Economic Demography Field Exam
Department of Economics
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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 equally in the overall grade (25 points each, as indicated in parentheses before each). You may use a calculator. You may use a special two page list of demographic formulas that has been given you with this exam. Please be as specific as you can in your answers, referring to the literature where appropriate.

1. (25) General health and longevity have improved markedly in the industrial nations during the past century or two. To some degree this improvement reflects advances in biomedical technology and public hygiene. However, rising income may also have been directly relevant, in addition to any indirect effects on technology and public hygiene. Draw on the theoretical and empirical literature to explain how and why economic improvement might have a direct effect. Discuss how any such effect might vary across the life cycle. Discuss why it is difficult to establish causality.

2. (25) A woman who turns 60 this week has seen the U.S. population grow from about 157.5 million in 1953 to 315 million today, a growth factor of about 315/157.5 = 2. In other words, there are two Americans today for every American around her when she was a newborn baby. (Two tables with data are given on the next page.)

   a) For men and women younger than 60, the growth factor they have experienced is less than 2. For men and women older than 60, the factor is greater than 2. Based on the tables below, estimate the average growth factor experienced since birth by living Americans today, averaging over all age groups in the population.

   You may treat each 20-year-wide age group as if it were concentrated at the middle age of the interval and use linear interpolation on the tables. Ignore contributions from the 94,000 individuals over age 100 and carry through your calculations for 1 January 2013, noting that Table 1 gives mid-year (1 July) population counts.

   b) Consider a stable population with an intrinsic rate of natural increase r. Using continuous values of age instead of discrete age groups, write down formulas for the following quantities:
       i.   the proportion of the stable population aged x;
       ii.   the number of people in a stable population aged x at time t as a function of t, taking t = 0 to be the present day.
       iii.   the growth factor experienced since birth by members of a stable population aged x at the present day.

   c) Derive a simple formula for the average growth factor experienced by the members of a stable population.

   d) Does your formula in Part c make sense in the case of a stationary stable population?

   e) Some of the economic consequences of population change, broadly construed, depend on changing proportions in age groups and would not be seen in a truly stable population. Others

depend on changing absolute numbers and would be expected even if the population were undergoing long-term stable growth. List two economic consequences that depend on changing absolute numbers and two that depend only on proportions. Based on your list, describe briefly some ways in which the doubling of U.S. population experienced by a 60-year-old woman has affected her life.

Table 1. Proportions by Age for U.S. Residents in 2013 (U.S. Census Bureau International Data Base)

Age Group	0 to 20	20 to 40	40 to 60	60 to 80	80 to 100
Proportion	0.266	0.269	0.270	0.158	0.037

Table 2. U.S. Resident Population over Time (Rounded U.S. Census Figures)

Year	Midyear Population in Millions
1890	63
1900	76
1910	92
1920	106
1930	123
1940	132
1950	151
1960	178
1970	203
1980	227
1990	249
2000	281
2010	309

3. (25) In recent years, the educational attainment of young women has been rising relative to young men, and the proportion of couples in which the woman earns more than the man has also been rising. Based on the economic theories of marriage, divorce and fertility, how would you expect these kinds of changes to influence the marriage market, the division of labor within marriage, divorce, fertility, and the responsiveness (elasticity) of fertility with respect to variations in the female and the male wage rate?

4. (25) Below are listed three papers on different aspects of the relation of population change to economic development (Acemoglu and Johnson, Bloom et al, and Miller). Each attempts to draw causal conclusions from empirical analysis. Explain the problems of endogeneity that arise in each of these three analyses, and the identification strategy employed in each case. Which of the three papers did you find most and least convincing, and why?
   a. Daron Acemoglu and Simon Johnson (2007) "Disease and Development: the Effect of Life Expectancy on Economic Growth", *Journal of Political Economy*, (December) volume 115, pp. 925-985.
   b. David E. Bloom, David Canning, Günther Fink and Jocelyn E. Finlay (2009) "Fertility, female labor force participation, and the demographic dividend" *Journal of Economic Growth* Volume 14, Number 2, 79-101, DOI: 10.1007/s10887-009-9039-9Open Access
   c. Grant Miller (2010) "Contraception as Development? New Evidence from Family Planning in Colombia," *Economic Journal*. Volume 120, Issue 545, pages 709–736.