GSERM - St. Gallen 2025: Analyzing Panel Data

Final Examination

Instructions

1. This examination has four questions, listed at the end of this document. **You are to choose two questions and answer them.** *Please do not attempt to answer all four questions.*

2. Each answer should take the form of a brief empirical analysis of the data provided that answers the question(s) asked. That may include plots, tables, and any other techniques you think will be useful in answering the question. Each answer may be as short or long as you feel is appropriate, but probably need be no longer than 2-3 pages, including text, tables, and graphs. Answers will be evaluated on the basis of (a) correct application and discussion of the methods discussed in class; (b) justification of the analytic choices made; and (c) presentation and discussion of findings. *In creating your answers, you should not use data outside of that provided in the dataset.* You will *not* be evaluated on your substantive knowledge of the topic(s) at hand.

3. Please submit your exam to the instructor electronically, *as a PDF file*, by e-mailing it to `zorn@psu.edu`. You should also include all code necessary to replicate the analyses you conduct; this could take the form of an appendix, a separate `.R` or `.do` file, or a compilable `.Rmd` file for the entire exam answer.

4. Exams should be submitted on the following schedule:

   - If you are opting for the "in class" exam option, please submit your answers at or before 6:30 p.m. CET on Friday, June 20, 2025.
   - If you are opting for the "take home" exam option, you should submit your exam no later than 6:30 p.m. CET time on Friday, June 27, 2025.

5. The exam is worth 700 possible points (350 possible points for each question answered).

6. If you have questions about the examination, please email me at `zorn@psu.edu`. I will respond promptly, and – after de-identifying the source of the question – CC all class members, to ensure a common understanding of the exam.

Data

All four final exam questions will make use of the same data. The data are "country-year" format, comprising annual measurements from 1946-2015 on several variables for approximately 180 countries in the international system ($N \approx 180$, $T = 70$, unbalanced). The data are available in .CSV format in the "Exam" folder at the github repository, in a file named `GSERM-APD-StGallen-2025-Final-Exam.csv`.

A short description of each of the variables in the examination data follows. Note that the data were created using Steven Miller's `peacesciencer` package; additional details about each of the variables can be found in the documentation there, should you be interested.

The variables are:

- `Country`: The name of the country for that observation.
- `CCode`: A three-digit country identifier.
- `Year`: The year of the observation.
- `Mountainous`: The percentage of the country that is considered "mountainous" terrain.
- `Population`: The country's population.
- `PostColdWar`: Equals 0 for years prior to 1990, and 1 for years after 1989.
- `MajorPower`: Equals 1 if the country is a major military / industrial power, 0 otherwise.
- `MilitaryPersonnel`: The number of active military personnel in that country/year, in thousands.
- `MilitaryExpend`: Military expenditures (in thousands of $US).
- `LeaderTransition`: Equals 1 if the country experienced an executive / leadership transition that year, and 0 otherwise.
- `EthnicFractionalization`: Ethnic fractionalization; equal to one minus the Herfindahl Index of ethnic group shares of the population. This variable reflects the degree of ethnic fractionalization; values closer to zero reflect more ethnically homogenous countries, while those closer to 1.0 reflect more ethnically heterogenous / fractionalized countries.[1]
- `ReligiousFractionalization`: The same as `EthnicFractionalization`, but with respect to religious groups / identities.
- `IGOs`: The count of the number of international governmental organizations (IGOs) to which that state is a member in that year;
- `ArmedConflictOnset`: Coded 1 if that country experienced the onset of a violent armed conflict in that year, and 0 otherwise.
- `Democracy`: A summary measure of the extent to which that country/year is a democracy; higher values denote more democratic countries, while lower values indicate less democratic / more autocratic ones.
- `GDP`: The total gross domestic product (GDP) of that country in that year, in constant (2011) U.S. dollars.
- `GDPPerCapita`: The country's per-capita GDP, also in constant (2011) U.S. dollars.
- `Imports`: The total value of imports into that country in that year, in *current* (not constant / deflated) U.S. dollars.

[1] See Alesina et al. (2003) for details.

Questions

1. What factors explain variation in countries' military capabilities (personnel and expenditures)?
2. Are more ethnically / religiously diverse countries likely to have higher levels of imports? (Hint: `Imports` should probably be logged, and a control for `Population` almost certainly needs to be present as well; beyond that, it's up to you.)
3. What (if anything) is the causal effect of a change in a country's executive leadership on its economy, measured in terms of GDP and/or GDP per capita?
4. Describe the (possibly non-monotonic) relationship between a country's regime type (autocratic vs. democratic) and the onset of armed conflict.