



Abstract

The **Carbon Price App (CPA)**, developed by the International Monetary Fund (IMF), is a sophisticated instrument designed to **simulate the effects of carbon pricing** (expressed in USD per ton of CO2 emitted) on industries within an economy and its ripple effects through the global supply chain.

By facilitating the application of diverse carbon pricing scenarios across **45 industries and 77 economies**, the CPA provides a nuanced understanding of how carbon pricing can incentivize sustainable practices, subsequently reducing emissions and influencing international trade dynamics and competitiveness.

Utilizing **global input-output tables and emissions data** and employing the **Leontief Price model**, the CPA facilitates a thorough economic analysis.

The tool's intuitive interface supports the assignment of different carbon prices, comparison of scenarios, and comprehensive visualization of **results**, including a) **price changes across industries and GDP components**; and b) **tax revenues generated by carbon pricing**.

Background

Carbon pricing aims at **internalizing external costs of climate change** not reflected in market prices of fossil fuels.

Imposing carbon pricing on polluters increases cost of producing goods and services:

- Which industries are most affected?
- What is the impact on inflation?
- What are the revenues raised?
- How do price changes propagate in the economy and in the global value chain?
- What is the impact on competitiveness?

Carbon Price App is **available for IMF users**:

- Based on multi-country input-output tables
- 77 economies
- 45 industries
- **1995 to 2020 annual data**
- Industry price changes
- Price changes for households, government consumption, capital formation, imports and exports
- **Propagation of price changes in the global supply chain**

Framework

Input-output price model $P = diag(v)(I - A)^{-1}$ where P is the price vector, v is the coefficients of value-added vector, I is the identity matrix, and A is the matrix of input-output coefficients.

Domestic price model extended to multi-countries by incorporating international trade to assess the cumulative effect of carbon pricing in the global supply chain:

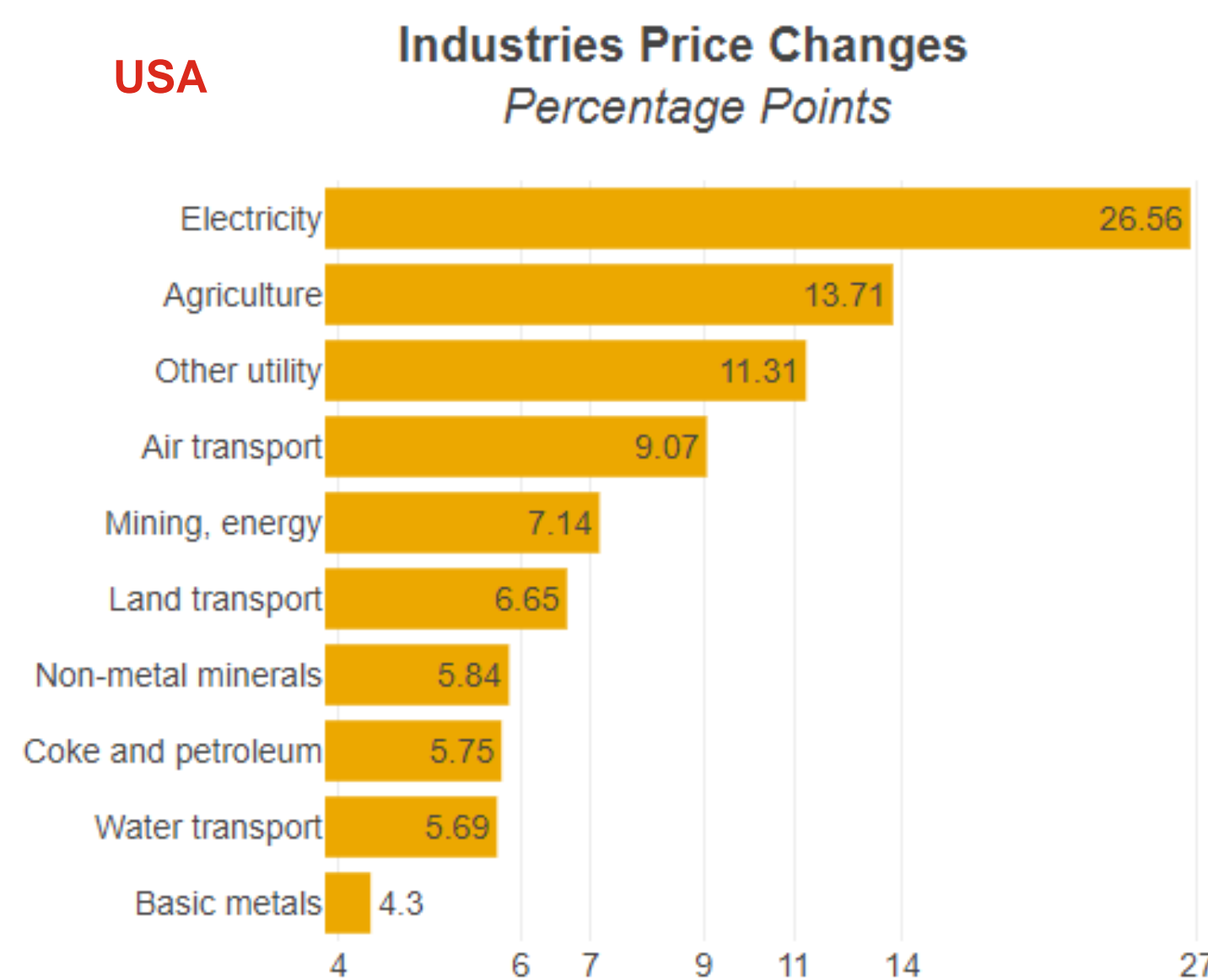
- Based on official national accounts statistics
- Not contingent on speculative changes in variables
- Corrections made on official statistics to ensure integrity and consistency

Case study: USA

Scenario:

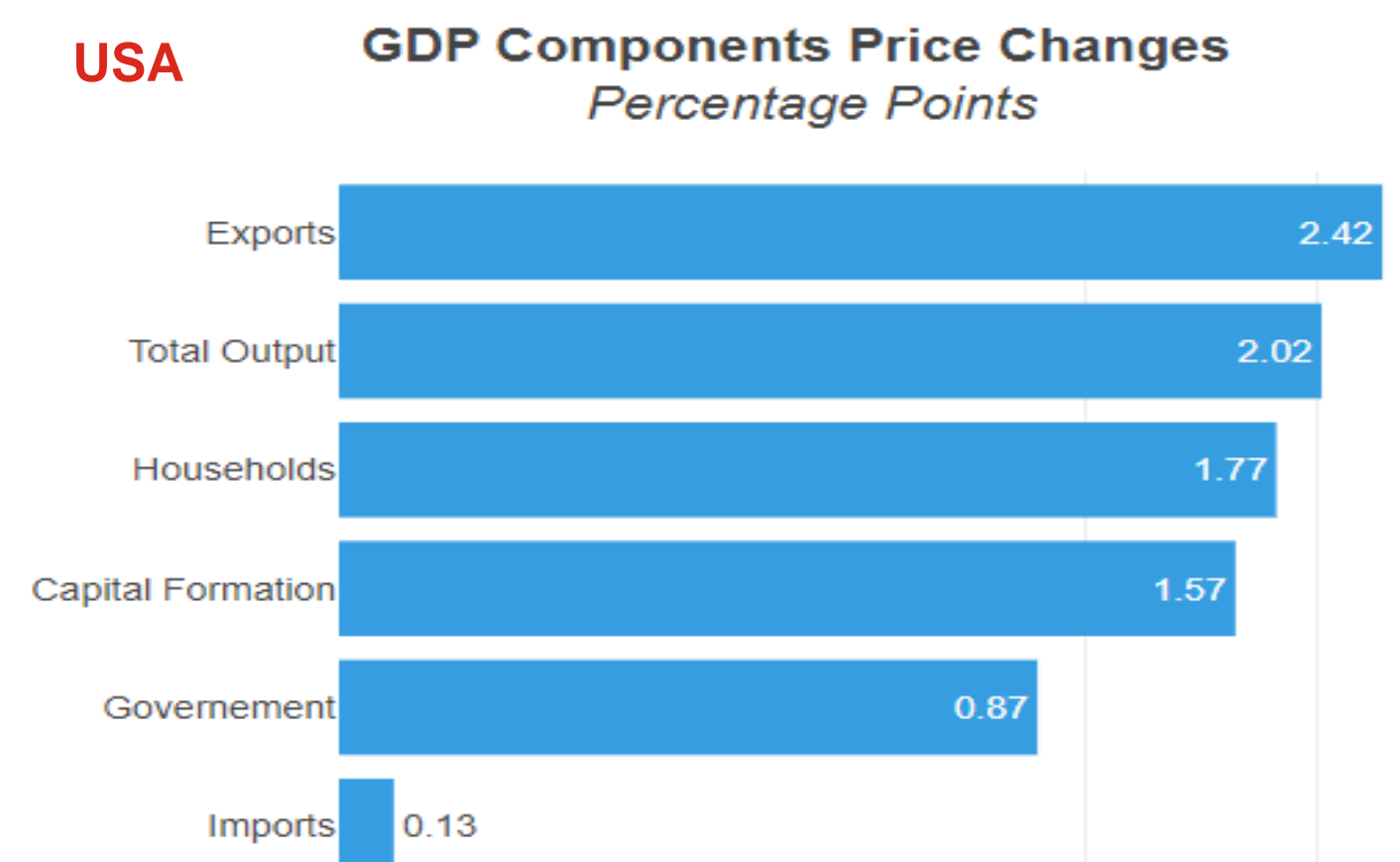
- **2020 data**
- **\$ 75 USD carbon pricing applied to all industries**
- Carbon pricing applied only in the **USA**

Industries price changes



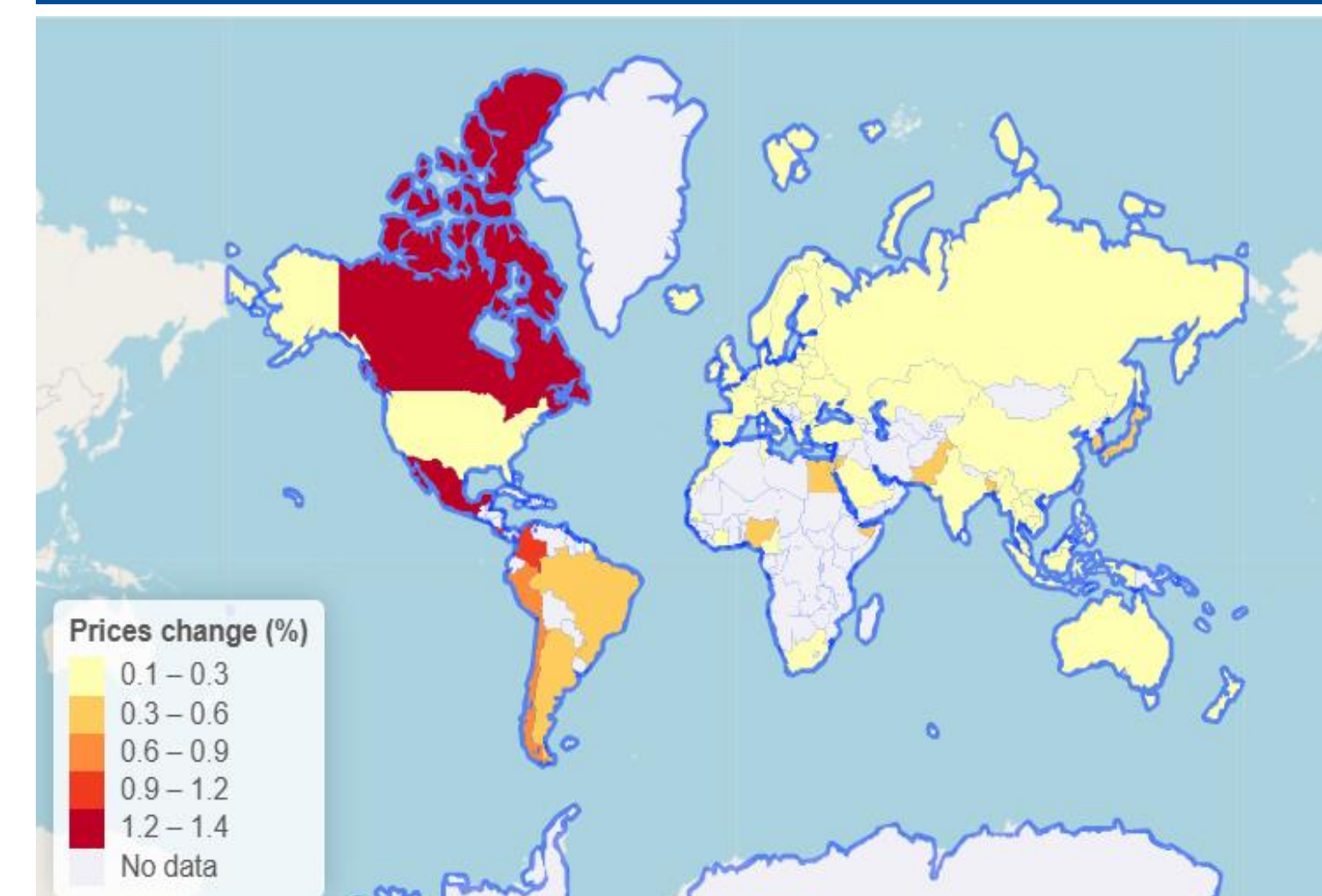
Source: IMF staff calculations based on the Carbon Price App estimates

GDP components price changes



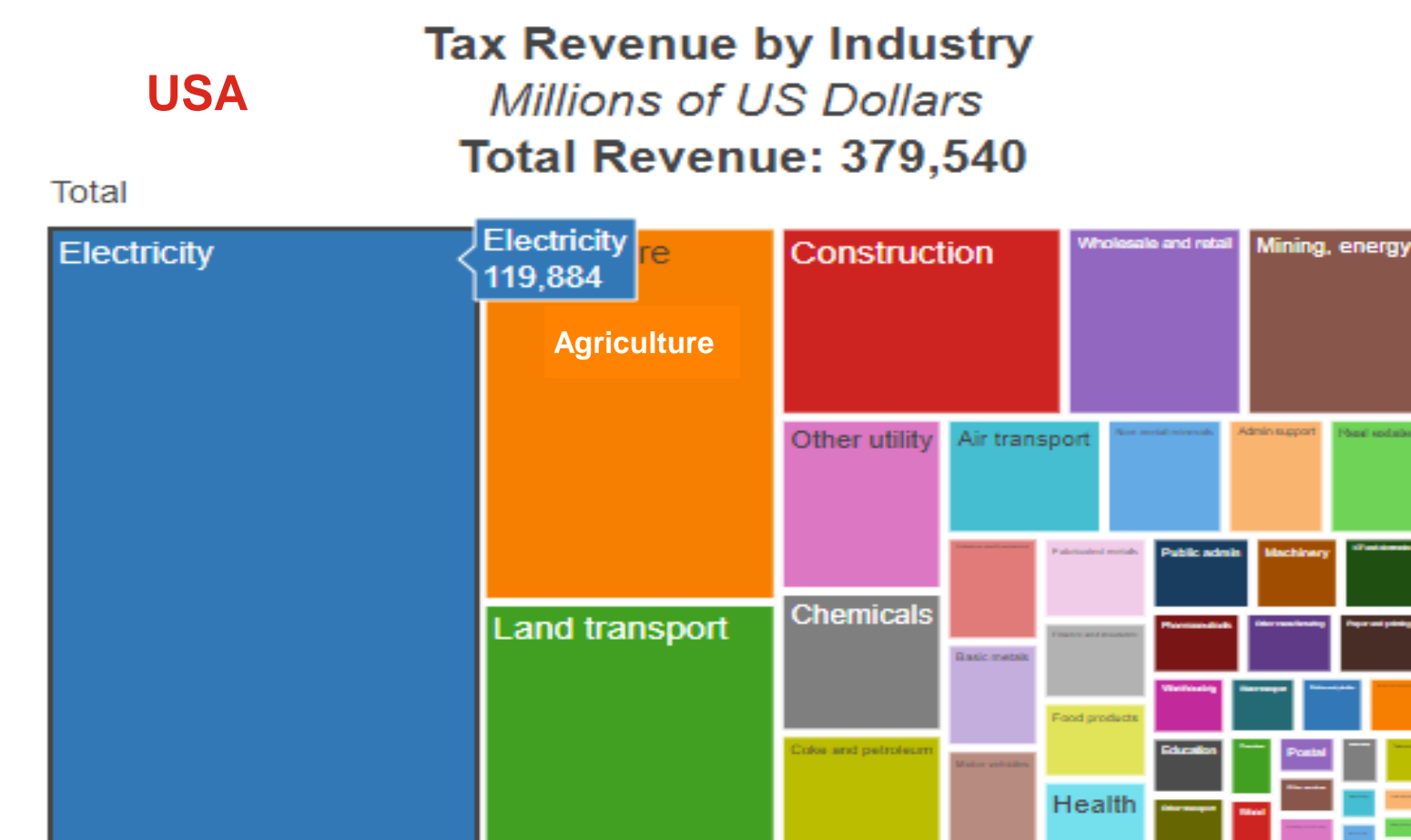
Source: IMF staff calculations based on the Carbon Price App estimates

Global import price changes



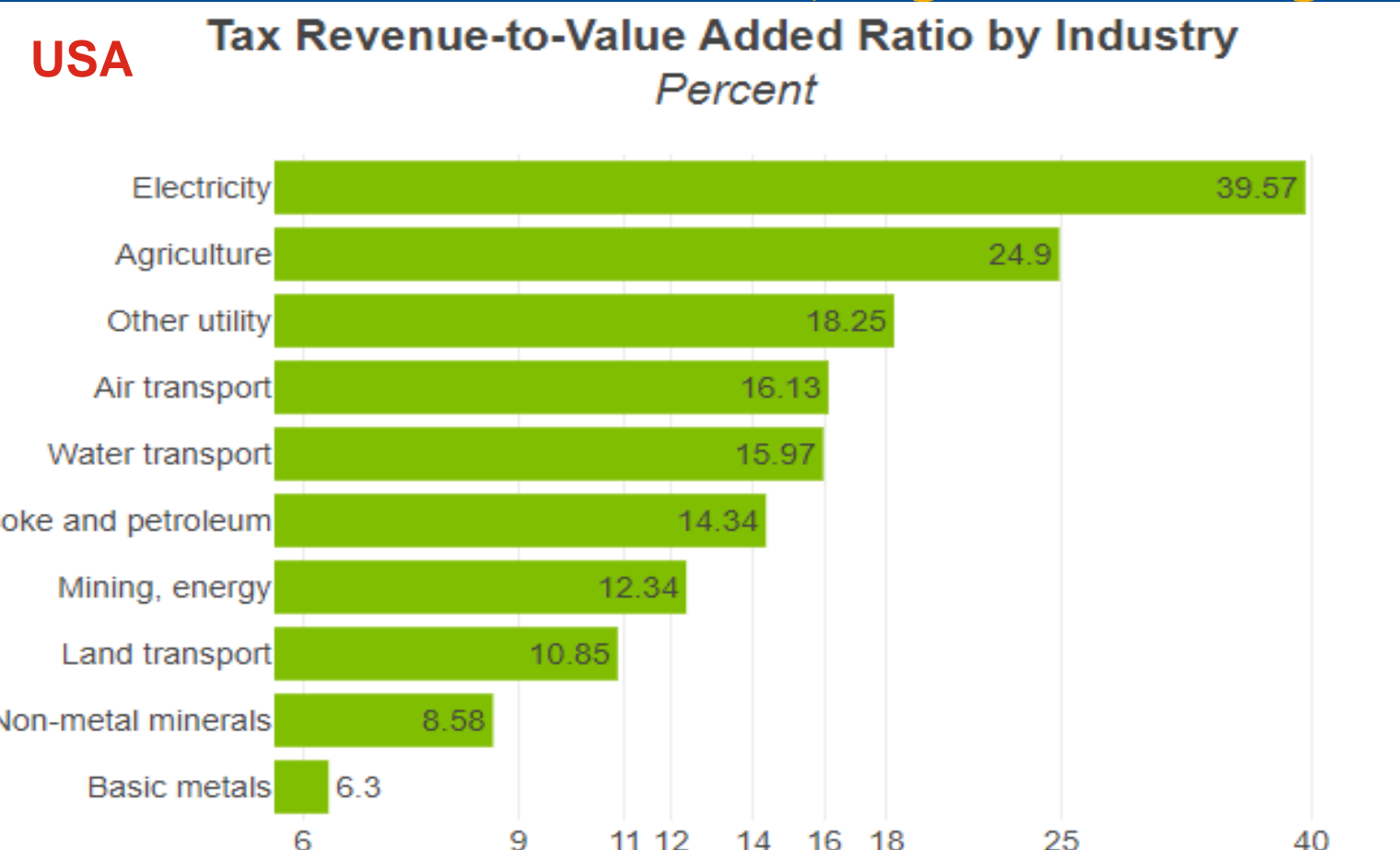
Source: IMF staff calculations based on the Carbon Price App estimates

Revenue by industry



Source: IMF staff calculations based on the Carbon Price App estimates

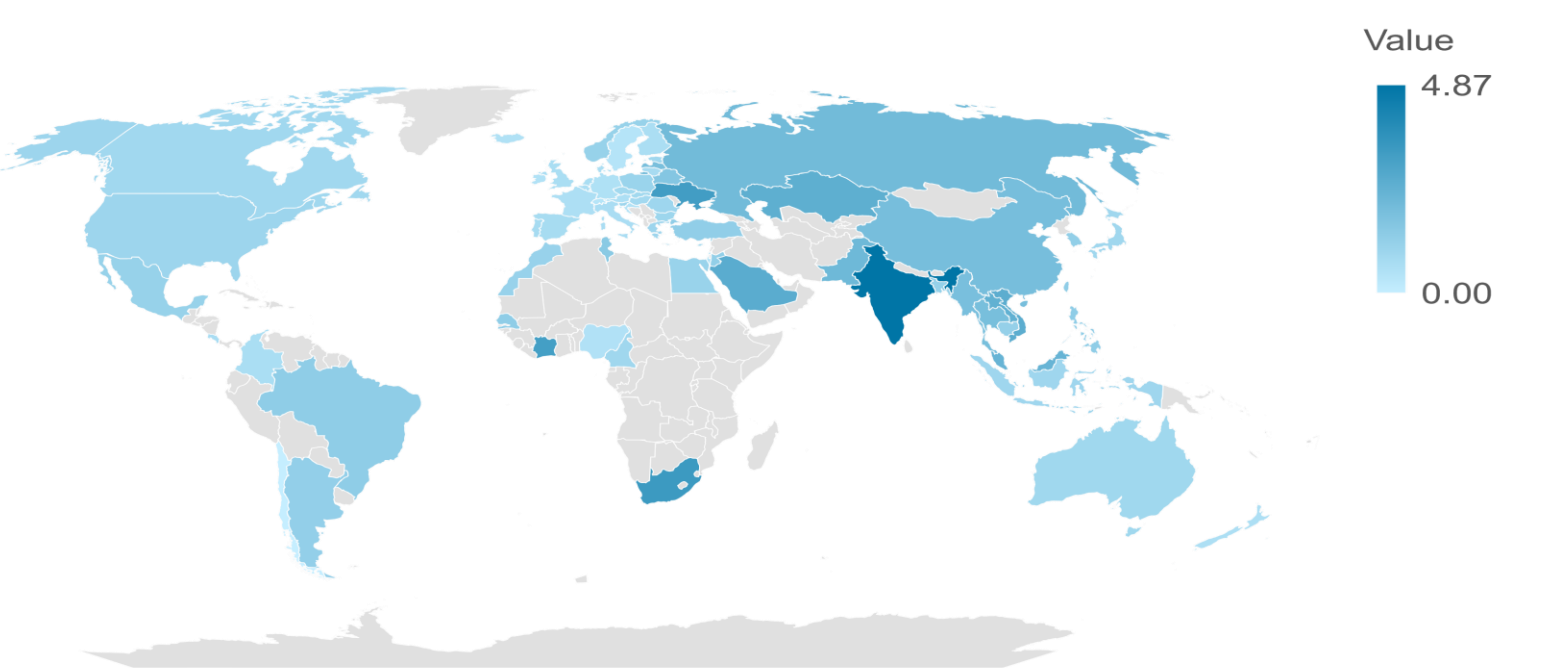
Tax revenue to value added ratio, by industry



Source: IMF staff calculations based on the Carbon Price App estimates

Impact on competitiveness

Motor vehicles relative emissions intensities (USA = 1)



Source: IMF staff calculations based on the Carbon Price App estimates

Way forward

Develop **analysis by household income groups**, further disaggregate **impact on prices and revenues associated with imported, exported, and domestic products**, as well as both **domestic and foreign demand**. Assess broader impacts on GDP and national competitiveness by **incorporating price elasticities**. Develop scores to gauge the potential **impact of each industry on the banking system's stability** using carbon tax exposure, probabilities of default, and industries debt ratios. Future expansions of the **model will use**, when available, the **IMF MARIO**, which covers **212 economies, 144 industries, from 1990 to 2023**. Making **CPA available to external users**.