

Economic Demography Field Exam  
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There are four questions and you may take up to three hours. Answer all parts of all questions. The questions will be weighted according to the percent given in parentheses following the number. You may use a list of class readings for Econ 275. You may use a calculator. You may use a special two page list of demographic formulas that will be provided for you. On the methods question 4), please show your work and label your answers clearly. Answers with decimals should be given with six figures beyond the decimal point.

- 1) (30) The fertility transition is a key component of the demographic transition.
  - a) In a paragraph, describe the fertility transition as a global phenomenon, with some discussion of the different broad regions of the world, and the extent to which the fertility transition has been completed or is still under way.
  - b) What are the key economic factors driving this fertility transition according to economic theories of fertility? Explain briefly the relevant models (you can use equations and/or diagrams if you choose, but these are not required here).
  - c) Does mortality decline, whether endogenous or exogenous, enter into the theories discussed in b)? Should it?
  - d) Assess the view that contraceptive availability is largely irrelevant to fertility outcomes in developing and developed countries.
  
- 2) (20) Health is a valued good, yet people choose to behave in ways that reduce their health. How do economists think about such behavior? How might insights arising from the economic approach bear on public health policies to address different kinds of health problems?
  
- 3) (25) International migration is largely driven by the efforts of individuals to improve their lives by moving to areas where their human capital will earn a higher rate of return. Explain how these attempts by some individuals to improve their situations have economic consequences for others, in both source and destination countries. Include health consequences in your discussion, but you can skip political and social issues.
  
- 4) (25) California finds itself in 2014 in the midst of a severe drought. A previous severe drought occurred in 1977. In the period since 1977 total available water has not substantially increased. More than three quarters of water supplies go to agriculture and less than a quarter to individual consumption. Total agricultural consumption has decreased while individual consumption has increased with the growth of population. (A sheet of mathematical formulas is appended).
  - a) Table 1 shows Census population counts for California from 1970 onwards along with an estimate of population in 2014. All counts pertain to 1 April (Census day). Assuming a constant growth rate between 1970 and 1980, estimate the population of California in 1977 and find the growth rate and overall percentage by which the population has grown since the 1977 drought up to the 2014 drought.
  
  - b) Table 2 shows some recent U.S. period lifetable values for a combined-sex lifetable with unit radix. Water use per individual has been averaging about 250 gallons per person per day. Make the

stylized assumption that lifetable values and water consumption remain constant into the future. How much would total future lifetime water consumption come out to be for a person age 25 newly arriving in California?

c) Ascribing consumption of water and other resources to particular age groups is no easy matter. It seems plausible that water usage per person peaks for families raising young children. A proxy for the share of such families is the proportion of the population under age 10. To assess the impact of the overall growth rate on this proportion, calculate the proportion under age 10 in a stable population with the given lifetable and with an intrinsic growth rate equal to the observed 1977-2014 growth rate from Part (c). To shorten calculations, you may assume that the Crude Birth Rate in this stable population is  $b_r = 0.020856$ .

d) Compare the proportion under 10 from Part (c) to the proportion under 10 in a stationary population with the same lifetable. You may assume that the Crude Birth Rate in the stationary population is  $b_0 = 0.012700$ .

e) In two sentences, mention a few ways in which you would want to make your calculations more realistic and relevant to policy discussions.

Table 1. California Population Counts from U.S. Census

1970	19,953,134
1980	23,667,902
1990	29,760,021
2000	33,871,648
2010	37,253,956
2014 est.	38,340,555

(see next page for Table 2)

Table 2. Recent Combined-Sex Period U.S. Lifetable

x	nqx	lx	nLx	x	nqx	lx	nLx
0	0.006	1	0.9943	50	0.024	0.943	4.6556
1	0.001	0.994	3.9727	55	0.035	0.92	4.5176
5	0.001	0.993	4.9625	60	0.049	0.887	4.3275
10	0.001	0.992	4.9593	65	0.074	0.844	4.0626
15	0.002	0.992	4.9514	70	0.111	0.781	3.6912
20	0.004	0.989	4.9347	75	0.172	0.695	3.1759
25	0.005	0.985	4.9122	80	0.269	0.575	2.4904
30	0.005	0.98	4.887	85	0.418	0.421	1.6642
35	0.007	0.975	4.8565	90	0.623	0.245	0.8431
40	0.01	0.968	4.8152	95	0.838	0.092	0.2683
45	0.016	0.958	4.752	100	0.9	0.015	0.0411