# Great Again: Improving U.S. Infrastructure

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INFORUM

# Outline

1. Purpose of data analysis and modeling
2. Inforum infrastructure studies
3. Assumptions & Implementation: FY 2018-2026
4. Results
5. Extensions

# Purpose of Data Analysis and Modeling

- Provide context of historical data for the policies and spending levels suggested.

- Though details are few, allow data to suggest how spending will be distributed.

- Use model to investigate the likely economic effects of such policy.

# Inforum Infrastructure Studies

- Failure to Act (ASCE, 2011-2012)
  - Investigated excess costs and lost productivity of bad infrastructure
  - Studies included land, water, and air transportation; water supply and wastewater; and electricity infrastructure
- Catching Up (National Association of Manufacturers, 2014)
  - Incorporated ASCE work on costs of bad infrastructure
  - Added effects of additional public spending on infrastructure
- Infrastructure: Economic Impact Analysis of FY 2018-2026 Investments (Department of Commerce, 2017)
  - Adapted earlier work (ASCE cost effects, NAM public investment)
  - Reflect policy details sketched by the Administration

# Assumptions for FY 2018-2026: Spending

- ## Total Spending (Billions of Dollars)

| | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2018-2026 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Federal | 0 | 5 | 25 | 40 | 50 | 40 | 20 | 10 | 5 | 5 | 200 |
| S&L + Private | 0 | 20 | 100 | 160 | 200 | 160 | 80 | 40 | 20 | 20 | 800 |
| = Total | 0 | 25 | 125 | 200 | 250 | 200 | 100 | 50 | 25 | 25 | 1000 |

- ## Federal Spending (Percent)

| | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |
|---|---|---|---|---|---|---|---|---|---|---|
| Direct | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Capital Transfers / Other | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 |

- ## Other Spending (Percent)

| | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |
|---|---|---|---|---|---|---|---|---|---|---|
| State and Local | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |
| Private | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 | 50 |

Preliminary assumptions.

# Assumptions for FY 2018-2026: Spending
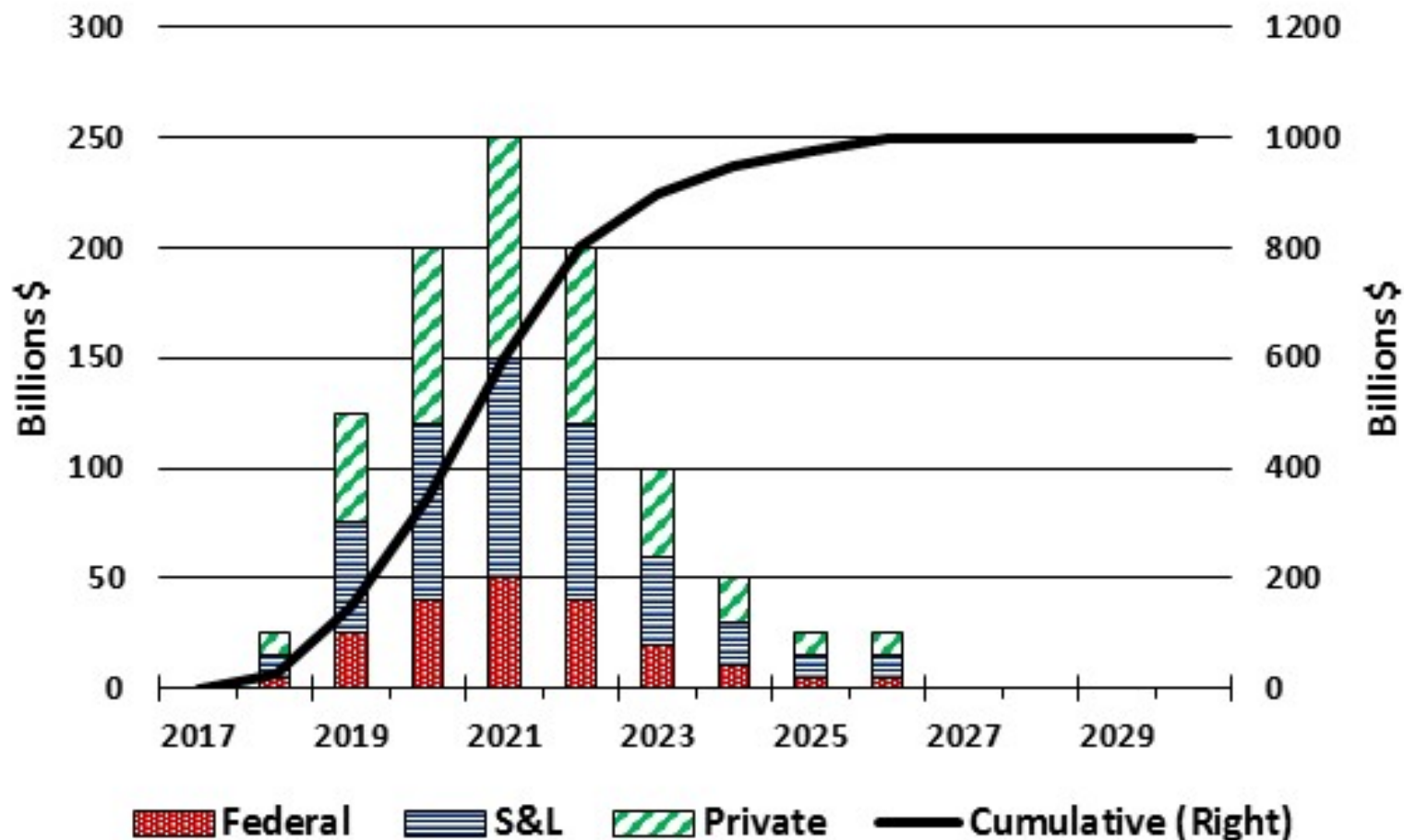
Preliminary assumptions.  Assumed total spending (direct and indirect) levels.

# Assumptions for FY 2018-2026: Basic Types

- ## Public Investment Spending (Percent)

| | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |
|---|---|---|---|---|---|---|---|---|---|---|
| Structures | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 | 75 |
| Equipment | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Intellectual Property | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Land Acquisition | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |

- ## Private Investment Spending (Percent)

| | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 |
|---|---|---|---|---|---|---|---|---|---|---|
| Structures | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 | 80 |
| Equipment | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| Intellectual Property | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |

Preliminary assumptions.

# Assumptions for FY 2018-2026: Revenue

- Government Revenue: Taxes and Fees
  - Few policy details given, but establish data & modeling techniques
  - Assume sufficient revenue to retire debt in 20-25 years (optimistic)

| Taxes and Fees | Static Revenue Projection |
|---|---|
| Personal license fees | + $ 6.7 billion |
| Public utilities TOPI | + $ 0.3 billion |
| Transportation TOPI | + $18.6 billion |
| Total (S&L) | + $25.6 billion |
| | |
| Transportation TOPI | + $15.0 billion |
| Total (Federal) | + $15.0 billion |

Preliminary assumptions.

# Assumptions for FY 2018-2026: PPPs

- Public-Private Partnerships
  - No policy details given; definition of PPPs is ambiguous
  - Assume two transportation industries provide services directly
    - Transit and Ground Passenger Transportation
    - Other Transportation and Support Activities
  - Assume construction, other industries add investment spending
    - Assume motivation is additional sales to support transportation O&M
  - Assume distribution of investment spending by industry
  - Assume greater spending on transportation by all sectors
    - Use of public roads (mostly) currently not market transactions. Define market transactions for use of transportation infrastructure.
    - Adjust demand for each industry so PDV of investment equals PDV of additional capital income.

Preliminary assumptions.

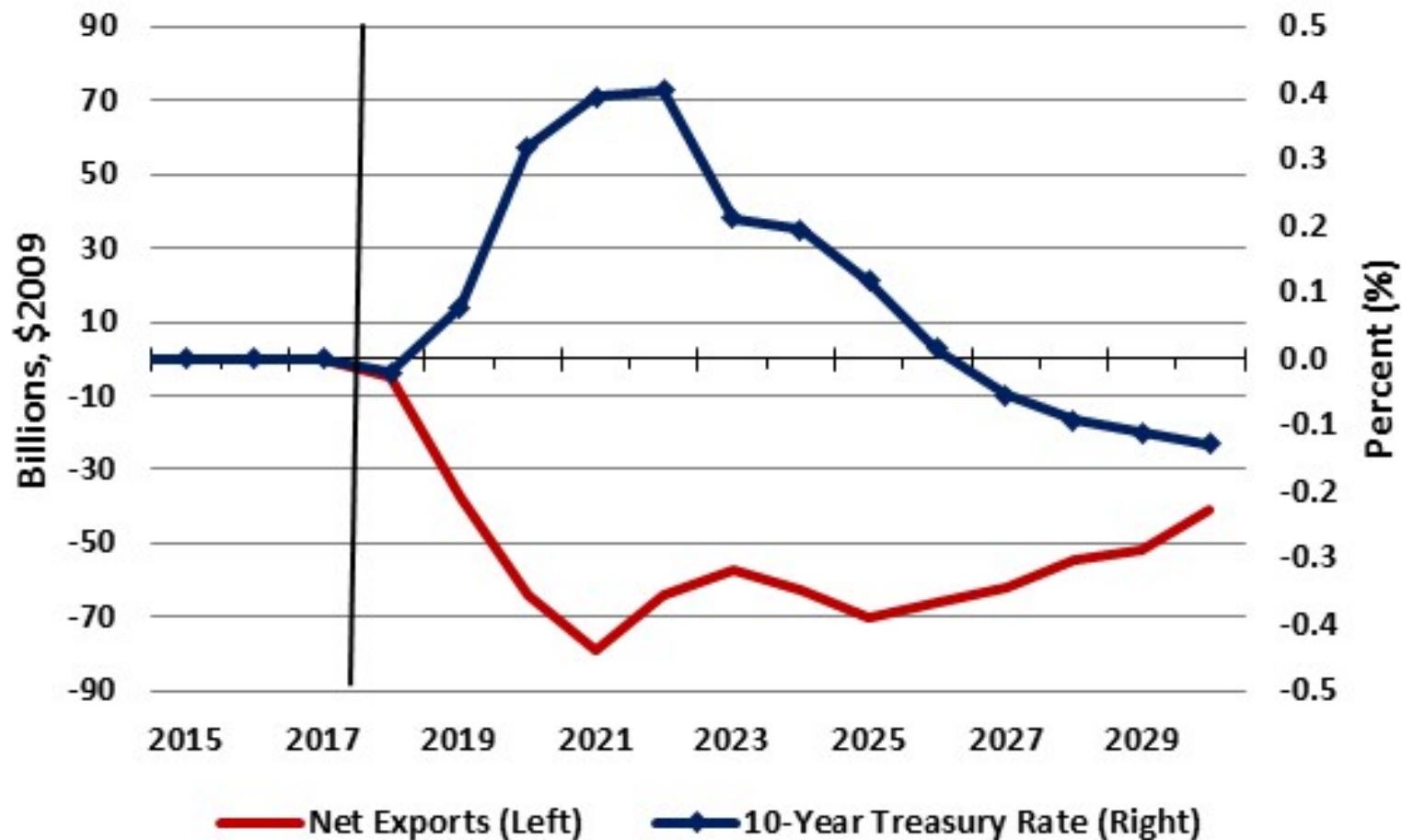# Productivity Effects of Enhanced Spending
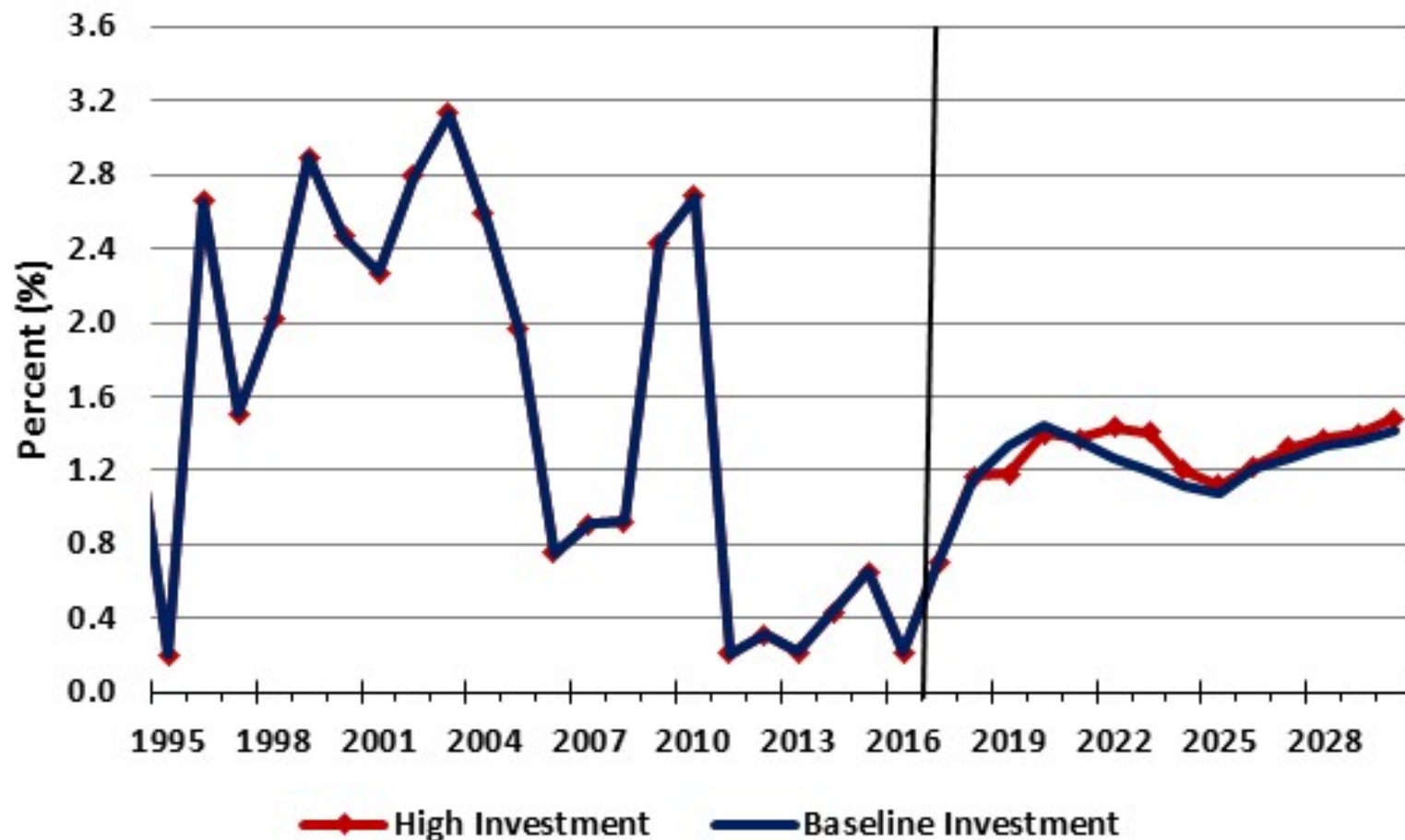


Annual growth rates.  Preliminary assumptions and results.

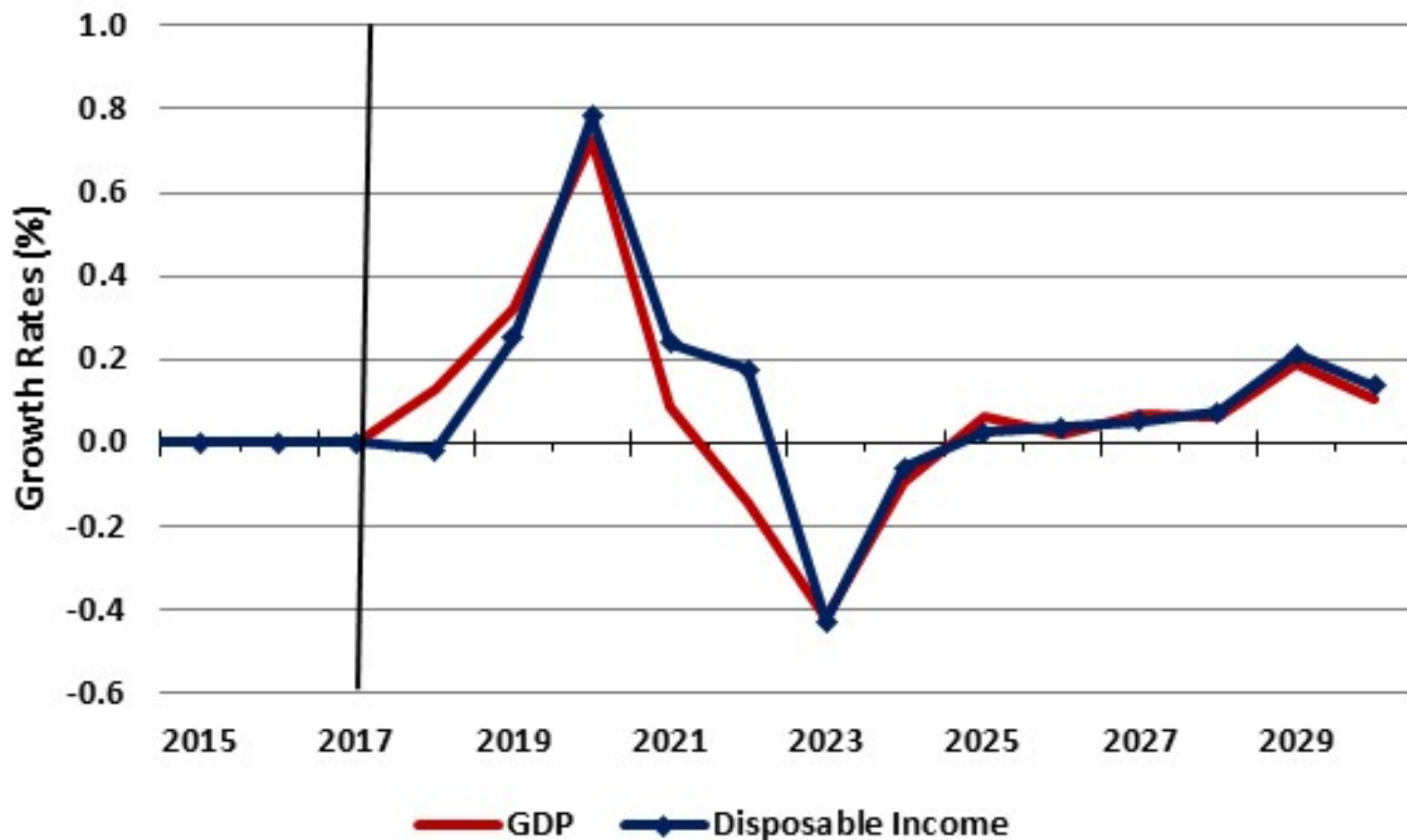# Enhanced Spending with Full Employment
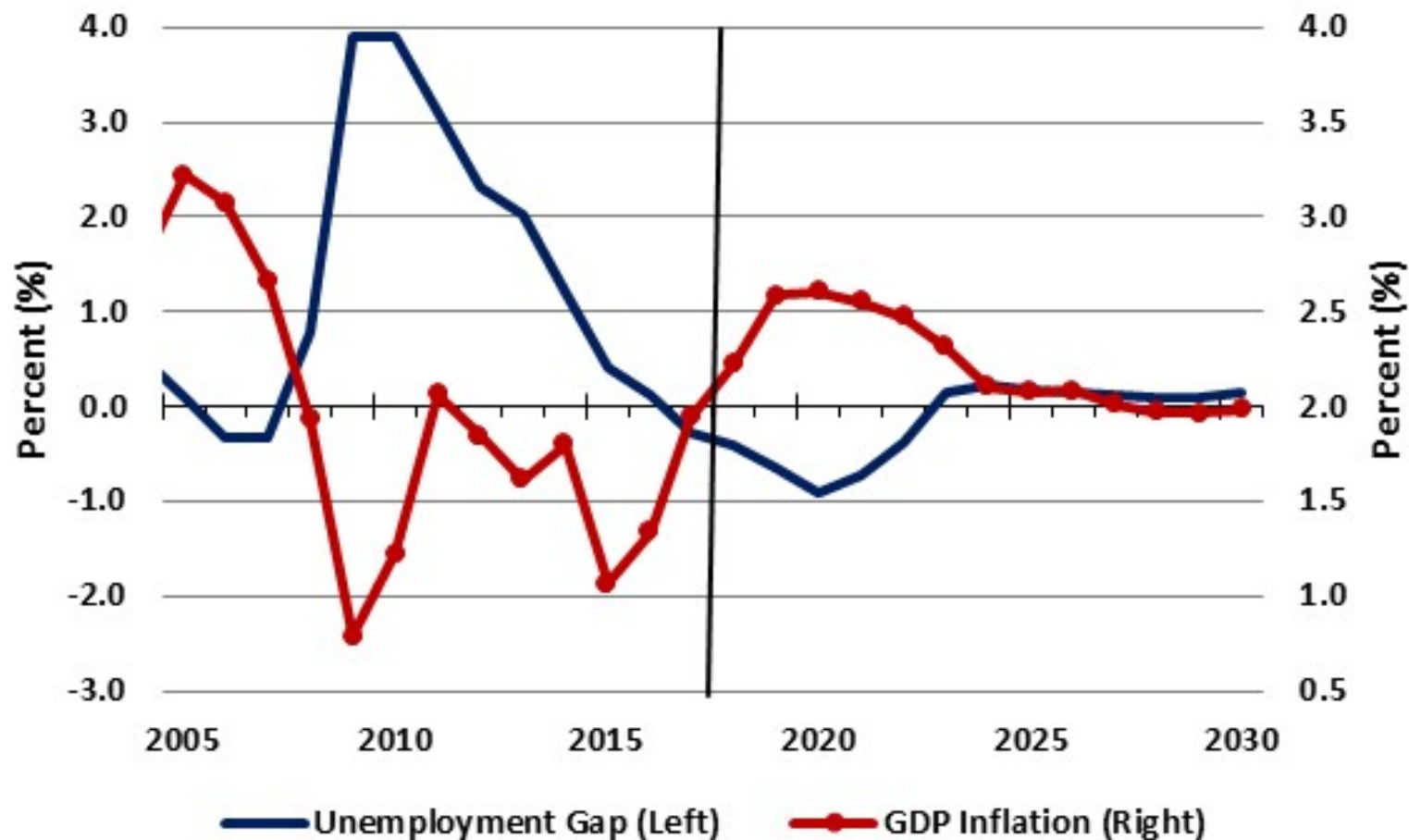


Hi-Spending Scenario.  Preliminary results.

# Enhanced Spending with Full Employment

Difference from Baseline growth rates (exports), difference from Baseline (interest rates). Preliminary results.

# Enhanced Spending with Full Employment



Difference from Baseline growth rates.  Preliminary results.

# Enhanced Infrastructure Impacts: Macro

| | 2018 | 2020 | 2021 | 2022 | 2024 | 2027 | 2030 |
|---|---|---|---|---|---|---|---|
| **Enhanced Nominal Investment** | | | | | | | |
| **Total Investment Spending** | 25.0 | 200.0 | 250.0 | 200.0 | 50.0 | 0.0 | 0.0 |
| Percentage of GDP | 0.1 | 0.9 | 1.1 | 0.8 | 0.2 | 0.0 | 0.0 |
| | | | | | | | |
| **Real GDP by Final Demand Category** | | | | | | | |
| Gross Domestic Product | 0.1 | 1.2 | 1.2 | 1.1 | 0.6 | 0.7 | 1.1 |
| Personal Consump Expenditures | 0.1 | 0.7 | 0.5 | 0.5 | 0.8 | 1.1 | 1.3 |
| Gross private domestic investment | 0.3 | 2.8 | 3.2 | 2.5 | 0.3 | 0.8 | 1.6 |
| Nonresidential Fixed Investment | 0.2 | 2.6 | 4.0 | 3.3 | 0.9 | 0.8 | 1.6 |
| Residential Investment | 0.3 | 2.3 | 1.2 | 0.6 | -0.9 | 0.5 | 1.3 |
| Exports | 0.0 | 0.2 | 0.2 | 0.1 | 0.1 | 0.9 | 2.1 |
| Imports | 0.2 | 2.2 | 2.7 | 2.1 | 1.9 | 2.4 | 2.7 |
| Government Consumption & Investment | 0.4 | 3.3 | 4.1 | 3.6 | 1.6 | 0.8 | 0.6 |
| | | | | | | | |
| **Price Indicators** | | | | | | | |
| GDP Deflator | 0.1 | 0.7 | 1.0 | 1.1 | 0.9 | 0.2 | -0.5 |
| PCE Deflator | 0.1 | 0.4 | 0.7 | 0.8 | 0.7 | 0.1 | -0.4 |
| Exports Deflator | 0.0 | 0.2 | 0.6 | 0.8 | 0.9 | 0.2 | -0.4 |

Percentage differences from Baseline levels.  Preliminary results.

# Enhanced Infrastructure Impacts: Real Output

| | 2018 | 2020 | 2021 | 2022 | 2024 | 2027 | 2030 |
|---|---|---|---|---|---|---|---|
| Gross Domestic Product | 0.1 | 1.2 | 1.2 | 1.1 | 0.6 | 0.7 | 1.1 |
| Farms, Forestry, fishing | 0.1 | 0.3 | 0.4 | 0.4 | 0.2 | 0.8 | 1.2 |
| Mining | 0.2 | 1.2 | 0.8 | 0.9 | -0.1 | 0.0 | 0.5 |
| Utilities | 0.1 | 0.7 | 0.6 | 0.5 | 0.2 | 0.4 | 0.7 |
| Construction | 1.2 | 9.0 | 10.5 | 8.0 | 1.4 | 0.5 | 1.1 |
| Nondurables Manufacturing | 0.1 | 1.1 | 0.7 | 0.5 | -0.4 | -0.1 | 0.3 |
| Durables Manufacturing | 0.3 | 1.9 | 1.6 | 1.3 | -0.7 | 0.1 | 0.8 |
| Durable Materials and Products | 0.4 | 3.0 | 2.3 | 1.8 | -0.6 | 0.2 | 0.8 |
| Non-Electrical Machinery | 0.2 | 2.1 | 2.4 | 1.7 | -1.1 | 0.1 | 0.9 |
| Electrical Machinery | 0.2 | 1.0 | 0.6 | 1.0 | -0.3 | 0.3 | 0.6 |
| Transportation Equipment | 0.2 | 2.1 | 1.9 | 1.5 | -0.8 | 0.0 | 1.0 |
| Miscellaneous manufacturing | 0.1 | 0.6 | -0.1 | -0.1 | -0.9 | -0.2 | 0.6 |
| Trade | 0.1 | 1.4 | 1.2 | 1.1 | 0.7 | 1.0 | 1.4 |
| Transportation | 0.2 | 2.5 | 2.7 | 2.9 | 2.7 | 3.0 | 3.2 |
| Finance, Insurance, and Real Estate | 0.1 | 1.0 | 1.0 | 0.9 | 0.8 | 1.1 | 1.4 |
| Other Services | 0.1 | 0.9 | 0.9 | 0.8 | 0.6 | 0.8 | 1.3 |

Percentage differences from Baseline levels.  Preliminary results.

# Enhanced Infrastructure Impacts: Employment

| | 2018 | 2020 | 2021 | 2022 | 2024 | 2027 | 2030 |
|---|---|---|---|---|---|---|---|
| Total Employment | 84.3 | 1775.1 | 1836.1 | 1508.3 | 586.5 | 656.8 | 1020.4 |
| Farms, Forestry, fishing | -4.2 | -7.4 | -12.2 | -14.2 | -23.6 | -22.9 | -24.5 |
| Mining | 0.6 | 6.3 | 3.9 | 2.7 | -5.7 | -5.2 | -1.5 |
| Utilities | -0.1 | 1.2 | 3.4 | 3.5 | 2.5 | 3.6 | 5.1 |
| Construction | 100.3 | 825.9 | 990.9 | 792.6 | 158.8 | 58.4 | 118.6 |
| Nondurables Manufacturing | 4.4 | 60.5 | 28.2 | 18.5 | -28.0 | -17.0 | 2.3 |
| Durables Manufacturing | 10.8 | 113.1 | 86.0 | 67.9 | -57.6 | -15.1 | 18.3 |
|   Durable Materials and Products | 6.7 | 51.5 | 41.3 | 29.6 | -11.7 | 1.8 | 12.0 |
|   Non-Electrical Machinery | 1.2 | 19.1 | 21.9 | 15.5 | -12.2 | -0.3 | 6.2 |
|   Electrical Machinery | 0.8 | 10.1 | 3.7 | 9.0 | -8.5 | -1.6 | 1.2 |
|   Transportation Equipment | 2.2 | 28.1 | 23.5 | 19.4 | -10.9 | -1.0 | 10.6 |
|   Miscellaneous manufacturing | -0.2 | 4.3 | -4.3 | -5.6 | -14.4 | -13.9 | -11.8 |
| Trade | -15.7 | 172.8 | 162.9 | 133.0 | 102.5 | 134.5 | 174.8 |
| Transportation | -21.5 | 45.5 | 45.6 | 33.6 | -36.8 | -140.4 | -245.2 |
| Finance, Insurance, and Real Estate | -3.1 | 58.5 | 36.9 | 19.6 | 15.5 | 47.0 | 85.0 |
| Other Services | 11.5 | 496.6 | 486.4 | 442.2 | 437.7 | 585.1 | 855.9 |

Differences from Baseline in Thousands of Jobs.  Preliminary results.

# Possibilities for Extensions

- Align detailed categories (CBO) with NIPA/Fixed Assets data
  - o Together, the data sets provide much richer picture of infrastructure history, but alignment is not trivial.
- Project detailed public spending (CBO) with Lift model (BEA concepts) projections
- Review data development for Operations and Maintenance
- Extend modeling of infrastructure funding mechanisms
  - o Taxes, tolls, fees, PPP, repatriation, infrastructure bank, etc.
- Further data and modeling development of  PPP mechanisms

# Contact Information

- Ronald Horst
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- www.Inforum.umd.edu
  - Catching Up: Greater Focus Needed to Achieve A More Competitive Infrastructure - September 23, 2014
  - Failure to Act: The Economic Impact Of Current Investment Trends in Airports, Inland Waterways, and Marine Ports Infrastructure - September 13, 2012
  - Failure to Act: The Economic Impact of Current Investment Trends on Surface Transportation Infrastructure - July 27, 2011