# The 2025 Trade War: Dynamic Impacts across U.S. States and the Global Economy

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# Model

- As in previous model:
  - Forward-looking agents facing moving costs as in ACM (2010)
  - Embedded in quantitative trade model with home production as in CDP (2019)
  - DNWR in manufacturing combined with a nominal anchor
    - Endogenous labor force participation and unemployment
- Changes and additions:
  - No migration across states
  - Tariff revenue rebated to states based on population
  - Tariffs come as surprise in 2025, perfect foresight afterward

# Data

- **87 regions:** 50 U.S. states, 36 other countries, aggregate RoW
- **15 sectors:** home production, 12 manufacturing sectors, services, agriculture
- **Baseline year is 2019:**
  - 2019 tariffs from Teti (2024), aggregation following Liao et al. (2021)
  - 2019 OECD's ICIO database: sector-level bilateral trade between countries
  - 2019 CFS: manufacturing trade flows across U.S. States
  - 2019 U.S. Census: trade between U.S. states and other countries
  - 2019 BEA: state-level production and consumption in services and agriculture + gravity
  - 2019 BLS and OECD: labor force participation
  - 2019 CPS: sector-level bilateral migration flows between U.S. states

# Calibration

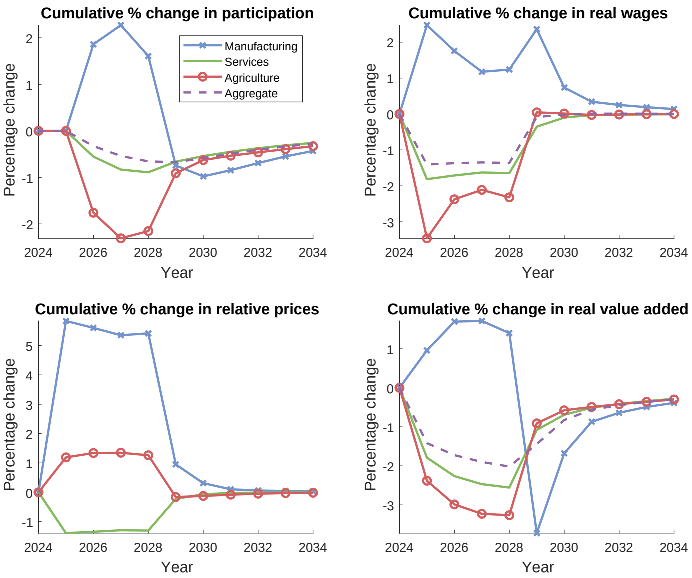
Table: **Parameter values used**

| Parameter | Value | Description | Source |
|---|---|---|---|
| $\delta$ | 1 | Lower bound in DNWR | Normalization |
| $\gamma$ | 3% | Growth rate of world nominal GDP in \$ | Suggestive |
| $\nu$ | 0.55 | Inverse elasticity of moving across sectors | RUV |
| $\sigma$ | 6 | Trade elasticity, but also 1.76, 2.44, and 3.12 | Trade Literature |

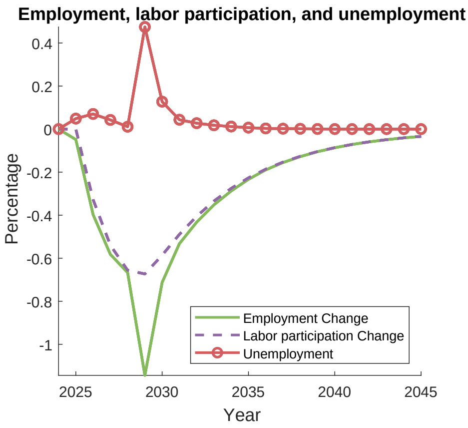
# Shock

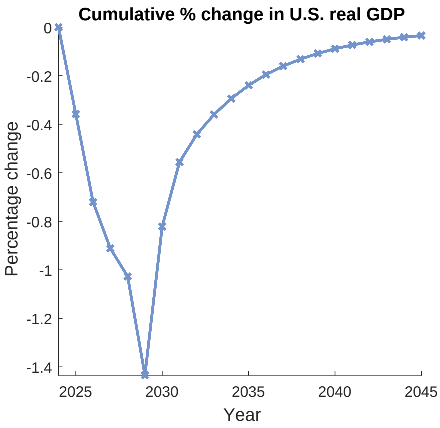
- Trump II tariffs
  - Tariffs on Canada and Mexico increase to 25%
  - Tariffs on China increase uniformly by 54%
  - For other countries, tariffs increase according to schedule from "liberation day"
  - In baseline, tariffs last 4 years, and affected countries retaliate with mirror tariffs
- Alternative scenarios:
  - Duration: 8, 12, or 16 years
  - Retaliation: 0%, 50%, and 150%

# Baseline results at the sectoral level in the US

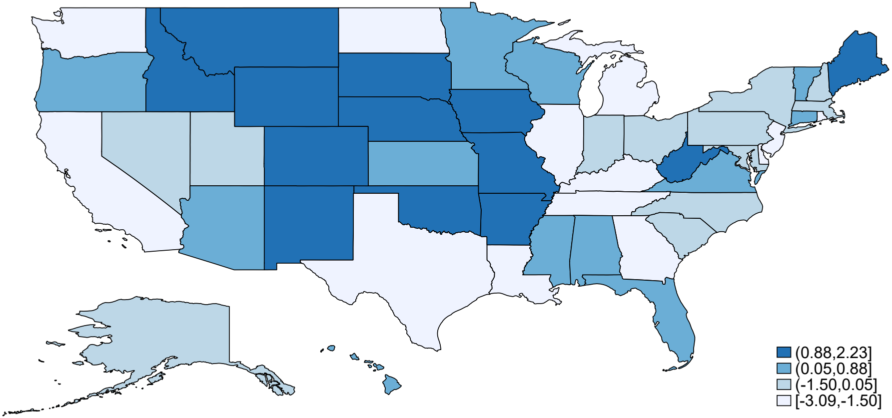


# Baseline results at the aggregate level in the US



# Cumulative change in real income across US states



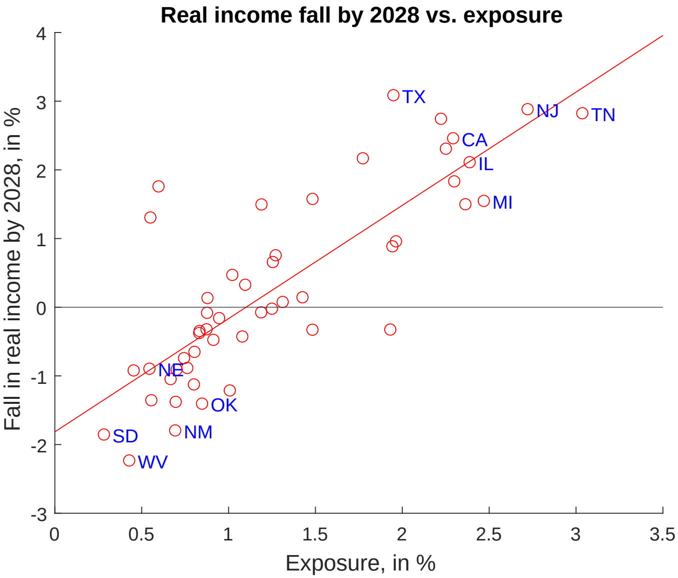
# Exposure to the shock at the regional level

- Exposure measure:

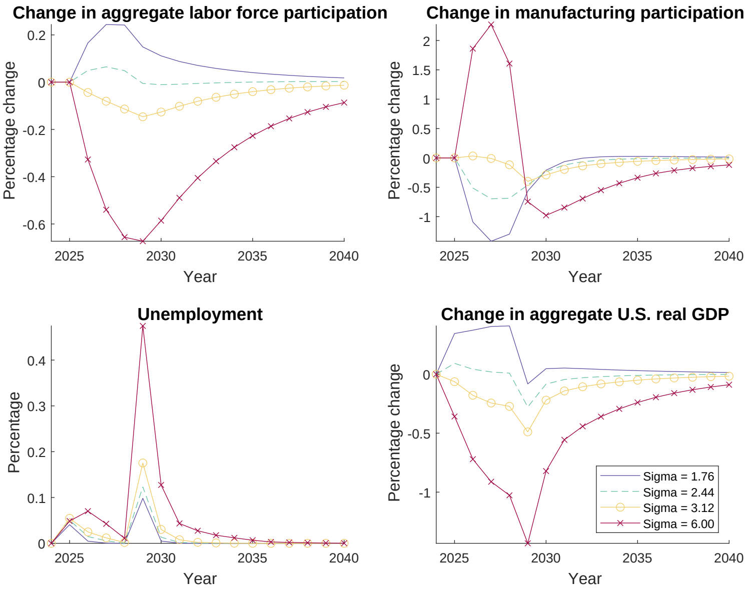
$$Exposure_i = \sum_{s=1}^{S} \sum_{j=1}^{I} \frac{EXP_{ji,s,0}}{EXP_{i,0}} \frac{t_{ji,s,1} - t_{ji,s,0}}{1 + t_{ji,s,0}}.$$

  * $EXP_{ji,s,0}$ total expenditure of region $i$ of goods from $j$ in sector $s$
  * $EXP_{i,0}$ total expenditure of region $i$
  * $\frac{t_{ji,s,1} - t_{ji,s,0}}{1 + t_{ji,s,0}}$: percentage change in the tariffs after the shock

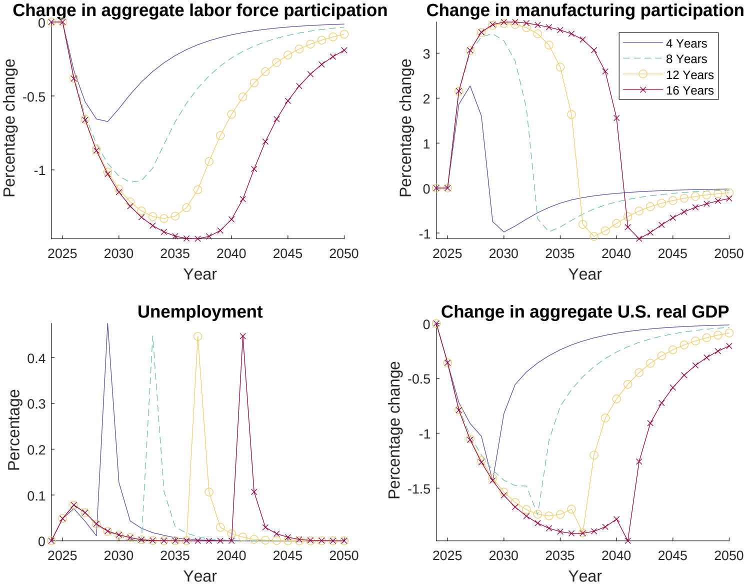
- We correlate this measure with cumulative changes in real income up to 2028


Real income fall by 2028 vs. exposure
Fall in real income by 2028, in %
Exposure, in %
4
3
2
1
0
-1
-2
-3
0
0.5
1
1.5
2
2.5
3
3.5
TX
NJ
TN
CA
IL
MI
NE
OK
SD
NM
WV

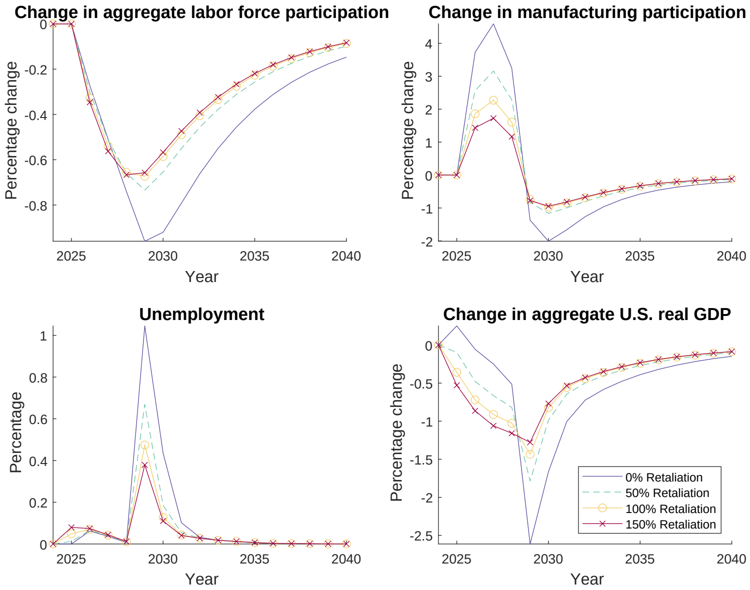
# What is the impact of the trade elasticity?



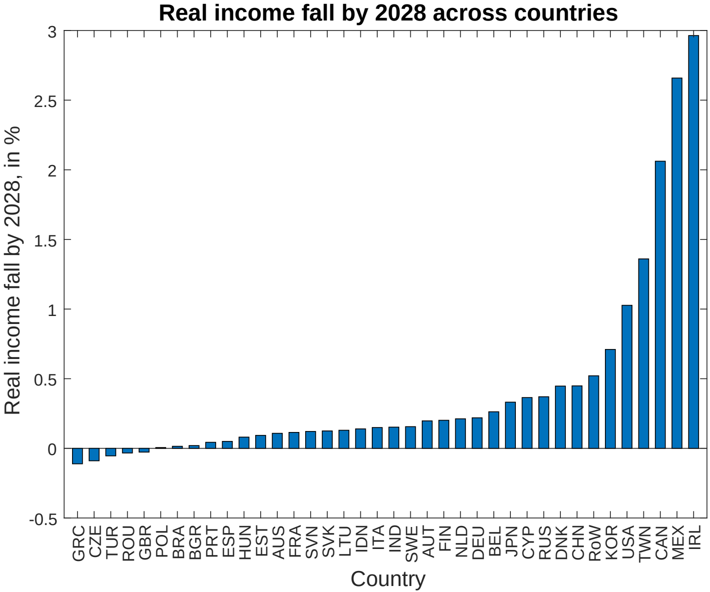
# What is the impact of the shock duration?



# What is the impact of different retaliation scenarios?



# Effect of the tariff shock on other countries



## Summary of Findings

- Effects of 2025 U.S. tariffs using a dynamic trade model a la ACM and DCP with DNWR (as in RUV):
  - Real GDP declines by around 1% by 2028
  - Aggregate employment falls by 1.1%
    - Increase in the home production sector
    - Unemployment rises post-shock as DNWR prevents wage adjustment
  - Large heterogeneity across states:
    - Some states lose more than 3% of real income
  - With a low trade elasticity, the U.S. can experience positive gains in real income
- For the rest of the world:
  - Close U.S. partners lose more from the tariff increase
  - Some countries could benefit due to trade diversion

# Caveats

- Perfect foresight not the best assumption for the future of Trump II tariffs
- Aggregation masks large granular effects that could be amplified through input-output or financial networks
- Cobb-Douglas assumption... maybe we should have lower elasticity of substitution in production
- As in DEK, we hold trade imbalances fixed
- Is it really feasible to enforce such a wide range of tariffs across importers?

# Model Environment: Consumption and Intermediate Inputs

- $I$ regions ($M$ inside US), $S$ market sectors plus home production
- Cobb-Douglas preferences ($\alpha_{i,s}$) across market sectors. Armington assumption within sectors with EoS $\sigma_s > 1$. All income devoted to consumption
- Cobb-Douglas production using labor ($\phi_{i,s}$) and intermediate inputs ($\phi_{i,ks}$)
- Perfect competition with iceberg trade costs $\tau_{ij,s,t} \geq 1$

$$P_{i,t} = \prod_{s=1}^{S} P_{i,s,t}^{\alpha_{i,s}}, \qquad P_{j,k,t}^{1-\sigma_k} = \sum_{i=1}^{I} p_{ij,k,t}^{1-\sigma_k}$$

where $p_{ij,k,t} = \tau_{ij,k,t} A_{i,k,t}^{-1} W_{i,k,t}^{\phi_{i,k}} \prod_{s=1}^{S} P_{i,s,t}^{\phi_{i,sk}}$

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# Market Clearing Conditions in the Static Equilibrium

- Total tariff revenue received (TRR) by region $i$ at time $t$ is:

$$TRR_{i,t} = \sum_j \theta_{ji} TRC_{j,t} \text{ with } \sum_i \theta_{ji} = 1 \quad \forall j$$

- The total revenue collected by region $j$ is:

$$TRC_{j,t} = \sum_s \sum_i \frac{t_{ij,s,t}}{1 + t_{ij,s,t}} \lambda_{ij,s,t} EXP_{j,s,t}$$

- Total expenditure by region $j$ in sector $s$ is:

$$EXP_{j,s,t} = \alpha_{j,s} \left( \sum_{s=1}^{S} W_{j,s,t} L_{j,s,t} + D_{j,t} + TRR_{j,t} \right) + \sum_{k=1}^{S} \phi_{j,sk} R_{j,k,t}$$

- The market clearing condition is:

$$R_{i,s,t} = \sum_{j=1}^{I} \frac{\lambda_{ij,s,t}}{1 + t_{ij,s,t}} \left( \alpha_{j,s} \left( \sum_{s=1}^{S} W_{j,s,t} L_{j,s,t} + D_{j,t} + TRR_{j,t} \right) + \sum_{k=1}^{S} \phi_{j,sk} R_{j,k,t} \right)$$

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## Labor Supply: Dynamic Decisions

- As in CDP and ACM:
  - Agents can move across sectors and regions
  - Forward-looking agents (with perfect foresight) move subject to relocation costs
  - In region $i$, time $t$, home production yields $\mu_i$ and sector $s$ yields $\omega_{i,s,t}$
- Different elasticities across sectors $(\frac{1}{\nu})$ and regions $(\frac{1}{\kappa})$
  - Nested Gumbel for amenity shocks across regions and sectors

$$\mu_{ji,sk|i,t} = \frac{\exp\left(\beta V_{i,k,t+1} - \varphi_{ji,sk}\right)^{1/\nu}}{\sum_{h=0}^{S} \exp\left(\beta V_{i,h,t+1} - \varphi_{ji,sh}\right)^{1/\nu}}$$

$$\mu_{ji,s\#,t} = \frac{\left(\sum_{h=0}^{S} \exp\left(\beta V_{i,h,t+1} - \varphi_{ji,sh}\right)^{1/\nu}\right)^{\nu/\kappa}}{\sum_{m=1}^{I} \left(\sum_{h=0}^{S} \exp\left(\beta V_{m,h,t+1} - \varphi_{jm,sh}\right)^{1/\nu}\right)^{\nu/\kappa}}.$$

- In CDP: $\omega_{i,s,t} \equiv \frac{W_{i,s,t}}{P_{i,t}}$. With DNWR and TRR $\omega_{i,s,t} = \frac{W_{i,s,t}L_{i,s,t} + \frac{\ell_{i,s,t}}{\sum_{k=1}^{S} \ell_{i,k,t}} TRR_{i,t}}{\ell_{i,s,t} P_{i,t}}$
- This block determines labor supply $\ell_{i,s,t}$

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# Nominal Wage Rigidity

- DNWR: $W_{i,s,t}^{LCU} \geq \delta_s W_{i,s,t-1}^{LCU}$
- Maximum employment: $L_{i,s,t} \leq \ell_{i,s,t}$
- Complementary slackness:

$$(\ell_{i,s,t} - L_{i,s,t})(W_{i,s,t}^{LCU} - \delta_s W_{i,s,t-1}^{LCU}) = 0$$

- For regions outside of the U.S., with exchange rate $E_{i,t}$ given in dollars per LCU, DNWR implies

$$W_{i,s,t} \geq \frac{E_{i,t}}{E_{i,t-1}} \delta_s W_{i,s,t-1}$$

- **Nominal anchor**: nominal world GDP in dollars grows at rate $\gamma$

$$\sum_{i=1}^{I} \sum_{k=1}^{K} W_{i,k,t} L_{i,k,t} = (1+\gamma) \sum_{i=1}^{I} \sum_{k=1}^{K} W_{i,k,t-1} L_{i,k,t-1}$$

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