Aggregate Estimates of Price Effects from Tariffs

Ray C. Fair[*]

March 2026

Abstract

This paper uses an aggregate price equation to estimate the effects of tariffs on the non farm price deflator. The Trump tariffs are estimated to have increased the deflator by about 1.7 percent by the fourth quarter of 2025.

1 Introduction

It is difficult to estimate price effects from tariffs because of so many details. Only a subset of goods is taxed; tariff rates differ by type of good and country source; timing is sometimes hard to pin down; pass throughs likely differ across goods; and prices may change for other reasons than just tariffs. It is difficult to model all these details. I take a different approach in this paper and ask whether an aggregate price equation can pick up the sum of all the effects. I have used the aggregate price equation in my US macroeconometric model (Fair (2024)). In the latest version of this equation there is a custom cost variable that is the ratio of custom (mostly tariff) revenue divided by nominal imports. Custom revenue will be denoted $CUST$, and $CUST$ divided by nominal imports will be denoted $RCUST$. $CUST$ is from the National Income and Product Accounts (NIPA), Table 3.2, line 3. $RCUST$

is statistically significant in the price equation and allows one to compute tariff effects on the aggregate price level.

$RCUST$ is plotted in Figure 1 for the 1952.1–2025.4 period. The Trump tariffs stand out in the last three quarters of 2025. The two other periods in which tariffs were noticeably increased are the last half of 1971 and 1975. In 1971 this was part of the "Nixon Shock," where on August 15, 1971 a ten percent import surcharge was imposed. The increase in 1975 was part of the Trade Act of 1974, which was implemented in 1975. The aim in this paper is to estimate what the aggregate price level would have been had there been no increase in tariffs in the last three quarters of 2025, i.e., had the plot in Figure 1 been flat from 2025.1 on.

As discussed below, the price variable explained is the private non farm price deflator in the NIPA. The question asked is whether tariffs affect the prices that domestic firms charge for their goods and services. Tariffs increase the cost of various imported inputs to domestic firms, and the question is whether firms respond to this by increasing their own (domestic) prices. Tariffs on imported goods that are directly sold to consumers go directly into the consumer price index (CPI) if they are passed on. The question here is different. If there are tariffs on imported input goods sold to firms, do firms increase their prices in response and by how much? Since not all of the value of $CUST$ in a given quarter is an input cost to firms, a key assumption in this analysis is that the fraction of input costs in $CUST$ is constant across time.

2 The Literature

As far as I know, there is no study doing what I am doing in this paper. Cavallo et al. (2025) examine the effects of the Trump tariffs on consumer prices. High frequency online price data are collected, both before and after a major tariff event. These prices include any tariffs. The actual price change in a product after the event is attributed to tariffs or if there is a pre-tariff trend the price change attributed to

tariffs is relative to the trend. These estimated price changes can be then be used to estimate the effects of the tariffs on the CPI. Cavallo et al. (2025) estimate that by September 2025, six months after the tariffs began, the CPI was 0.7 percentage points higher. A similar approach is followed in Barbiero and Stein (2025) and Minton and Somale (2025), where generally all of the price change or all of the price change relative to a pre tariff trend is attributed to tariffs. This is obviously a strong identifying assumption since prices move for many reasons, and so the results must be interpreted with caution.

Amiti et al. (2026) estimate the size of the pass through of tariffs to U.S. buyers. They regress the twelve-month log change in import prices exclusive of tariffs (foreign export prices) on the twelve-month log change in one plus the tariff rate using data at the 10-digit Harmonized Tariff Schedule-country level from January 2023 through November 2025. The regression includes product fixed effects and country-date fixed effects. A similar procedure is followed in Gopinath and Neiman (2025), Hinz et al. (2026), and Fajgelbaum and Khandelwal (2026). These studies find that almost all the tariffs are passed through, that the coefficient estimate on the tariff rate variable is close to zero. These studies do not estimate how much of the tariff cost to US buyers is born by consumers versus firms.

3 The Price Equation

A widely cited price deflator in the media is the price deflator for personal consumption expenditures, PCE. This is the price deflator targeted by the Fed. If, however, one is interested in explaining the pricing behavior of agents in the U.S. economy, PCE is not appropriate because it includes import prices (as well as excluding export prices). The same is true of the CPI. Import prices (before tariffs) reflect decisions of foreign agents and the behavior of exchange rates, which are not decision variables of domestic agents. The price deflator used here is the non farm price deflator from the National Income and Product Accounts, denoted PF.

Figure 1
Custom Revenue/Nominal Imports
1952.1--2025.4
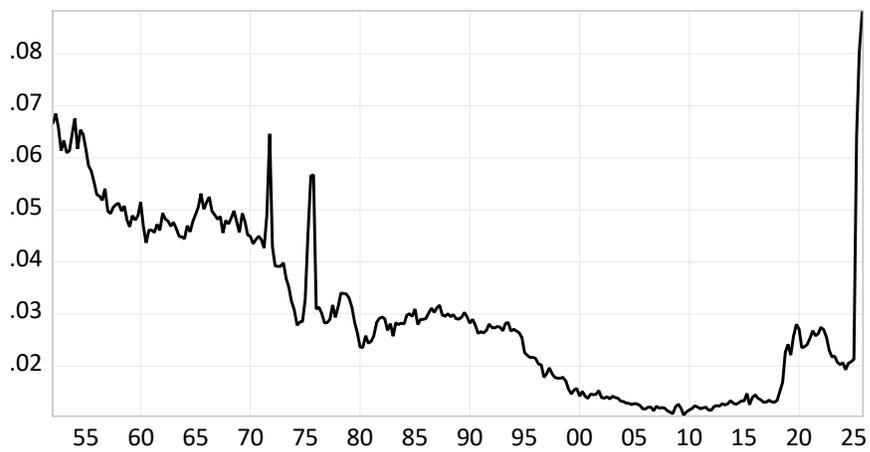
It reflects private, domestic decisions.

It is common in the literature to estimate price equations where the LHS variable is the rate of inflation. I have found, however, that the data do not support this specification. The dynamics are wrong. The data support price equations specified in (log) level form.[1] In the price equation considered here, which is in log form,[2] the LHS variable is $\log PF$.

This level specification is consistent with a theory in which the decision variable of a monopolistically competitive firm is the level of its price. If a firm's market share is a function of the ratio of its price to the average price of other firms, the objective of the firm is to choose the optimizing price level. This is the theory behind the price equation.

The price equation includes as explanatory variables the lagged price level, a resource utilization variable, and cost shock variables. The resource utilization variable is the reciprocal of the unemployment rate. Phillips curves are usually specified using the level of the unemployment rate, but it seems likely that there is a nonlinear effect. It is likely that the lower is the unemployment rate the larger is the effect on inflation or the price level from a decrease in the unemployment rate. I have found better results using the reciprocal.

The cost shock variables are the nominal wage rate inclusive of the employer social security tax rate, the price of imports, and $RCUST$ discussed above. The price of imports variable does not include tariffs. The wage rate variable has subtracted from it a measure of potential labor productivity.

The estimated price equation is presented in Table 1. It is equation 10 in my US model. Notation is presented at the bottom of the table. The estimation period is 1954.1–2025.4. Although the estimates are not presented in the table, eight dummy variables are added to the equation to account for the pandemic. For each

---

[1]This is documented in Fair (2022) and Fair (2024, Chapter 4), and this discussion will not be repeated here.

[2]Although the variables in the equation are logged, for ease of discussion "log of" will not usually be used when mentioning the variables.

Table 1
Estimated Price Equation: PF
LHS Variable is $\log PF$

RHS Variable	Coef.	t-stat.
$\log PF_{-1}$	0.84828	57.47
$\log[WF(1 + D5G)/LAM]$	0.07605	5.32
constant	-0.01667	-1.21
T	0.00031	11.07
$\log PIM$	0.05198	16.97
$1/UR$	0.00063	7.07
$\log[CUST/(PIM * IM)]$	0.00481	3.72
RHO1	0.27050	4.49
SE	0.00368	
R^2	0.999	

Estimation period is 1954.1-2025.4.
Estimation method is NL2SLS.
Eight dummy variables added, 2020.1–2021.4.

First Stage Regressors

$\log PF_{-1}$, $\log[[WF(1 + D5G)/LAM]_{-1}$, constant, T, $\log PIM_{-1}$, $1/UR_{-1}$, UR_{-1}, $\log[(COG + COS)/POP]_{-1}$, $\log[(TRGH + TRSH)/(POP \cdot PH)]_{-1}$, $\log(EX/POP)_{-1}$, $\log PF_{-2}$, $\log[CUST/(PIM \cdot IM)]_{-1}$, $\log[CUST/(PIM \cdot IM)]_{-2}$

Notation

COG = real purchases of consumption and investment goods, federal government.
COS= real purchases of consumption and investment goods, state and local governments.
$CUST$= nominal custom duties.
$D5G$ = federal employer social security tax rate.
EX = real exports.
IM = real imports.
LAM = potential output per worker hour.
PF = private non farm price deflator.
PH = price deflator for consumption expenditures and housing investment.
PIM = import price deflator.
POP = noninstitutional population 16+.
$RHO1$ = first order serial correlation coefficient.
T = linear time trend.
$TRGH$ = nominal transfer payments, federal government to households.
$TRSH$ = nominal transfer payments, state and local governments to households.
UR = civilian unemployment rate.
WF = average hourly wage rate of workers in the firm sector.

quarter between 2020.1 and 2021.4 a dummy variable was constructed that was 1 in that quarter and zero otherwise. The equation is estimated under the assumption of first order serial correlation of the error term. The estimate of the first order serial correlation coefficient is 0.27050 with a t-statistic of 4.49.

The equation is estimated by non linear two-stage least squares (NL2SLS)(non linear because of the serial correlation coefficient). The first stage regressors (FSRs) are listed at the bottom of Table 1. The wage rate, the price of imports, the unemployment rate, and $RCUST$ are all taken to be endogenous. This is to avoid possible contemporaneous correlation between these variables and the error term in the equation. The FSRs are variables in my US model. The FSRs are all lagged at least one quarter and can be assumed to be uncorrelated with the error term left after serial correlation is removed. This is an important point. The NL2SLS coefficient estimates are consistent as long as the lagged values are uncorrelated with the comtemporaneous error term in the equation after removal of serial correlation.

The variables are all significant. The wage variable has a t-statistic of 5.32, the price of imports has a t-statistic of 16.97, and $RCUST$ has a t-statistic of 3.72. The reciprocal of the unemployment rate has a t-statistic of 7.07.

The time trend, T, is meant to pick up any trend effects on the price level not captured by the other variables. Adding the time trend to an equation like this is similar to adding the constant term to an equation specified in terms of changes rather than levels. The time trend will also pick up any trend mistakes made in constructing LAM, the measure of potential labor productivity.

The price of imports is a key explanatory variable in the equation. It rose substantially in the 1970's, which explains much of the inflation in this period. A common view in the literature is that price equations (in particular Phillips curves) "broke down" in the 1970's when there was stagflation. In fact, the high inflation in the 1970's is well explained by cost shocks, particularly oil price shocks, which are picked up here by the price of imports. Also, the relative price of imports fell

in the 1980's, which is a factor leading to the falling inflation in the 1980's aside from aggregate demand effects. Volcker was help by favorable cost shocks during this period.

One might think that the significance of $RCUST$ is due to the last three quarters of 2025, but this is not the case. When the equation is estimated only for the 1954.1– 2025.1 period, the results are very close. The coefficient estimate of $\log RCUST$ is 0.00548 versus 0.00481 in Table 1, with t-statistics of 2.98 and 3.72 respectively.

The coefficient estimate of the lagged price level is 0.84828 with a t-statistic of 57.47, or a standard error of 0.01477. The t-statistic for the hypothesis that the coefficient is equal to 1.0 is 8.72, which is a strong rejection of the equation in first difference form. This result is robust. When the one-quarter lagged values of the wage rate, the price of imports, the reciprocal of the unemployment rate, and $RCUST$ are added to the equation (to allow them to be in change form), the coefficient estimate of the lagged price level is 0.88380 with a t-statistic of 37.33 and a standard error of 0.02368. The t-statistic for the hypothesis that the coefficient is 1.0 is 4.91.

4 Estimated Tariff Price Effects

One can use the estimates in Table 1 to estimate the effects of the tariffs on the aggregate price level. This can be done by simply changing $CUST$ and examining the effects on PF. The experiment is as follows. Add the estimated residuals to the equation for the 2025.2–2025.4 period. This means when the equation is solved for this period there is a perfect tracking solution. Now take for the values of $CUST$ for 2025.2–2025.4 the actual value in 2025.1, before the Trump tariffs. Solve the equation using these values. For each quarter the difference between the solution value and the actual value is the estimated effect of the change on PF.[3]

---

[3]The actual values of the wage variable, the import price variable, and the unemployment rate variable were used for these calculations, but any values will give the same results as long as the

Table 2
Estimated Effects of Tariffs on PF
Percent Deviation in Percentage Points

| | Individual | | Full Model | |
	Tariffs Continue	Tariffs End	Tariffs Continue	Tariffs End
2025.2	0.49	0.49	0.52	0.52
2025.3	1.00	1.00	1.10	1.10
2025.4	1.48	1.48	1.67	1.67
2026.1	1.88	1.26	2.17	1.50
2026.2	2.22	1.07	2.61	1.33
2026.3	2.51	0.91	2.99	1.18
2026.4	2.76	0.77	3.32	1.03
2027.1	2.97	0.66	3.61	0.90
2027.2	3.15	0.56	3.86	0.78
2027.3	3.30	0.48	4.08	0.68
2027.4	3.43	0.41	4.27	0.60

Results are presented in Table 2 for PF. For the three quarters of interest, the price level is higher by 0.49 percent in the 2025.2, 1.00 percent in 2025.3, and 1.48 percent in 2025.4.

The experiment just described can be extended to future quarters given an assumption about future values of $CUST$.[4] Table 2 presents under "Tariffs Continue" results extending through 2027.4 under the assumption that the values of $CUST$ in 2026.1–2027.4 are the same as the value in 2025.4. In other words, the Trump tariffs are assumed to persist at the same level. The results show that by 2027.4 the price level is 3.43 percent higher. Under "Tariffs End" the Trump tariffs are assumed not to persist. The values of $CUST$ in 2026.1–2074.4 were taken to be the same as the value in 2025.1, before the tariffs were imposed. The table shows

estimated residuals that are added to the equation use these values.

[4]Again, it doesn't matter what values of the other variables are used as long as the appropriate estimated residuals are added to the equation.

that the price level by 2027.4 is only 0.41 percent higher in this case.

Some of the right hand side variables in the price equation are endogenous. This has been taken into account in the estimation of the equation, but not in the solution. One needs to embed the PF equation in a complete model to account for this. I have done this using my US model. The exact model used is on my website and is estimated through 2025.4. The price equation is part of the model.

The experiment is the same as above except now with the full model. The estimated residuals are added to all the equations in the model for the 2025.2–2027.4 period. This results in a perfect tracking solution using the actual values of all the exogenous variables in the model. The first experiment is then to take for the values of $CUST$ for 2025.2–2027.4 the actual value in 2025.1, before the Trump tariffs. Solve the model using these values. For each quarter the difference between the solution value and the actual value is the estimated effect of the change on PF.[5] The second experiment assumes that the Trump tariffs end in 2025.4, the same assumption made for the second experiment using the individual equation.

The results are also presented in Table 2. For both experiments the price level is somewhat higher using the full model. The values for the first three quarters are 0.52 versus 0.49, 1.10 versus 1.00, and 1.67 versus 1.48. By 2027.4 the price level is 4.27 percent higher versus 3.43 percent using only the price equation.

Regarding these differences, there are two offsetting effects at work using the full model. First, the increased price level (and inflation) triggered by the tariffs leads the Fed to raise the interest rate (through an estimated interest rate rule). This is contractionary, lowering output and raising the unemployment rate. The higher unemployment rate has a negative effect on PF in the price equation and leads, other things being equal, to a lower price level when the full model is used. Second, there is a wage equation in the model, where prices affect wages and vice versa. This leads, other things being equal, to a higher price level when the full

---

[5]Since actual values are only known through 2025.4, forecast values have to be used for 2026.1–2027.4. The values used for the present experiment are from a forecast I made on February 20, 2026, which is on my website.

model is used because of the wage/price nexus. The net effect is that the second effect dominates the first, and so the price level is higher when the full model is used.

5   Conclusion

The NIPA values on tariff revenue ($CUST$) are aggregate estimates for the whole economy. They are the sums of millions of individual tariffs paid. It turns out that this variable is significant in explaining the aggregate price level, assumed to be an input cost variable to firms setting prices. An advantage of the aggregate work here is that one does not have to estimate what is taxed and by how much. In the end it is just the sum of all the taxes.

The variable explained is the private non farm price deflator, PF. It is the appropriate price variable to examine if one is interested in prices set by domestic firms. The results in Table 2 show that the Trump tariffs are estimated to have increased PF by 1.67 percent by 2025.4 (using the full model). If the tariffs continue at the same level from 2026.1 on, the price level is estimated to be 4.27 percent higher by 2027.4 (using the full model). If the tariffs are eliminated, the price level is only 0.60 percent higher in 2027.4.

References

[1] Amiti, Mary, Chris Flanagan, Sepastian Heise, and David E. Weinstein, 2026, "Who is Paying for the 2025 Tariffs?" Liberty Street Economics, Federal Reserve Bank of New York, February 12.

[2] Barbiero, Omar, and Hillary Stein, 2025, "The Impact of Tariffs on Inflation," *Current Policy Perspectives*, Federal Reserve Bank of Boston, February 6.

[3] Cavallo, Alberto, Paola Llamas, and Franco M. Vazquez, 2025, "Tracking the Short-Run Price Impact of U.S. Tariffs," NBER Working Paper 34496, November.

[4] Fair, Ray C., 2024, *Macroeconomic Modeling The Cowles Commission Approach*, Cambridge, MA: The MIT Press.

[5] Fair, Ray C., 2022, "A Note on the Fed's Power to Lower Inflation," *Business Economics*.

[6] Fajgelbaum, Pablo, and Amit Khandelwal, 2026, "Tariffs in 2025: Short-Run Impacts on the U.S. Economy," March.

[7] Gopinath, Gita, and Brent Neiman, 2026, "The Incidence of Tariffs: Rates and Reality," NBER Working Paper 34620, February.

[8] Hinz, Julian, Aaron Lohmann, Hendrik Mahlkow, and Anna Vorwig, 2026, "America's Own Goal: Who Pays the Tariffs?" Keil Policy Brief 201, Kiel Institute for the World Economy, January.

[9] Minton, Robbie, and Mariano Somale, 2025, "Detecting Tariff Effects on Consumer Prices in Real Time," FEDS Notes, Board of Governors of the Federal Reserve System, May 9.