplies from any other industry, including from abroad.[1] (We describe the model in the Box: Updated cModel at the end of this brief.)

Some observers reckon that President Trump will only partially implement his campaign pledges. We've got that possibility covered too in the simulations that follow. What we won't address is the timing or the legality of any tariff moves. Our focus is on the impact on politically salient job and wage outcomes.

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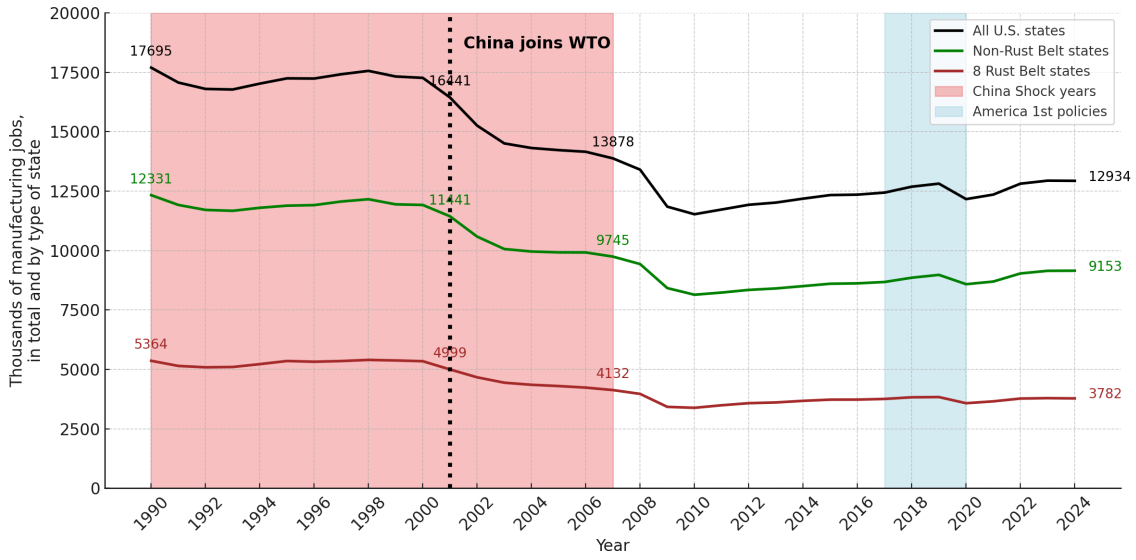
[1]The cModel was deployed to good effect when Western sanctions were implemented on Russian exports in 2022. We found in cBriefs then that those sanctions would likely have little impact on the Russian economy—a finding that has stood the test of time.

Figure 1: U.S. Manufacturing Employment.
Manufacturing head counts in the United States have been stable for the past 15 years



Source. US FRED database.
Note. Rust Belt states in the graph are Indiana, Illinois, Ohio, Michigan, Missouri, Pennsylvania, West Virginia, and Wisconsin (following Encyclopedia Britannica).

Figure 1 provides context and shows that the total number of manufacturing jobs in the Rust Belt states stabilized 15 years ago. Comparable counts of manufacturing jobs in other states have in fact grown. In the preceding years during 1990-2007—a period that some refer to as that of the "China Shock"—the number of manufacturing jobs clearly dropped, while U.S. goods imports surged. A leading study of that shock by Autor, Dorn and Hanson (2013) estimates that 21% of the total manufacturing job loss—or 1.53 million jobs—was attributable to increased Chinese imports. One way to judge Trump's tariff pledges is to ask: what share of those job losses can be restored with higher taxes on imports now?

To make matters concrete, we define three progressively restrictive scenarios for tariff hikes based on repeated campaign statements by President Trump:

Scenario 1. Increases by 60% in the ad valorem tariff rates on all Chinese imports.

Scenario 2. Scenario 1 plus 25% increases in ad valorem tariff rates on all imports from Canada and Mexico.

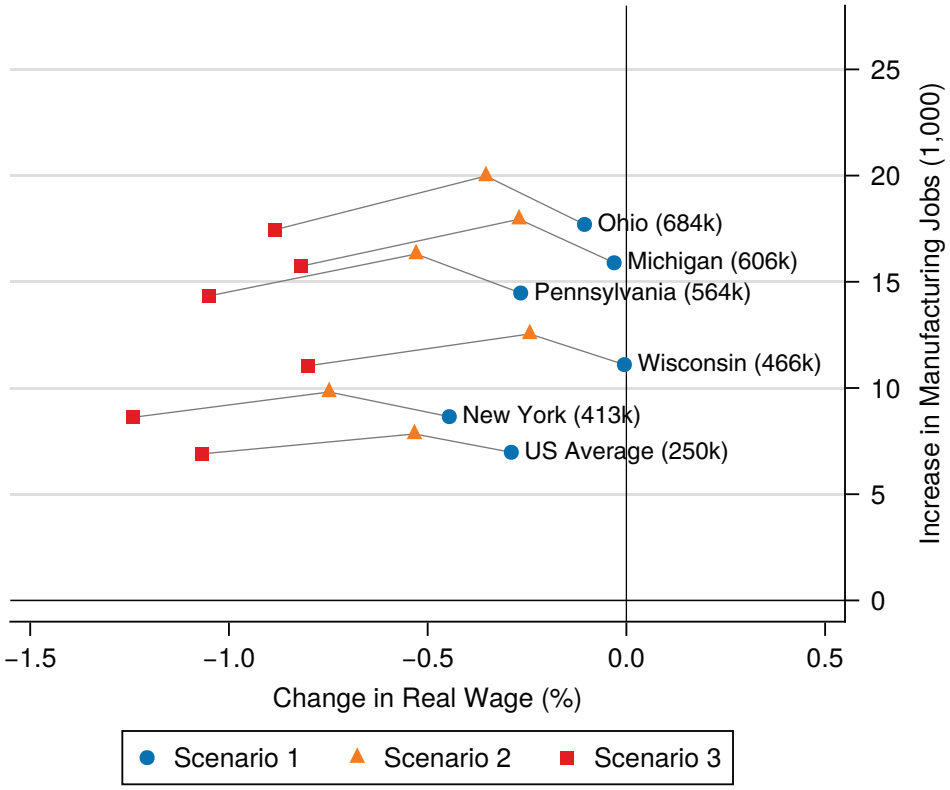
Scenario 3. Scenarios 1 and 2 plus a 20% increase in ad valorem tariff rates from every other nation.

For the moment, in the cModel simulations that immediately follow, we take it that these tariff increases are fully implemented. We use U.S. county-level data to simulate the impact on the total number of manufacturing jobs as well as on inflation-adjusted wages and then aggregate up the totals at the U.S. state level, where we assume labor markets to clear, and to the national level for all countries. We report the effects on four Rust Belt swing states: Ohio, Michigan, Pennsylvania and Wisconsin. We benchmark those outcomes against New York state (which used to have over a million manufacturing jobs in 1990) as well as the "average" U.S. state (the unweighted mean across 50 states and Washington, DC).

Doubts about the payoffs from Scenario 3

Figure 2 reports the number of manufacturing jobs created and the impact on inflation-adjusted wages when implementing each of the three tariff scenarios based on the President's campaign pledges. There are employment gains in manufacturing, shown along the vertical axis, as workers are predicted to move

Figure 2: Tariff Change Scenarios and U.S. Outcomes.
Imposing 60% tariffs on China accounts for the bulk of job gains



Notes. Scenario 1: increase of tariffs on U.S. imports from China resulting in 60-percent increase of 2019 trade costs for Chinese shipments to the United States; Scenario 2: in addition to scenario 1, increase of tariffs on U.S. imports from Mexico and Canada resulting in 25-percent increase of 2019 trade costs for Canadian and Mexican shipments to the United States; Scenario 3: in addition to scenarios 1 and 2, increase of tariffs on U.S. imports from rest of the world resulting in 20-percent increase of 2019 trade costs of shipments from the rest of the world to the United States. Employment shifts within U.S. states between non-manufacturing and manufacturing industries, inferred using the Quarterly Census of Employment and Wages second quarter of 2024 and computed as percentage-change predictions in the updated cModel (2024 employment levels in thousands in parentheses). Real-wage changes computed from the percentage-change predictions for the state-level nominal wages (change of the numerator of the real wage) and the percentage-change prediction for U.S. wide consumer price inflation (change of the denominator of the real wage) in the cModel. U.S. economy-wide average is the unweighted average for 50 U.S. states and Washington, DC.

from non-manufacturing to manufacturing industries within their states. The real-wage impact shown on the horizontal axis combines two factors—possible increases in nominal wages, which vary state by state depending on the industry mix, and changes in the U.S. wide cost of living. A real-wage decline along the horizontal axis means that the cost-of-living impact of higher tariffs more than offsets any wage benefit.

A key finding for manufacturing employment in Figure 2 is that—while all three scenarios create manufacturing jobs—almost all manufacturing job gains come from the 60% tariff on Chinese goods. Taxing Canadian and Mexican imports in addition creates few extra manufacturing jobs. Going further and imposing tariffs on the rest of the world's imports reverts the manufacturing job gains and actually reduces employment at U.S. manufacturing firms. Their profitable product-market expansion is forestalled by expensive, and more frequently domestically produced, parts and components on the input side. These findings apply in every state reported in Figure 2, including all four Rust Belt swing states as well as New York state for comparison, and in the average U.S. state.

When it comes to the impact on the living standards of American workers, our analysis yields an unambiguous finding. Each scenario lowers living standards and the more far-reaching the tariffs imposed, the more the hit to American prosperity. We find that the U.S. consumer price inflation under the import

tax hikes eliminates the nominal-wage gains in all states. For Michigan and Wisconsin, taxing only Chinese imports (in Scenario 1) results in offsetting nominal wage gains and inflation losses, with roughly a net-zero real wage change. In all other Rust Belt states shown and New York, and in the average U.S. state, inflation-adjusted wages strictly decline under all scenarios. The cause is meaningful consumer price inflation: carrying out Scenario 1 (a 60-percent trade-cost increase for Chinese imports) raises U.S. consumer prices by 1.9 percent overall; under Scenario 2 (a 25-percent trade-cost increase for Canadian and Mexican imports in addition to Scenario 1), U.S. price inflation is 3.2 percent higher;[2] under Scenario 3 (a 20-percent trade-cost increase for imports from the rest of the world in addition to Scenarios 1 and 2), U.S. prices jump up by 11.1 percent. Implementing the 20% across-the-board import tariffs on all non-Chinese, non-Canadian, and non-Mexican imports is particularly harmful because it multiplies the hit to American families. The Rust Belt doesn't buck any of these findings, inflation-adjusted worker incomes decline everywhere.

Put the findings on manufacturing job creation and living standards together and one immediate policy implication follows—pursuing Scenario 3 makes little sense. That scenario, which extends the tariff hikes to all America's trading partners, subjects American families to higher costs of living while raising the costs of U.S. manufacturing firms so much that those companies scale back job creation.

Arguably more interesting is the choice between Scenarios 1 and 2. Hitting Canadian and Mexican imports with tariffs after doing so to Chinese goods creates 44,000 more manufacturing jobs at the cost of reducing American living standards by a further quarter percent. There is no job benefit to Michigan, Ohio, Pennsylvania, and Wisconsin of executing Scenario 3 over Scenario 2. To the contrary, more than 8,000 manufacturing jobs are lost in these four Rust Belt swing states alone by imposing tariffs on the rest of the world in Scenario 3—after applying tariffs to imports from China, Canada and Mexico under Scenario 2—because supply chains that benefit U.S. companies are being disrupted. A total of 48,000 manufacturing jobs fall away in the United States when going from Scenario 2 to 3, while workers switch to non-manufacturing.

In terms of economy-wide manufacturing job creation, Scenario 1 attracts 356,000 workers from non-manufacturing into new manufacturing jobs in the United States. Scenario 2 prompts workers to move into 400,000 new manufacturing jobs, whereas Scenario 3 opens up only 352,000 U.S. manufacturing jobs. Even under the favorable Scenario 2, results imply that employment in U.S. manufacturing would increase by about 3.1%. These job creation totals for manufacturing pale in comparison to the headline 1.53 million jobs loss attributed to the China Shock. In a nutshell, none of the President's high-profile campaign pledges on tariffs are going to restore manufacturing jobs lost since 1990.

Partial implementation of tariff pledges

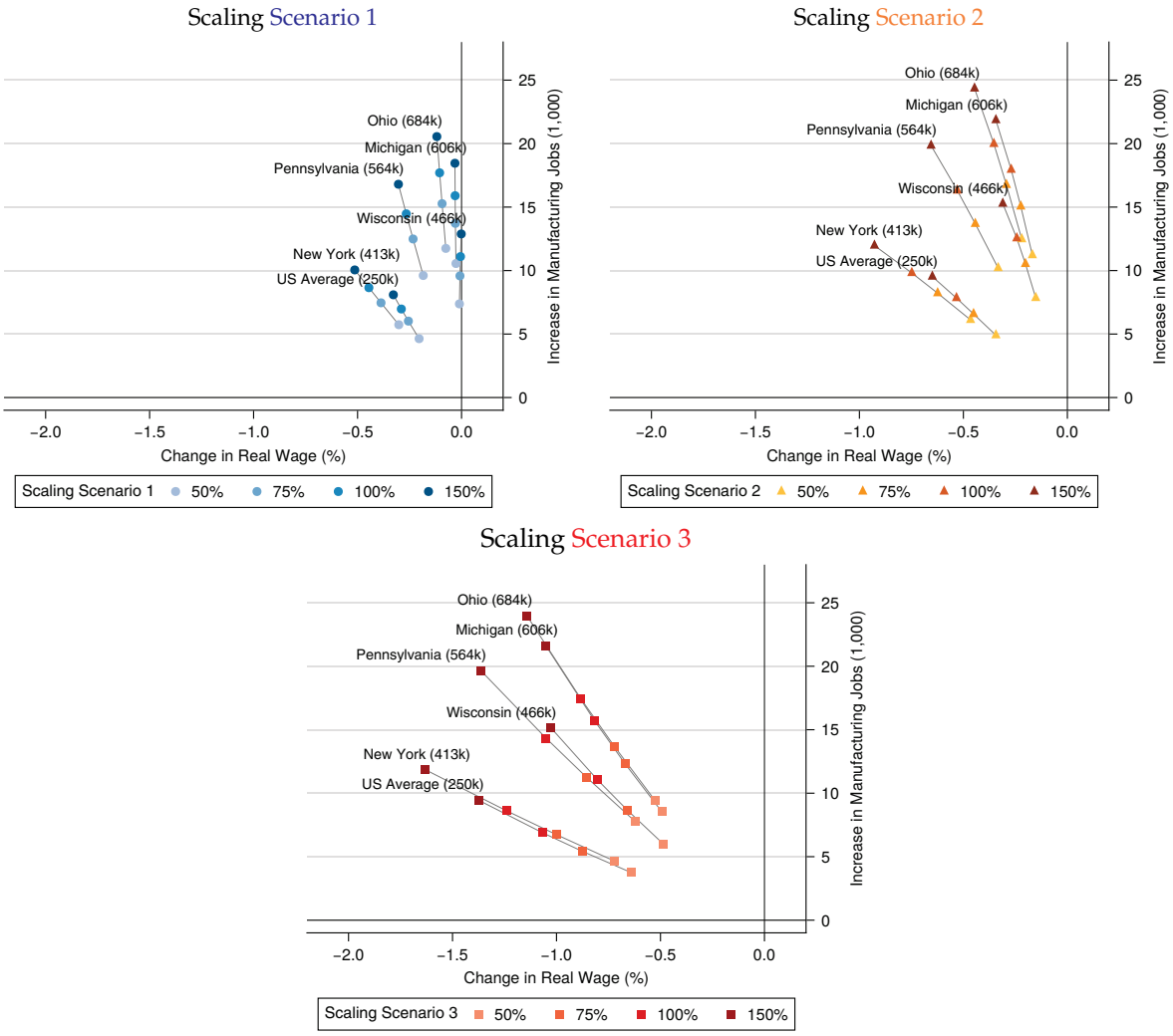
Some commentators discount the President's campaign rhetoric and argue that the tariff increases that the Trump administration is likely to implement will be a fraction of those promised. We hear those claims. But we are also open to the possibility that the President—realizing that his initial pledges won't generate sufficiently many manufacturing jobs—overshoots beyond the campaign pledges.

For this reason, for Scenarios 1 through 3, we also simulate the manufacturing job creation impact and living standard consequences of an implementation of (a) half the pledged tariff increases, (b) 75% of the pledged increase, (c) 100% (replicating the results reported in Figure 2), and (d) 150% of the pledged tariff increases. To take case (d) as an example, under Scenario 3 the tariff hike on Chinese imports would be 90 not 60%, on Canadian and Mexican imports an increase of 37.5 instead of 25%, and for imports from the rest of the world 30% instead of 20% percent higher tariffs.

Figure 3 depicts how each of our four Rust Belt swing states would be affected by partial implementation and by Presidential over-reaction. Again, we benchmark the effects in these sensitive swing states against that for New York state and the U.S. national average. In each case, the closer tariffs are raised to the pledged levels the more workers move from non-manufacturing into new manufacturing jobs. But again, note how the incremental gains moving from Scenario 1 to Scenario 2 are small, irrespective of the degree of implementation.

[2] To provide context note that, according to the U.S. Bureau of Labor Statistics in 2023 the average American household spent 2.4% of their pre-tax income on gasoline. Moving from Scenario 1 to 2, that is, imposing tariffs on USMCA partners, takes the same bite out of American spending as a 50% increase in gas prices over 2023 levels.

Figure 3: Scaled Versions of Combined Tariff Changes and U.S. Outcomes.
Scaling down does not avoid income losses, scaling up adds few manufacturing jobs.



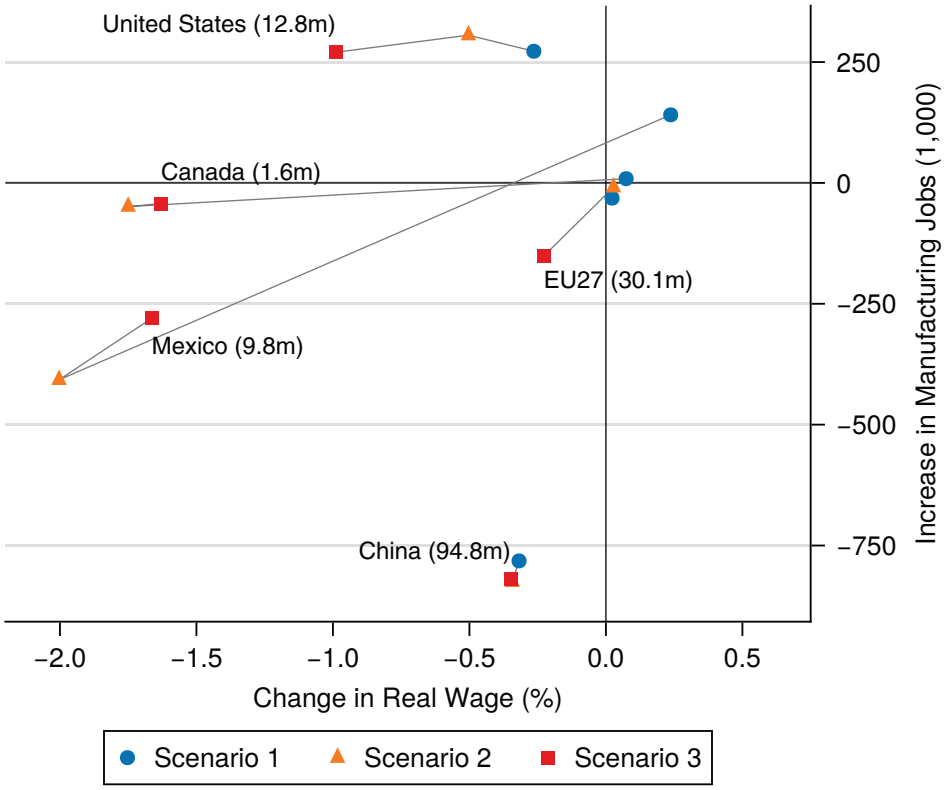
Notes. Scaling Scenario 1 in the upper left-side graph, Scenario 2 in the upper right-side graph, and Scenario 3 in the lower graph. Examples: The 100-percent scaling in the upper right-side graph replicates Scenario 2 in Figure 2; the 150-percent scaling results in a 90-percent trade-cost increase for Chinese shipments, a 37.5-percent trade-cost increase for Canadian and Mexican shipments, and a 30-percent trade-cost increase for shipments from the rest of the world. Employment shifts within U.S. states between non-manufacturing and manufacturing industries, inferred using the Quarterly Census of Employment and Wages second quarter of 2024 and computed as percentage-change predictions in the updated cModel (2024 employment levels in thousands in parentheses). Real-wage changes computed from the percentage-change predictions for the state-level nominal wages (change of the numerator of the real wage) and the percentage-change prediction for U.S. wide consumer price inflation (change of the denominator of the real wage) in the cModel. U.S. economy-wide average is the unweighted average for 50 U.S. states and Washington, DC.

The earlier finding from Figure 2 that Scenario 2 generates only minor manufacturing job gains over Scenario 1 carries over to cases where the President's policy implementation goes beyond his campaign pledges: Scenario 2 scaled to 150% adds only few additional manufacturing jobs compared to itself at 100% and compared to Scenario 1 at 150%.

Even a partial implementation of the campaign announcements for tariffs results in cost-of-living hits, as found earlier. In a nutshell, there is little incremental employment payoff but there is a clear adverse living standard impact from shifting from Scenario 1 to Scenario 2. Drawing Canada and Mexico into the dragnet of higher import taxes yields little additional benefit in the Rust Belt states and nationwide.

What if the Trump administration overshoots, and goes 50% beyond tariff levels threatened on the cam-

Figure 4: Tariff Change Scenarios and Worldwide Outcomes.
Impact differs between U.S. trading partners under the three scenarios



Notes. Scenario 1: increase of tariffs on U.S. imports from China resulting in 60-percent increase of 2019 trade costs for Chinese shipments to the United States; Scenario 2: in addition to scenario 1, increase of tariffs on U.S. imports from Mexico and Canada resulting in 25-percent increase of 2019 trade costs for Canadian and Mexican shipments to the United States; Scenario 3: in addition to scenarios 1 and 2, increase of tariffs on U.S. imports from rest of the world resulting in 20-percent increase of 2019 trade costs of shipments from the rest of the world to the United States. Employment shifts between non-manufacturing and manufacturing industries, inferred using the Quarterly Census of Employment and Wages second quarter of 2024 and computed as percentage-change predictions in the updated cModel (2024 employment levels in millions in parentheses). Real-wage changes computed from the percentage-change predictions for country-level nominal wages (change of the numerator of the real wage) and the percentage-change prediction for consumer price inflation (change of the denominator of the real wage) in the cModel. U.S. economy-wide total for 50 U.S. states and Washington, DC. The Scenario 2 result for China closely overlaps with the finding for Scenario 1 and is similar to Scenario 3.

paign trail? Doing so would increase the manufacturing job gain nationwide from 400,000 to 486,000 in Scenario 2, an increase of 86,000 manufacgturin jobs. Fewer than 15,000 of those additional 86,000 manufacturing jobs would be created in the four Rust Belt swing states Ohio, Michigan, Pennsylvania and Wisconsin. These predictions make apparent the limited use of tariffs as a policy measure to revive the manufacturing industry in the Rust Belt and beyond. Other policy tools are needed.

Impacts on Canada, China, the EU and Mexico

The three scenarios that we consider differ markedly in the way trading partners' exports get constricted. In Scenario 1, Chinese firms are hit directly while Canadian and Mexican firms are afforded the chance to expand shipments to the United States and meet U.S. buyer needs, replacing their weakened Chinese competitors. Likewise, Scenario 2 hits Canadian, Mexican as well as Chinese producers and opens the doors for EU exporters to form new supplier relationships in the United States. Scenario 3 hits all American trading partners but, as far as tariff increases are concerned, differentially. How do the chips for leading

U.S. trading partners fall under these three tariff scenarios? In what follows, it is important to bear in mind that—like other economic models—the cModel simulates what happens when labor markets fully adjust. The immediate short-term impact may differ.

Figure 4 summarizes our key findings. Chinese manufacturing jobs are lost: Scenario 2 results in a manufacturing employment contraction by 825,000 jobs in China. However, it is important to keep a sense of proportion. Being able to redirect exports to third markets or to redeploy labor outside of manufacturing implies that total job losses can be kept to less than one percent of the current manufacturing worker head count in China.

As conjectured, Canada and Mexico gain manufacturing jobs when China alone is hit by higher U.S. import tariffs under Scenario 1. Once these U.S. neighbours are drawn into the trade policy expanse under Scenario 2, Canada and Mexico too will lose manufacturing jobs to non-manufacturing sectors. A shift from Scenario 2 to 3, when the rest of the world is hit with U.S. import taxes in addition, does little to change the labor market impact of U.S. tariffs on Canada, China, or Mexico. We forecast with the cModel that the EU loses around 150,000 jobs in manufacturing should Scenario 3 come to pass—representing a fall of just half of one percent of the aggregate manufacturing worker head count in the 27 members countries of the European Union. Of course, some industries are more adversely affected than others, but there will be yet other industries that are not, and the non-manufacturing sector expands.

The Rust Belt shouldn't count on Trump tariff hikes

There is compelling evidence of the suffering that communities in the Rust Belt faced after manufacturing jobs were lost during the years 1990 to 2007. That this suffering calls for a policy response in the democratic process is right and expected, and the search for policy levers to pull and improve living standards is a crucial response. For decades during U.S. Presidential elections, candidates from both parties have proposed raising import tariffs and other policies, with the goal of restoring the days of thriving postwar U.S. manufacturing. President Trump now has the opportunity to follow through on his campaign pledges.

If creating better paying manufacturing jobs in the Rust Belt and in the rest of the United States is the metric by which campaign pledges and policies will be judged, then the findings presented here cast doubt on the benefits. Notably, in our three simulated scenarios we deliberately ignore the possibility that U.S. trade partners whose industries are hit with U.S. import taxes will be inclined to retaliate with trade interventions of their own. While the cModel can easily accommodate projected retaliation measures outside the United States, this cBrief gives the President's campaign pledges the benefit of the doubt that the proposed tariff measures will bring about their economic consequences in isolation. Taking into consideration both the predicted impacts of the policies in this cBrief on their own, and the prospect of possible retaliations in addition, we see little reason that citizens in Rust Belt states and the politicians who represent them should get their hopes up for a tariff-led manufacturing renaissance.

Box: Updated cModel

Junyuan Chen, Fabian Eckert, Marc-Andreas Muendler and Fabian Trottner, UC San Diego (2025)

The cModel, a computational model of the global economy, is based on the Ricardian trade framework by Eaton and Kortum (2002), with competitive global markets for goods and services and with competitive local factor markets for labour and capital. Goods and services enter production as intermediate goods in addition to their final uses by households and government. In each industry and country, producers combine local labor and capital with globally procured intermediate inputs and offer a set of varieties. An active government in each country collects revenues from taxes and tariffs, while government expenditure is spent on subsidies as well as goods and services procurement. Producers, households and governments globally procure varieties within industries from the least costly producer. The simulation algorithm, implemented in Julia, calls equilibrium convergence for mutually consistent producer, household, and government decisions and budgets. Each country's observed net exports or imports (a trade surplus or deficit) are exogenous.

Version 2.0 of the cModel, underlying the simulations of this cBrief 4, is based on updated data for model calibration and accommodates state-specific simulation outcomes for all 50 U.S. states and Washington, DC. For details on Chen et al. (2023) version 1.0 see the online documentation.

From the ITPD-S data Release 1 (December 2024) by Borchert et al. (2024), we obtain production and trade flows for 170 supply industries in the benchmark years 2017-2019, including services trade. To account for the input-output relationships across countries and activities, we employ the Extended OECD Inter-Country Input-Output (ICIO) tables from the OECD (2023) for the years 2018-2020, extracting shares of supply industries by source country in use industries by destination (under Cobb-Douglas production) as well as expenditure shares of supply industries in (Cobb-Douglas) household and government consumption. Using shares of supply industries within use industries preserves positive value added by use industry but can result in negative inventory changes for data consistency. We apply the Wolsky (1984) disaggregation to infer a consistent input-output structure for the 170 ITPD-S industries that map into 41 matching aggregates of the 45 industries in the OECD-ICIO data. The baseline cModel has 76 individual countries (78 economies after splitting China and Mexico into export processing and main economies) plus an aggregate of the rest of the world for mutual consistency between the ITPD-S and OECD-ICIO data.

To account for state-specific outcomes within the United States, we use County Business Patterns 2022 data from the U.S. Census Bureau (2022), combined with 2024 Quarterly Census of Employment and Wages data. We obtain state-level labor supply and allow for varying industry productivity within and across U.S. states. We assume all U.S. residents to have identical consumption preferences. To recover trade flows between U.S. states, we suppose that trade is free and balanced between states within the United States. All U.S. states face the same trade cost with a source or destination country outside the United States.

In the cModel, Scenario 1 is implemented as an increase of import tariffs on all Chinese goods by 60 percent relative to the trade cost in 2019. Scenario 2 considers, in addition to the Chinese tariff raise, an increase in import tariffs on all Canadian and Mexican goods by 25 percent relative to 2019. Scenario 3 explores, in addition to the cumulative second scenario, an increase in import tariffs on all goods from the rest of the world by 20 percent relative to 2019.

To compute manufacturing job gains and losses in absolute numbers updated to 2023 and 2024 (head counts of employed persons in manufacturing), we use: QCEW (Quarterly Census of Employment and Wages) data for the second-quarter of 2024 from the U.S. Bureau of Labor Statistics (2024); employment in state-owned and private manufacturing firms from the Chinese National Bureau of Statistics for fourth-quarter of 2023; manufacturing employment from Statistics Canada for 2023; employment in *industrias manufactureras*, including informal workers, from ENOE (Encuesta Nacional de Ocupación y Empleo) for the fourth trimester of 2023; and manufacturing employment from Eurostat for the 27 EU countries in 2023.

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