Expert Elicitation of Long Run Economic Growth

Modeling Uncertainty Project

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Outline

Primary Question

How can we construct a pdf for long run economic growth?

1. What information and estimates are currently available?
2. What are the important dimensions of uncertainty?
3. How should we think about dependence?

Why Uncertainty in Economic Growth?

- Productivity growth is a critical determinant of emissions and the SCC
  - PAGE (Hope 2006)
    - increase in year 2000 global GDP from PAGE95 to ($33.3 trillion US) to PAGE2002 ($43.6 trillion US) lead to an 82% rise in mean marginal impact of CO_2
  - DICE (Nordhaus 2007)
    - a 2-sigma increase in g(TFP) is associated with a 163% increase in global CO_2 emissions in 2100
    - a 2-sigma increase in productivity growth g(TFP) is associated with a greater than 70% increase in the social cost of carbon

Existing Estimates of Long Run Growth Rates

1. European Union - “2050 Global Europe”
   - scenario approach
2. PwC: “World in 2050”
3. HSBC: “World in 2050”
4. Goldman: ’Dreaming With BRICs: The Path to 2050’

Existing Work on Uncertainty

1 known survey: Nordhaus 1995 (unpublished)

- Sent to 7 experts (economists in research institutions)
- Elicits estimates of per capita GDP (PPP)
  1. experts report rates or magnitudes
  2. 4 periods
     - 1990-2025
     - 2025-2050
     - 2050-2100
     - 2100-2200

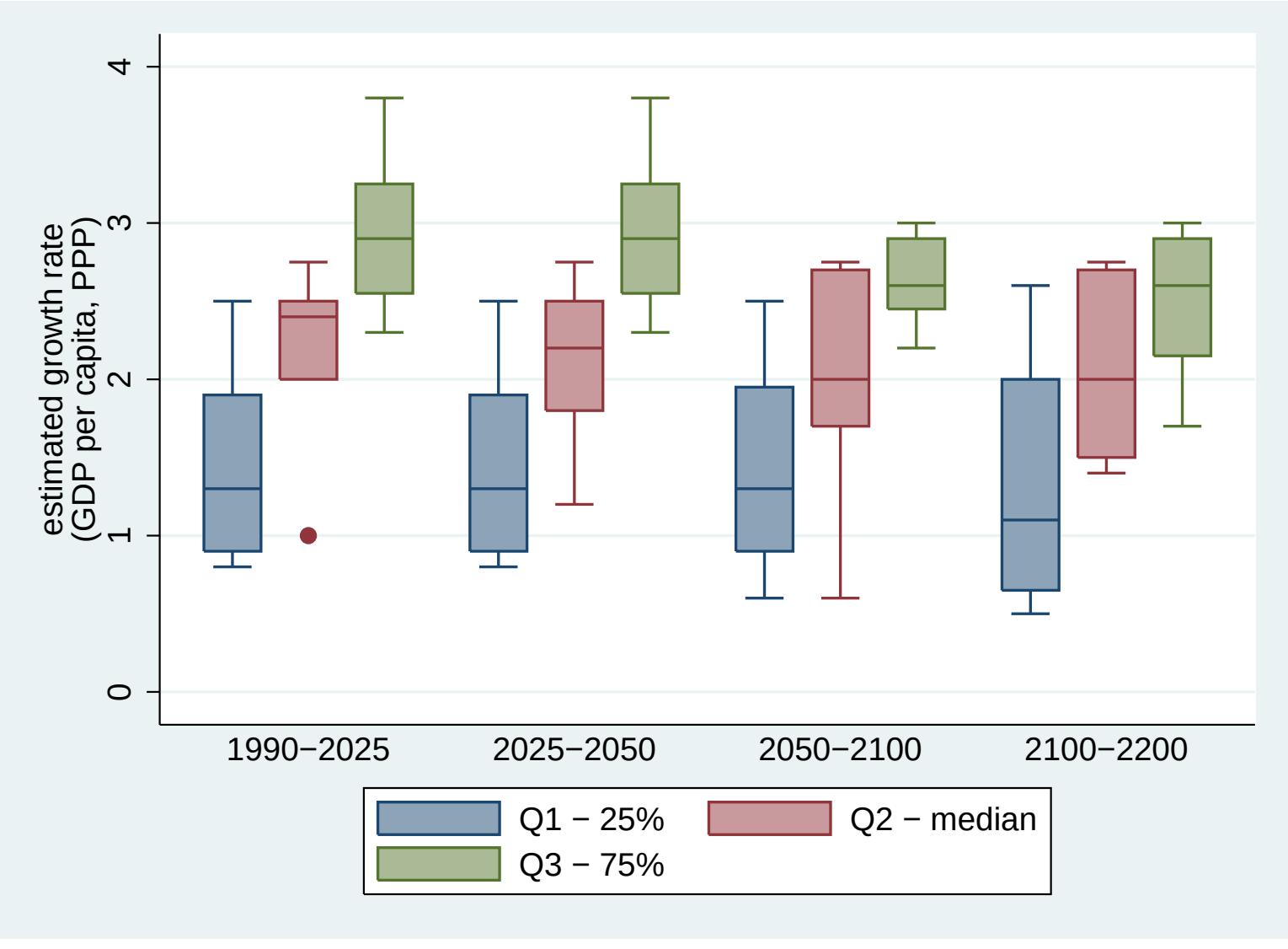
What did we learn?

1. Experts may prefer to think in terms of rates rather than levels
2. Precise definitions
3. Estimates beyond 2100?
4. Compression at zero
5. Outliers may be important

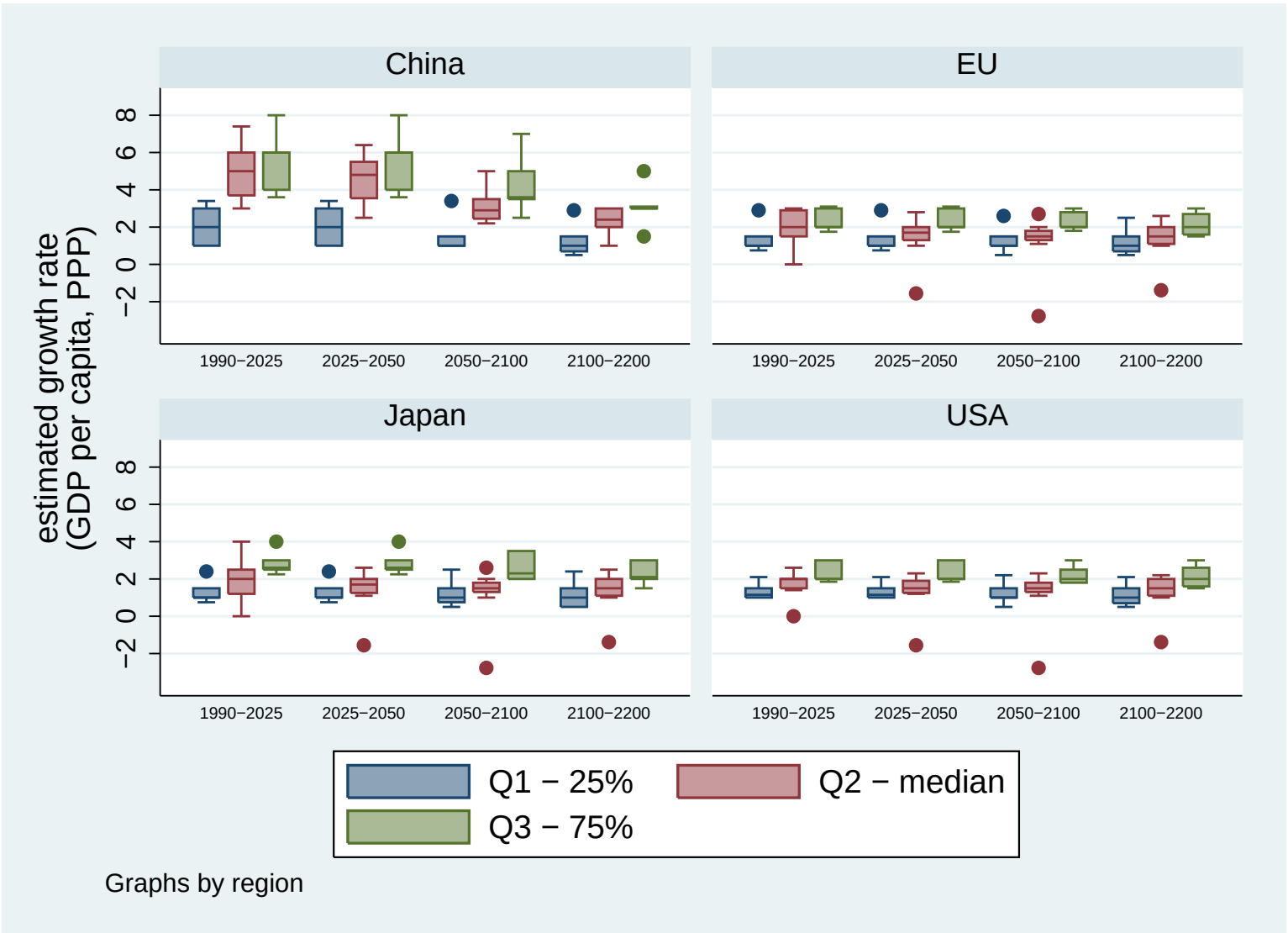
Table : Deviations across Quartiles

	mean	sd
Q1	1.332031	.702503
median	2.20016	1.464048
Q3	3.078125	1.332533

World Growth Rates



Regional Growth



5 Objectives of the Protocol Design

1. Maximize Response Rate
2. Ensure Clarity
3. Focus on Useful Information
4. Incorporate Dependence
5. Incorporate Heterogeneity in Expertise

Objective 1: Maximize Response Rate

1. Parsimony: 4 questions
2. Administered electronically or by mail
3. Potential Sample
   - Experts on Growth (regionally stratified)
   - Experts on Trade
   - Experts on Development (Yale Growth Center)
   - IAM Modeling Community
   - IGM Economic Experts Panel (Booth School of Business)

Objective 2: Ensure Clarity

1. Parameter Definition – GDP per capita
   - defined according to IMF (PPP exchange rates)
   - average annual rate
2. Regional Heterogeneity
   - Regional Groupings
     - World
     - United States
     - China
     - High Income (including US)
       $>$\$30,000 per year
     - Middle Income (including China and India)
       \$2,000-30,000 per year
     - Low Income:
       $<$\$2,000 per year
3. Definition of regions in elicitation protocol
   - Aggregated by IMF per capita GDP (2007, PPP exchange rates)
     - shares of global GDP provided
     - list of countries provided

Objective 3: Focus on Useful Information

1. Percentiles
   - 25th %ile
   - 50th %ile
   - 75th %ile
   - (10th/90th %iles)
2. Temporal Intervals:
   - 2010-2025
   - 2025-2050
   - 2050-2075
   - 2075-2100

Objective 4: Incorporate Dependence

1. Regional Dependence: Experts are asked to estimate correlations between US growth rate and other regions
   - "Assume US grows at 25th and 75th percentile rates and provide IQR for other regions"
2. Dependence due to common information:
   - experts report use of source materials

Objective 5: Incorporate Heterogeneity in Expertise

1. Predictions about short run growth (2014)
2. Self Reported Measures
   - rank of expertise
   - time to complete survey

Timeline

1. Design
   - February 2013 - Decision to undertake TFP Elicitation
   - April 2013 - Draft #1 of Elicitation
2. Development
   - **July 2013: Round #1 Pilot: Graduate Students**
   - August 2013: Round #2 Pilot: Broader Research Community
   - Remainder of 2013: Constant Pretesting
3. Deliver
   - Early 2014: Finalize Instrument (digital instrument) and Sample
   - March/April 2014: Administer Elicitation

Thank You