Introduction:
Class Overview
+
10,000 Years of World Population

Economic Demography
(econ/demog c175)
Prof. Josh Goldstein
Spring 2023, Lecture 1

Today's agenda

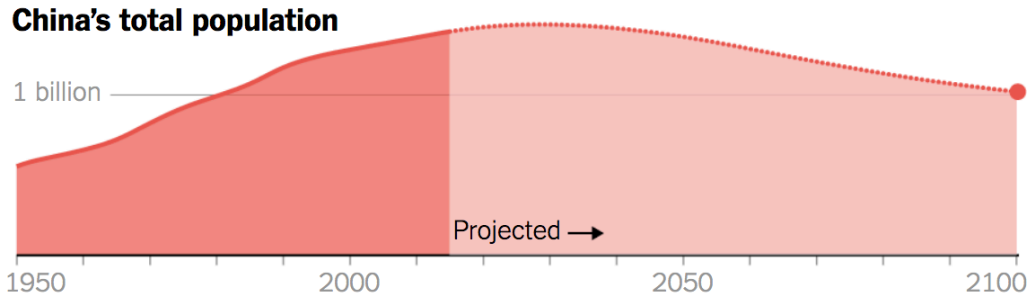
1. What is this class about?
2. Logistics
   - Semester plan
   - Work and grading
   - Resources
3. Our 1st topic: All of human history (!)
   - A very brief history of humanity
   - The exponential growth model

What is "Economic Demography"

- Broadly, we are interested in the *consequences* of population for human welfare
(1st half of the semester)

- We will also study the *causes* of population change. Births, deaths, migration, marriage, divorce
(2nd half of semester)

What is “Economic Demography”? An example



China’s Looming Crisis: A Shrinking Population

By STEVEN LEE MYERS, JIN WU and CLAIRE FU JAN. 17, 2019

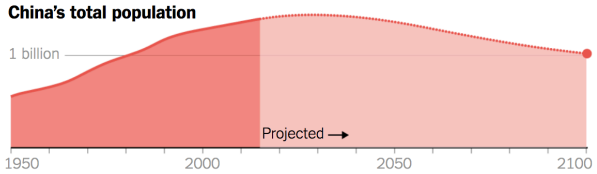
And in today's New York Times

China's Population Falls, Heralding a Demographic Crisis

Deaths outnumbered births last year for the first time in six decades. Experts see major implications for China, its economy and the world.

Chinese officials have tried for years to slow down the arrival of this moment, loosening a one-child policy and offering incentives to encourage families to have children. None of those policies worked. Now, facing a population decline, coupled with a long-running rise in life expectancy, the country is being thrust into a demographic crisis that will have consequences not just for China and its economy but for the world.

Questions raised …



China's Looming Crisis: A Shrinking Population

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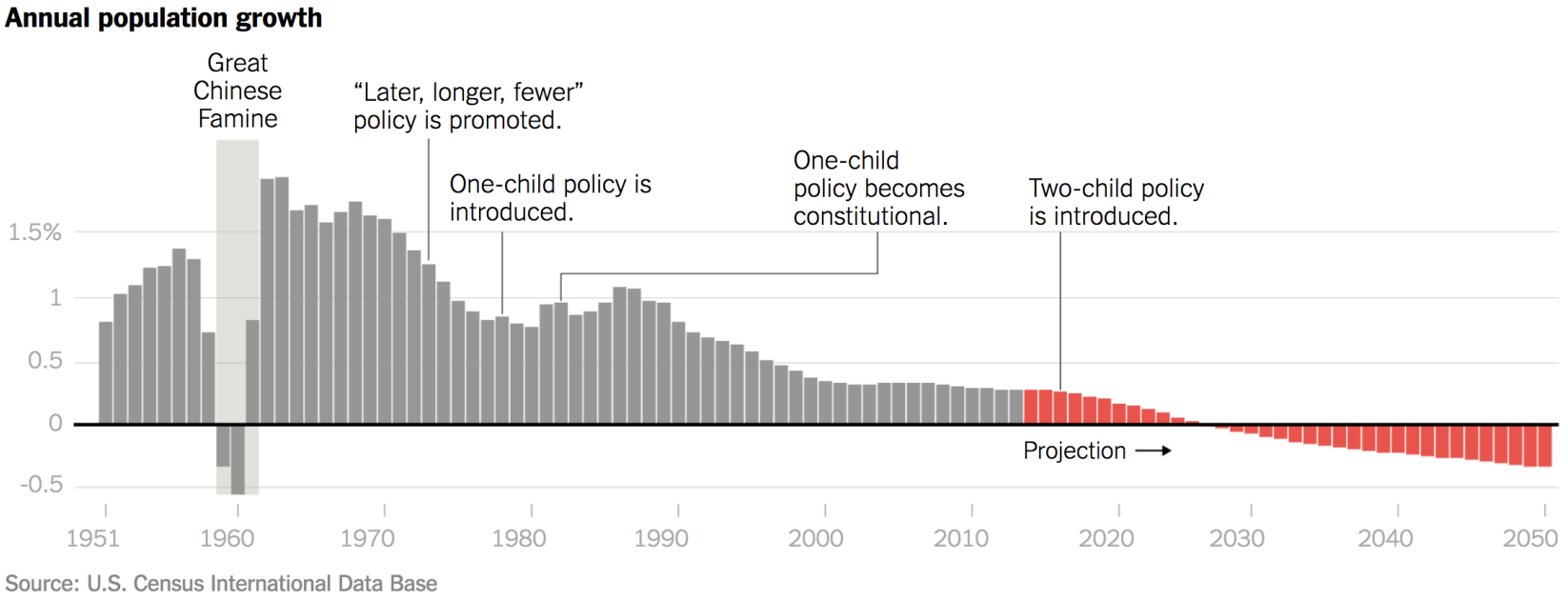
"Crisis"? I thought problem was too many people.

1. What's wrong with a shrinking population?
2. What is best size? For whom?
3. Why did pop grow so much since 1950?
4. What limited growth in earlier centuries?
5. What will happen to environment?
6. To inequality?

Note: In China, fertility story is not just policy, there's something long-term going on.



Goals of this class

Big picture:

- Learn why population matters (and doesn't)
- Learn about human behavior: choices about kids, marriage, migration, even longevity

Skills that I hope you gain ("learning aims"):

- Economic modeling in a new context (production, growth, choice, matching, investment)
- Data analysis. To evaluate the usefulness of our models and theories and need for new explanations.
- Critical thinking. About our world, data, models.

Format of Class

Details are in syllabus on bCourses

Please read the fine-print

Plan for semester

Part 1: Macro-demography (how population matters)

- Grand theories (optimum population, Malthus, neo-classical growth, Boserup)
- Demographic Transition
- Population Aging
- Population and Environment

Part 2: Micro-demography (behavior and determinants of population)

- Marriage and the family
- Fertility
- Migration
- Mortality

Questions? (please!)

Key documents

- Syllabus (grading, resources, policies, pre-req info)
- Course Calendar with readings (details of course content, with lab listings, links to readings, and lecture topics) [let's look at]
- Other guides (e.g., using gradescope, computing, etc.) bCourses & custom-site: https://courses.demog.berkeley.edu/goldstein175/

Course requirements

- Class attendance (in-class activities, demos)
- Weekly labs (35%)
- Exams: mid-term (25%) and final (40%)
- Extra-credit: 2% for being helpful on Piazza.
- Mini-project option, by approval (changes exam weights)
- Grading: We *curve*, so your numerical scores have only relative (not absolute) meaning. We will give you a letter grade with your numerical exam scores. Historically, final grades about evenly divided between As, Bs, and below-Bs

Active classroom

Dos

- Take part in in-class activities. Raise your hand, volunteer for demo, ...
- Take notes (pen and pencil)
- Ask questions; argue, query, contradict!
- Tell me if too fast, unclear, too quiet, ...

Don'ts

- No cell phones ("negative externalities")
- No laptops*
  * (unless in front row)

Advice

- Read "efficiently". Skim whole to see what it's about and then focus on important parts. Reading calendar has indications and hints.
- Team up. Do homework together (but write up independently). We will have a study hall on Fridays in Demography seminar room Social Science Building 3rd floor.
- Reviewing for exams. Slides are most important. Great study technique is to write your own Qs based on lectures and labs.

Labs (starting next week)

- Most weeks computing labs with real data and/or simulations + some other exercises.
- We're going to be using "R" and "Rstudio"

http://courses.demog.berkeley.edu/goldstein175/

- Don't worry if you don't know R or haven't had statistics. We are going to build gradually.
- Goal of labs is to learn economic demography, but a nice side-effect will be to learn "R".

Labs (grading)

- Electronic submission of graded portion (Gradescope)
- Sorry, we can't grade late submissions
- We will drop your lowest 2 grades (low stress).
- Can work together on problem sets, but you (1) must acknowledge the names of your collaborators. And (2) you must write up your answers by yourself.
- An optional mini-project (by application). Can extend a lab, do something new, or even write a "shiny" simulation app.

Mid-term and Final

- Mid-term will be about 80 mins
- Final will be during regular exam time (170 mins), covers whole semester, but emphasizes 2nd half.

Our team (people who can help you)

- Head GSI:
  - Mallika Snyder (mallikasnyder@berkeley.edu) (Enrollment issues, CE, DSP, first point of contact)
- Regular GSIs:
  - Elizabeth Breen (elizabeth_breen@berkeley.edu)
  - Juana Montoya Murillo (jgmontoyam@berkeley.edu)
  - Liam Jameson (liamjameson@berkeley.edu)
- Computing infrastructure
  - Dr. Carl Boe (cboe@berkeley.edu)

Resources

- Human beings
  - *Optional sections* (about 6 weeks over semester, multiple times in week)
  - Office hours (GSIs will post, and I will also be available)
  - Weekly Study Hall (Friday afternoons, SSB 3rd floor, in Demography Seminar Room
- Written word
  - Required readings (25-100 pages a week)
  - Available on-line, via bCourses
  - Copies of lecture slides (When available before class, I recommend printing out and taking notes directly on them)

e-resources

- Department-hosted course website (computing, important docs, links to bCourses and everything) http://courses.demog.berkeley.edu/goldstein175/

- Ed Discussions (replaces Piazza) discussion board

- Gradescope (for turning in labs)

https://courses.demog.berkeley.edu/goldstein175/GradescopeGuide.pdf

Communication

Suggested order

1. Ed Discussions
   Great place for logistical questions, because you are likely not the only one. Also good for substance. GSIs will check periodically but it's a huge help when other students answer.
2. Emailing head GSI (mallikasnyder@berkeley.edu)
3. Emailing me (josh.goldstein@berkeley.edu). For logistical matters, *please do last, not first*. For substance, always ok.

Questions?

- Topics?
- Logistics?
- Anything else?

Population Growth

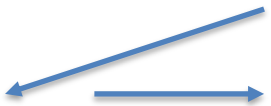
The Exponential Model and the History of Humanity

Class activity: Generational Population Growth (We'll try this on Thursday in break out rooms)

- We'll simulate generational growth, with each row of class a generation.
- Everyone in front row gets out a piece of paper.
- Everyone in class computes generational growth implied by their own family.
- Let's see what happens.

Format of sheet

Generation	# of kids	"per parent"	cumulative product
	N	N/2	multiply
0	3	1.5	1.5
1	1	.5	.75
2	2	1	.75
3 …		…	…



Discussion

- What happened?
- If we shift order of generations, would it matter?
- Is this a good statistical estimate of your parent's generations growth rate? What might be wrong?

World Population Growth

An overview of all of humanity's past and its future

World Population Size

Year	Millions	Growth rate (persons per yr)	Growth rate (%)
-8,000	4		
1	211		
500	200		
1000	290		
1500	473		
1750	764		
2000	6,080		
2015	7,218		

Source of Pop. Estimates: Weeks

World Population Size

Year	Millions	Growth rate (persons per yr)	(%)
-8,000	4	25k	
1	211	-22k	
500	200	180k	
1000	290	366k	
1500	473	1,160k	
1750	764	21,000k	
2000	6,080	75,000k	
2015	7,218		

World Population Size

Year	Millions	Growth rate (persons per yr)	Growth rate (% per yr)
-8,000	4	25k	~ 0
1	211	-22k	~ 0
500	200	180k	0.1
1000	290	366k	0.1
1500	473	1,160k	0.2
1750	764	21,000k	0.8
2000	6,080	75,000k	1.1
2015	7,218		

Which should we model?

The change in absolute numbers

OR

The proportional change?

Calculating exponential growth rate

Exponential Model

$$N(t) = N(0)\, e^{Rt}$$

To rewrite in terms of R, take natural logs (when I write "log", I mean "ln") and rearrange

$$\log N(t) = \log N(0) + R\, t$$

$$R = [\, \log N(t) - \log N(0) \,] \;/\; t$$

This is slope (rise-over-run) of graph of logarithm of population

Let's practice

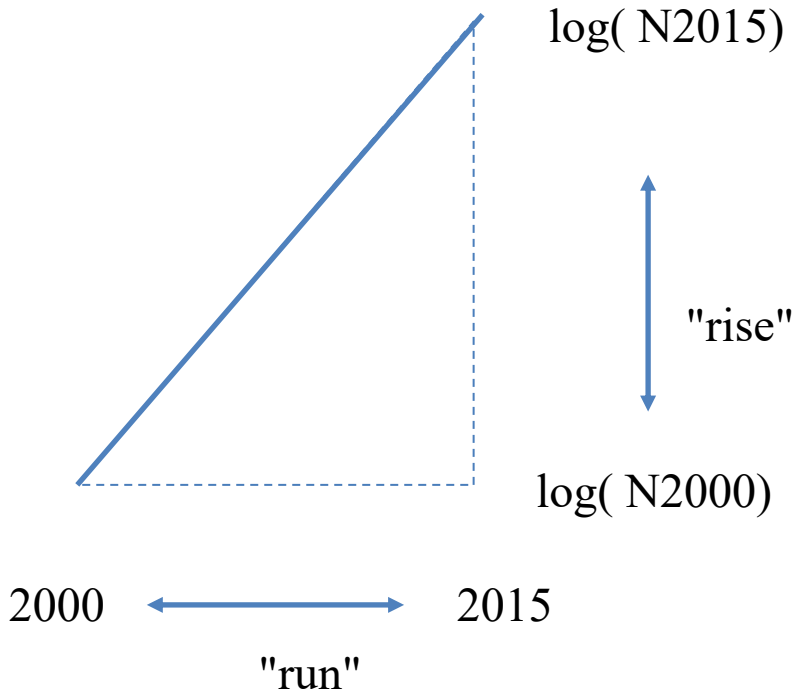
R = *slope of log graph*
= *rise / run*
= *change in log(pop) / time*

$R = [\ log\ N(t\ ) - log\ N(0)\ ]\ /\ t$

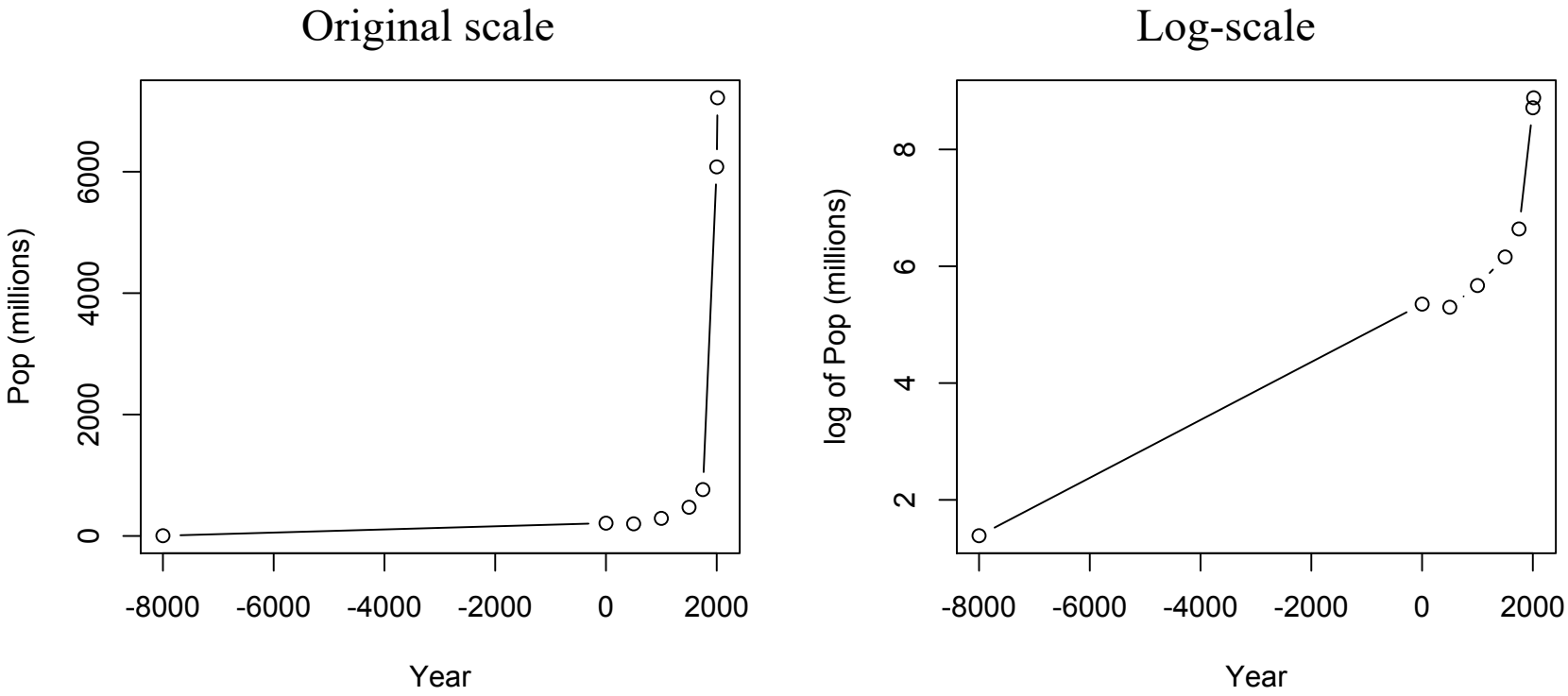
R (2000 to 2015) =
[*log*(N2015) – *log*(N2000)] /
(2015- 2000)

= [*log*(7,218) – *log*(6,080)] / 15

= ?



Seeing World Population Growth



What is closest to exponential growth rate over last 10,000 years?
A. 1/100 = 1%. B. 1/1000 = 0.1%. C. 1/10000 = 0.01%.

Has the growth rate been constant or increasing?

Conclusions

- Most of human history, no population growth
- Then, a period of accelerating growth rate
- We'll see in lab that *most recently*, slowing growth rate

  (Future of humanity may depend on pace of this slowing)

Understanding each of these phases is one of our goals. On Thursday, we'll cover the Demographic Transition, and then in a few weeks we'll study pre-modern times (Malthus).

For Thursday

1. Do the Coale reading [available at bCourses]