The Macroeconomic Impact of NAFTA Termination

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Motivation

Donald J. Trump
@realDonaldTrump

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We are in the NAFTA (worst trade deal ever made) renegotiation process with Mexico & Canada.Both being very difficult,may have to terminate?

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Background

Since NAFTA's inception, US, Canada, and Mexico's economies have become heavily intertwined

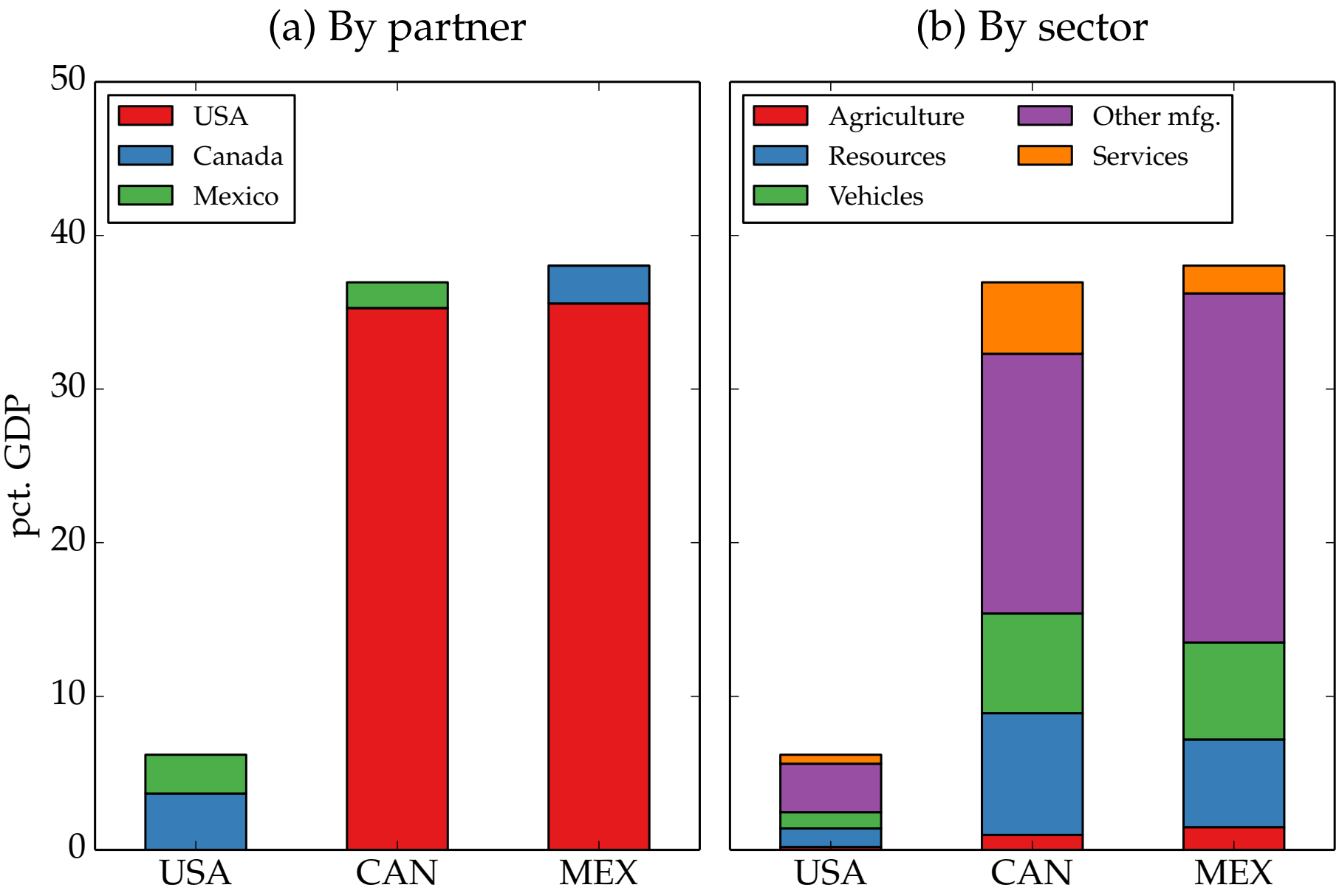
- Mexico and Canada trade significantly more with US than with any other country; US trades more only with China
- Extensive regional supply chains, particularly in transportation equipment sector
- But also trade imbalances: US trade deficits with Canada and Mexico

President Trump's policies have cast doubt on NAFTA's future

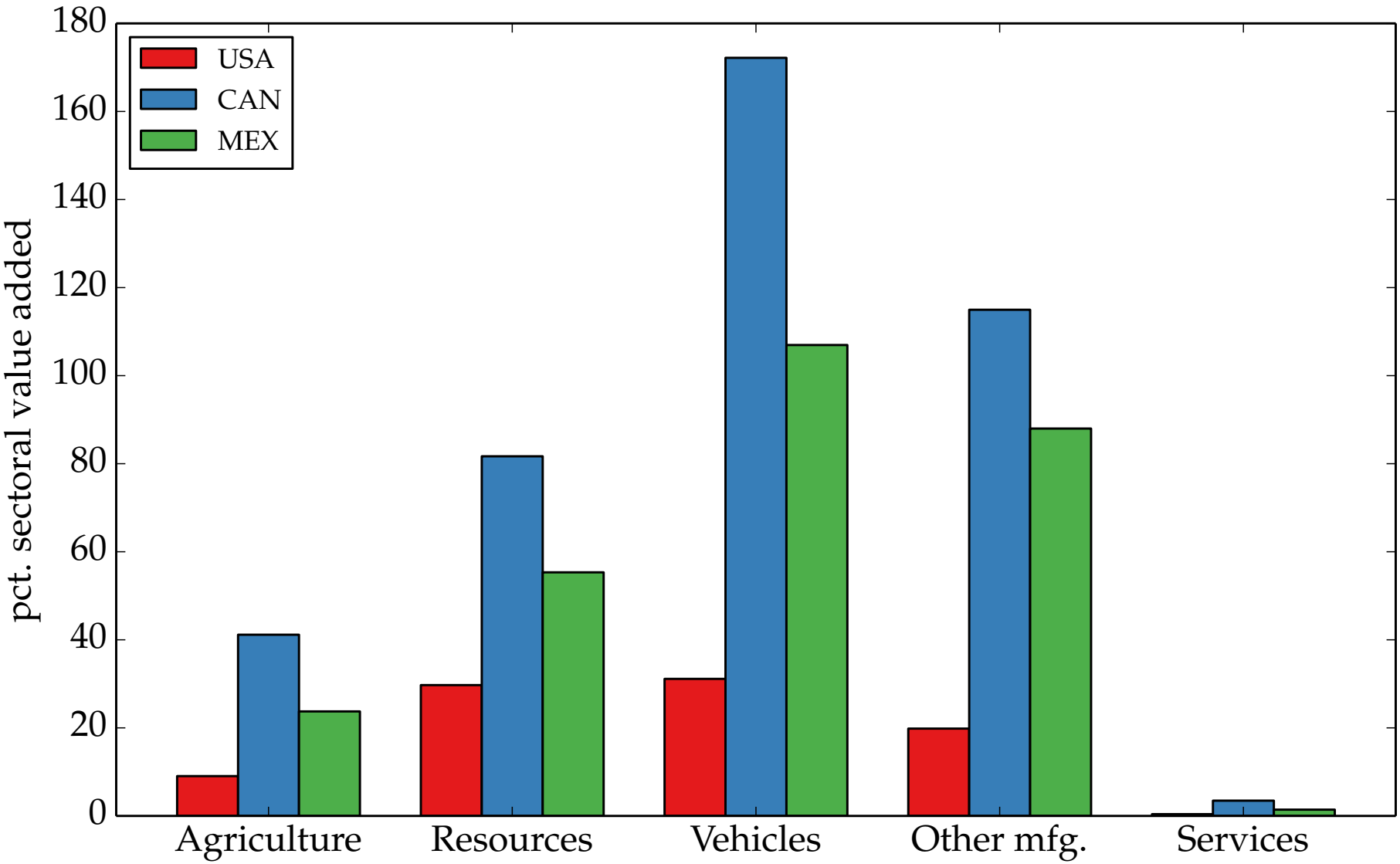
Macroeconomic consequences of NAFTA termination?

- Trade and sectoral reallocation in the long run?
- Short-run transition dynamics and welfare?
- Trade imbalances?

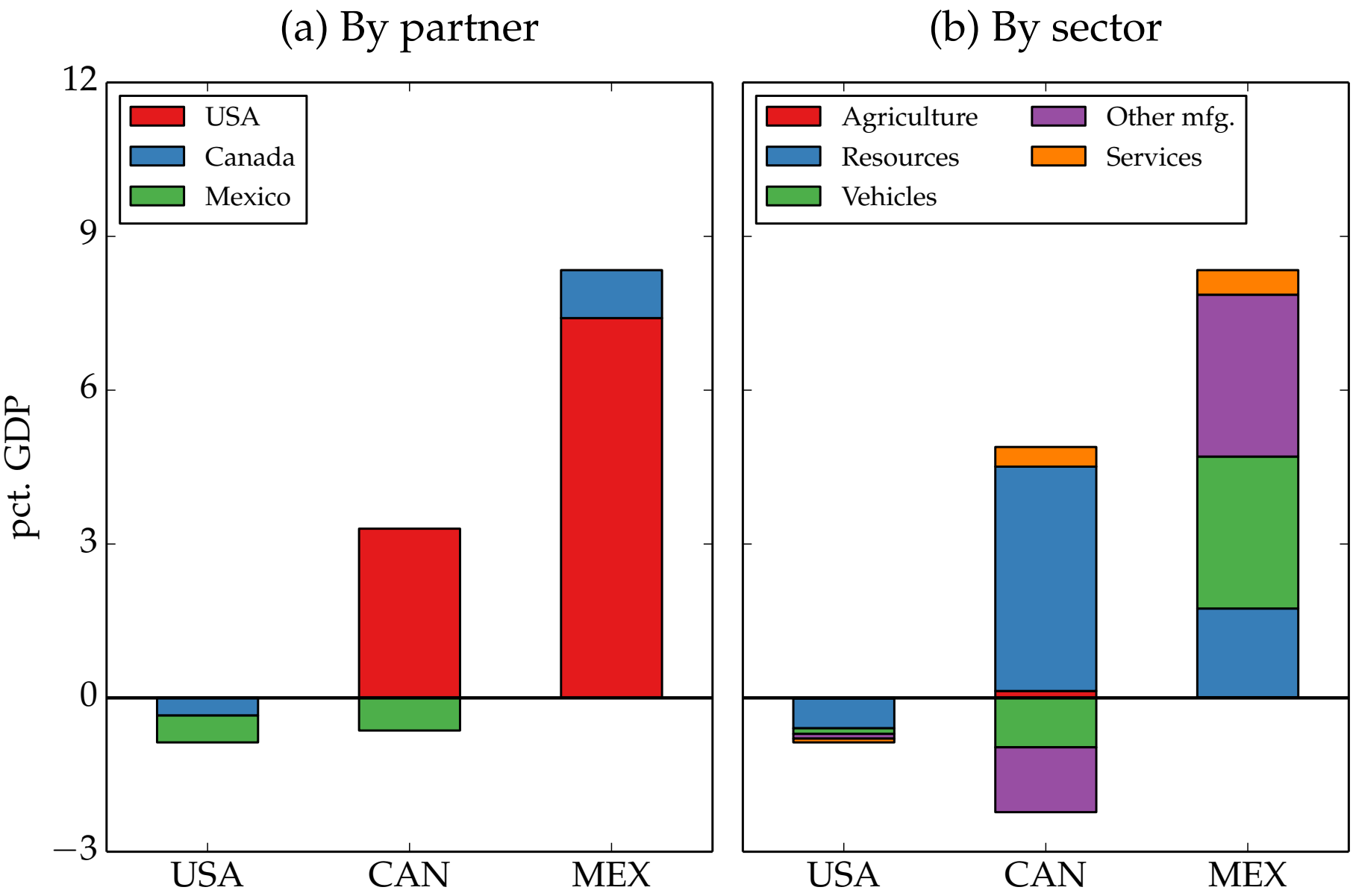
Gross NAFTA trade flows (2010–2014 averages)



NAFTA intermediate input trade (2010–2014 averages)



NAFTA trade imbalances (2010–2014 averages)



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What I do

Build dynamic CGE model of NAFTA

- Multi-sector, input-output framework (Caliendo-Parro, 2015)
- Time-varying trade elasticities (Ruhl, 2008; Alessandria-Choi, 2016)
- K and L adjustment costs (Ravikumar et al., 2018; Dix-Carneiro, 2014)
- Endogenous trade balances

Calibrate steady state to match 2014 input-output table

Evaluate macroeconomic consequences of NAFTA termination and alternative policies

What I find

Trade falls dramatically in agriculture (high tariffs) and resources (high elasticity)

Consumption falls most in vehicles (low elasticity, high reliance on imported intermediates)

Small welfare consequences, short-run adjustment costs negligible

Little impact on trade imbalances

- US trade deficit with Canada shrinks
- US trade deficit with Mexico grows

Model: Overview

Four countries: US, Canada, Mexico, and rest of the world

- Representative households work, consume, trade bonds
- Governments levy import tariffs and rebate proceeds to households

Five sectors: agriculture, resources, vehicles, other mfg., services

- Competitive firms produce using capital, labor, intermediate inputs
- Armington aggregators conduct international trade

Dynamic adjustment margins:

- Trade and factor adjustment costs
- Endogenous trade imbalances

Perfect foresight

- Steinberg (2017): Brexit uncertainty has little macroeconomic impact

Model: Producers

Firm in country i's sector s chooses labor, investment, intermediate inputs to maximize PDV of dividends

Production function:

$$y_{i,t}^s = \min\left\{\frac{(k_{i,t}^s)^\alpha(\ell_{i,t}^s)^{1-\alpha}}{\lambda_i^{s,v}}, \min_{r=1,\ldots,5}\left[\frac{m_{i,t}^{s,r}}{\lambda_i^{s,r}}\right]\right\} - \sum_{r=1}^{5}\phi_\ell\left(\frac{\ell_{i,t}^s}{\ell_{i,t-1}^s} - 1\right)^2 \ell_{i,t-1}^s$$

Law of motion for capital (Lucas and Prescott, 1971):

$$k_{i,t+1}^s = (1-\delta)k_{i,t}^s + \delta^{1-\phi_k}(x_{i,t}^s)^{\phi_k}(k_{i,t}^s)^{1-\phi_k}$$

Budget constraint:

$$d_{i,t}^s = p_{i,t}^s y_{i,t}^s - w_{i,t}\ell_{i,t}^s - p_{i,t}^x x_{i,t}^s - \sum_{r=1}^{5} p_{i,t}^{m,r} m_{i,t}^{s,r}$$

Model: Distributors

Distributors combine domestic and foreign products into nontradable Armington composites

Aggregation technology for use $u = m, f$ in country i's sector s:

$$q_{i,t}^{u,s} = \left[\sum_{j=1}^{4} \mu_{i,j}^{u,s} \left(z_{i,j,t}^{u,s} \right)^{\frac{\zeta^s - 1}{\zeta^s}} \right]^{\frac{\zeta^s}{\zeta^s - 1}} - \sum_{j \neq i} \phi_u \left(\frac{z_{i,j,t}^{u,s}}{z_{i,j,t-1}^{u,s}} - 1 \right)^2 z_{i,j,t-1}^{u,s}$$

- Long-run trade elasticities, ζ^s, vary by sector
- Adjustment frictions lower short-run elasticities (Krugman, 1986)
- Stand in for new exporter dynamics (Alessandria and Choi, 2016)

Dynamic problem: choose inputs to maximize PDV of dividends,

$$d_{i,t}^{u,s} = p_{i,t}^{u,s} q_{i,t}^{u,s} - \sum_{j=1}^{4} (1 + \tau_{i,j,t}^{s}) z_{i,j,t}^{u,s}$$

Model: Households and investment

Household in country i chooses consumption, labor, bonds to maximize lifetime utility subject to budget constraints (standard)

Aggregate consumption is CES bundle of sectoral consumptions:

$$c_{i,t} = \left[\sum_{s=1}^{5} \varepsilon_i^s \left(c_{i,t}^s \right)^{\frac{\rho-1}{\rho}} \right]^{\frac{\rho}{\rho-1}}$$

Aggregate investment is Cobb-Douglas aggregate (Bems, 2008):

$$q_{i,t}^x = \prod_{s=1}^{5} (z_{i,t}^{x,s})^{\mu_i^{x,s}}$$

Model: Equilibrium

Given tariffs, $\tau^s_{i,j,t}$, and initial conditions for bonds and capital, equilibrium is sequence of prices and quantities that

- Solves households', firms', and distributors' problems
- Clears markets for output, composites, investment, labor, and bonds:

Period 0 in model corresponds to year 2014 in data

Construct two equilibria in quantitative exercise:

- NAFTA equilibrium: tariffs between NAFTA members zero forever
- Termination equilibrium: tariffs unexpectedly rise to most-favored-nation defaults in 2018

Calibration: input-output data

World Input Output Database (WIOD)

- Widely used in quantitative trade studies
- Summarizes production, intermediate inputs, and final demand for 43 countries and 56 2-digit ISIC industries

Aggregate non-NAFTA countries into single "rest of the world" and industries into 5 broad sectors

Data for 2014

- Latest available data
- Several years before Trump's election (and NAFTA termination) thought possible

Calibration: assigned parameters

Common parameters (β, ψ, α, δ, ρ, γ) assigned to standard values

Initial conditions for bonds and capital taken directly from data

Long-run trade elasticities based on Caliendo and Parro (2015)

- CP estimate trade elasticities for 2-digit ISIC industries (same as in raw WIOD data)
- Aggregate to sector level by taking import-weighted averages

Sector	Elasticity
Agriculture	8.11
Resources	31.82
Vehicles	0.88
Other mfg.	5.17
Services	5.00

Calibration: calibrated parameters

Expenditure shares ($\lambda_i^{s,v}$, $\lambda_i^{s,r}$, $\mu_{i,j}^{u,s}$, $\mu_i^{x,s}$, ε_i^s) chosen so that first period of equilibrium replicates aggregated IO table

Capital adjustment cost (ϕ_k) set to 0.5 (Eaton et al., 2014)

Labor adjustment cost (ϕ_ℓ) set to 6.5 (Kehoe and Ruhl, 2008; Sargent, 1978)

Trade adjustment costs (ϕ_u) chosen so that 1-year trade elasticity in termination equilibrium is 1

Calibration: tariffs in termination equilibrium

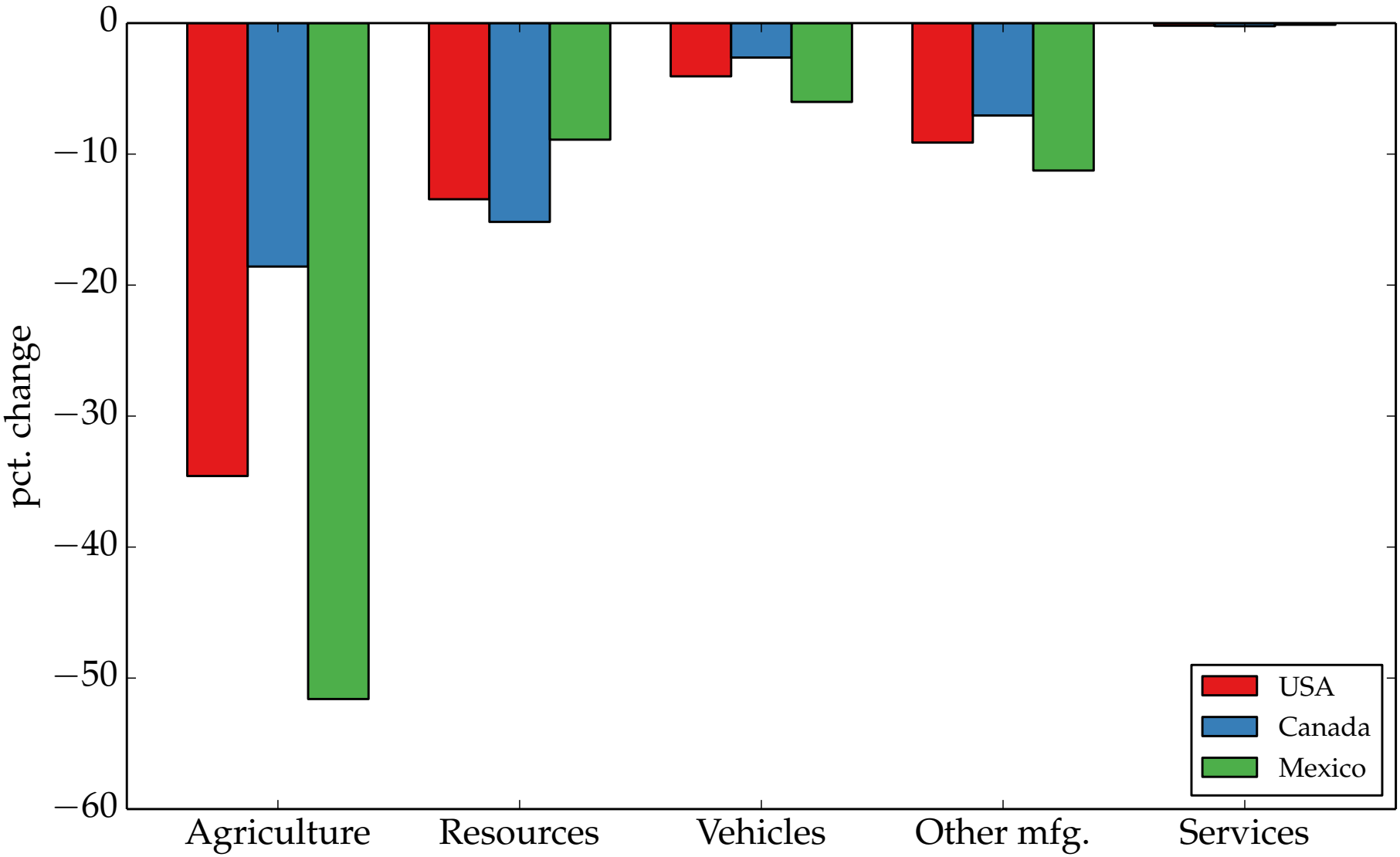
Based on most-favored-nation tariff schedules for 6-digit HS industries reported by WTO

Aggregate to 5 broad sectors using COMTRADE bilateral trade flow data as weights

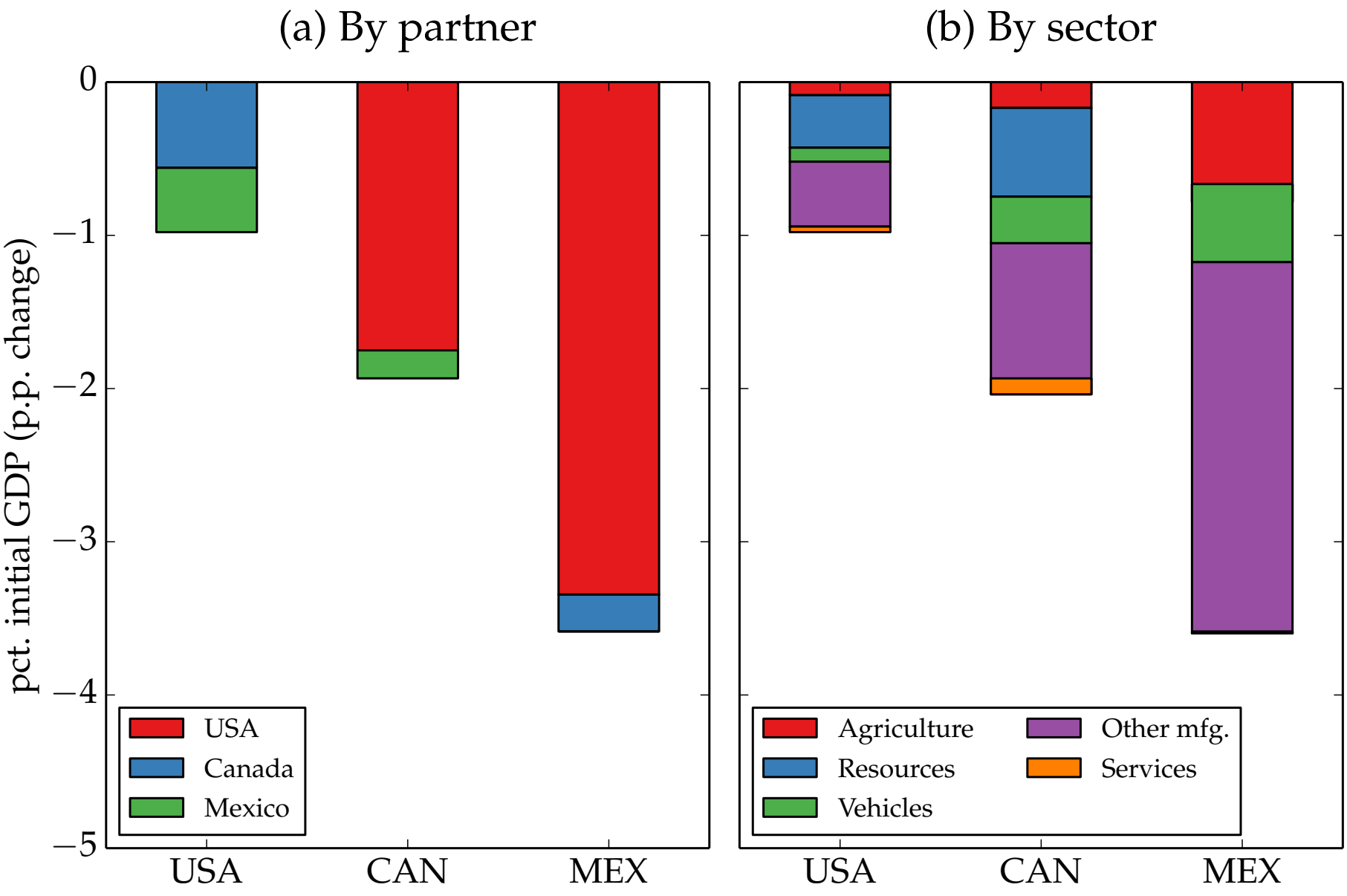
Table : Change in import tariffs after NAFTA termination

Trade partner	Agriculture	Resource extraction	Trans. equip.	Other manuf.	Total
(a) United States					
Canada	1.74	0.74	2.30	1.79	1.51
Mexico	3.19	0.52	7.75	1.76	3.14
(b) Canada					
United States	3.28	0.61	4.55	1.55	2.14
Mexico	0.57	0.38	5.20	1.47	2.56
(c) Mexico					
United States	29.18	0.18	7.62	3.65	5.40
Canada	13.29	0.08	12.22	2.97	6.19

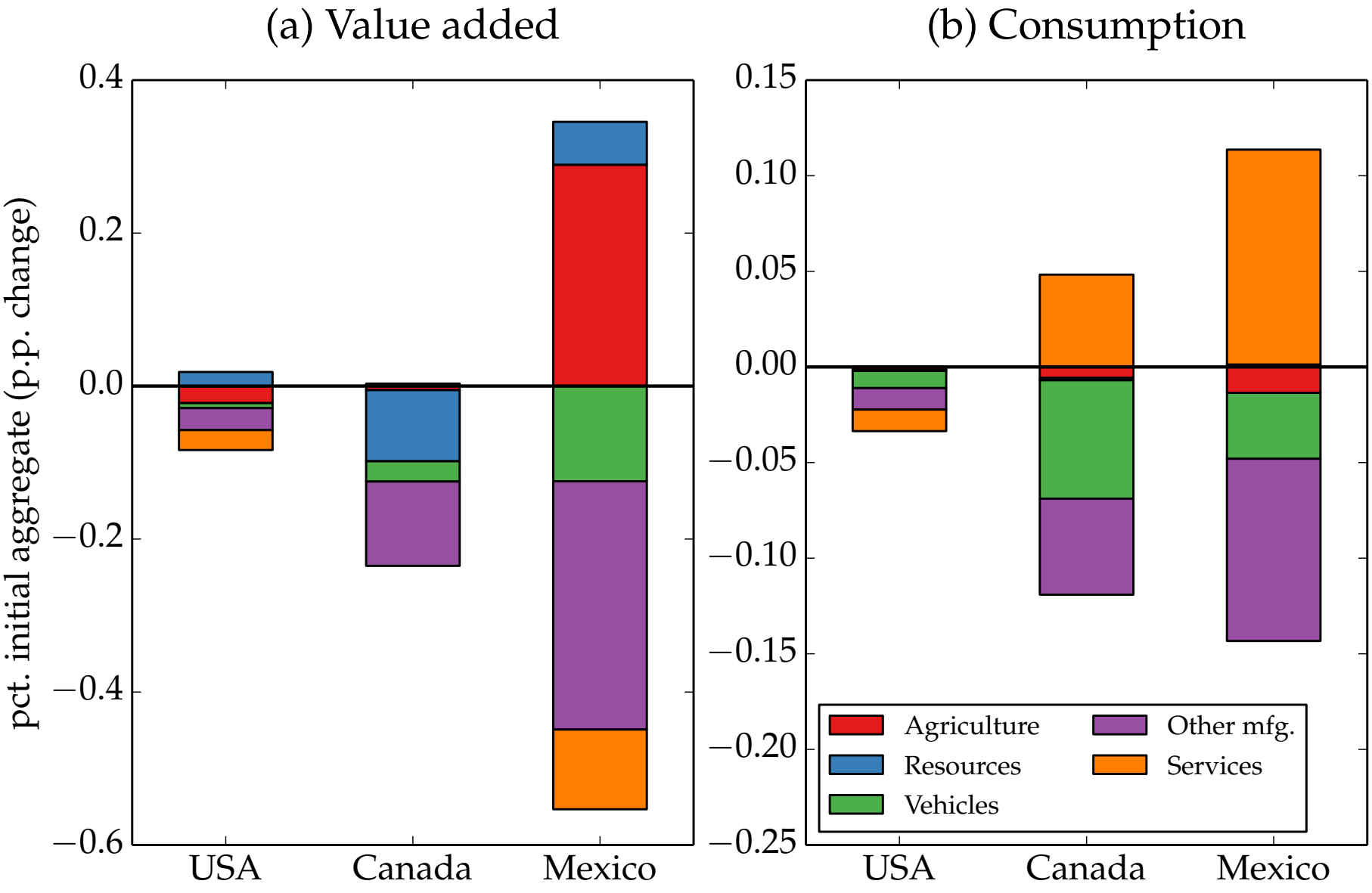
Long-run results: gross NAFTA trade volumes



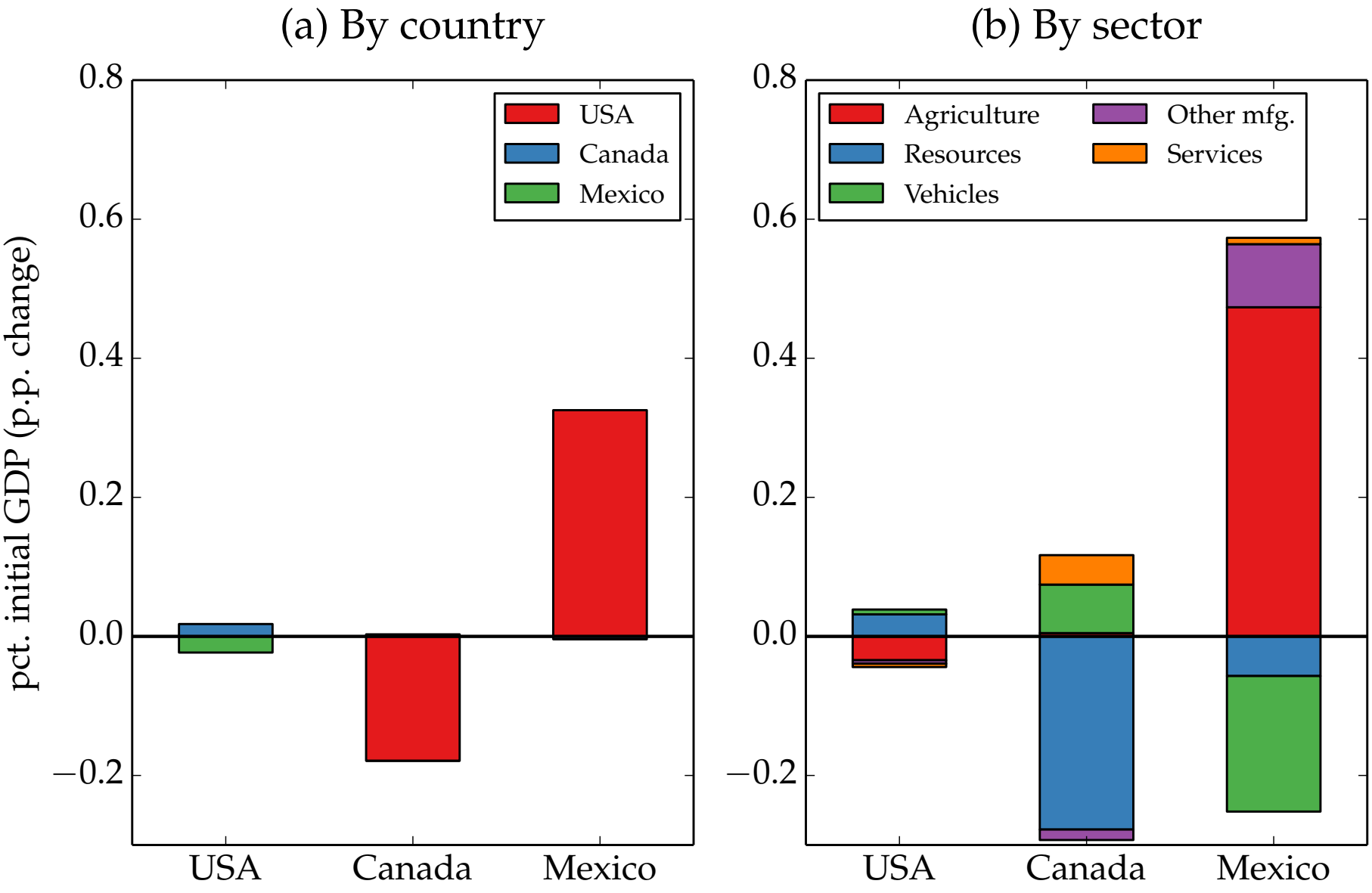
Long-run results: NAFTA trade



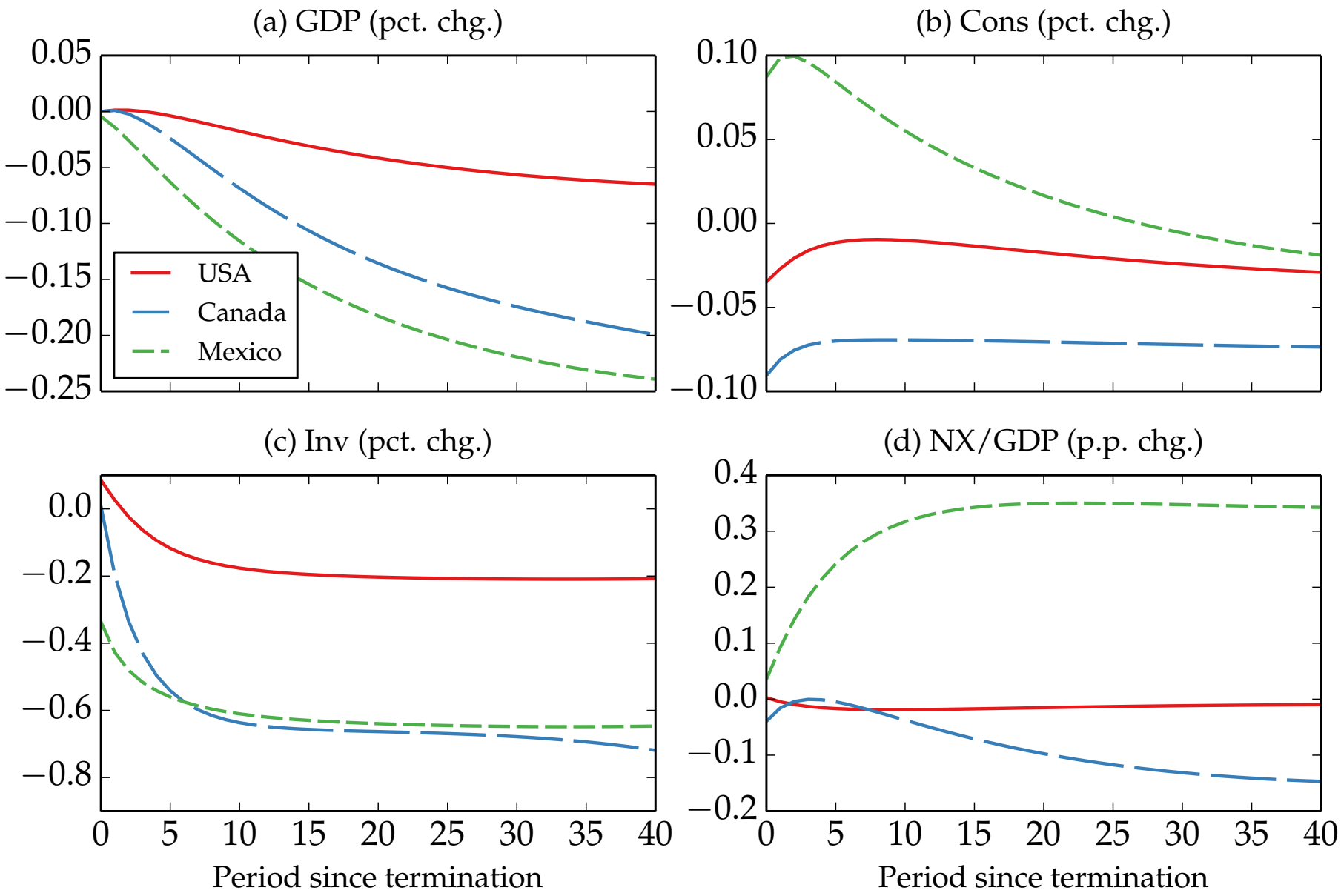
Long-run results: output and consumption



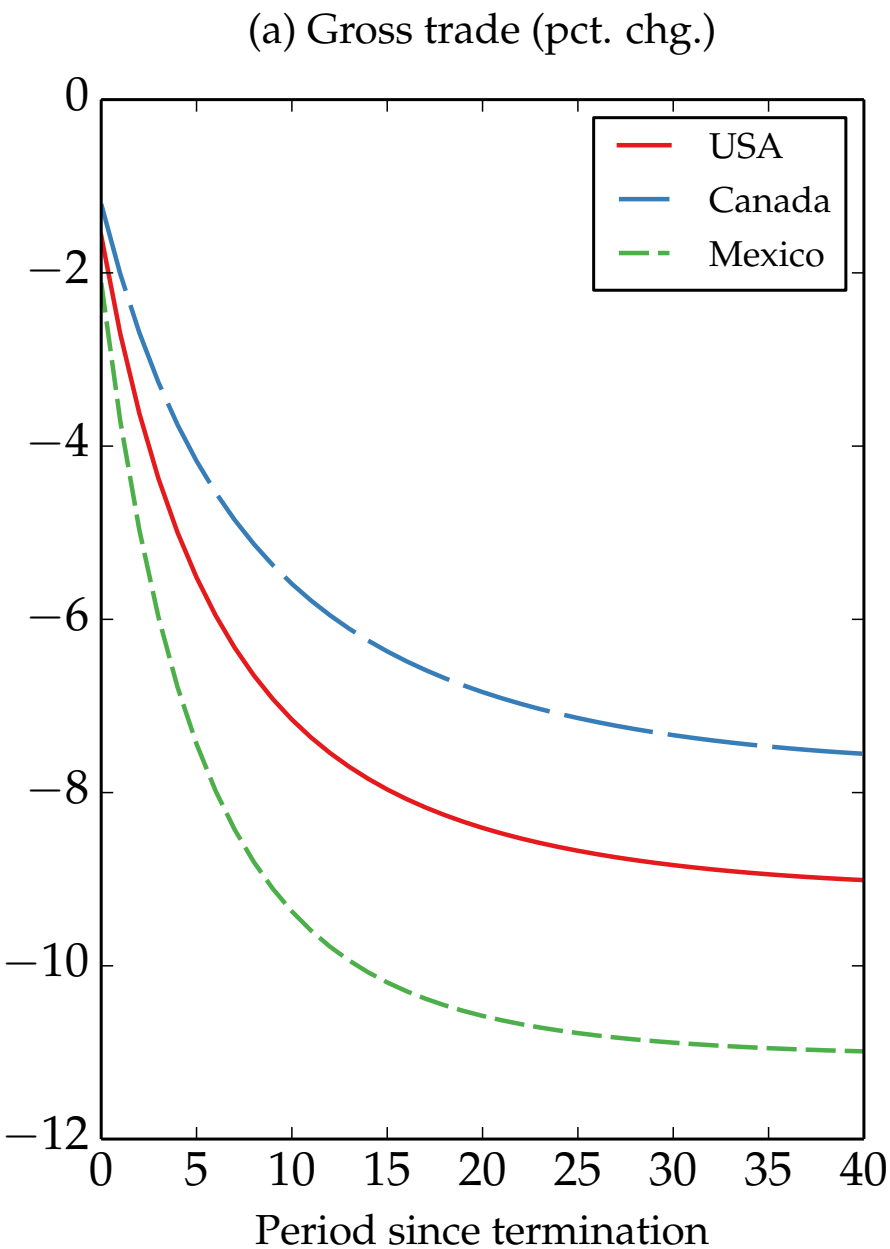
Long-run results: NAFTA trade balances

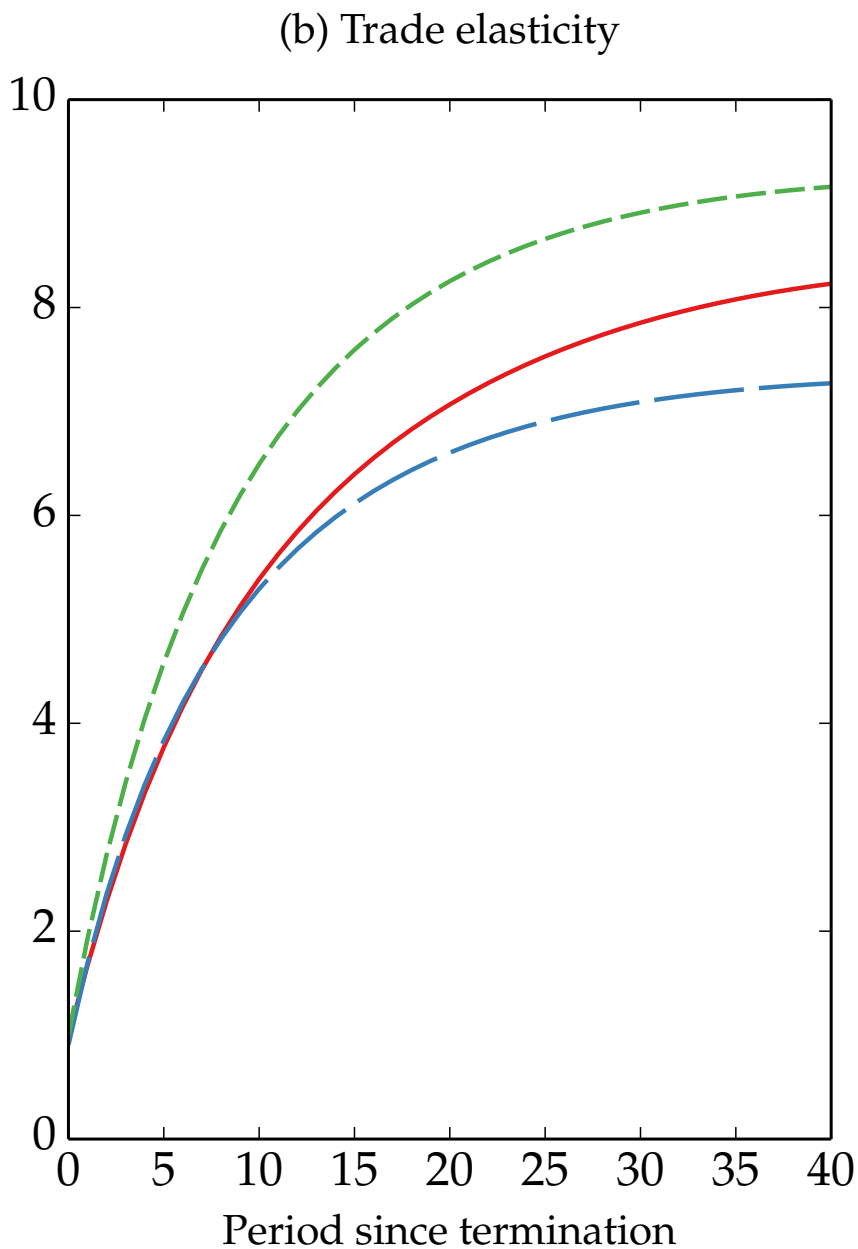


Dynamic results: macro aggregates

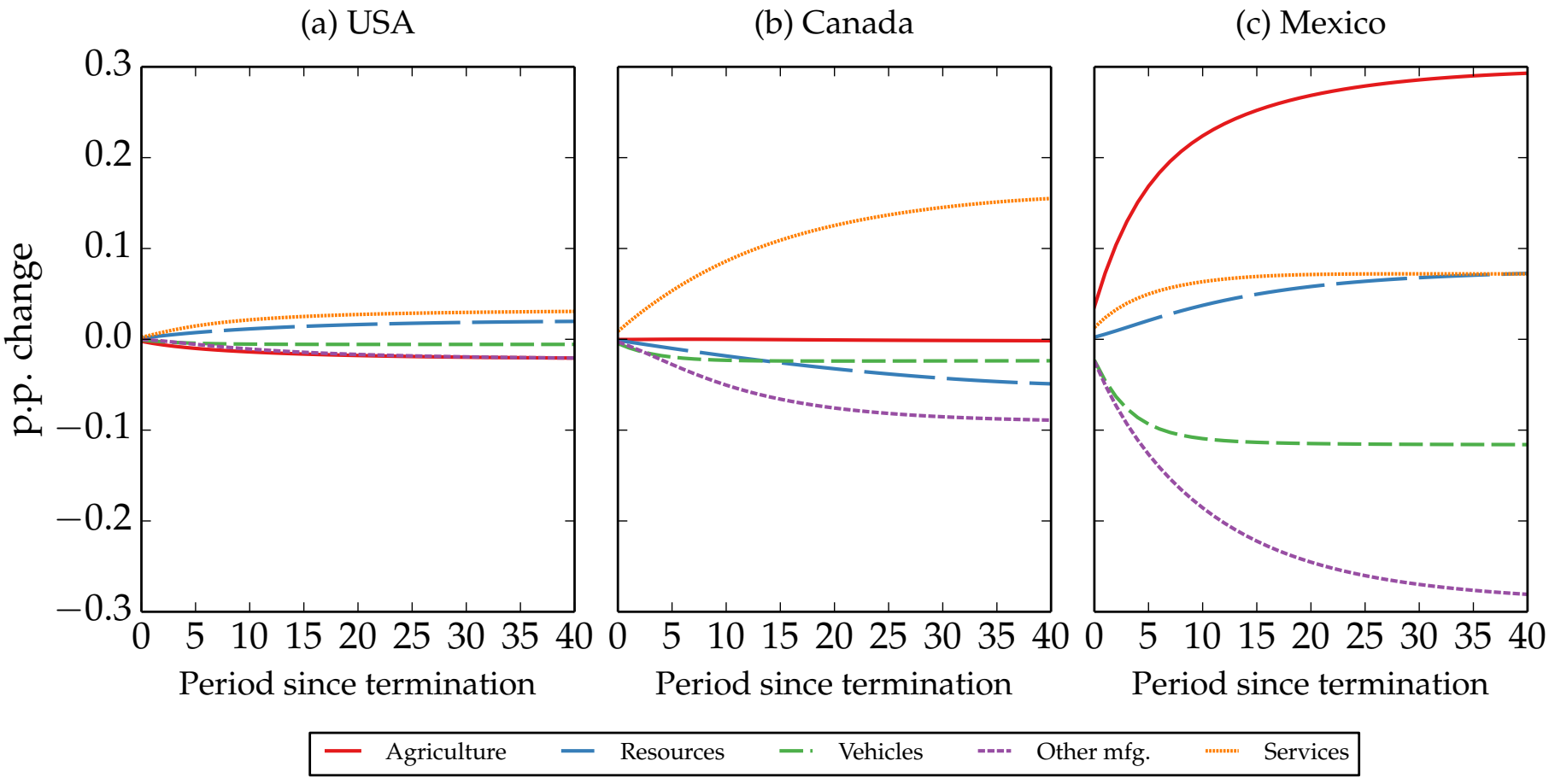


Dynamic results: NAFTA trade

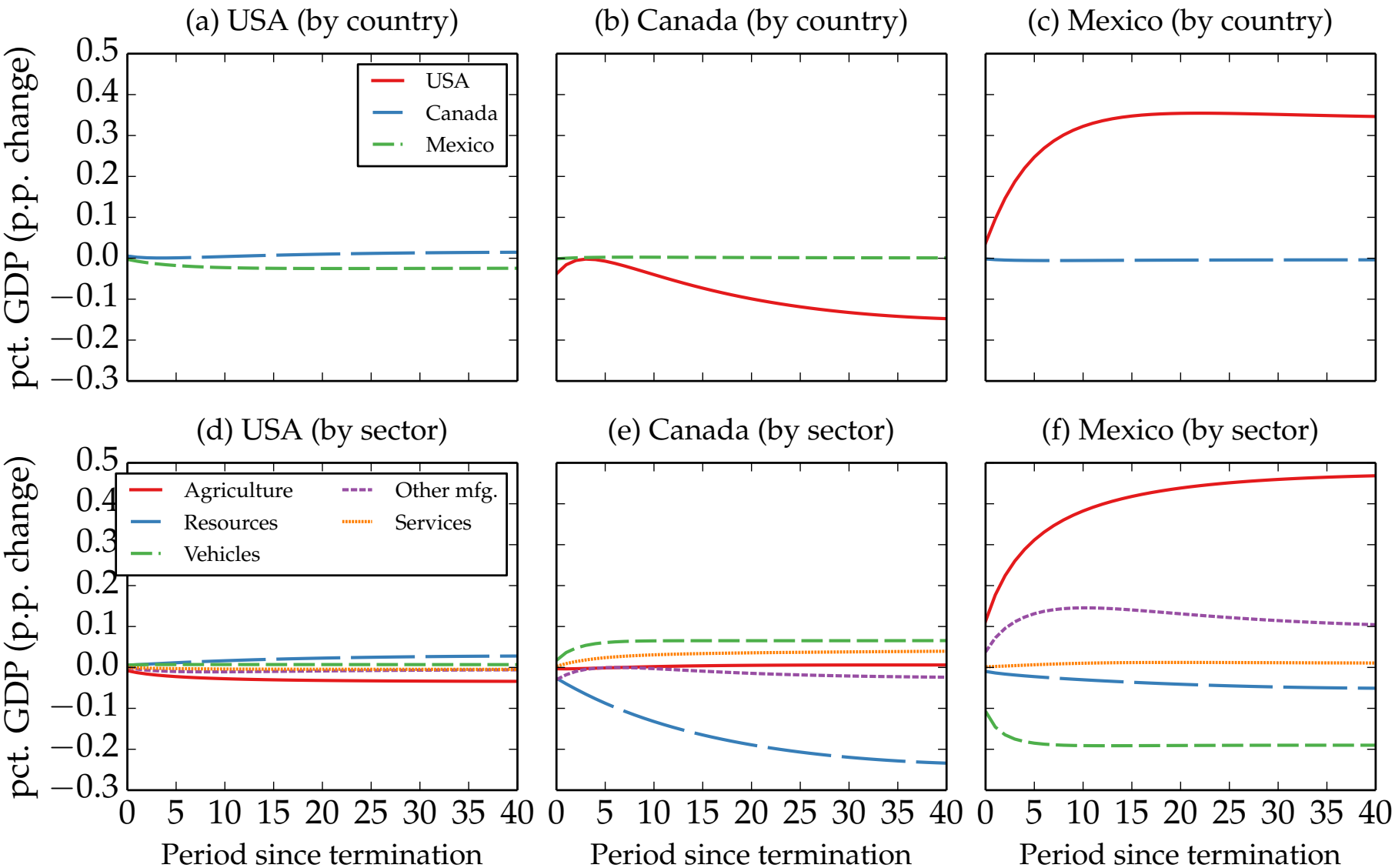




Dynamic results: value added shares (p.p. chg.)



Dynamic results: NAFTA trade balances (p.p. change)



Welfare consequences and sensitivity analyses (pct. chg.)

	Welfare			NAFTA trade		
Model	USA	Canada	Mexico	USA	Canada	Mexico
Baseline	-0.03	-0.07	0.01	-9.35	-7.87	-11.35
Sensitivity analyses						
No import adj. costs	-0.03	-0.07	-0.01	-9.33	-7.85	-11.35
No capital adj. costs	-0.03	-0.07	0.01	-9.35	-7.87	-11.37
No labor adj. costs	-0.03	-0.07	0.01	-9.35	-7.87	-11.36
No intermediate inputs	0.02	0.00	0.02	0.34	0.03	0.65
LTP trade elasticities	-0.03	-0.08	-0.02	-11.77	-9.68	-14.67
Sym. trade elasticities	-0.02	-0.09	-0.22	-9.15	-6.15	-13.46
Iceberg costs	-0.11	-0.54	-0.65	-9.19	-7.74	-11.17
Alternative scenarios						
Higher U.S. tariffs	0.05	-0.23	-0.16	-12.54	-10.80	-14.49
US-Canada FTA	-0.02	-0.01	-0.00	-4.71	-0.29	-11.49
Canada-Mexico FTA	-0.02	-0.07	0.00	-9.38	-7.50	-10.74
Stricter DCR	-0.36	-0.56	-0.64	2.46	2.72	2.03

Consequences for the vehicles sector (pct. chg.)

	Value added			Consumption		
Model	USA	Canada	Mexico	USA	Canada	Mexico
Baseline	-0.43	-1.76	-3.45	-0.57	-1.91	-0.84
Sensitivity analyses						
No import adj. costs	-0.43	-1.75	-3.46	-0.57	-1.91	-0.87
No capital adj. costs	-0.44	-1.76	-3.46	-0.58	-1.91	-0.82
No labor adj. costs	-0.43	-1.76	-3.45	-0.57	-1.91	-0.83
No intermediate inputs	-0.01	0.01	0.02	0.02	-0.02	-0.01
LTP trade elasticities	-0.42	-1.82	-3.62	-0.57	-1.92	-0.88
Sym. trade elasticities	0.16	-5.73	-12.22	-0.49	-1.95	-1.17
Iceberg costs	0.19	-0.32	-0.03	-0.66	-2.40	-1.51
Alternative scenarios						
Higher U.S. tariffs	-0.70	-2.67	-5.78	-1.08	-2.37	-1.14
US-Canada FTA	-0.15	-0.09	-3.46	-0.42	-0.28	-0.84
Canada-Mexico FTA	-0.43	-1.64	-3.26	-0.57	-1.73	-0.79
Stricter DCR	-0.61	-1.00	-0.73	-0.67	-0.79	-1.08