Technical Appendix:
The Impact of Tariffs on Inflation

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We map the theoretical framework in Baqaee and Rubbo (2023) and Silva (2024) on the US Bureau of Economic Analysis (BEA) input–output data and price classification. We assume that wages, productivity, or other intermediate input prices do not respond to import price fluctuations. Then, assuming an unexpected and permanent shock in the vector of import price changes τ_M, consumer price changes can be calculated according to the following equation:

$$\hat{P}^T = [\tau_M^T(\omega^M + \underbrace{B^M D(\mathbb{I} - BD)^{-1}}_{\substack{\text{Total Import} \\ \text{Requirement Matrix}}}\omega^D)]C \tag{1}$$

Here, $\hat{P}$ is a vector of log price changes of dimension $E \times 1$, where E is the number of NIPA expenditure codes (212 in our estimates).[1] τ_M is a vector of dimension $N \times 1$, where N is the number of BEA commodities (402) under the BEA input–output 2017 detailed classification. It denotes the weighted percentage change in the tariff of each commodity, where the weights are defined by each country market share in the BEA category. The country market shares are computed using the US Census Bureau Foreign Trade import data for the year preceding the implementation of the tariff shock. Because tariff data are at the NAICS-code level, not the BEA-commodity-code level, calculating these price changes requires the BEA-NAICS concordance table, available in the input–output raw data files from the BEA website.

ω^M is a diagonal matrix $N \times N$ that gives the share of expenditure directly spent on each imported commodity (402 commodities by 402 industries in our estimates). It is calculated from the BEA's Input–Output Import Table (after-redefinition version), which includes a column that contains the personal consumption expenditure value imported for

[1] According to the detailed 2017 PCE Bridge file, in the 2017 sheet there are 211 unique NIPA Line categories. We have 212 categories because we also have an NA (not available) category that we had to create for consistency with previous years.

each BEA commodity. Conversely, $\omega^D = \mathbb{I} - \omega^M$ gives the share of expenditure spent on each domestically produced commodity.

The matrix B is the BEA direct domestic input coefficient matrix of dimension $N \times M$ (402 commodities by 402 industries). It is defined as the domestic use table, in which each column is divided by a normalization variable that depends on our markup assumption. Under the constant-percentage markup assumption, we normalize by the sum of total (that is, imported and domestic across all commodities) intermediates and compensation of employees.[2] Under the constant-dollar markup assumption, we normalize by total industry output.[3] B^M is the BEA commodity-by-industry ($N \times M$) import input-ouput matrix representing the share of imported commodities used in each industry. It is defined by normalizing the BEA import matrix by either total industry output or total variable cost, according to whether we want to use the constant-dollar or constant-percentage markup assumption, exactly as for B. The matrix D is the market share matrix. It is an $M \times N$ matrix calculated by normalizing the Make table (after redefinition version) by the total output of the commodity produced by each industry. The total requirement matrix is calculated as $(\mathbb{I} - BD)^{-1}$.

The matrix C is an $N \times E$ matrix that maps BEA commodities to NIPA expenditure categories, accounting for the value added by transportation, wholesale, and retail. This concordance matrix comes from the PCE bridge files, which decompose the commodity composition of the PCE and adjusts producer prices to final purchaser prices. Specifically, it gives the share of each NIPA category PCE expenditure for each BEA commodity code in producer value terms and purchaser value terms. The purchasers' value sums to the aggregate PCE value. In essence, the bridge files provide two functions. First, they serve as a concordance between PCE NIPA categories and BEA commodity categories. Second, they are used to decompose the discrepancy between producer prices and purchase prices into value added by transportation, wholesale, and retail. Under the constant-dollar markup assumption, it is sufficient to normalize the values in the bridge file by the purchaser total value of the NIPA category. The constant-percentage markup assumption requires us to estimate gross operating surplus plus taxation and subsidies, that is, value added minus compensation of employees. We do so by using the share of compensation of employees over value added of transportation, wholesale, and retail computed from the BEA use matrix to net out compensation of employees in each cell of the bridge matrix C.

Finally, our PCE contribution shares are year-specific, but for simplicity, we avoid the time subscript in the formula presented earlier. The highest level of industry detail that we

[2]Including compensation of employees embeds the assumption that compensation does not respond to tariff changes.

[3]When calculating the share of consumption spent on imports (Section 1 in the main text), we use the normalization under the constant-dollar assumption.

use is available only every five years (2017 was the last year). We use the coarser level of aggregation in the yearly data and multiply these tables by the interpolated cell-blocks share trends in each matrix to extend the level of detail to the most recent years.

References

Baqaee, David, and Elisa Rubbo. 2023. "Micro Propagation and Macro Aggregation." *Annual Review of Economics*, 15:91-123.

Silva, Alvaro. 2024. "Inflation in Disaggregated Small Open Economies."