

The Macroeconomic Consequences of Tariffs

Jonathan D. Ostry
International Monetary Fund

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This presentation is based on joint work with Davide Furceri, Swarnali Hannan and Andrew Rose. Views expressed are those of the authors and should not be attributed to the IMF.

Motivation

- **Agreement among economists that international trade should be free...**
 - “Deadweight loss” associated with tariffs
 - Tariffs not optimal solution to market imperfections
- **...and that tariffs should not be used as a macroeconomic policy tool**
 - Tariffs offset by exchange rate
 - Superior alternatives such as monetary and fiscal policy
- **Indeed, protectionism has not been much used in practice as a macroeconomic policy tool...until now...**

Contribution and approach

Contribution

- **Re-examine the macroeconomic consequences of tariffs**
 - Predisposition against protectionism is based on evidence that is either a) theoretical, b) micro, or, c) aggregate but dated

Approach

- **What are the effects of tariffs on key variables of interest: output , productivity, unemployment, inequality, the real exchange rate, and the trade balance?**
 - We examine three distinct features of the actual policy context: tariffs are increasing, in advanced economies, in a period of economic expansion
 - Using Jorda's (2005) LPM, to account for non-linearity without imposing much dynamic restrictions on a large (unbalanced) panel data covering 151 countries from 1963 to 2014
 - We try to be conservative: limit the response to the medium term; cost of tariff as a lower bound of the costs of protectionism; domestic focus; possible second-round effects due to retaliation
 - We complement the analysis with industry-level data to address some inherent limitations of an approach using macro data and to shed some light on the channels through which tariffs affect output and productivity

Key findings

- **Tariff increases lead to:**
 - Economically and statistically significant declines in output and productivity
 - Increases in inequality and unemployment
 - Exchange rate appreciation, and little effect on trade balance
- **The effects of tariffs are larger:**
 - When tariffs go up
 - In advanced economies
 - When carried out in periods of economic expansions

Data

Macroeconomic variables

- Data for annual GDP, labor productivity (defined as the ratio of GDP to employment), the unemployment rate, real effective exchange rates (period average, deflated by CPI) and the trade balance (period average, deflated by GDP) are taken from IMF WEO and World Bank WDI
- Data on the Gini coefficient from the Standardized World Income Inequality Database (SWIID)

Tariff data

- Our tariff series, T , is based on trade tariff rate data at the product level. The main sources are the World Integrated Trade Solution (WITS) and World Development Indicators (WDI); other data sources include: the World Trade Organization (WTO); the General Agreement on Tariffs and Trade (GATT); and the Brussels Customs Union database (BTN)
- We aggregate product-level tariff data by calculating weighted averages, with weights given by the import share of each product, measured as fractions of value

Methodology

$$(1) \quad Y_{i,t+k} - Y_{i,t-1} = \alpha_i + \gamma_t + \beta \Delta T_{i,t} + vX_{i,t} + \varepsilon_{i,t}$$

- $Y_{i,t+k}$ is the outcome variable of interest (log of output, productivity, unemployment rate, Gini coefficient, log real exchange rate, or trade balance/GDP) for country i at time $t+k$,
- $\{\alpha_i\}$ are country fixed effects to control for unobserved cross-country heterogeneity,
- $\{\gamma_t\}$ are time fixed effects to control for global shocks,
- $\Delta T_{i,t}$ is the change in the tariff rate,
- v is a vector of nuisance coefficients,
- $X_{i,t}$ is a vector of control variables, including two lags of each of: a) changes in the dependent variable, b) the tariff, c) log output, d) the log of real exchange rates and d) the trade balance in percent of GDP, and
- ε is an unexplained (hopefully well-behaved) residual

Equation (1) estimated at the annual frequency for an unbalanced sample of 151 countries from 1963 to 2014. Confidence bands based on DK standard errors.

Industry-level analysis

$$(1') \quad Y_{j,i,t+k} - Y_{j,i,t-1} = \alpha_{ij} + \gamma_{it} + \rho_{jt} + \beta^I \Delta T_{j,i,t}^I + \beta^O \Delta T_{j,i,t}^O + \nu X_{j,i,t} + \varepsilon_{j,i,t}$$

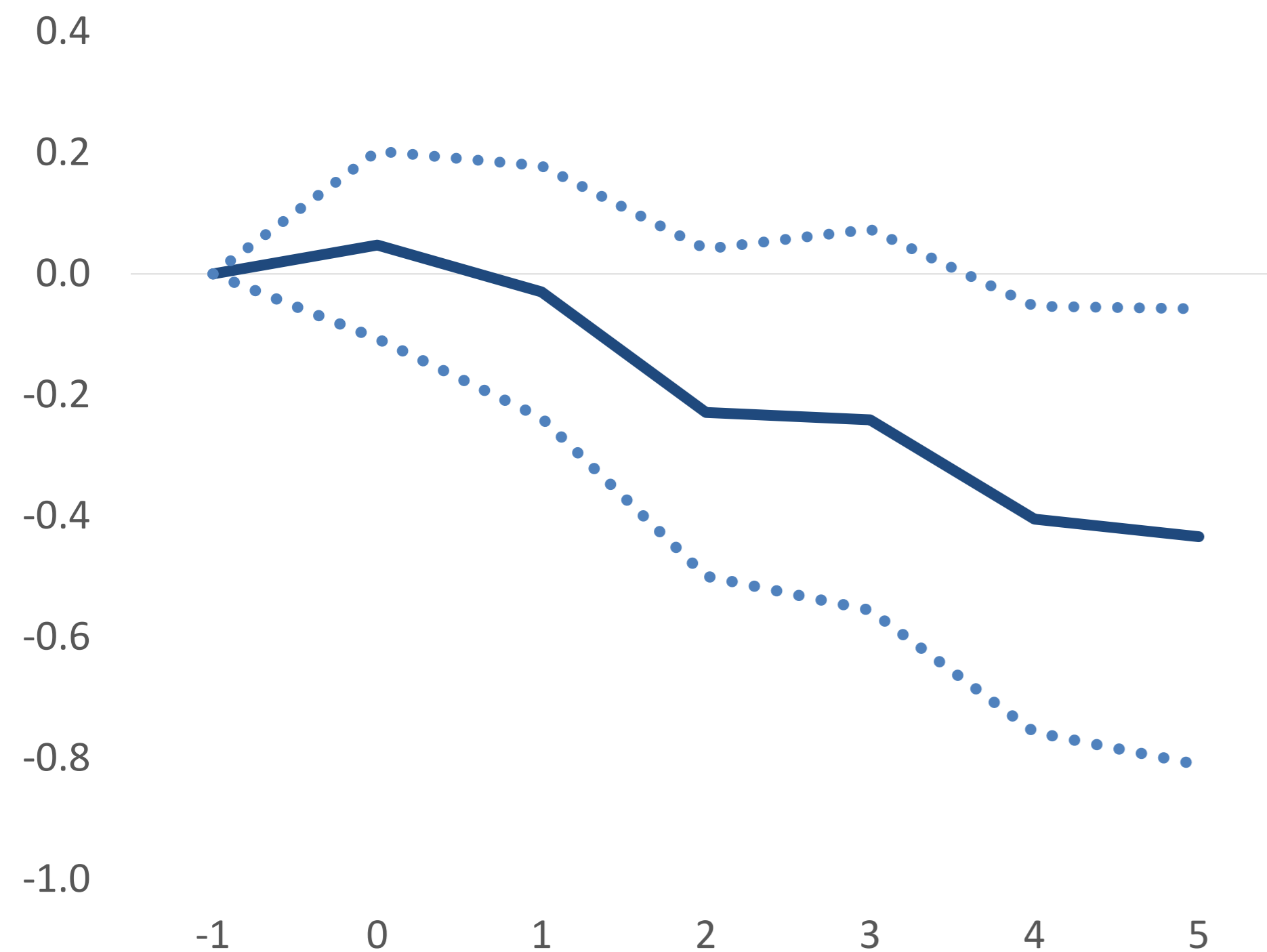
- $T_{j,i,t}^O$ is output tariff in each sector j , that is, the 2-digit level corresponding tariff rate.
- $T_{j,i,t}^I$ is input tariffs, computed as weighted average of output tariffs in all sectors, with weights reflecting the share of imported inputs from each of these sectors used in the production of sector j 's total input

Equation (1') is estimated at the annual frequency for an unbalanced panel with 16 sectors for 39 countries over the period 1991-2014. Confidence bands based on DK standard errors.

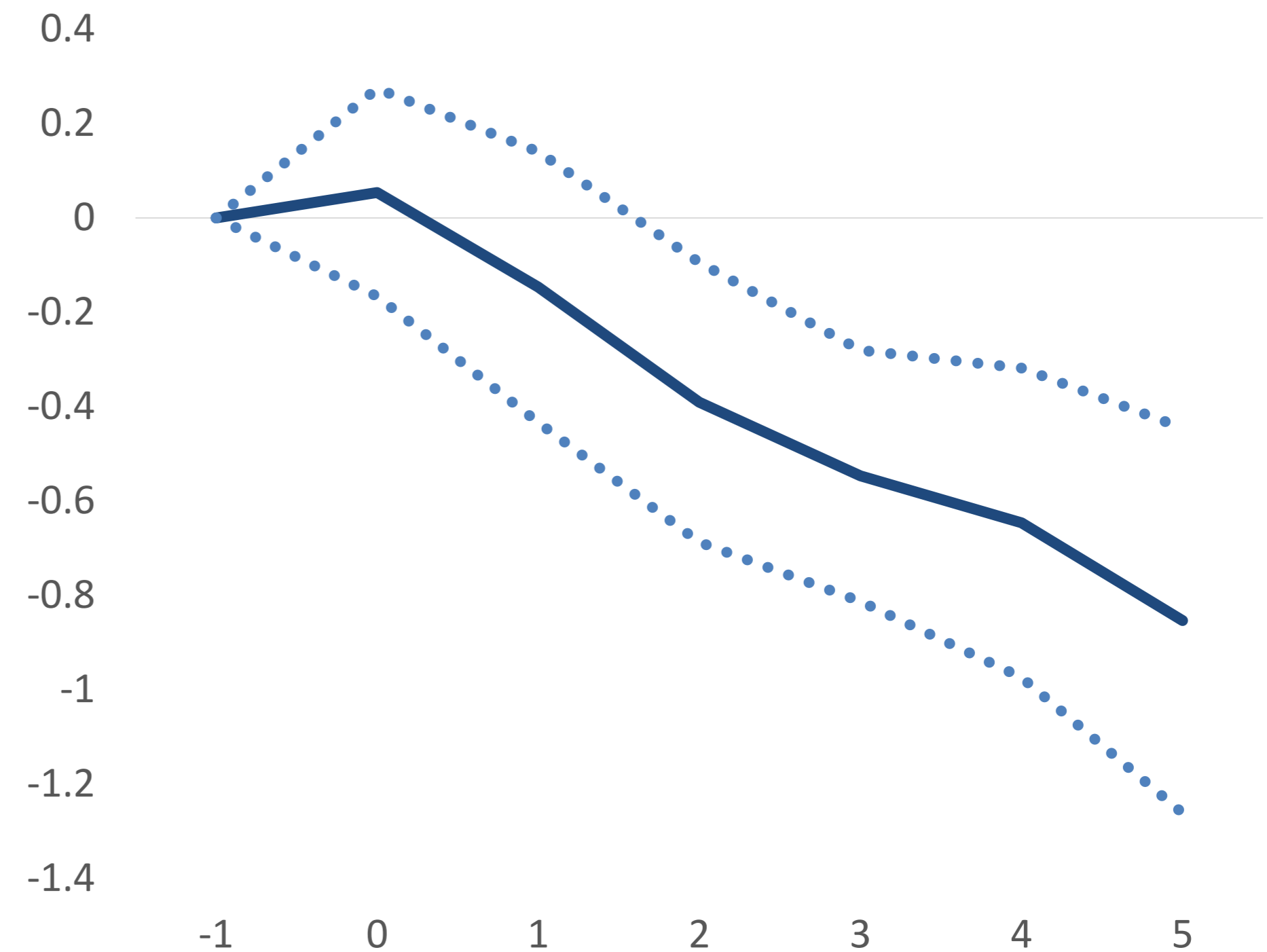
The effect on aggregate value added of a tariff increase in sector j can be expressed (in the absence of output spillovers across sectors) as the sum of the effect of the tariff increase on the value added of sector j (output tariff effect) and its effect on the value added of all remaining sectors (effect through the input channel)

Tariff increases lead to declines in output and productivity

Output (%)



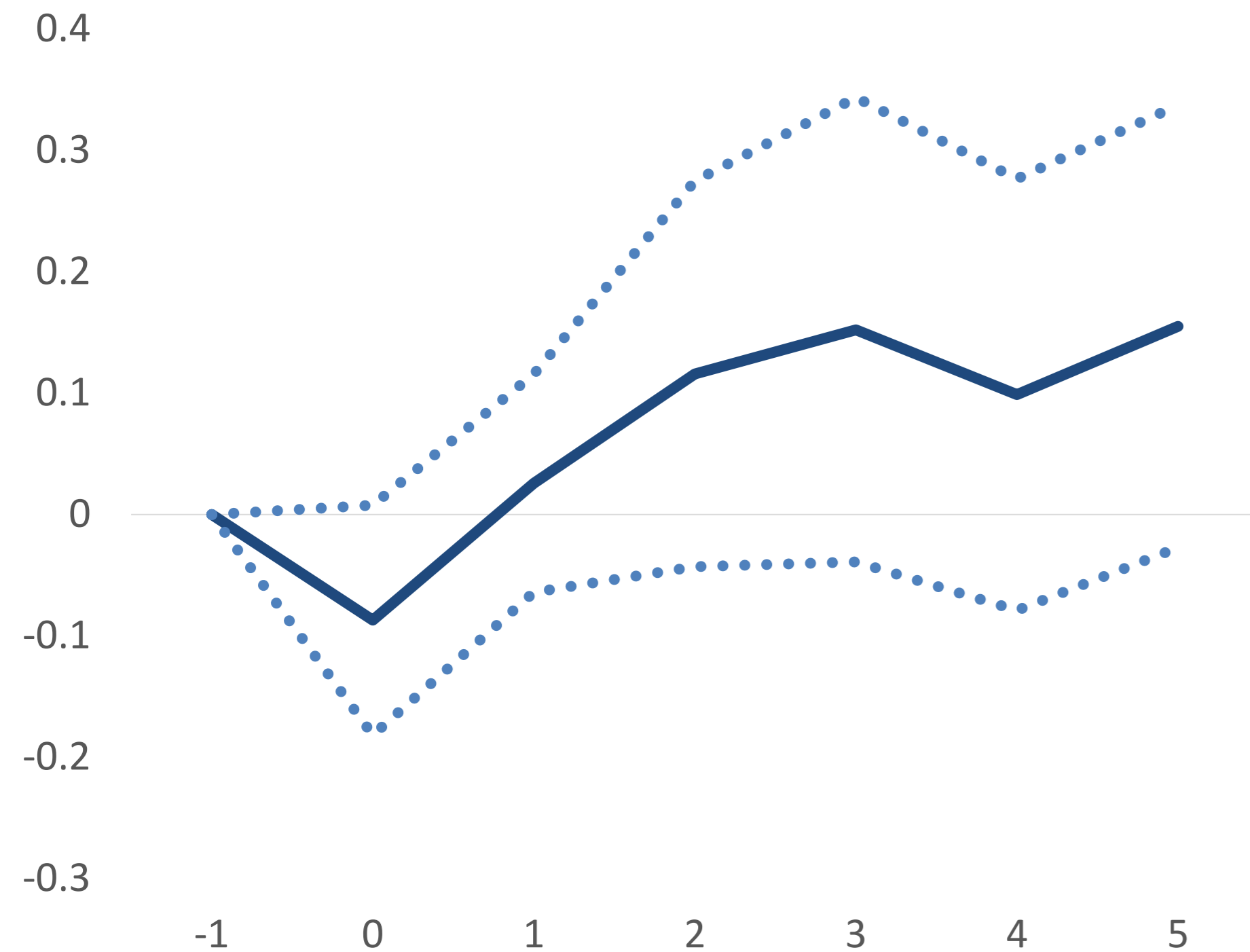
Productivity (%)



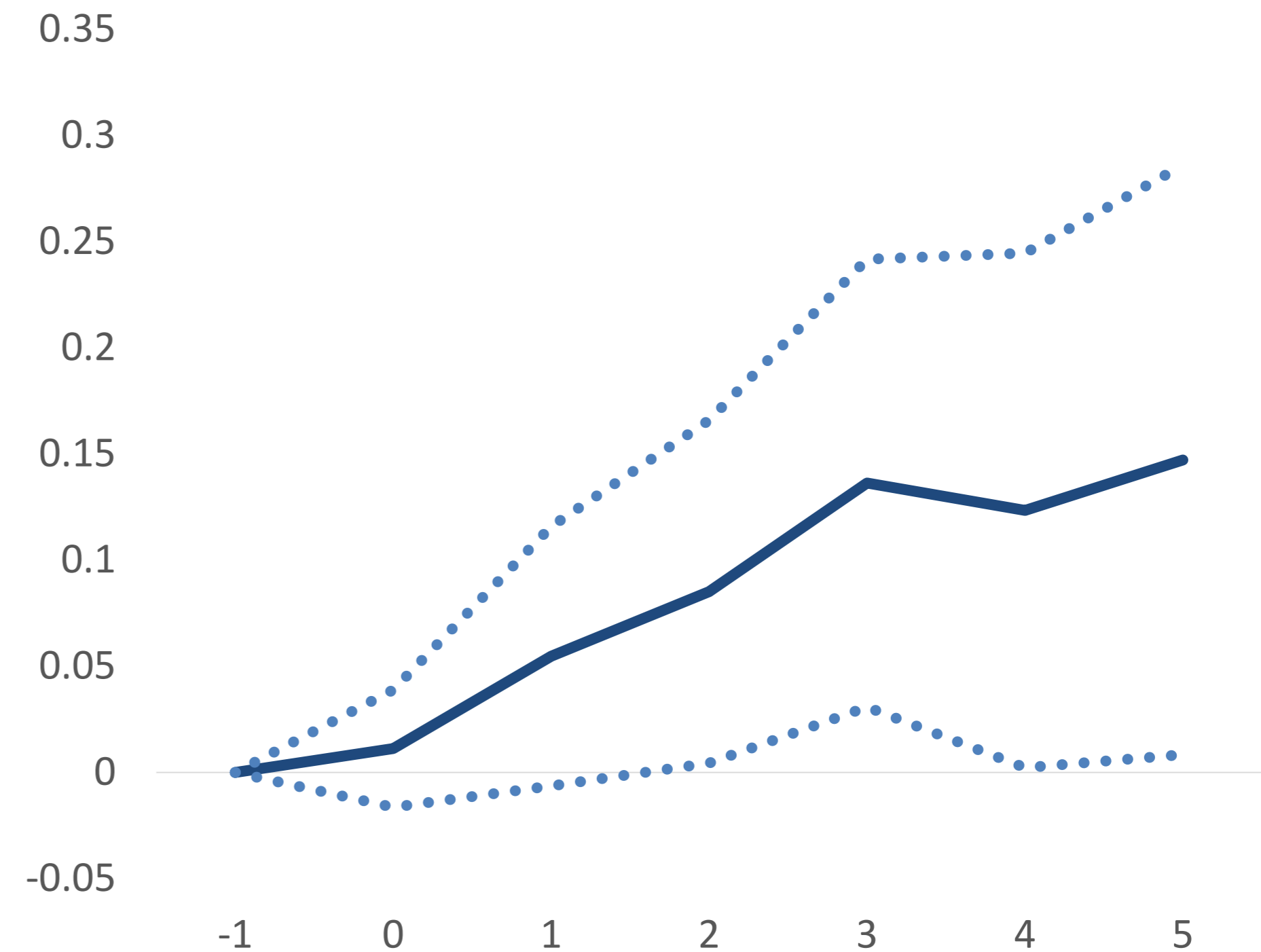
Note: The solid lines indicate the response of output (productivity) to one-standard deviation (about 3.6 percentage points) increase in the tariff rate; dotted lines correspond to 90 percent confidence bands. The x-axis denotes time. t=0 is the year of the tariff change. Estimates based on equation (1).

And increases in unemployment and inequality

Unemployment (ppt)



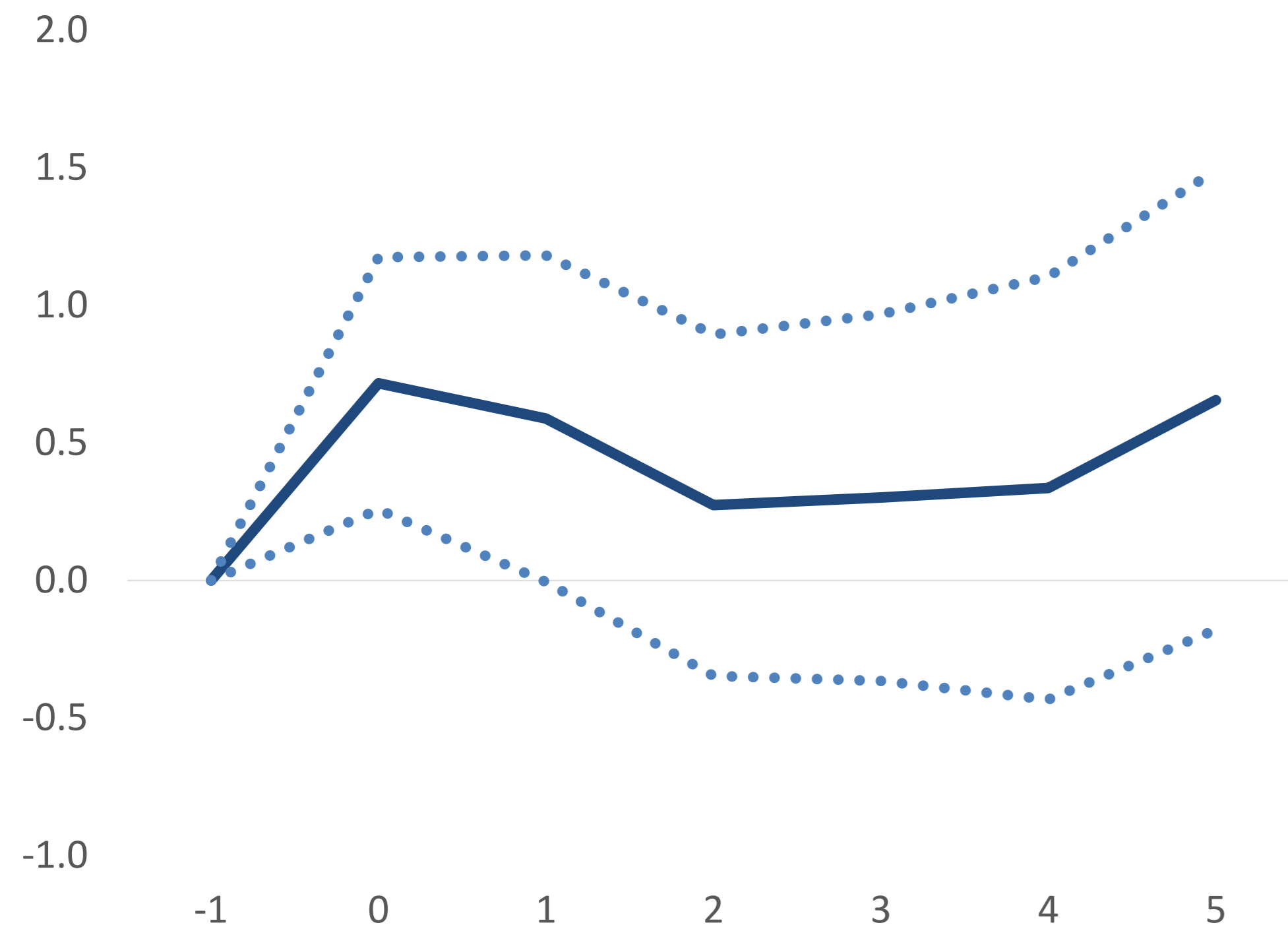
Inequality (ppt)



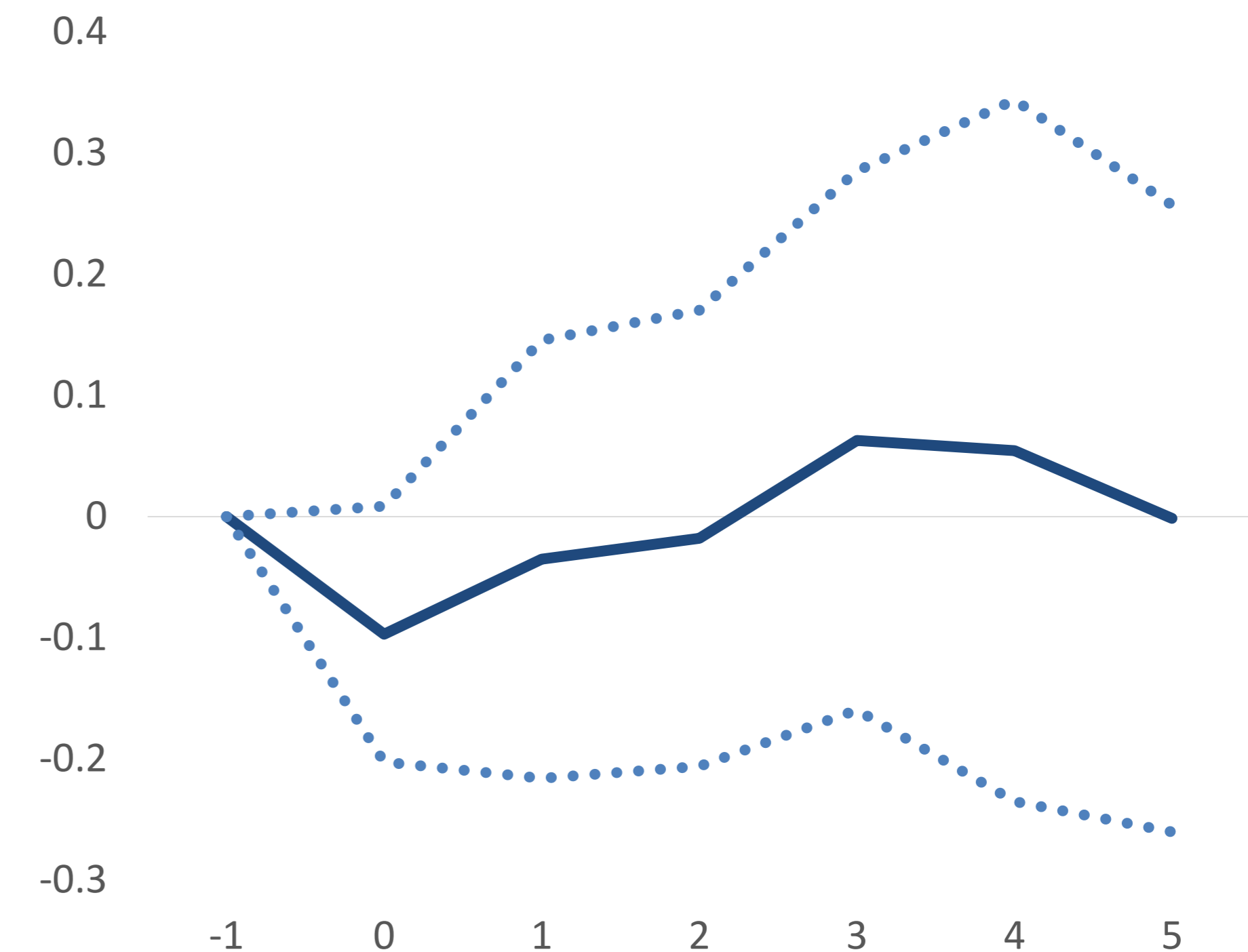
Note: The solid lines indicate the response of unemployment (inequality) to one-standard deviation (about 3.6 percentage points) increase in the tariff rate; dotted lines correspond to 90 percent confidence bands. The x-axis denotes time. t=0 is the year of the tariff change. Estimates based on equation (1).

RER appreciates leading to not much effect on trade balance

RER (%)



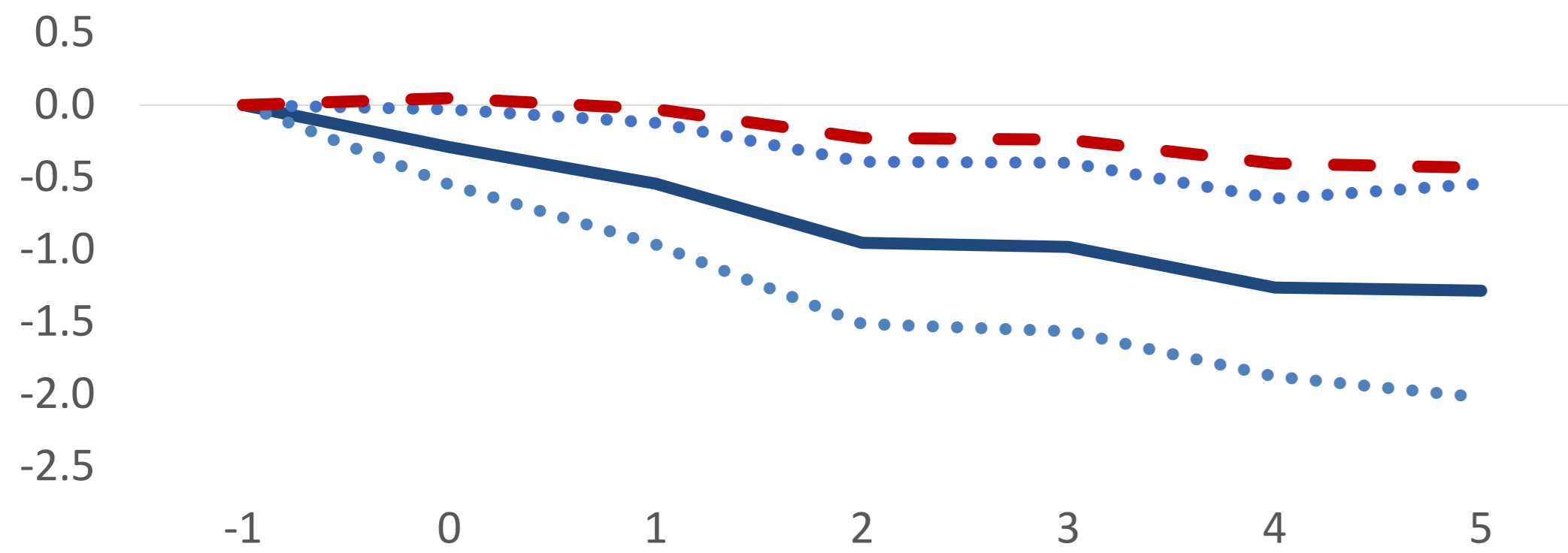
Trade balance (ppt of GDP)



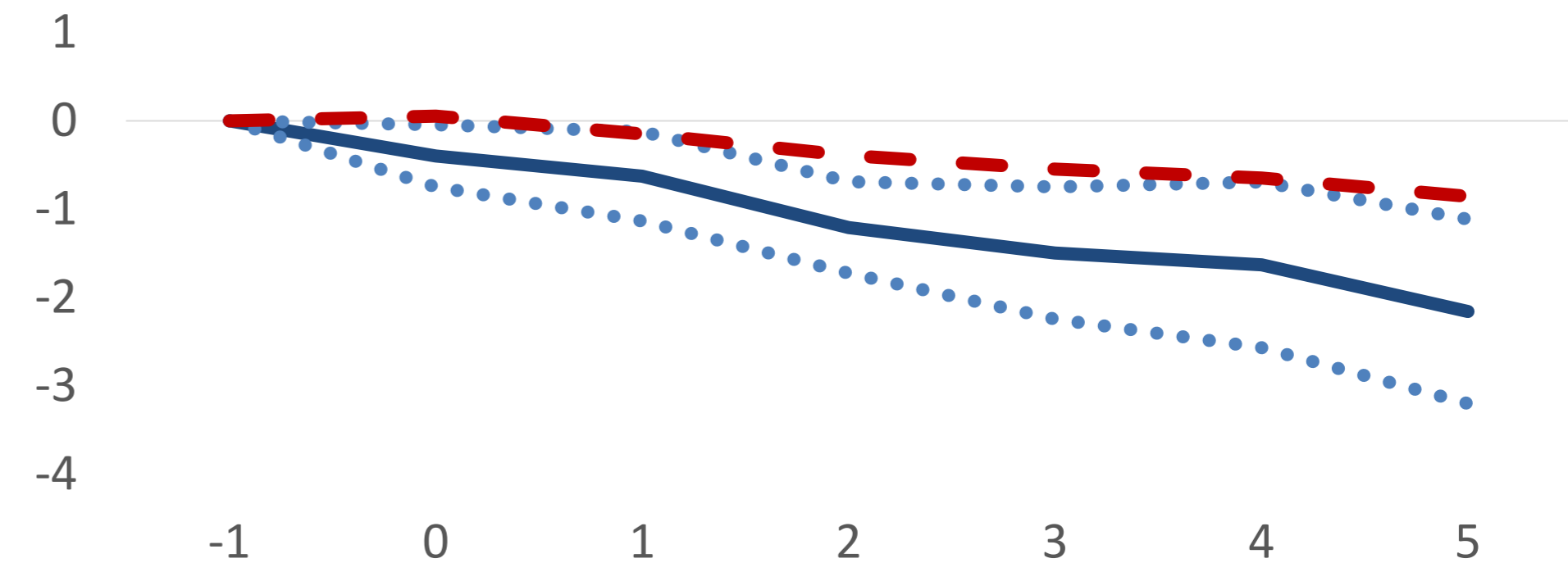
Note: The solid lines indicate the response of RER (trade balance) to one-standard deviation (about 3.6 percentage points) increase in the tariff rate; dotted lines correspond to 90 percent confidence bands. The x-axis denotes time. t=0 is the year of the tariff change. Estimates based on equation (1).

Larger effects for tariff increases...

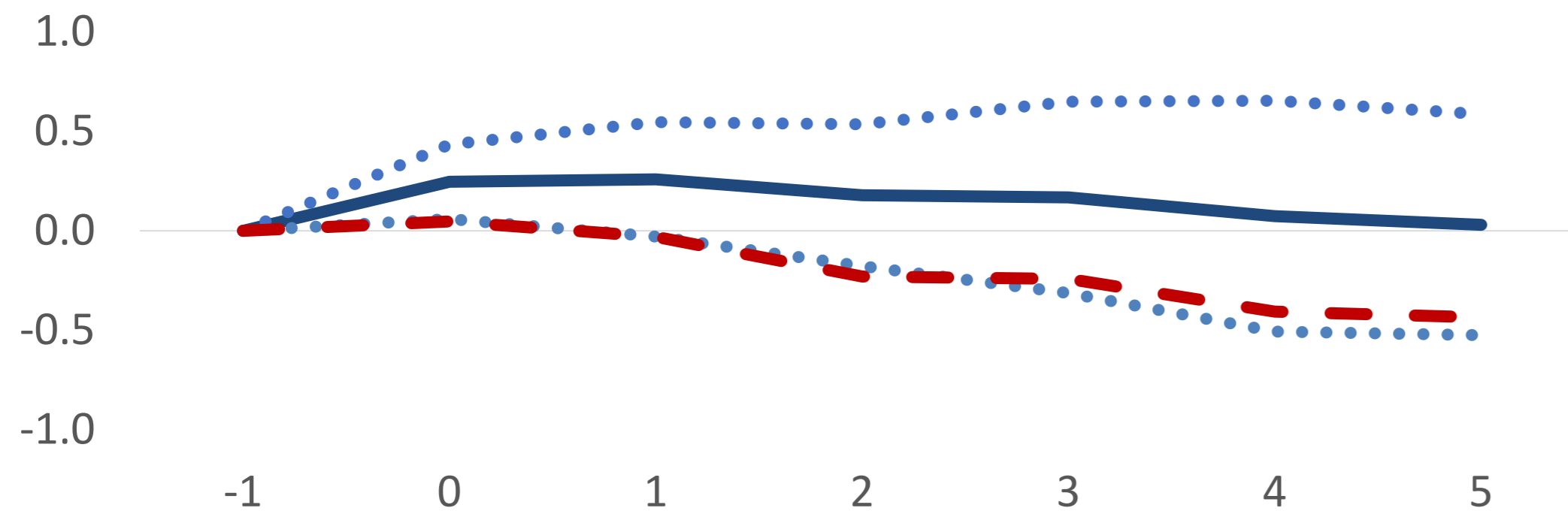
Output (%)—tariff increases



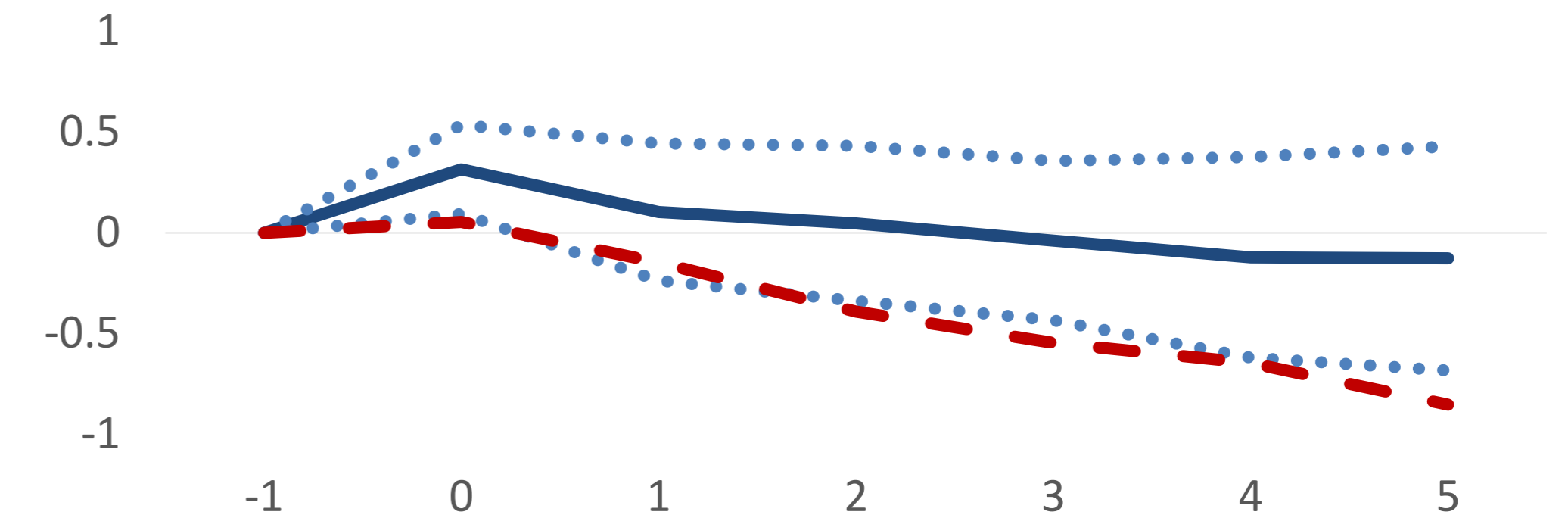
Productivity (%)—tariff increases



Output (%)—tariff decreases



Productivity (%)—tariff decreases

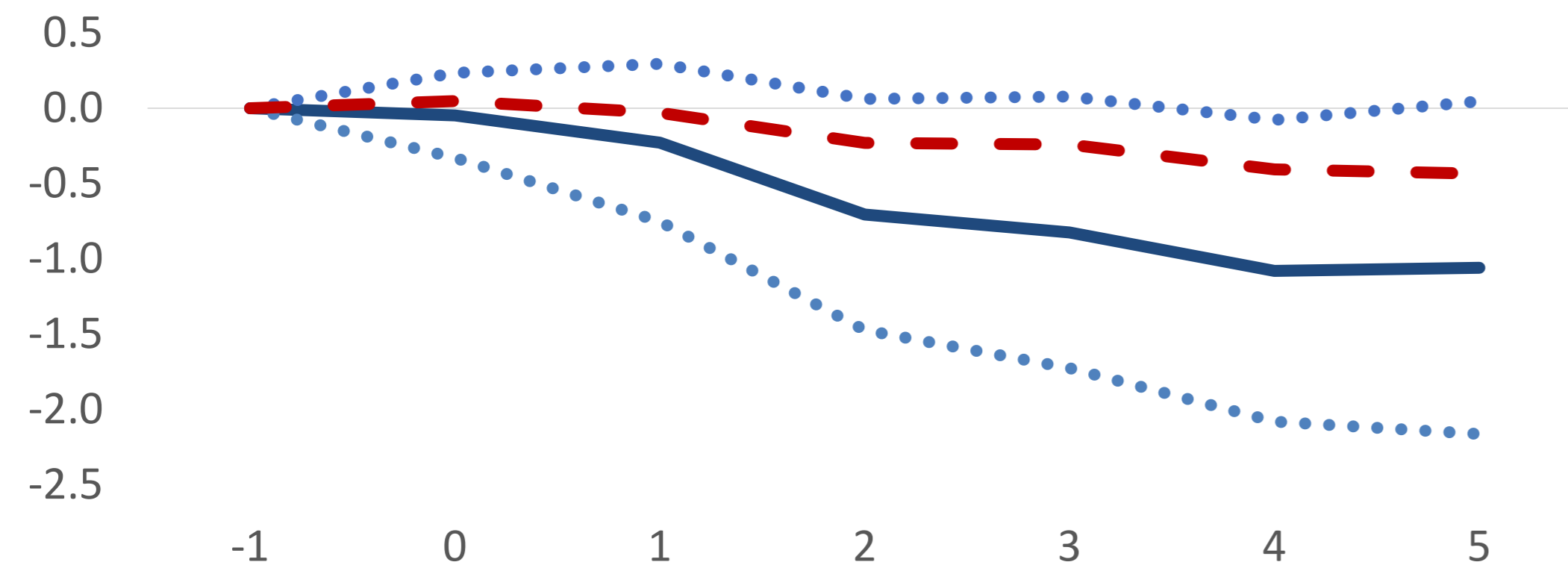


Note: The solid lines indicate the response of output (productivity) to one-standard deviation (about 3.6 percentage points) change in the tariff rate; dotted lines correspond to 90 percent confidence bands. The dashed red lines denote the baseline effect. Estimates based on:

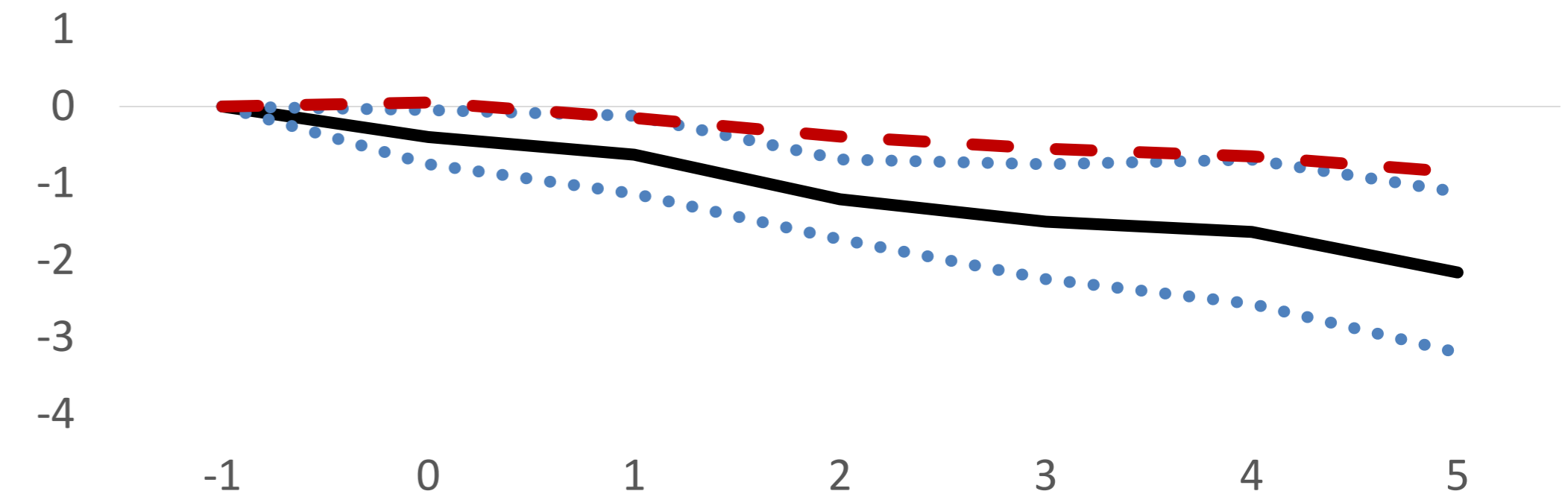
$$Y_{i,t+k} - Y_{i,t-1} = \alpha_i + \gamma_t + \beta^P DP_{i,t} \Delta T_{i,t} + \beta^N (1-DP_{i,t}) \Delta T_{i,t} + vX_{i,t} + \varepsilon_{i,t};$$
 where $DP_{i,t}$ is a binary variable which is equal to unity when the change in tariff is positive, zero otherwise.

...in advanced economies...

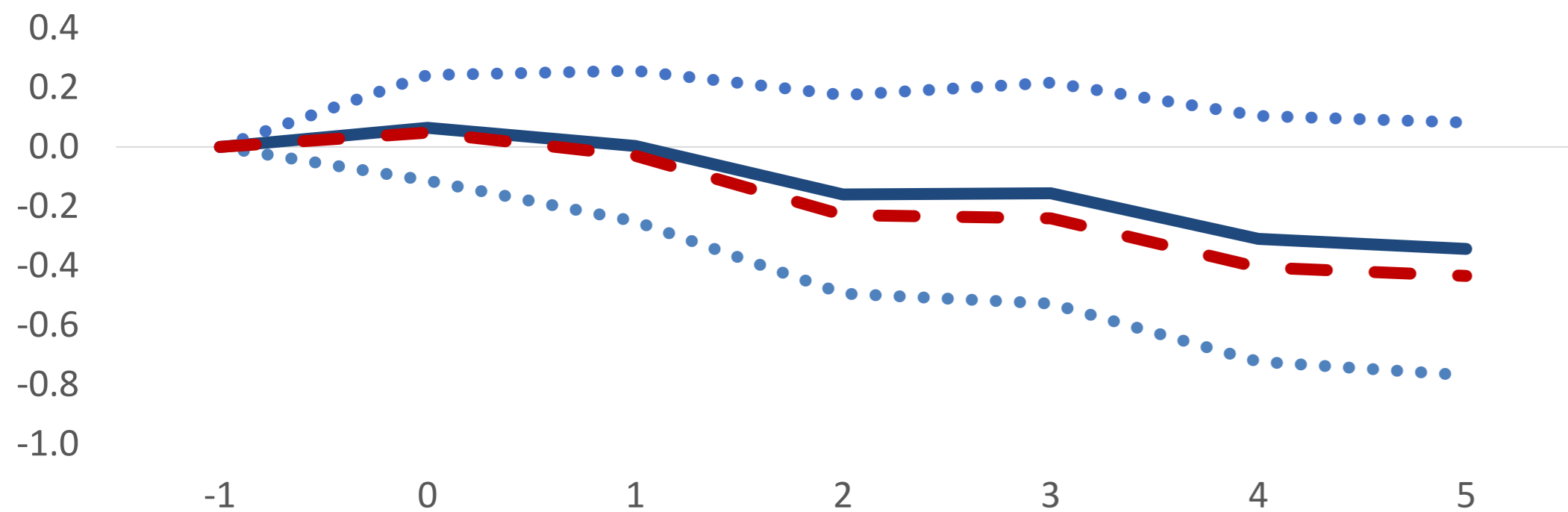
Output (%)—AEs



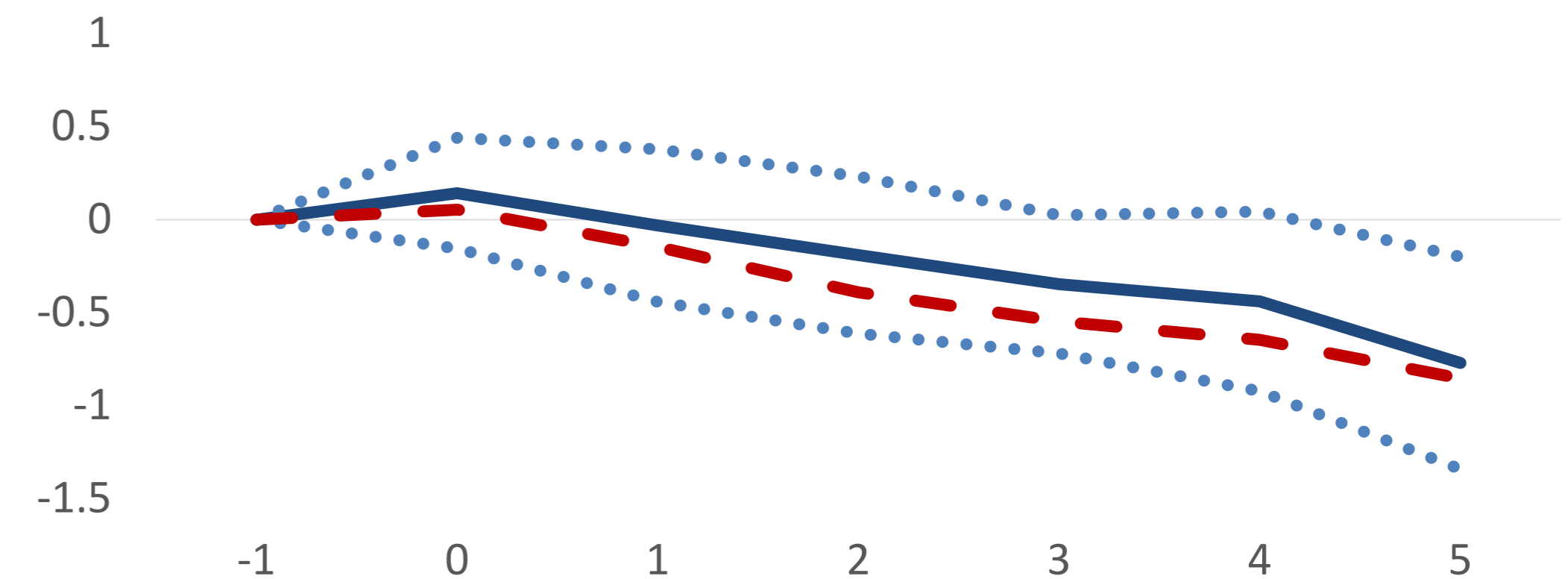
Productivity (%)—AEs



Output (%)—EMDEs



Productivity (%)—EMDEs



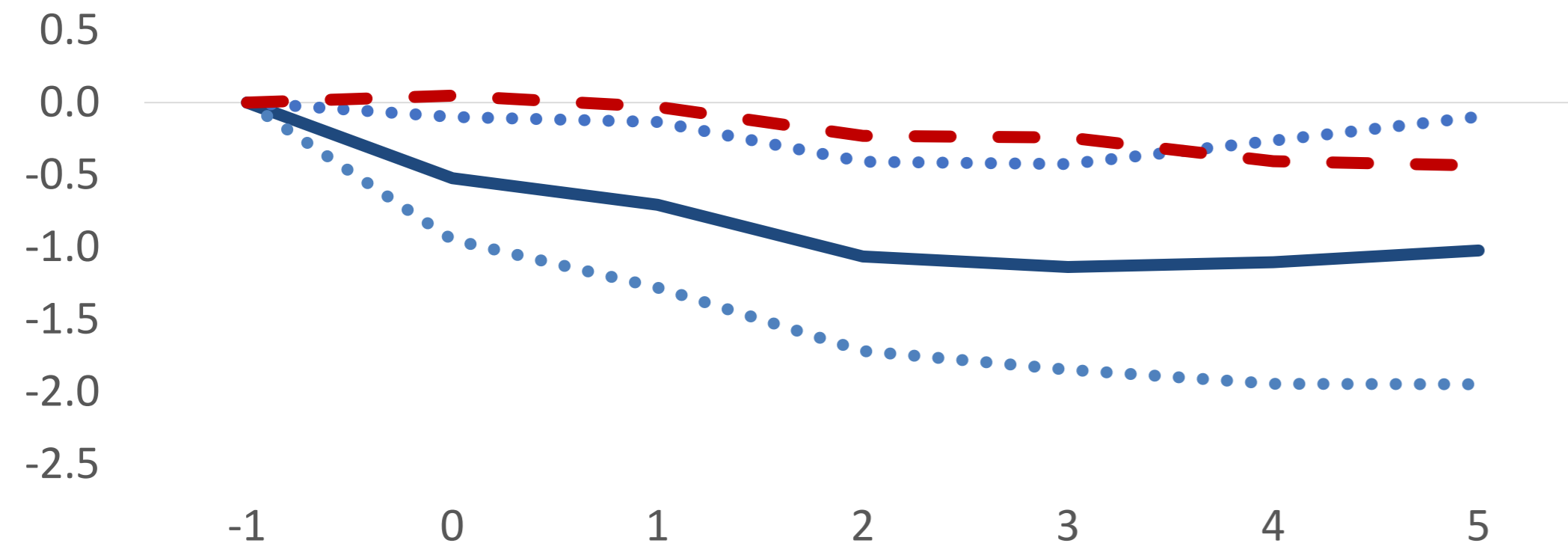
Note: The solid lines indicate the response of output (productivity) to one-standard deviation (about 3.6 percentage points) change in the tariff rate; dotted lines correspond to 90 percent confidence bands. The dashed red lines denote the baseline effect. Estimates based on:

$$Y_{i,t+k} - Y_{i,t-1} = \alpha_i + \gamma_t + \beta^P DA_{i,t} \Delta T_{i,t} + \beta^N (1-DA_{i,t}) \Delta T_{i,t} + vX_{i,t} + \varepsilon_{i,t};$$

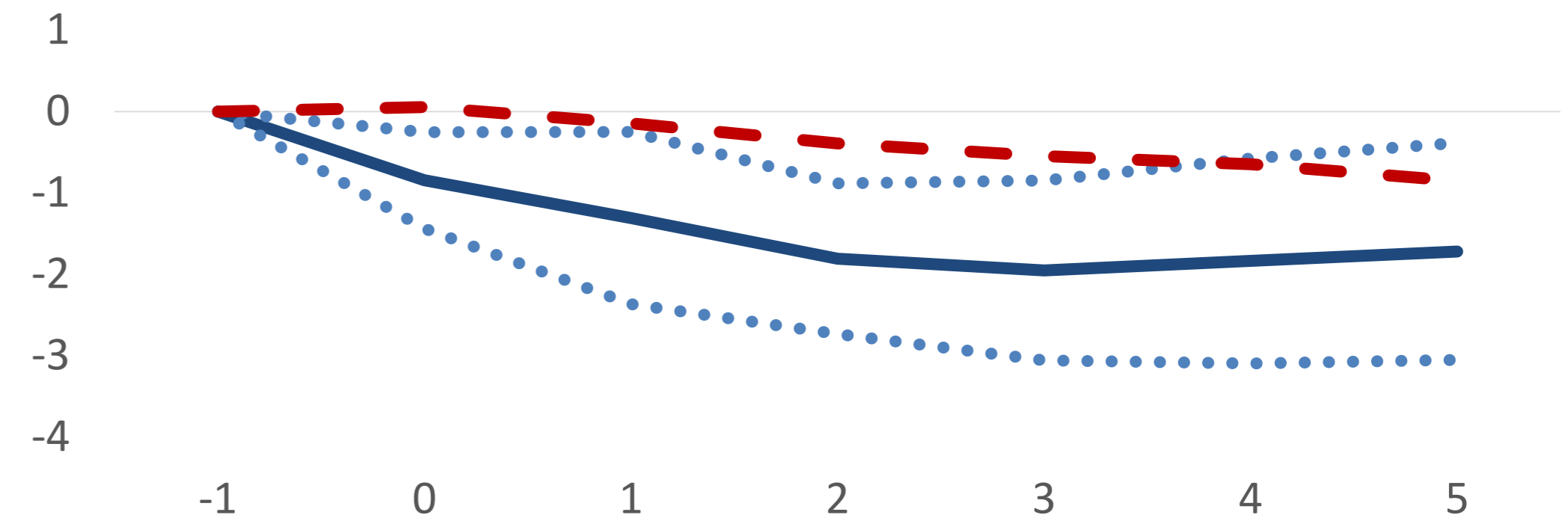
where $DA_{i,t}$ is a binary variable which is equal to unity for advanced economies, zero otherwise.

...and in expansions

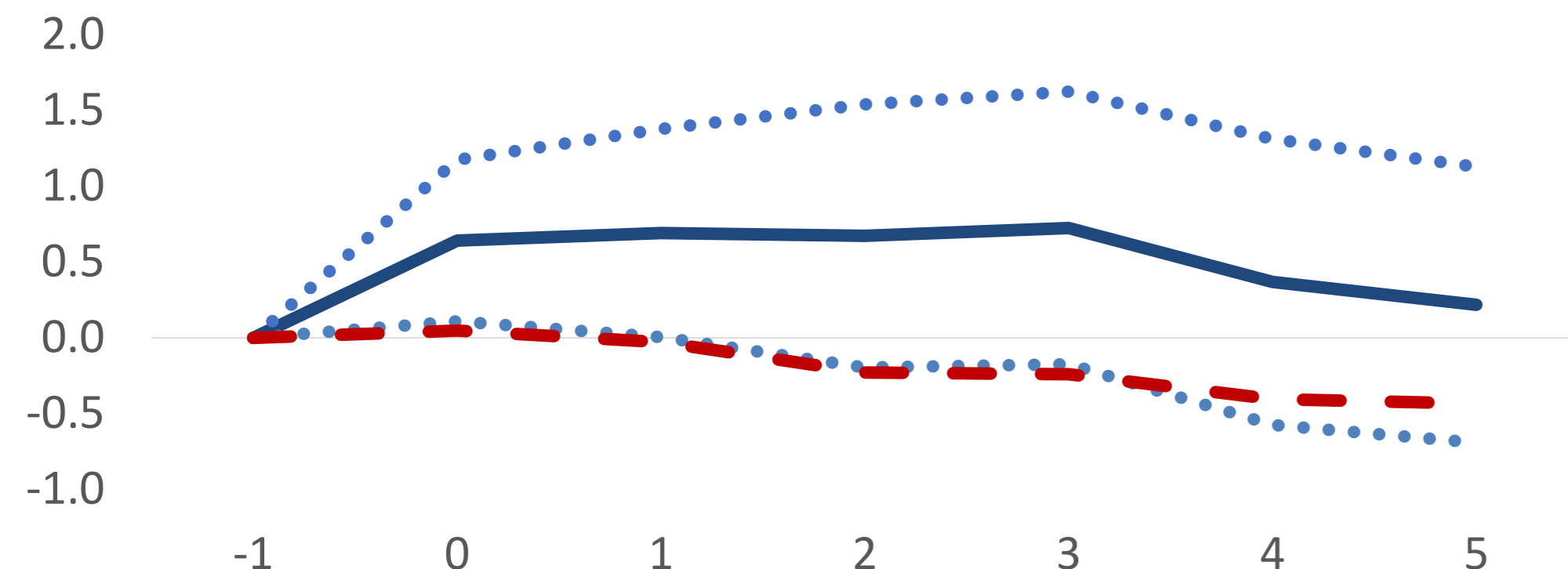
Output (%)—Expansions



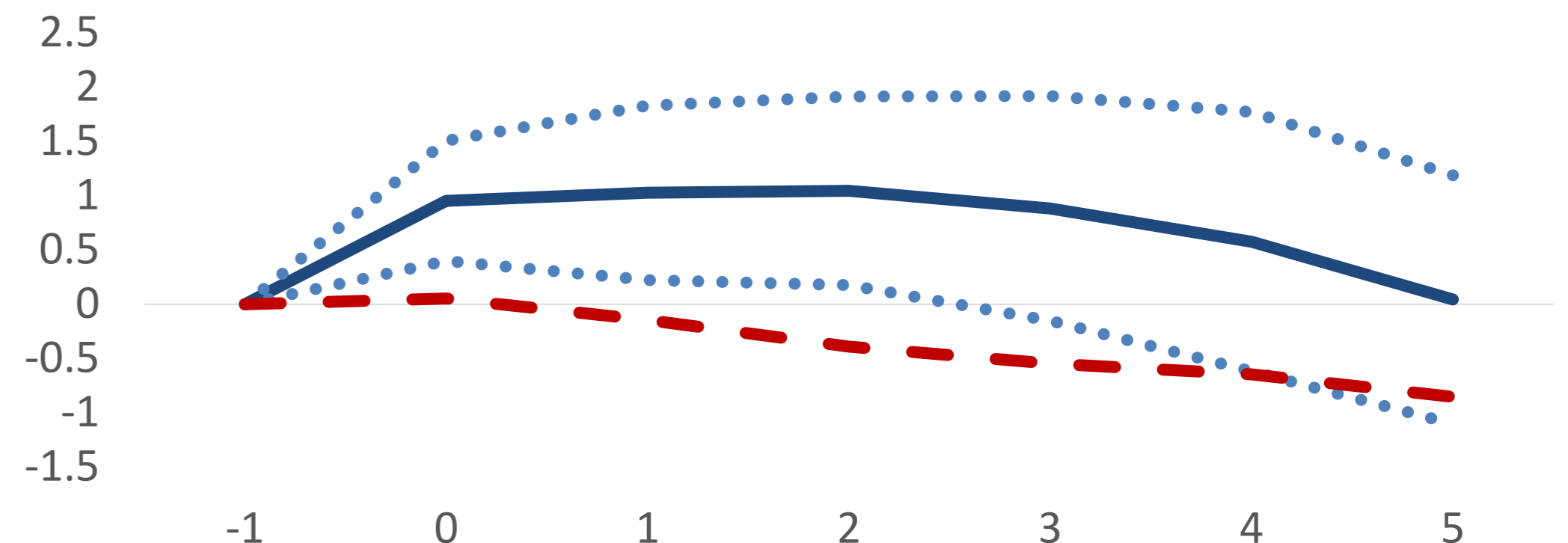
Productivity (%)—Expansions



Output (%)—Recessions



Productivity (%)—Recessions



Note: The solid lines indicate the response of output (productivity) to one-standard deviation (about 3.6 percentage points) change in the tariff rate; dotted lines correspond to 90 percent confidence bands. The dashed red lines denote the baseline effect. Estimates based on:

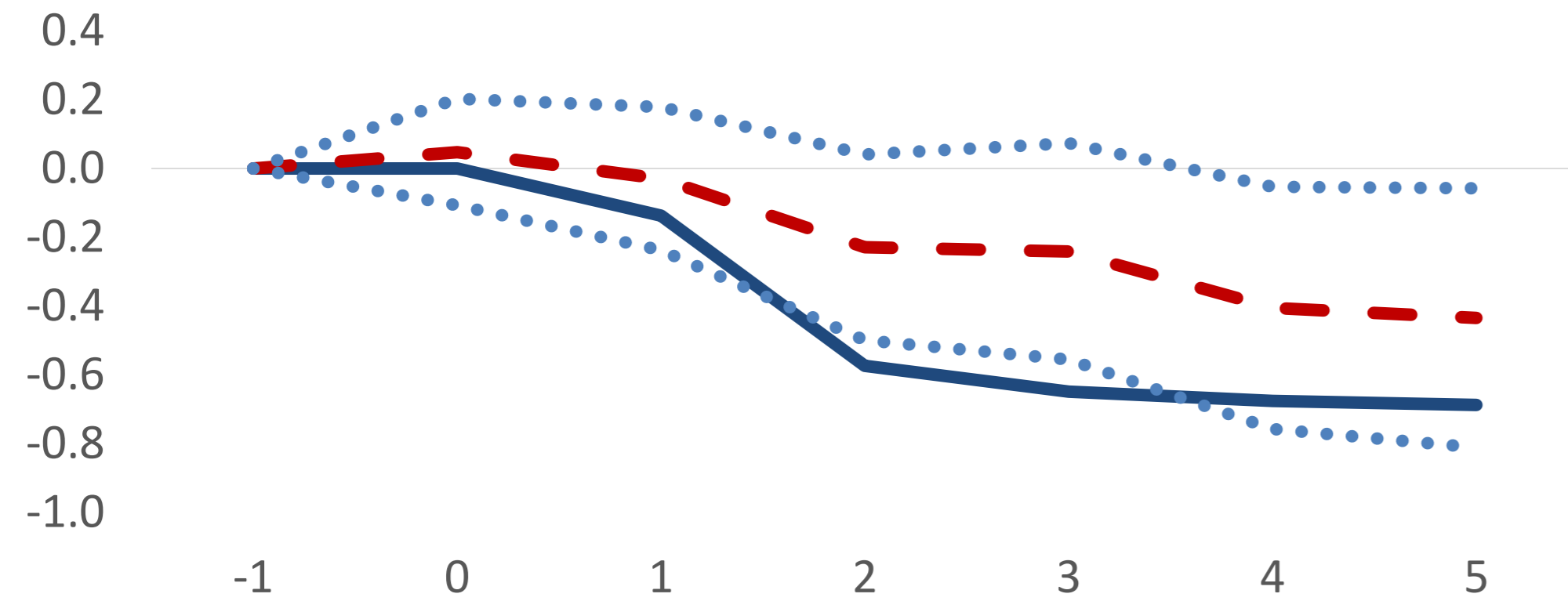
$$Y_{i,t+k} - Y_{i,t-1} = \alpha_i + \gamma t + \beta^L F(z_{i,t}) \Delta T_{i,t} + \beta^H (1 - F(z_{i,t})) \Delta T_{i,t} + \phi Z_{i,t} + \varepsilon_{i,t}; \text{ where } F(\cdot) \text{ is a smooth transition function of economic conditions.}$$

Robustness checks

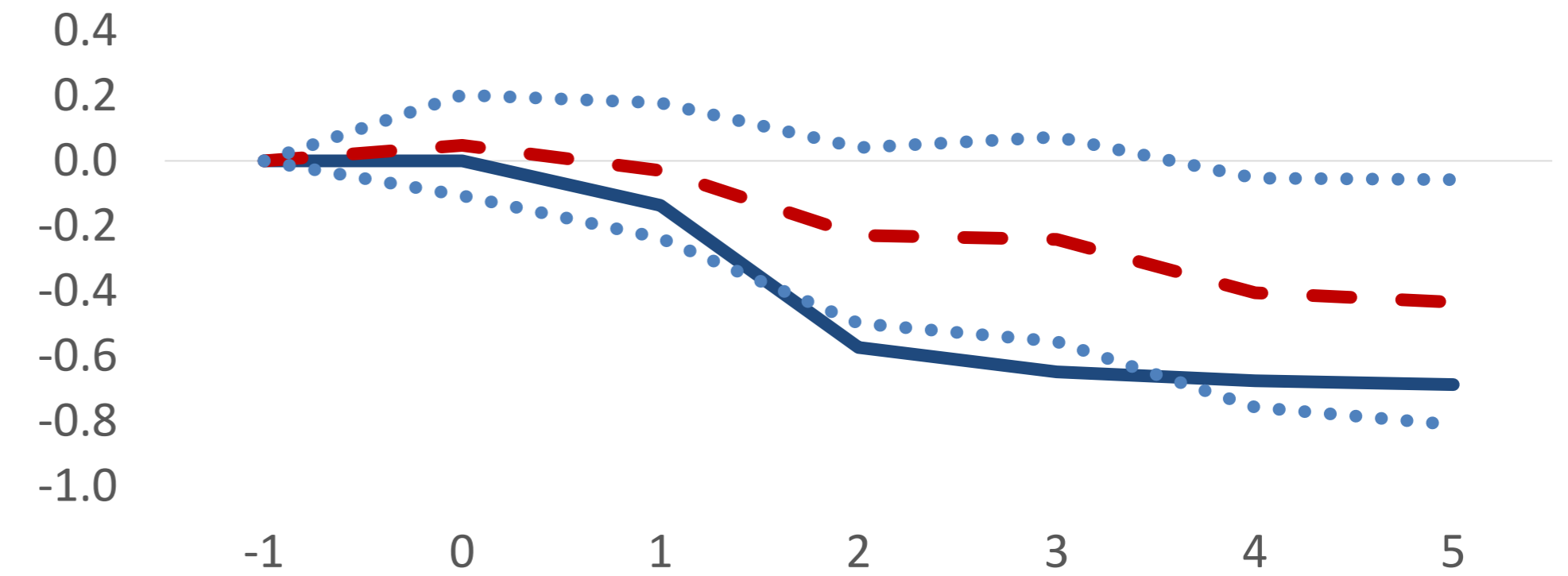
- **Changing our key regressor** (percent changes instead of absolute changes)
- **Concerns about endogeneity**
 - *VAR analysis (tariff ordered last)*
 - Controlling for contemporaneous effect of RER and trade balance
 - Controlling for future economic growth (that is, growth forecast)
 - *IV: weighted average of changes in tariff in major (top 5) trading partners*
- **Concerns about sample**
 - Drop series with gaps and less than 20 consecutive years
 - Drop high inflation episodes, small countries, outliers, high tariff episodes
 - Sample after 1979, excluding Americas, Asia and SSA

Robustness checks—endogeneity

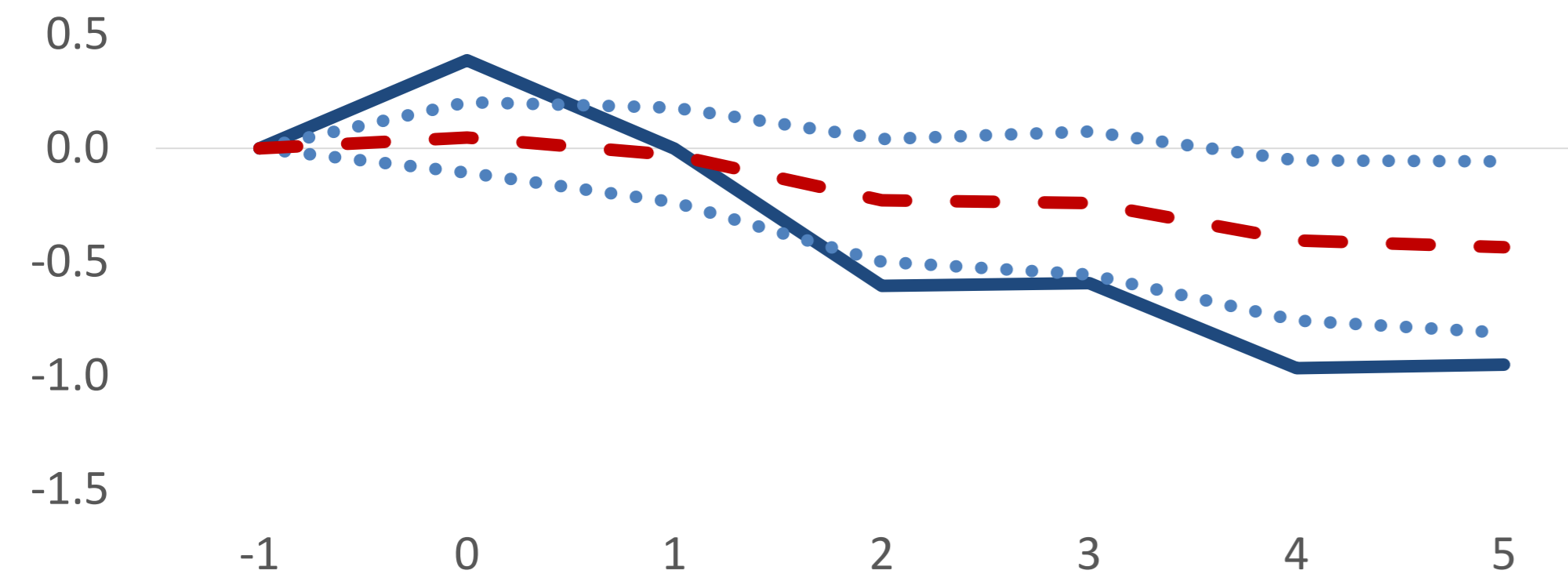
Output (%)—VAR



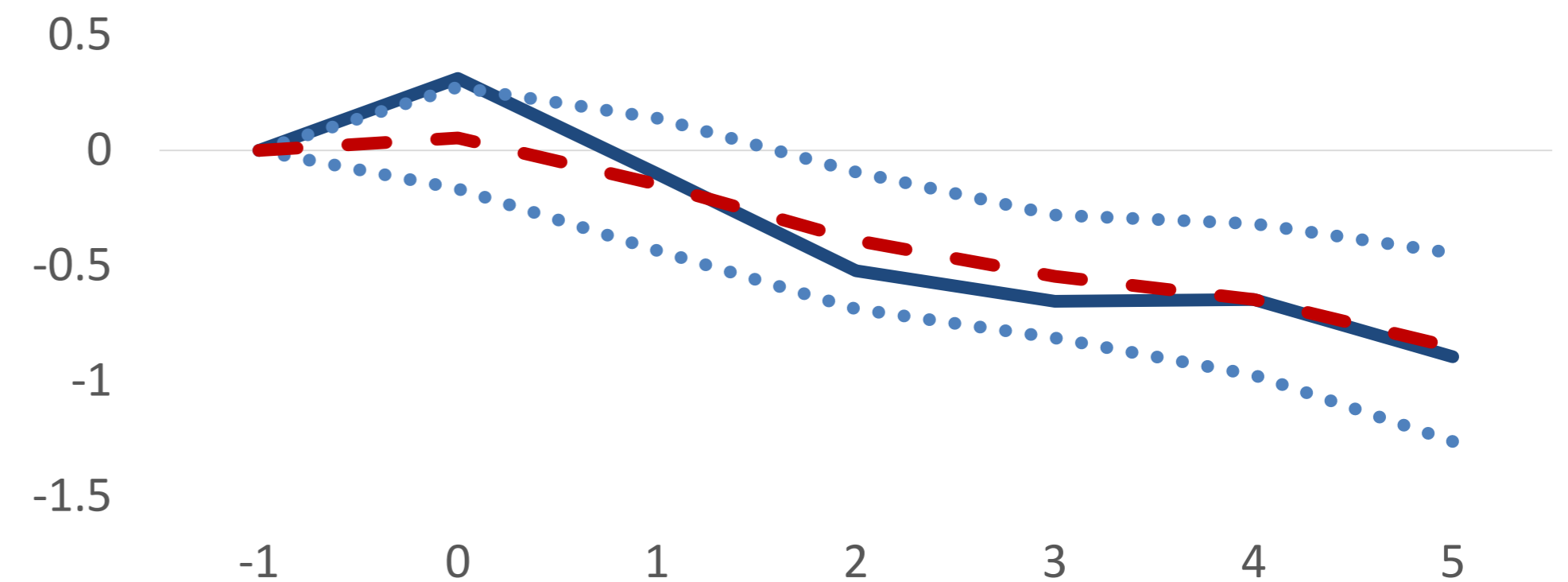
Productivity (%)—VAR



Output (%)—IV



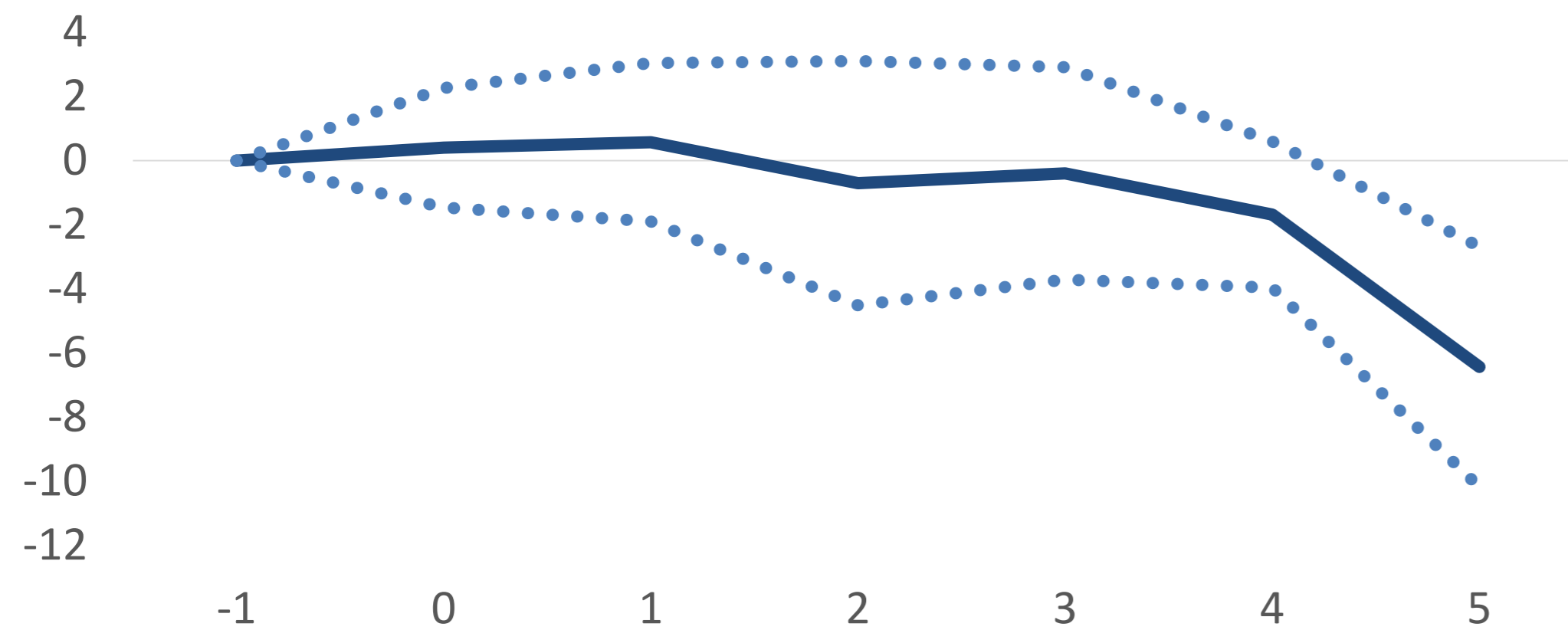
Productivity (%)—IV



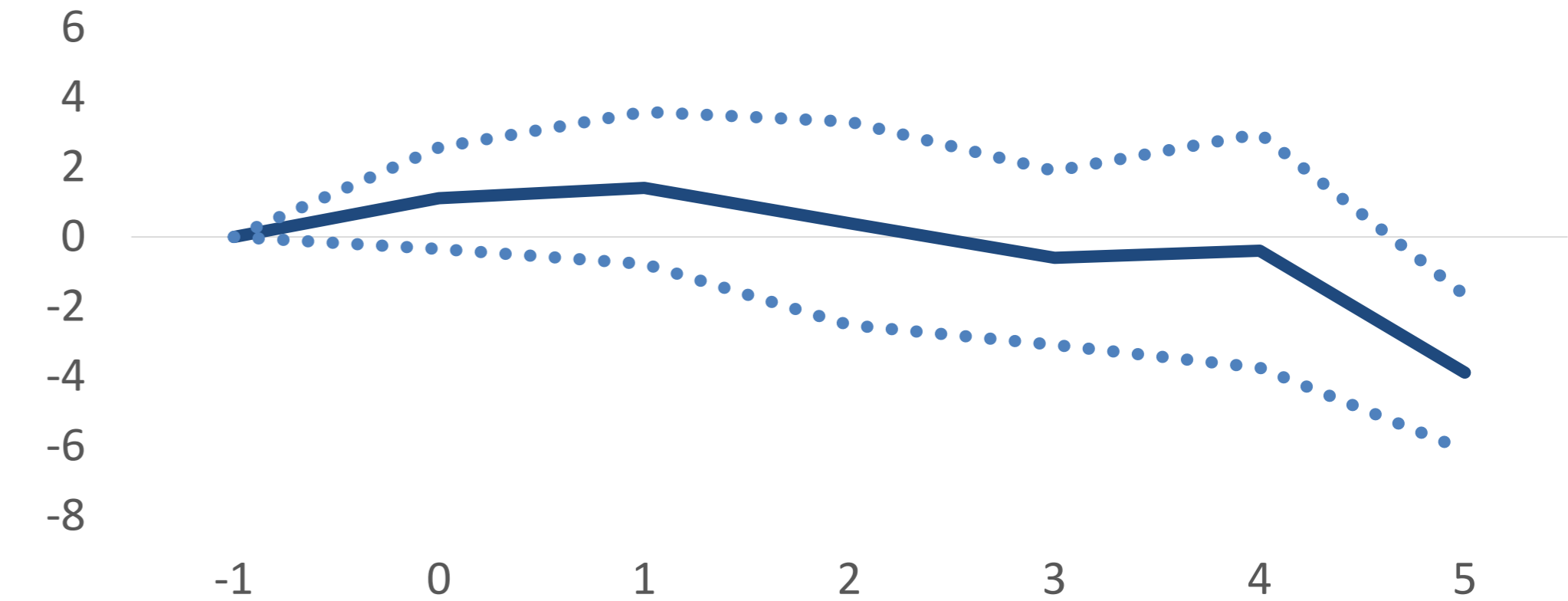
Note: The solid lines indicate the response of output (productivity) to one-standard deviation (about 3.6 percentage points) increase in the tariff rate. The dashed red lines denote the baseline effect. Dotted lines correspond to 90 percent confidence bands of the baseline estimate.

Industry-level analysis

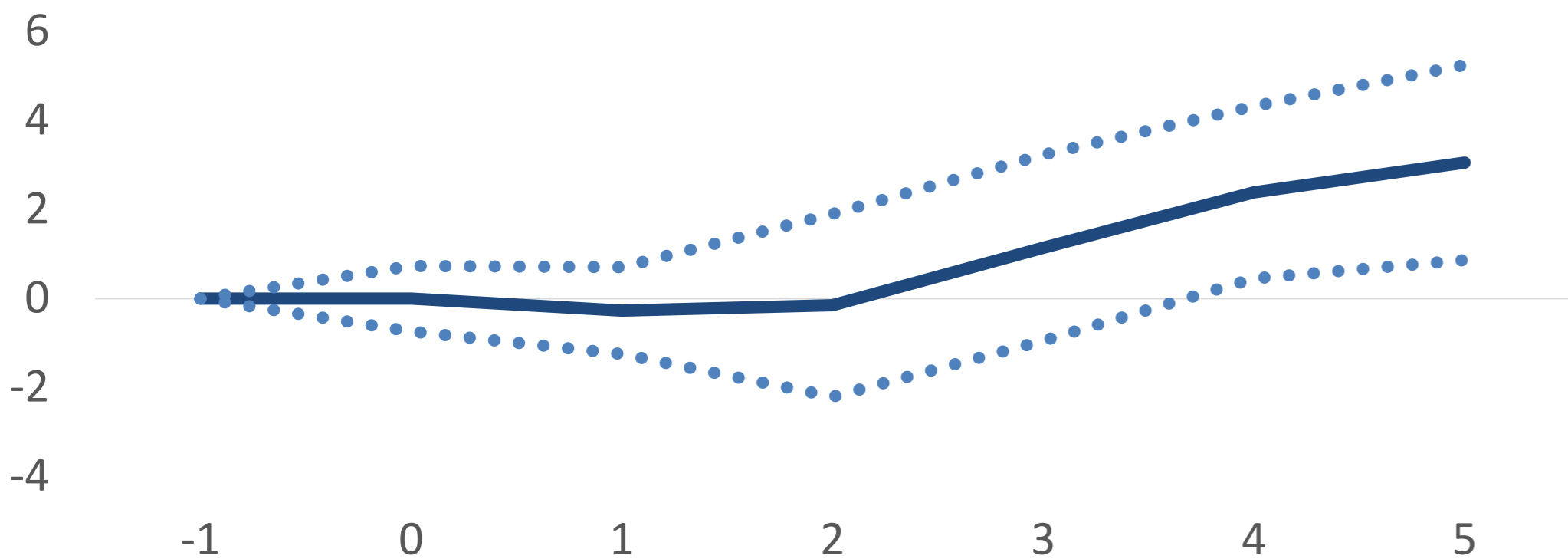
Output (%)—Input tariff



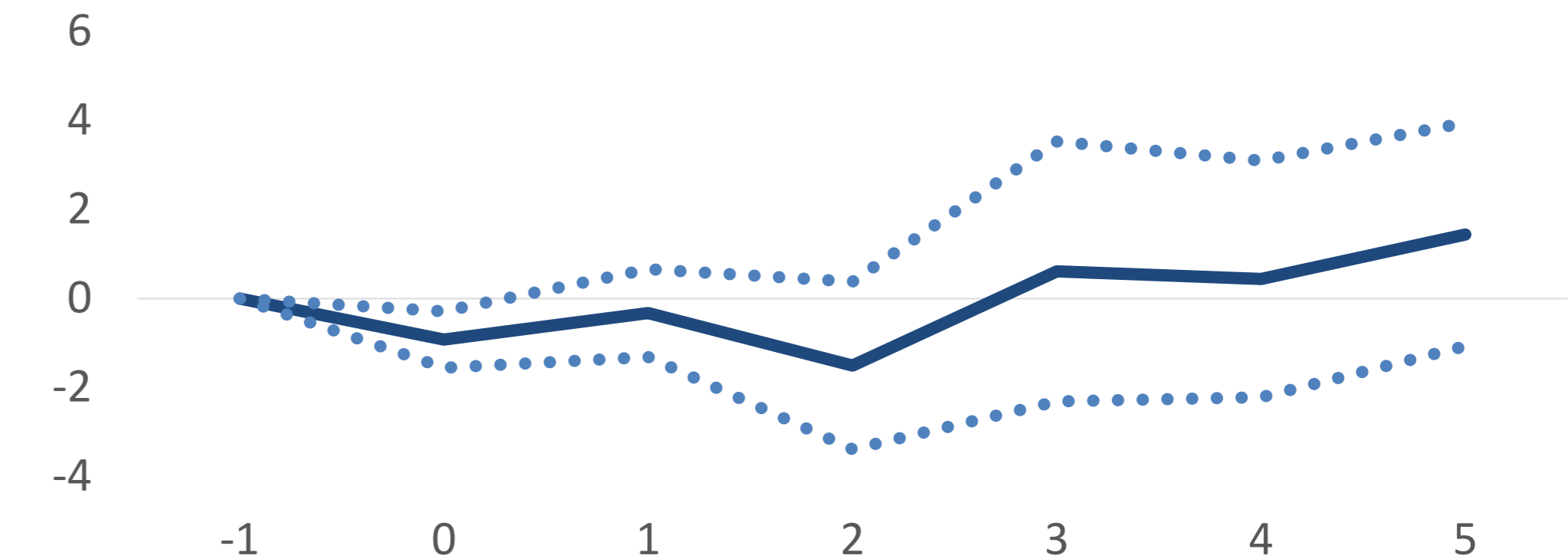
Productivity (%)—Input tariff



Output (%)—Output tariff



Productivity (%)—Output tariff



Note: The solid lines indicate the response of output (productivity) to one-standard deviation increase in input and output tariffs; dotted lines correspond to 90 percent confidence bands. Estimates based on equation (1').

Summary and caveats

- **Aversion of economics profession to the deadweight losses caused by protectionism seems well-founded**
 - Tariffs lead to declines in output and productivity, increases in unemployment and inequality
 - Effects larger for tariff increases, for advanced economies and in expansions
- **Caveats and Limitations**
 - Reduced-form, purely empirical approach
 - Hard to isolate causal effects, though robustness checks mitigate this concern