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BAK3: Introduction to Quantitative Methods

Week 3: Measurement

Leonardo Carella

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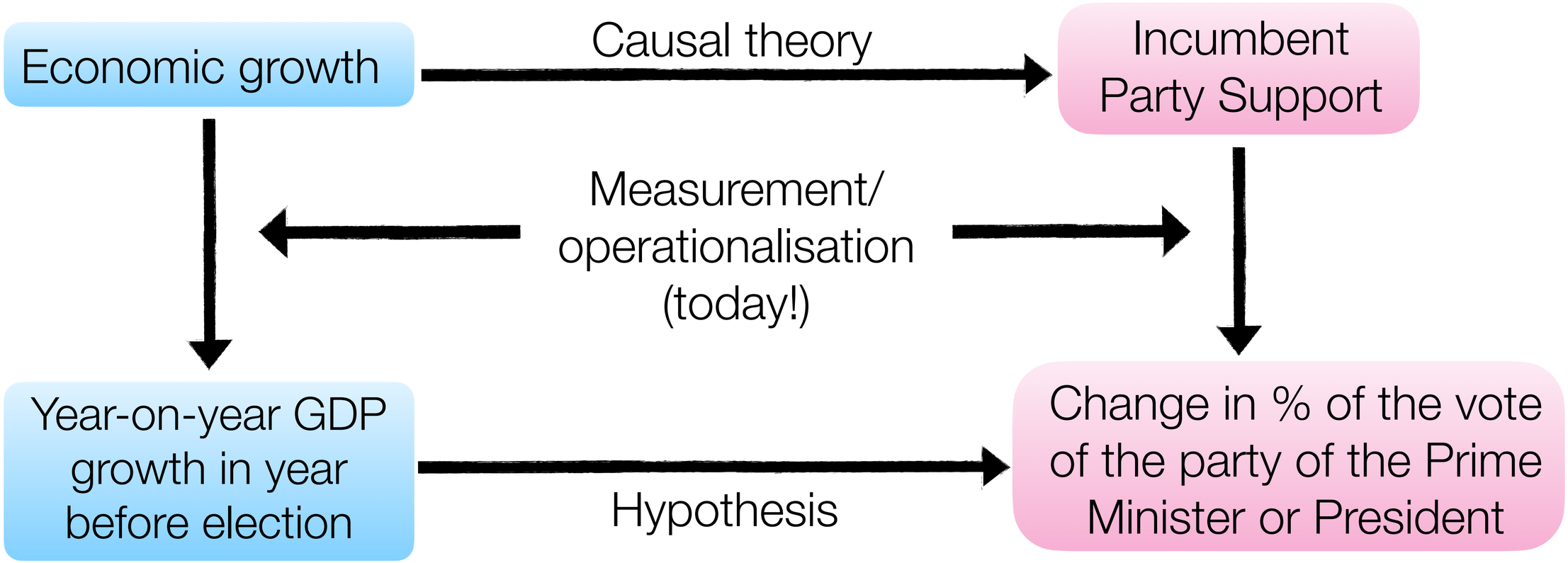
The Plan for today

- Research Design:
  - Levels of Measurement
  - Measurement Quality
- Coding in R:
  - Describing and creating variables in R.
  - Importing packages (for next time).

Last Time…


Economic growth
Causal theory
Incumbent Party Support
Measurement/ operationalisation (today!)
Year-on-year GDP growth in year before election
Hypothesis
Change in % of the vote of the party of the Prime Minister or President

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Variables, Again…

- **Variables as Concepts**: properties or characteristics of some entity.
  - E.g., “Political Knowledge” or “Economic Inequality”.
- **Variables as Measures:** guidelines to assign values to those entities, reflecting the extent to which they have that characteristic or property.
  - E.g., “the sum of the number of politicians correctly named in a quiz” or “the ratio of the income share of the richest 10% and that of the poorest 40%”.
- **Units of analysis:** the entities you’re interested in measuring the variable for.
  - E.g., “Voting-age individuals” or “Countries”.
- **Operationalisation/Measurement:** the process of assigning values to units.

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Levels of Measurement

- Annoyingly, classifications and terminology often differ across textbooks and sources. For the purposes of this course, let's settle on…

- Nominal
- Ordinal

} Categorical

- Interval
- Ratio

} Numerical

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Nominal Variables

- Capture **qualitative** differences; values don't convey order nor distance:
  - Religion (Christian, Muslim, Hindu, No Religion, Other);
  - Sometimes, recorded in datasets as numbers (e.g. 1 = SPÖ, 2 = ÖVP, 3 = FPÖ, 4 = NEOS, 5 = Grüne, 6 = Others, 0 = Didn't Vote) etc. but these numbers are only 'placeholders', not meaningful.
- A "dichotomous" or "binary" variable (a.k.a. "dummy", now an obsolete term) is — ***arguably*** — a nominal variable with only two categories:
  - Example: Presidential System, (0 = no, 1 = yes).

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Ordinal Variables

- Capture differences where there's a 'natural' **order**, but the distance between categories in not numerically meaningful:
  - Religious Attendance (never, less than once a month, about 1–3 times a month, every week, more than once a week).
  - Polity score (0 = Autocracy, 1 = Hybrid, 2 = Democracy).
- ***Dirty little secret:*** in practice, we sometimes treat these as numerical.
  - E.g. 'Likert' scales in surveys: "1 = Strongly Disagree, 2 = Disagree, 3 = Neither Agree nor Disagree, 4 = Agree, 5 = Strongly Agree".

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Interval Variables

- Values convey meaningful **order** and **distance**, but have no meaningful ‘zero’ point.
- This means that adding and subtracting makes sense, but dividing and multiplying does not. E.g. Time in Years:
  - ***order***: 2020 is ‘later’ than 2000;
  - ***distance***: gap between 2000 to 2010 is equal to the gap between 2010 and 2020 (ten years);
  - ***no meaningful zero***: year 2000 is not “twice as late” as the year 1000, because the year zero is a convention.

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Ratio Variables

- Values convey meaningful **order** and **distance**, and have a **meaningful ‘zero’ point**.
- E.g. Age in Years:
  - ***order***: 40 is older than 20;
  - ***distance***: gap between 20 and 40 is the same as the gap between 40 and 60;
  - ***meaningful zero***: a 40 year-old is ‘twice as old’ as a 20 year-old. The zero represents the year of birth.

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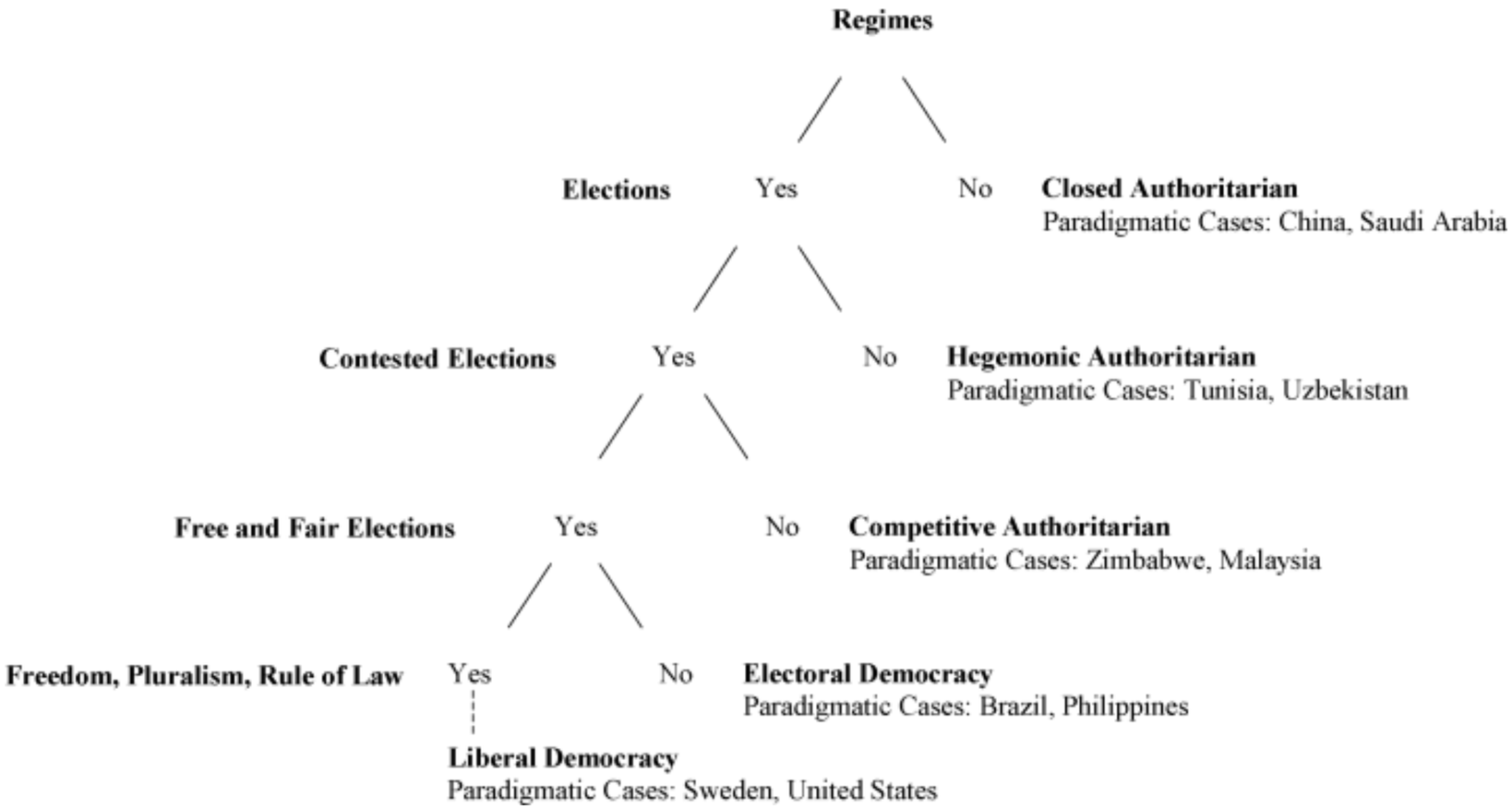
Discrete/Continuous

- Numerical variables (*both* interval *and* ratio) can be:
  - ***discrete:*** possible values form a set of separate numbers.
    - E.g. Number of siblings, number of candidates.
  - ***continuous:*** continuum of possible real number values (or at least, the distribution of values is so dense as to be close to a continuum).
    - E.g. GDP, Gini index, inflation rate, vote share.
- Nominal and ordinal variables are **always** discrete.

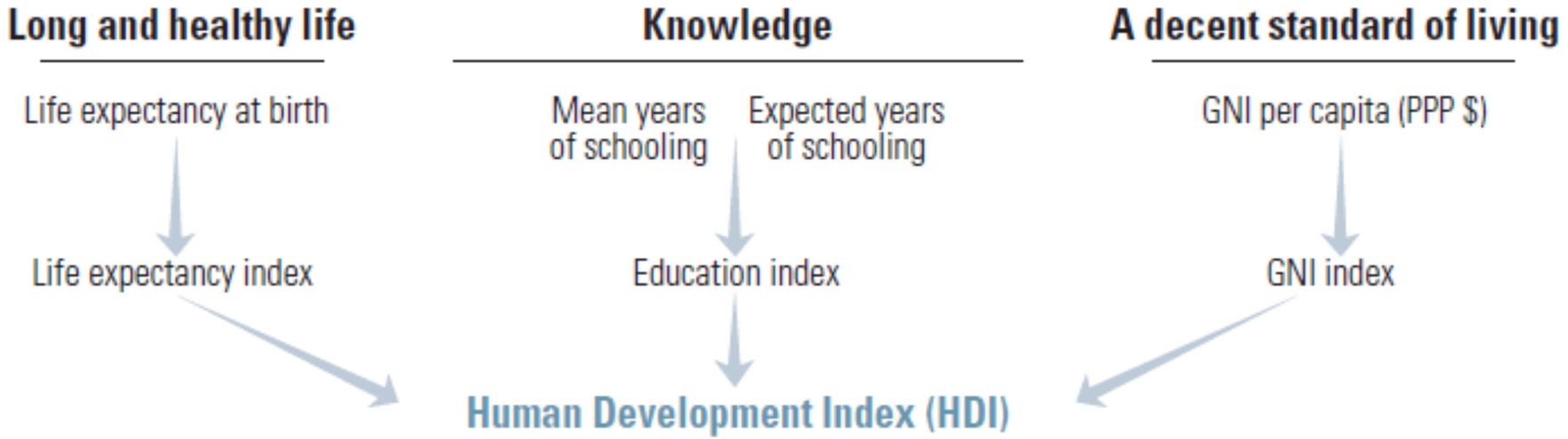
Common Measurement Strategies

- Decision Trees



Common Measurement Strategies

- Composite Indices



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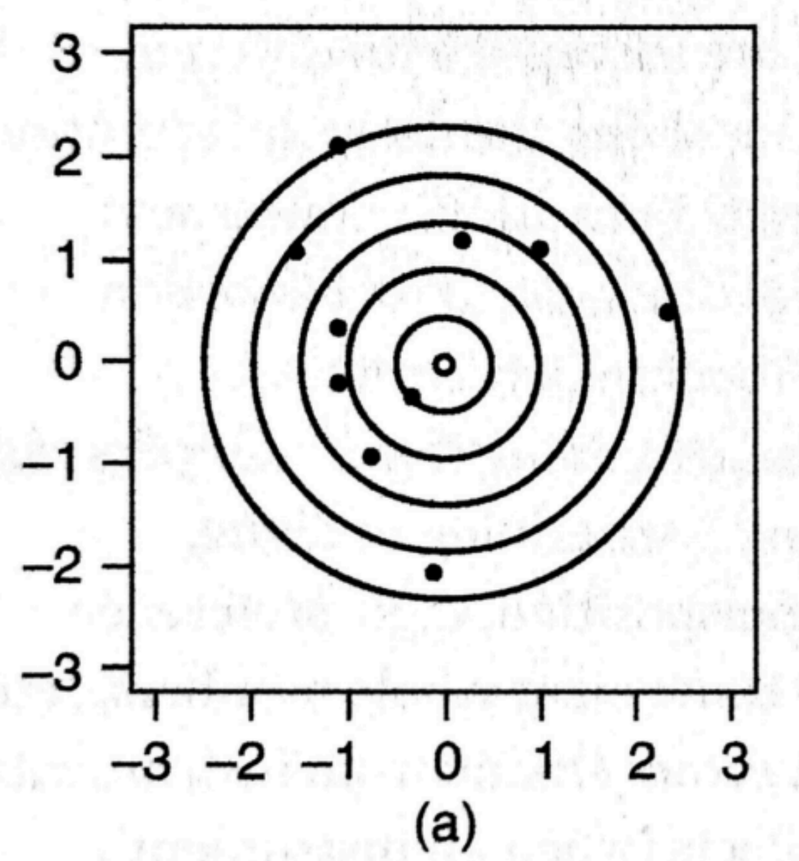
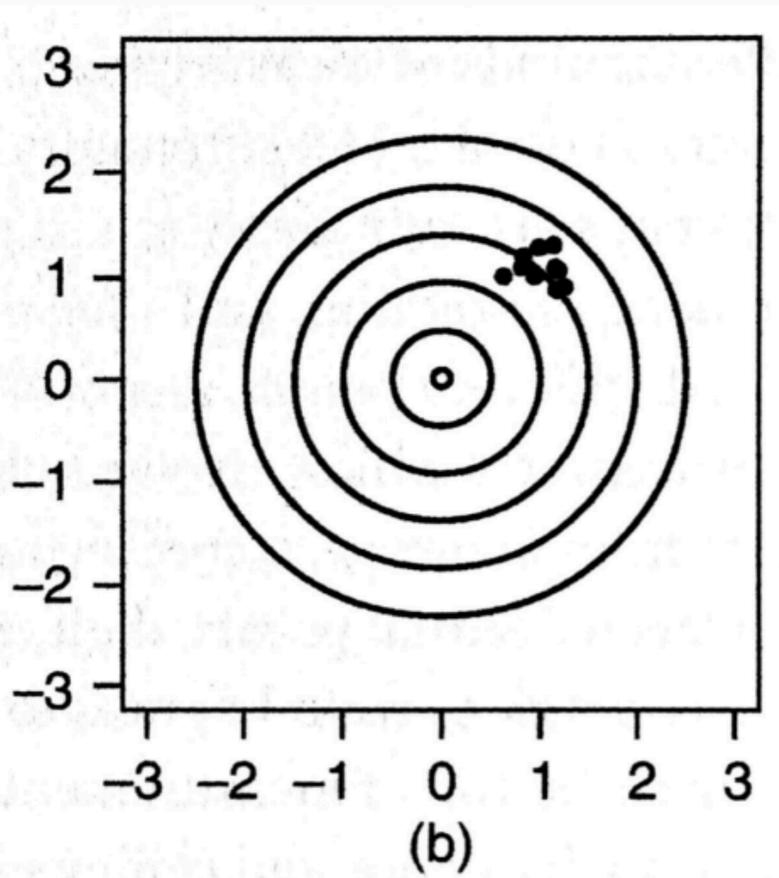
Measurement Quality

- What makes for good measurement?
  - ***Low bias*** (= high accuracy): the variable measures the target concept well, *on average*.
  - ***Low variance*** (= high precision): the variable does not change much across repeated measurements.

Measurement Quality

- Low bias, high variance: measurement (a) is accurate, but unreliable.
- Low variance, high bias: measurement (b) is reliable, but inaccurate.





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Why Measurement Matters

"Although definitions of democracy commonly include all adults, **measures of democracy often fail to include women**…This **incorrect operationalization** can affect: (1) **our measurement** of transition dates to democracy, (2) **our description** of the emergence of democracy, and (3) **our understanding** of the causes of democratization" (Paxton 2000, p. 93)

Paxton, P. (2000). Women's suffrage in the measurement of democracy: Problems of operationalization. *Studies in Comparative International Development*, 35(3), 92-111.

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Why Measurement Matters

- Paxton shows that by not treating countries as full democracies until women have suffrage:
  - The date they now count as democracies shifts by 1-123 years later.
  - Democracies no longer appear to emerge in clear waves (Huntington 1991); many less-developed countries became democracies first.
  - The conditions thought necessary to understand when democracies emerge (e.g., growing economies, growing civil societies, increased literacy, etc.) also change.

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Summing up…

	Scale Level	Meaningful order?	Meaningful distance?	Meaningful zero point?
Categorical	Nominal	-	-	-
	Ordinal	✓	-	-
Numerical	Interval	✓	✓	-
	Ratio	✓	✓	✓

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And now, let's open RStudio…