ANTICIPATED TARIFF REDUCTIONS AND COMPENSATING DIFFERENTIALS IN WAGES

David Riker

ECONOMICS WORKING PAPER SERIES
Working Paper 2024–10–B

U.S. INTERNATIONAL TRADE COMMISSION
500 E Street SW
Washington, DC 20436

October 2024

Anticipated Tariff Reductions and Compensating Differentials in Wages
David Riker
Economics Working Paper 2024–10–B
October 2024

Abstract

I construct an economic model that simulates the effects of tariff reductions on domestic wages and employment. The model focuses on the compensating increases in wages and reductions in employment that precede a tariff reduction when the reduction is anticipated but not when the reduction is a surprise. I calibrate the model to 2023 data from the U.S. manufacturing sector and simulate the economic effects of eliminating all tariffs on U.S. imports of manufactures. Then I examine the sensitivity of these effects to modeling assumptions about the transferability of work experience between jobs, unemployment of displaced workers, and workers' discount rates. Compensating differentials in wages can be important considerations when developing econometric estimates of labor market responses to changes in trade policy and also when designing trade adjustment assistance programs.

David Riker
Research Division, Office of Economics
david.riker@usitc.gov

1 Introduction

Tariff reductions usually decrease demand for domestic labor, putting downward pressure on wages and employment.[1] These labor market adjustments can be complicated when policy changes are staged over time. When tariff reductions are announced and then anticipated before they are phased in, they can lead to compensating differentials in the wages of domestic workers.[2] For example, Hakobyan and McLaren (2016) document compensating differentials in the wages of U.S. workers during the implementation of the North American Free Trade Agreement. They find that NAFTA tariff reductions that were announced when the agreement was reached but were not phased in for many years had a positive impact on U.S. wages at the time of the agreement, followed by a negative impact on wages when the tariff reductions actually occurred.

In Section 2, I construct an economic model of the labor market effects of reducing import tariffs. The model focuses on compensating increases in wages and reductions in employment that precede a tariff reduction when the reduction is anticipated but not when it is a surprise. The wage differentials create incentives for inexperienced workers to enter and remain in the manufacturing sector *despite* the risk of future job displacement from anticipated tariff reductions. Section 3 calibrates the model to data from the U.S. manufacturing sector in 2023.

Section 4 reports policy simulations of the wage and employment effects of eliminating all tariffs on U.S. imports of manufactures, and then section 5 examines the sensitivity of these effects to modeling assumptions about the transferability of work experience between jobs, unemployment of displaced workers, and workers' discount rates. Section 6 applies the

[1]For example, Riker (2021), Riker (2022), Jestrab and Riker (2023), and Riker and Schrammel (2024) are models that quantify the impact of tariff changes on the labor market outcomes of domestic workers.

[2]Compensating differentials occur when firms must pay higher wages in the present to keep or attract workers who would otherwise avoid the industry, for example due to burdensome work conditions or lack of job security.

model to alternative policy scenarios, including tariff increases and country-specific tariff reductions.

The model offers three different ways to measure the impact of tariff reductions on the wages of workers in the domestic industry: the percent change in wages from the period before the tariff reduction to the period after, the percent change in wages in the period of tariff reductions relative to a counterfactual without the tariff reductions, and the cumulative net wage loss over time from the tariff reductions. When tariff reductions are anticipated and there are compensating differentials in wages, the first two measures are misleading, because they do not make a clear distinction between compensated and uncompensated wage losses. Only the third measure gets it right.

Compensating differentials in wages should be taken into account in econometric analyses of the impact of trade policy changes on domestic labor market outcomes. Estimates based on the contemporaneous correlation between changes in trade policy and changes in employment and wages will not accurately measure the effects of the tariff reductions. They will overestimate the negative effect on wages, because some of the loss in wages will have been compensated in anticipation of potential displacement. On the other hand, they will underestimate the negative effect on employment, since some downsizing will precede, rather than coincide with, tariff reductions that are anticipated.

Compensating differentials also have policy implications. If a tariff reduction is announced well ahead of time and gradually phased in, then workers with sector-specific skills will be at least partly compensated for the risk of displacement through ex ante wage differentials, and wage losses from the change in trade policy will be mitigated. Ex ante compensation is a market solution that can complement trade adjustment assistance.

Section 7 concludes with a summary of findings and a discussion of potential directions for further research.

2 Modeling Framework

To illustrate the possibility of compensating differentials in a concise way, the model is limited to two time periods, labeled period 1 and period 2. There is a tariff on imports of manufactures that is reduced in period 2, from an initial tariff factor of $\tau > 1$ down to 1.[3] I consider two alternative sets of expectations about this policy change: the tariff reduction is either anticipated ahead of time in period 1 or it is a surprise in period 2.

Workers in the manufacturing sector are differentiated by their level of experience on the job prior to period 1. I assume that producing one unit of output requires one inexperienced worker, while the relative productivity of initially experienced workers, χ, is equal to $\theta^{\,y} > 1$ in period 1. $\theta > 1$ is a productivity growth factor, and y is the number of years on the job prior to period 1.

The wage of inexperienced workers is w in both periods. This is the outside wage available to inexperienced workers in other sectors of the economy. I assume that w is determined on a large national labor market for inexperienced workers and is exogenous to the model. If there were not any tariff reduction in period 2, then the wage of experienced workers in period 1 would be productivity-adjusted wage $\chi\, w$. This is the cost of replacing the experienced worker with an inexperienced worker who is paid w. If an experienced worker were to move to another sector in period 1, there would be incomplete transfer of experience. The worker's productivity would become $((\chi - 1)\, \lambda + 1)$, where the transferability of experience is represented by $0 \leq \lambda \leq 1$. Experienced workers receive rents above the workers' alternatives in other sectors, since $\chi\, w > ((\chi - 1)\, \lambda + 1)\, w$ as long as $\lambda < 1$ and $\chi > 1$.

Period 2 wages reflect increased productivity due to accumulated experience. They are also shaped by whether the worker is displaced and the transferability of the worker's skills. Consider first the case of a surprise tariff reduction in period 2. If an experienced worker is

[3]The tariff factor is one plus the tariff rate.

not displaced by the tariff reduction in period 2, then the worker's wage increases from $\chi\ w$ in period 1 to $\theta\ \chi\ w$ in period 2, as on-the-job experience increases the worker's productivity by the productivity growth factor θ. For inexperienced workers, wages increase from w to $\theta\ w$.

If the worker is displaced by the tariff reduction, on the other hand, wages after displacement are $((\chi\ \theta\ -\ 1)\ \lambda\ +\ 1)\ w$ for experienced workers and $((\theta\ -\ 1)\ \lambda\ +\ 1)\ w$ for inexperienced workers. While a share of workers are displaced in period 2, since there is downsizing with the tariff reduction, it is not anticipated by workers in period 1 and is not incorporated into period 1 wages.

Next, consider the case of a tariff reduction in period 2 that is fully anticipated in period 1. In this case, wages in period 1 include a compensating differential. The magnitude of the compensating differential is determined by the indifference condition for new, inexperienced workers in equation (1).

$$\omega_1 + \beta\ \phi\ \ (1 + (\theta - 1)\ \lambda)\ \ (1 - \nu)\ w + \beta\ (1 - \phi)\ \theta\ w = w + \beta\ \theta\ w \tag{1}$$

ω_1 is the period 1 wage, which includes the compensating differential. β is the discount factor. ϕ is the correctly anticipated probability that the individual worker will be displaced in period 2. ν is an indicator that is equal to one if displaced workers become unemployed and receive no income in period 2 and is zero otherwise. This indifference condition sets the expected present discounted value of wages of initially inexperienced workers who are employed in the manufacturing sector for the two periods equal to the expected present discounted value of wages if these workers are employment in another sector of the economy for the two periods. The wage differential compensates the expected wage losses of inexperienced workers and makes new entrants willing to work in the relatively risky manufacturing sector.[4]

[4]This differential only partly compensates the loss of rents of initially experienced workers who are displaced in period 2. The wage of experienced workers is determined by the cost of replacing them with

Equation (2) is the solution to the period 1 wage, ω_1.

$$\omega_1 = w \; [1 + \phi \, \beta \; (\theta \; - \; (1 - \nu) \; (1 + (\theta - 1) \; \lambda))] \tag{2}$$

$\omega_1 > w$ as long as $\phi > 0$. Equation (3) expresses the compensating differential in period 1 wages as a percent of w.

$$\kappa_1 = \frac{\omega_1 - w}{w} \tag{3}$$

Equation (4) substitutes ω_1 from equation (2) into equation (3).

$$\kappa_1 = \phi \, \beta \; (\theta \; - \; (1 - \nu) \; (1 + (\theta - 1) \, \lambda)) \tag{4}$$

κ_1, the percent compensating differential, is increasing in the worker's probability of job displacement ϕ. If the tariff reduction in period 2 is a surprise that is not anticipated in period 1, then $\omega_1 = w$ and $\kappa_1 = 0$.

The compensating differential in equation (4) is larger if there is a significant increase in productivity from accumulating work experience and this increase is not transferable to other sectors (θ is high and λ is low), or workers do not discount the future much (β is high), or displaced workers face prolonged unemployment (ν is equal to one). Compensating differentials are likely to vary with the age of the workforce. Older workers typically have more work experience but also a lower discount factor, since they are more likely to retire in the near future. Consequently, they will have little or no compensating differentials in wages, and most of their wage losses from the tariff reduction are not compensated.

Next, I define the *wage effect* as the percent difference between the wage in period 2 after job displacement caused by the tariff reduction and the wage in period 2 without

inexperienced workers, which is higher than the value of the experienced worker's employment in another sector.

displacement. In contrast, I define the *net wage loss* as the wage effect in period 2, discounted to period 1, minus the compensating differential in wages in period 1. The net wage loss could also be called the uncompensated or true wage loss. There is a net wage loss for workers who are displaced and a net wage gain for workers who are not displaced.[5]

The probability of individual displacement, ϕ, depends on the extent of downsizing in the manufacturing sector in each period. Job losses in period 2 are randomly assigned across the incumbent workforce in the sector.

$$\phi = 1 - \frac{L_2}{L_1} \tag{5}$$

For example, if the manufacturing sector is downsized by 10 percent, then each incumbent worker faces a 10 percent probability of job displacement. The model assumes wage rigidity: experienced workers cannot make wage concessions in period 2 to avoid displacement and maintain a portion of the rents associated with their sector-specific skills.[6]

The next step is to derive the change in employment in the manufacturing sector between period 1 and period 2. I assume that there is constant elasticity of substitution (CES) demand for the domestic product and imports with elasticity σ and a Cobb-Douglas production function within the manufacturing sector with labor cost share α. Equation (5) is domestic labor demand in period t, L_t.

$$L_t = \frac{E_t \, (P_t)^{\sigma - 1} \, (p_t)^{1 - \sigma} \, \alpha}{w} \tag{6}$$

E_t is total market demand for manufactures in period t, p_t is the price of the domestic product, and P_t is the CES price index defined in equation (7).

[5]The compensating differential results in zero net wage losses *in expectation*.

[6]If they could make wage concessions, then there might not be any displacements.

$$P_t = \left((p_t)^{1\,-\,\sigma}\ +\ \zeta\ (p^*\ \tau_t)^{1\,-\,\sigma}\right)^{\frac{1}{1\,-\,\sigma}} \tag{7}$$

τ_t is the tariff factor. p^*, the foreign producer price of imports, is constant over the two periods. Both are exogenous variables in the model. ζ is a relative preference weight on imports. Given the Cobb-Douglas production technology, $p_t = (w)^{\alpha}\ (r)^{1-\,\alpha}$, where r is the exogenous price of non-labor inputs.

Equations (8) and (9) are the price indices in periods 1 and 2 when the tariff reduction in period 2 is anticipated in the wage in period 1.

$$P_1 = \left(((\omega_1)^{\alpha}\ (r)^{1-\alpha})^{1\,-\,\sigma}\ +\ \zeta\ (p^*\ \tau)^{1\,-\,\sigma}\right)^{\frac{1}{1\,-\,\sigma}} \tag{8}$$

$$P_2 = \left(((w)^{\alpha}\ (r)^{1-\alpha})^{1\,-\,\sigma}\ +\ \zeta\ (p^*)^{1\,-\,\sigma}\right)^{\frac{1}{1\,-\,\sigma}} \tag{9}$$

Equations (10) and (11) are the corresponding employment levels in the manufacturing sector. If the tariff reduction is not anticipated in period 1, then w replaces ω_1 in equation (10), and L_1 is higher.

$$L_1 = \frac{E_0\ (P_1)^{\sigma\,-\,1}\ ((\omega_1)^{\alpha}\ (r)^{1-\alpha})^{1\,-\,\sigma}\ \alpha}{\omega_1} \tag{10}$$

$$L_2 = \frac{E_0\ \gamma\ (P_2)^{\sigma\,-\,1}((w)^{\alpha}\ (r)^{1-\alpha})^{1\,-\,\sigma}\ \alpha}{\theta\ w} \tag{11}$$

$\gamma > 1$ is a parameter that measures growth in total market demand for manufactures in period 2.

When the tariff reduction in period 2 is anticipated in period 1, there is a reduction in domestic sector employment in period 1 as well as a reduction in sector employment in period 2. L_2 is the same whether the tariff reduction is anticipated or not, and since L_1 is lower when the tariff reduction is anticipated, the decline in employment from period 1 to period 2 is smaller. In that case, part of the overall decline in sector employment occurs in anticipation. This is a feature of dynamic models: anticipatory effects in wages usually move in the opposite direction from the effects at the time of the tariff reduction and at least partly offset them, while employment adjusts part way in anticipation, and the impact on sector employment is only partly captured by the change in employment from period 1 to period 2.

To simplify the notation, I define μ as the import penetration rate in a recent historical period.

$$\mu = \frac{(w)^{\alpha}\ (r)^{1-\alpha}}{((w)^{\alpha}\ (r)^{1-\alpha})^{1\ -\ \sigma}\ +\ \zeta\ (p^{*}\ \tau)^{1\ -\ \sigma}} \tag{12}$$

As long as I have a measure of μ from a recent historical period. I do not need values for w, r p^{*}, or ζ to calibrate the model and run simulations. Equations (13) and (14) are the relative price index and relative labor demand after substituting μ into equations (8) through (11).

$$\left(\frac{P2}{P1}\right)^{\sigma-1} = \frac{(1-\mu)\ (1+\kappa_1)^{(1-\sigma)\ \alpha} + \mu}{(1+\mu) + \mu\ (\tau)^{\sigma-1}} \tag{13}$$

$$\left(\frac{L2}{L1}\right) = \frac{\gamma\ \left((1-\mu)(1+\kappa_1)^{(1-\sigma)\ \alpha} + \mu\right)}{\theta\ \left((1-\mu) + \mu\ (\tau)^{\sigma-1}\right)\ (1+\kappa_1)^{1+\alpha\ (\sigma-1)}} \tag{14}$$

The probability of displacement in equation (15) combines equations (5) and (14).

$$\phi = 1\ -\ \frac{\gamma\ \left((1-\mu)(1+\kappa_1)^{(1-\sigma)\ \alpha} + \mu\right)}{\theta\ \left((1-\mu) + \mu\ (\tau)^{\sigma-1}\right)\ (1+\kappa_1)^{1+\alpha\ (\sigma-1)}} \tag{15}$$

This equation implicitly defines κ_1 as a decreasing function of the probability of displacement ϕ_1.

The compensating differential and probability of displacement are simultaneously determined: a larger value of ϕ increases the compensating differential κ_1, and a larger value of κ_1 reduces employment in period 1 and reduces the probability of displacement ϕ. The equilibrium values of ϕ and κ_1 are jointly determined by equations (4) and (15).[7]

Simple calculations of the changes in wages over time, from period 1 before the tariff reduction to period 2 after the tariff reduction, will not measure the uncompensated or true net wage loss of the displaced workers. Only the net wage loss measure gets it right. Equations (16) and (17) are the positive net wage losses of experience and inexperienced workers who are displaced by the tariff reductions.

$$NWL\ (\chi) = -\chi\ \kappa_1\ +\ \beta\ (1-\nu)\,(\chi\ \theta\ -\ (1\ +\ (\chi\ \theta\ -\ 1)\ \lambda)) \tag{16}$$

$$NWL\ (1) = -\kappa_1\ +\ \beta\ (1-\nu)\,(\theta\ -\ (1\ +\ (\theta\ -\ 1)\ \lambda)) \tag{17}$$

Workers who are not displaced experience a net *gain* when the tariff reduction is anticipated: the net wage losses of experienced and inexperienced workers who are not displaced are negative, $-\chi\ \kappa_1$ and $-\kappa_1$.

3 Calibration of the Model

I apply the model to data from the U.S. manufacturing sector in 2023. The import penetration rate, μ, is calculated as the ratio of the landed duty-paid value of U.S. manufacturing imports in 2023 ($2.816 trillion) over the sum of the values of domestic shipment ($6.934 trillion in total shipments minus $1.291 trillion in exports) and imports. The sources for these annual data are the U.S. Census Bureau's Manufacturers' Shipments, Inventories, and

[7] If these two equations were depicted in a graph, with ϕ on the horizontal axis and κ_1 on the vertical axis, then the curve for equation (4) would slope upward, the curve for equation (15) would slope downward, and the equilibrium would lie at the intersection of the two curves.

Orders (M3) survey and the U.S. International Trade Commission's Trade Dataweb.[8]

I derive an econometric specification that I use to estimate σ. Equation (18) is the CES demand, with imports in year t from many countries indexed by f.

$$v_{ft} = E_t \ (P_t)^{\sigma - 1} \ (p_{ft} \ \tau_{ft})^{1 - \sigma} \ \zeta_f \tag{18}$$

p_{ft} is the producer price of imports from country f in year t. τ_{ft} is the trade cost factor for imports from country f, and ζ_f is the preference parameter in the CES price index. E_t is aggregate expenditure on manufactures in year t, including imports and domestic products.[9] P_t is the CES price index for domestic products and the composite of imports, and σ is the elasticity of substitution. Equation (19) is a log-linearization of the model in equation (18).

$$ln \ v_{ft} = a_t \ + \ b_f \ + \ (1 \ - \ \sigma) \ ln \ \tau_{ft} \ + \ e_{ft} \tag{19}$$

with

$$a_t = \ln E_t \ + \ (\sigma \ - \ 1) \ \ln P_t \tag{20}$$

$$b_f = \ln \zeta_f \tag{21}$$

$$e_{ft} = (1 \ - \ \sigma) \ln p_{ft} \tag{22}$$

Equation (23) is a Poisson version of this econometric specification.

[8]These data are publicly available at `https://www.census.gov/manufacturing/m3/index.html` and `https://dataweb.usitc.gov/`.

[9]The model assumes separability of demand across industries, following a common assumption in trade models that preferences are Cobb-Douglas across sectors.

$$v_{ft} = \exp\left[\, a_t \ + \ \beta_f \ + \ (1 \ - \ \sigma) \ ln \ \tau_{ft} \,\right] \ \eta_{ft} \tag{23}$$

p_{ft} becomes part of the error term η_{ft}. I assume that it is determined by foreign production costs and is orthogonal to $\ln \tau_{ft}$.

I construct an estimation sample that includes bilateral import values for 2012–2023. The data are from the Trade Dataweb.[10] I measure the trade cost factor as the ratio of the landed duty-paid value of the imports to their customs value. I estimate the parameters of equation (21) using the high-dimension fixed effects Poisson Pseudo Maximum Likelihood estimator in Stata, with country and year fixed effects. The point estimate for σ is 4.5354, with a robust standard error of 0.7058 and an R^2 of 0.9942. There were a total of 2,765 observations in the sample.

I set the productivity factor associated with each extra year of experience, θ, equal to 0.048, based on estimates in Caplin, Lee, Leth-Peterson, Saeverud and Shapiro (2023). This study of job tenure uses a purpose-designed survey of Danish employers. Their quasi-experimental approach separates the effects of tenure in a specific job from the effects of general work experience associated with age. Their identification strategy is based on responses to counterfactual hiring scenarios posed in the survey.

I set α equal to 0.1197 based on data for the U.S. manufacturing sector from the 2021 Annual Survey of Manufactures.[11] I set the discount factor β equal to 0.9600 to reflect a 4.17% discount rate. Finally, I set the baseline values for ν, λ, and γ at values that simplify the baseline simulation, and then I consider alternative values for these parameters in subsequent simulations.

[10] These data are publicly available at `https://dataweb.usitc.gov/`.

[11] These data are publicly available at `https://www.census.gov/programs-surveys/asm.html`.

Table 1 reports the baseline values of all of the model inputs.

Table 1: Model Inputs for U.S. Manufacturing Sector in 2023

Model Parameter	Value
Initial Import Penetration Rate (μ)	33.29%
Initial Tariff Factor (τ)	1.0269
Elasticity of Substitution (σ)	4.5354
Productivity Growth Factor (θ)	1.0480
Experience Productivity Factor (χ)	1.2642
Total Expenditure Growth Factor (γ)	1.0480
Transfer Rate for Productivity (λ)	0.0000
Unemployment after Displacement (ν)	0.0000
Labor Share of Cost (α)	0.1197
Discount Factor (β)	0.9600

4 Simulated Effects of the Tariff Reduction

Table 2 reports the simulated wage and employment effects of eliminating all tariffs on U.S. imports of manufactures. The compensating differential is zero if the tariff reduction is a surprise in period 2 and is 0.146% if the tariff reduction is anticipated in period 1. While this seems small, it makes sense: 0.146% is approximately equal to the product of the simulated probability of individual displacement (3.16%) and the simulated wage effect on displaced workers (-4.58%).

The simulated wage effects reported in Table 2 are estimates of how much period 2 wages are reduced when workers are displaced by the tariff reduction. They compare the period 2 wage against a counterfactual wage in period 2 rather than measuring the change in wages over time. The wage effects are larger for experienced workers, who lose all of the value of their experience in this baseline simulation since $\lambda = 0$. For inexperienced workers, the wage effects are the same whether the tariff reduction is anticipated or a surprise.

Next, the table reports the simulated changes in wages over time, from period 1 to period 2. There is a larger decline in wages from period 1 to period 2 for experienced workers who are displaced. This decline is magnified if the tariff reduction is anticipated, because the wage in period 1 is elevated by the compensating differential, though not all of the decline from period 1 to period 2 is an uncompensated loss. Wages rise for workers who are not displaced due to the productivity increase represented by θ, by the same amount for initially experienced and inexperienced workers. These increases are slightly lower when the tariff reduction is anticipated.

The table also reports simulated net (or uncompensated) wage losses. Workers are better off if they anticipate the tariff reduction due to the compensating differential in period 1 wages. The net wage losses of displaced workers are lower if the tariff reduction is anticipated, and non-displaced workers have negative net wage losses (i.e., net gains).[12]

The lower panel of Table 2 reports the simulated changes in employment in the U.S. manufacturing sector. The cumulative employment change over the two periods is the same whether the tariff reduction is anticipated or not. It is determined by the magnitudes of τ and σ. However, if the tariff reduction is anticipated, then there is some downsizing that happens in period 1 in anticipation, since the increase in period 1 wages reduces labor demand before the tariff reduction occurs in period 2. In this case, there is less decline in sector employment in period 2.

5 Sensitivity Analysis of Key Model Parameters

Tables 3 and 6 report additional simulations that vary the modeling assumptions from the baseline values in tables 1 and 2. Table 3 reports changes in wages and employment when the tariff reduction is anticipated in period 1 for different assumptions about the transferability

[12]They receive the compensating differential in period 1 but experience no losses in period 2.

Table 2: Simulated Effects of Tariff Elimination

	Anticipated Tariff Reduction	Surprise Tariff Reduction
Compensating Differential κ (%)	0.146	0.000
Wage Effect of Displacement in Period 2		
Initially Experienced (%)	-24.520	-24.520
Initially Inexperienced (%)	-4.580	-4.580
Change in Wages from 1 to 2, Displaced		
Initially Experienced (%)	-21.012	-20.897
Initially Inexperienced (%)	-0.146	0.000
Change in Wages from 1 to 2, Non-Displaced		
Initially Experienced (%)	4.647	4.800
Initially Inexperienced (%)	4.647	4.800
Net Wage Loss for Displaced Workers		
Initially Experienced (%)	31.001	31.186
Initially Inexperienced (%)	4.462	4.608
Net Wage Loss for Non-Displaced Workers		
Initially Experienced (%)	-0.185	0.000
Initially Inexperienced (%)	-0.146	0.000
Employment Change in Period 2 (%)	-3.168	-3.167
Change over the Two Periods (%)	-3.167	-3.167

parameter λ.

Greater transferability of experience reduces the compensating differential. The negative wage effect in period 2 and the decline in wages from period 1 to period 2 for displaced workers are both smaller. There is a slightly larger wage increase for non-displaced workers (because the wage in period 1 is lower). Greater transferability significantly reduces the net wage losses of displaced workers.[13] These is no significant effect of λ on the cumulative change in employment; however, higher transferability reduces κ_1, and this dampens the decline in employment in period 1, leading to a slightly larger employment decline in period 2.

Table 4 reports the simulated labor market effects when the tariff reduction is anticipated and all displaced workers remain unemployed and earn no income in period 2 (setting $\nu = 1$). When displaced workers face prolonged unemployment, there is a much larger reduction in wage income in period 2 and consequently a much larger compensating differential in wages in period 1, 1.855% instead of 0.146%. There is also much larger net wage losses of displaced workers. The higher compensating differential in period 1 reduces employment in period 1 and so the decline in employment at the time of the tariff reduction in period 2 is smaller, a decline of 1.844 percent instead of 3.168 percent, but the cumulative change in employment over the two periods is still the same.

Table 5 reports the sensitivity of the simulation results to the workers' discount factor. A lower discount factor reduces the compensating differential and the decline in the wages of displaced workers and increases the rise in the wages of non-displaced workers. It also reduces the net wage losses of displaced workers. The discount factor has little impact on employment changes.

[13]It also reduces the small net wage gains of non-displaced workers.

Table 3: Effects of Anticipated Tariff Elimination: Sensitivity to Skill Transfer

	$\lambda = 0$	$\lambda = 0.25$	$\lambda = 0.50$
Compensating Differential κ (%)	0.146	0.110	0.073
Wage Effect of Displacement in Period 2			
Initially Experienced (%)	-24.520	-18.390	-12.260
Initially Inexperienced (%)	-4.580	-3.435	-2.290
Change in Wages from 1 to 2, Displaced			
Initially Experienced (%)	-21.012	-14.566	-8.116
Initially Inexperienced (%)	-0.146	1.089	2.325
Change in Wages from 1 to 2, Non-Displaced			
Initially Experienced (%)	4.647	4.685	4.723
Initially Inexperienced (%)	4.647	4.685	4.723
Net Wage Loss for Displaced Workers			
Initially Experienced (%)	31.001	23.251	15.501
Initially Inexperienced (%)	4.462	3.346	2.231
Net Wage Loss for Non-Displaced Workers			
Initially Experienced (%)	-0.185	-0.139	-0.092
Initially Inexperienced (%)	-0.146	-0.110	-0.073
Employment Change in Period 2 (%)	-3.168	-3.171	-3.172
Change over the Two Periods (%)	-3.167	-3.167	-3.167

Table 4: Sensitivity to Unemployment

	$\nu = 0$	$\nu = 1$
Compensating Differential κ (%)	0.146	1.855
Wage Effect of Displacement in Period 2		
Initially Experienced (%)	-24.520	-100.000
Initially Inexperienced (%)	-4.580	-100.000
Change in Wages from 1 to 2, Displaced		
Initially Experienced (%)	-21.012	-100.000
Initially Inexperienced (%)	-0.146	-100.000
Change in Wages from 1 to 2, Non-Displaced		
Initially Experienced (%)	4.647	2.891
Initially Inexperienced (%)	4.647	2.891
Net Wage Loss for Displaced Workers		
Initially Experienced (%)	31.001	124.840
Initially Inexperienced (%)	4.462	98.753
Net Wage Loss for Non-Displaced Workers		
Initially Experienced (%)	-0.185	-2.346
Initially Inexperienced (%)	-0.146	-1.855
Employment Change in Period 2 (%)	-3.168	-1.844
Change over the Two Periods (%)	-3.167	-3.167

Table 5: Sensitivity to Discount Factor

	$\beta = 0.96$	$\beta = 0.90$
Compensating Differential κ (%)	0.146	0.137
Wage Effect of Displacement within Period 2		
Initially Experienced (%)	-24.520	-24.520
Initially Inexperienced (%)	-4.580	-4.580
Change in Wages from 1 to 2, Displaced		
Initially Experienced (%)	-21.012	-21.005
Initially Inexperienced (%)	-0.146	-0.137
Change in Wages from 1 to 2, Non-Displaced		
Initially Experienced (%)	4.647	4.657
Initially Inexperienced (%)	4.647	4.657
Net Wage Loss for Displaced Workers		
Initially Experienced (%)	31.001	29.064
Initially Inexperienced (%)	4.462	4.183
Net Wage Loss for Non-Displaced Workers		
Initially Experienced (%)	-0.185	-0.173
Initially Inexperienced (%)	-0.146	-0.137
Employment Change in Period 2 (%)	-3.168	-3.168
Change over the Two Periods (%)	-3.167	-3.167

Finally, table 6 adjusts the exogenous growth in demand for manufactures in the United States, γ. With higher growth there is a lower compensating differential, less decline in the wages of displaced workers, more increase in the wages of non-displaced workers, slightly larger net wage losses of displaced workers (due to the smaller compensating differential), and a smaller decline in sector employment.

Table 6: Sensitivity to the Growth Rate

	$\gamma = 1.048$	$\gamma = 1.058$
Compensating Differential κ (%)	0.146	0.103
Wage Effect of Displacement within Period 2		
Initially Experienced (%)	-24.520	-24.520
Initially Inexperienced (%)	-4.580	-4.580
Change in Wages from 1 to 2, Displaced		
Initially Experienced (%)	-21.012	-20.979
Initially Inexperienced (%)	-0.146	-0.103
Change in Wages from 1 to 2, Non-Displaced		
Initially Experienced (%)	4.647	4.692
Initially Inexperienced (%)	4.647	4.692
Net Wage Loss for Displaced Workers		
Initially Experienced (%)	31.001	31.055
Initially Inexperienced (%)	4.462	4.505
Net Wage Loss for Non-Displaced Workers		
Initially Experienced (%)	-0.185	-0.131
Initially Inexperienced (%)	-0.146	-0.103
Employment Change in Period 2 (%)	-3.168	-2.243
Change over the Two Periods (%)	-3.167	-2.243

6 Alternative Policy Scenarios

In the final set of simulations, I consider alternative policy scenarios. In the first, the tariff on imports is doubled, from 2.686% to 5.372%, rather than eliminated. The effects on wages and employment are asymmetric. When tariffs are increased, there is no compensating differential, not even a negative one, because staying in a *more protected* manufacturing sector is not a worse employment opportunity for new workers than employment in other sectors of the economy. In this case, there is no displacement of incumbent workers, and no negative wage effects on experienced or inexperienced workers in period 2. All wages increase by 4.800% from period 1 to period 2 due to the productivity increase represented by θ. There is not an additional wage increase due to the higher tariff and the resulting higher labor demand, because wages are set by the cost of replacing incumbents with new, inexperienced workers. There is no net wage loss in this case. Sector employment increases by 2.991%.

Turning back to tariff reductions, the model can be used to estimate the effects of tariff reductions on imports from specific countries. The magnitudes of these effects will depend on each country's import penetration rate and the initial tariff rate it faces. Table 7 reports three separate simulations that eliminate tariffs on U.S. imports of manufactures from China, Brazil, or Turkey *in isolation*. The compensating differential and the employment effects from eliminating tariffs on imports from China are approximately 100 times greater than the effects for the other two countries. This reflects the higher share and initial tariff rates on U.S. imports from China. On the other hand, the net wage losses of displaced workers are similar in magnitude, varying only with the magnitudes of the compensating differentials.

Table 7: Country-Specific Anticipated Tariff Elimination

	Brazil	China	Turkey
Import Share	0.0036	0.0560	0.0019
Initial Tariff Factor	1.01342	1.10784	1.03689
Compensating Differential κ (%)	0.001	0.110	0.001
Wage Effect of Displacement within Period 2			
Initially Experienced (%)	-24.520	-24.520	-24.520
Initially Inexperienced (%)	-4.580	-4.580	-4.580
Change in Wages from 1 to 2, Displaced			
Initially Experienced (%)	-20.898	-20.984	-20.898
Initially Inexperienced (%)	-0.001	-0.110	-0.001
Change in Wages from 1 to 2, Non-Displaced			
Initially Experienced (%)	4.799	4.684	4.799
Initially Inexperienced (%)	4.799	4.684	4.799
Net Wage Loss for Displaced Workers			
Initially Experienced (%)	31.185	31.047	31.184
Initially Inexperienced (%)	4.607	4.498	4.607
Net Wage Loss for Non-Displaced Workers			
Initially Experienced (%)	-0.001	-0.139	-0.002
Initially Inexperienced (%)	-0.001	-0.110	-0.001
Employment Change in Period 2 (%)	-0.017	-2.386	-0.026
Change over the Two Periods (%)	-0.017	-2.385	-0.026

7 Conclusions

The model is a practical tool for including compensating differentials in an assessment of the dynamic labor market effects of tariff reductions. Whether wage losses are compensated and how quickly the manufacturing sector is downsized both depend on the timing and anticipation of the tariff reductions.

There are many potential extensions to the modeling framework. First, the model could be applied to tariff reductions on imports of specific products rather than the broad U.S. manufacturing sector. Second, the model could be used to simulate the wage and employment effects of improving access to U.S. export markets rather than reducing tariffs on U.S. imports. This extension would require data on foreign tariffs, U.S. producers' share of the foreign markets, and the export share of their production. Third, the model could be extended to include more than two worker types, reflecting differences in initial experience levels, discount rates, or other attributes. Finally, the model could relax the assumption that there are no wage concessions. For example, it could assume that experienced workers make concessions to avoid displacement and are able to retain part of their sector-specific rents.

References

Caplin, A., Lee, M., Leth-Peterson, S., Saeverud, J. and Shapiro, M. D. (2023). How Worker Productivity and Wages Grow with Tenure and Experience: the Firm Perspective. NBER Working Paper 30342.

Hakobyan, S. and McLaren, J. (2016). Looking for Local Labor Market Effects of NAFTA, *Review of Economics and Statistics* **98**(4): 728–741.

Jestrab, R. and Riker, D. (2023). Trade Policy, Human Capital, and Costly Worker Transitions. USITC Economics Working Paper 2023-10-A.

Riker, D. (2021). Labor Adjustment and the Staging of Tariff Reductions. USITC Economics Working Paper 2021-07-C.

Riker, D. (2022). State-level Import Penetration. USITC Economics Working Paper 2022-03-C.

Riker, D. and Schrammel, M. (2024). Expected Wage Losses Due to Trade-Related Job Displacements. USITC Economics Working Paper 2024-02-B.