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Male-Female Life Expectancy and Economic Freedom

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Since the advent of the Industrial Revolution, death rates have been declining in industrialized countries. During the 20th century, this mortality decline spread worldwide. Since 1950, for example, life expectancy rose from 67 years to just over 80 years in the world=s more developed countries. At the same time, the increase in less developed countries was from 37 to 68 years (Lomborg, 2001, 52). Longevity has obvious attractions as a measure of well-being: AThe extent that life expectancy is a summary of people=s health conditions, it is another dimension of individual welfare, independent of income and comparable to, but easier to evaluate than other non-income dimensions like safety, freedom, or access to justice or education@ (Bourguignon and Morrisson, 2002, 741). An important added advantage for longevity as a measure of welfare is that, alone among common measures, separate data on this aspect of well-being are available for each sex.[1]

[1]The UNDP=s Gender Development Index (GDI): measures Aachievements in the same dimensions and using the same indicators as the HDI [Human Development Index], but captures inequalities in achievement between women and men. It is simply the HDI adjusted downward for gender inequality@ (2002, 49). Such an index suffers from subjectivity that would render suspect any estimated relationships based on it. For the 163 countries for which GDI measures are available, the coefficient of correlation between GDI and life expectancy is 0.90. Income as a measure of welfare is appealing because it is easy to obtain, even on a household level. However, consumption within the household is hard to measure (Lazear, 1989, pp. 5-6).

The degree to which economic progress and free markets offer advantage to members of one sex relative to the other is the subject of much analysis. The United Nations Development Programme (UNDP) attempts to provide earnings data by sex, noting that the best that can be done is to offer crude estimates for many developing countries (UNDP 2002, 255). In general, evidence indicates that the spread of markets improved the relative lot of females. Chodes (1994) argues that females gained disproportionately from the opportunity to work in New England factories in the late 19th century. The gains that Chodes addresses related to household status: Young women who had left home to earn income, much of which was remitted to the household, were no longer as likely to accept the authority of the putative head of the household. In like vein, Geddes and Lueck (2002) report that Aincreases in wealth and the growth of cities (and their attendant specialized markets) is associated with the expansion of women=s rights@ (2002, 1091).

Other analysts focus directly on the advantages of having labor market participation as an option that results in more favorable resource allocation for women through increased bargaining power in intergenerational and betrothal negotiations. Klein (2002) measures women=s economic opportunity with labor force participation rates in his study of the factors that explain women=s international athletic performance. Khandker (1987, p. 541) buttresses the efficacy of this variable in finding that working Aas an unpaid family worker is not an independent choice for rural women in Bangladesh,@ meaning that the optimal market/non-market division of income is not obtained. Closer to the issues addressed herein, Edwards (1988, p. 241) reports increased life expectancies for Japanese women with greater labor force participation. Edwards does not directly address the issue of relative longevity of men and women.

The proposition that markets increase women=s welfare is disputed, at least in some cases. Brainerd (1998) reports that women=s wages in Russia fell relative to men=s wages from 1991 to

1994, but explanations for some of the wage differential are the greater proportion of women in the state sector, where earnings performance was poor, and different non-wage benefits (p. 1099). Brainerd (p. 1108) asserts that AY the breakdown of state control over enterprises may have enabled employers to discriminate against women more openly.@

This paper addresses the correlates of the relative well-being of females by examining the effects of two policy-related issues on relative longevity. In this regard, it follows Edwards. The policy-related variables are (1) a government=s view of its country=s population level compared to an ideal and (2) the extent of economic freedom in the country. In order to isolate the effects of these variables, we control for a set of variables that seem likely to affect relative longevity.

The paper proceeds as follows. The next section introduces the variables that are considered as correlates of relative longevity. The third section discusses the procedure for estimating the relationships between these variables and relatively longevity and presents the resulting estimates. The fourth section contains conclusions and a summary statement.

Correlates of relative longevity

Table 1 lists the variables included in the study, along with separate averages for male and female life expectancy. The mean (median) difference in female life expectancy and that of males is 4.367 (4.000) years. The minimum value (-2 years) occurred in Afghanistan; the maximum value (+13 years) occurred in Russia. The variables that are used to explain variations include the following descriptive variables: fertility rates (FertRate), the percent of population with HIV (PctHIV), income in $US1000 (Income [$1000]), the percent of the population living in urban areas (PctUrb), a measure of economic freedom (FreeIndx), and the percent of the population that uses contraceptives (PctConcp). Three categorical

variables enter the analysis: OldUSSR = 1 indicates that the country was a member of the former Union of

Table 1. Summary Statistics for Selected Variables

Variable	MEAN	MEDIAN	MIN	MAX
LifeDiff	4.367	4.000	-2.000	13.000
LifeExpM	61.899	66.000	37.000	77.000
LifeExpF	66.266	71.000	38.000	84.000
FertRate	3.348	3.100	1.1000	7.5000
PctHIV	3.434	0.500	0.100	35.800
Income($1000)	7.287	4.260	0.500	31.910
PctUrb	51.861	52.000	5.000	97.000
PctConcp	52.949	60.000	4.000	91.000
FreeIndx	6.2871	6.310	4.470	8.540
OldUSSR	0.152			
GovtHigh	0.519			
GovtLow	0.203			

Last three variables are binary. AMEAN@ shows proportion.

Soviet Socialist Republics, GovtHigh = 1 indicates that the government is on record as perceiving that the population is too large, and GovtLow =1 indicates that the government perceives that the population is too small. We briefly consider each variable.

a. *Fertility*

Because childbirth is among the leading causes of female mortality, especially in less-developed countries, fertility rates must enter into the analysis.[2] Observed fertility rates are often explained by differences opportunity costs of child rearing. For the data period under consideration, the fertility rate ranged from a low of 1.1 (in Armenia) to a high of 7.5 (in Niger).The fertility rate continues its secular decline: between 1970-75 and 1995-2000 this rate fell from 2.1 to 1.7 in high income countries, from 4.6 to 2.2 in middle income countries, from 5.7 to 4.0 in low-income countries, and worldwide from 4.5 to 2.8 (UNDP, 2002, Table 5).[3]

b. *HIV incidence*

[2]AEvery year more than 500,000 women die as a result of pregnancy and childbirth with huge regional disparities Y. The situation is worst in Sub-Saharan Africa, where a woman has a 1 in 13 chance of dying in pregnancy or childbirth@ (UNDP, 2002, 26).

[3]The measure of fertility used is ATotal Fertility Rate@ as reported in Population Reference Bureau, henceforth PRB (2002)[3]. Unless otherwise noted, other data are from that source.

That HIV is a worldwide threat to human welfare is now a commonplace. The threat is most grave in Africa: ASub-Saharan Africa, ravaged by HIV/AIDS and conflict, saw life expectancy reverse in the 1990s from already tragically low levels@ (UNDP, 2002, 26). For the present analysis, a salient aspect of this tragedy is its relative effect on women. According to a recent UN report (United Nations Integrated Regional Information Networks, 2002), AMore women than men are dying of HIV/AIDS in South Africa, a study of death certificates by Statistics SA [South Africa] has found. Y. In the 15 to 29 age group, HIV/AIDS deaths among females was about three times higher than among males.@ Gregson, Garnett, and Anderson (1994, 445) report a Atendency for female partners to be younger then their male counterparts,@ meaning that the increased mortality rates from HIV affects women at younger ages than it does for men. The percentage of populations reported HIV-positive ranges from a low of 0.1 (Algeria) to a high 35.8 (Botswana).

c. *Income*

The lowest per capita income level, $500 per year, is observed in Tanzania; the highest, $31,940 per year, is in the United States. These data are measured in Gross Domestic Income using Purchasing Power Parity exchange rates (PRB, 2002, 13). That income is directly related to longevity is generally accepted. Theory does not appear to offer guidance regarding whether females or males should gain more from increased income.

d. *Percent urban*

Urbanization affects family dynamics in numerous ways. These include access to schooling, access to job markets, and access to and information about contraceptives (Cochrane and Guilkey, 1995). Therefore, this aspect of a country must be taken into account, even though its implication for relative longevity is not apparent. One observation suggests, however, that urbanization might lead to a

relatively large increase in female longevity. Urbanization is associated with decreased infant mortality in developing countries (Maine, McNamara, Wray, Farah, and Wallace, 1990, 100-01). The same advantages that reduce infant mortality might reduce the incidence of delivery-related deaths, thus increasing women=s relative life expectancies.

Again, we use PRB (2002) data. The percent of the population living in urban areas ranges from 5 percent in Rwanda to 100 percent in Singapore, Hong Kong, and Kuwait. In many third-world countries, well under one quarter of the population lives in urban areas, while in industrialized countries the percentage is typically above three fourths.

e. *Percent using contraceptives*

That the use of reliable contraceptives can dramatically affect fertility is obvious and, evidence suggests, quite significant quantitatively. Roudi-Fahimi reports that Aif no women experienced contraceptive failure or stopped using a method, Egypt and Jordan=s total fertility rate would drop to 2.0 births per woman, Morocco=s to 2.4, and Turkey=s to 1.5" (2002, 5). The use of barrier contraceptives can also affect the spread of socially transmitted diseases. Accordingly this variable has potential for affecting relative longevity via its effect on fertility. Furthermore, this variable probably serves as a proxy for other underlying attitudes that can affect female longevity (Cochrane and Guilkey, 1995). Pharmaceutical contraceptives can directly affect longevity, but this effect appears to be small.[4] The

[4]Fortney, Harper, and Potts (1986, 121) report that for women in the United States, five years of oral contraceptive use has no effect on the life expectancies for women under 30 and decreases life expectancy up to 88 days for women over 40.

percentage using contraceptives ranges from a low of four percent in Chad and Mauritania to 91 percent in Italy.[5]

f. *Economic freedom*

[5]Contraceptive use is measured as he percentage of currently married or Ain-union@ women of reproductive age who are currently using any form of contraception. PRB (2002, 13).

We now turn from demographic control variables to the first of our measures of the political/economic environment within which people live. The preceding section suggests evidence that increased reliance on markets has improved the relative lot of women.[6] This paper uses a measure of economic freedom developed by Gwartney *et al.* (2002). Values of this variable range from a low of 4.47 to a high of 8.54. Countries with values below 5.00 are Algeria, Ukraine, Malawi, Togo, Russia, Zimbabwe, and the Congo. Those with values above 8.00 are the Netherlands, Canada, Ireland, New Zealand, Switzerland, the U. K. the U. S., Singapore, and Hong Kong.

A possible confounding factor in discovering any effect of economic freedom on relative longevity using cross-section data relates to the possibility that countries that have less economic freedom might also have more government-provided health care. Anecdotal evidence suggests that countries like Cuba do have good general health care, though they might not have the types of advanced treatment that freer countries might enjoy. If such government-provided health care focuses on prenatal and neonatal care, it could lead to increased life expectancy among females, masking other effects of economic freedom on relative female longevity. (See Maine, *et al.*, 1990, 90-91.)

A further complicating factor is that some countries have a high degree of economic freedom, but this does not extend to prenatal and neonatal care. Even in Singapore, where health care provision is largely market-oriented (according to WHO data on government health care expenditures as a percentage of total health care expenditures), hospitals charge higher fees for delivery if a family already has more than a determined number of children (David, 1982, 166).

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[6]An annotated bibliography of articles showing how economic freedom affects income growth and other aspects of citizens= welfare is maintained by the Fraser Institute, http://www.freetheworld.com/papers.html.

g. *The former Soviet Union*

The data examined includes a set of binary variables. The next two of these relate to policy stances. This one is purely descriptive and was added after preliminary data analysis showed a persistent set of deviations from the regression equation=s predictions. The countries that were members of the former U. S. S. R. account for 15.2 percent of the sample. The transition appears to have been most difficult for older men (Brainerd, 1998, 1105) who earn little more than new market entrants because their skills are obsolete. The countries in which the life expectancy difference was above ten years are the following: Kazakhstan, Ukraine, Latvia, Estonia, Belarus, and Russia.

h. *Government view of population size*

Finally, we consider the government view of population size. Table 1 reports that in 51.9 percent of the countries considered government considers the population to be too large, and that in 20.3 percent government considers the population to be too small.[7] Presumably these views translate into action to discourage or encourage fertility. Either anti-natal or pro-natal policies can affect the relative well-being of females.

[7]For a discussion of the variable, see PRB (2002), page 13.

Where governments view the population as too large, the potential for coercion is real. The most infamous of such policies is that of China. Aside from sensationalist stories of forced abortions and other procedures, the broad outline of the Chinese policy is well documented. Births in China are classified as approved and unapproved. A couple receives a card for an approved child (applied for in advance) and the card is shown for prenatal care, for the birth at the hospital, and neonatal care (Hardee-Cleaveland and Banister, 1988, 273). Fines are levied if a couple has more than the approved number, with payments continuing until the child is fourteen to sixteen years of age, thus increasing the cost of children in the years in which maintenance costs are greater than any income-earning potential.[8] Rural families who violate the guidelines may be allotted less productive agricultural lots and may be denied access to Aprivate@ markets where products in excess of their mandated output quota can be sold at a favorable price (see Scotese and Wang, 1995). A reported result of this policy is the phenomenon of the Amissing girls.@[9] Not only has the gender ratio of births changed unfavorably for females, but since the vigorous enforcement of China=s population policy in the 1980s, the number of abandoned healthy girls brought to orphanages, where mortality rates are high, has increased (Johnson et al., 1998, pp. 471, 474, 483). Adoption

[8]Johnson et al (1998) report that China=s one-child policy became vigorously enforced in the 1980s. Rural resistance brought a concession of allowing a second child if the first was a girl (p. 472).

[9]AThe proportion of boys increased after 1980: it was 108.5 in 1982 (the third national census); 110.9 in 1987 (population sample surveys showed); and 111.3 in 1990 (the fourth national census).Population experts see three factors as primarily responsible for the rise: increasing under-reporting of female births, excessive female infant mortality, and an increasing incidence of prenatal sex determination and subsequent sex-selective abortion of female foetuses@ (Shanghai *Star*, 2002).

would be an escape option for these girls but Chinese law restricts adoptions to parents older than 35 without children, exempting only orphans and disabled children from these restrictions (Johnson et al., 1998, 482).

Nor is this concern limited to China: AAnd around the world there are an estimated 100 million >missing= women--50 million in India alone--who would be alive but for infanticide, neglect or sex-selective abortions. A recent survey in India found 10,000 cases of female infanticide a year, and a study of a clinic in Bombay found that 7,999 of 8,000 aborted foetuses were female@ (UNDP, 2002). Infanticide does not explain the whole unfavorable situation facing females in the developing world, but is symptomatic of adverse treatment. Sen (2001, 3) reports that the Amortality disadvantage of women@ is through Aneglect of health, nutrition, and other interests of women that influence survival.@

While the behavior of China and India might be extreme, we expect that a government view that the population is too large can result in policies that reduce the relative longevity of females. Specifically, limitation of the number of births may increase women=s pregnancy-related mortality rates from increased recourse to unsanitary abortion procedures. Also, the limitation on the number of births may encourage women to postpone pregnancy so that wealth accumulation at a later age will allow for greater human capital investment in the smaller number of children. A postponement could put the delivery in women=s more dangerous childbearing years of the mid 30s. Finally, if a government views population as too high and has a monopoly on health care provision, it can ration prenatal care in a way that would be detrimental to pregnant women who, without prenatal care, are more likely to develop potentially fatal problems in pregnancy and childbirth, particularly in developing countries (see Maine et al., 1990, 91-92).

Whether a view that the population is too small should translate into a difference in expected longevity is less obvious. For

the sake of symmetry, however, we include a variable that takes into account such a view. One possible avenue for this stance to matter is via neonatal care. A pro-natal policy probably induces more neo-natal care and, given that male infants have a higher mortality rate, this behavioral change, though nominally sex-neutral, redounds to males= benefit and thereby reduces the female/male differential.

The following report on Hungarian mortality supports this hypothesis: A[F]rom the early 1920s to 1980 the mortality of the girls improves to a greater extent compared to the boys. After this however the rate of male mortality decreases more. The difference can be explained with the various development of neonatal mortality by sex. And as Dr. Zoltáán Marton writes at the early 1960s: >The extremely high neonatal mortality of the male infants can be attributed first of all to the different physiological and development characteristics but also the differences in mortality existing in later periods to show that the boys need a much greater care than the girls=@ (Marton, 1962 cited in Gáárdos and Joubert, 2001, 3).

As noted above, however, improved neonatal care could increase female longevity in more direct ways. The improved care redounds to the benefit of the mother as well as that of the child. In addition to the effect via neonatal care, a pro-natal policy stance could increase females= relative longevity by facilitating births in the prime childbearing years, thus avoiding the dangers noted above that relate to postponement of births.

The model and results

The dependent variable in the model is the difference between male and female life expectancies, measured in years. The independent variables are those introduced in the preceding section. Thus, the equation to be estimated is of this form:

$$LifeDiff = b_0 + b_1FertRate + b_2PctHIV + b_3Income + b_4PctUrb + b_5FreeIndex + b_6PctContp + b_7OldUSSR + b_8GovtHigh + b_9GovtLow + e.$$

The equation is estimated using a Afeasible generalized least squares@ method of adjusting for heteroskedasticity (Ramanathan, 2002, 358 BB 361). Heteroskedasticity could derive from any of a number of sources: country size, data quality,[10] and idiosyncrasies among countries.[11] The model is estimated six times. The first pass examines the 134 countries for which all data were available for all variables except that related to economic freedom and contraceptive use. The next two variables add the freedom index (reducing the sample size to 107) and contraception (further reducing the sample size to 89). The next three equations repeat the analysis in the first three, but with data excluded for Bangladesh, India, and China. These exclusions were based on concerns raised above that these countries= behavior might be atypical.[12] Estimation results largely conform with theoretical expectations. Consider first the Acontrol@ variables. The results show strong evidence in support of the hypothesis that fertility reduction increases the relatively longevity of women: A reduction in the average number of births increases the relative

[10]PRB (2002) reports a data quality variable. Using that variable as a weight in weighted least squares generated results generally consistent with those reported.

[11]Estimation is with GRETL. Ramanathan describes GRETL=s adjustment process. For more detail see Cottrell (2002, 37).

[12]China=s official stance regarding fertility is anomalous (Johnson et al., 1998). Differential treatment of male and female infants in India is widely reported (Sen, 2001; UNDP, 2002). Chowdhury and Bairagi (1990) report a strong preference for sons among Bangladeshis, and Caldwell et al. (1999) report the success of Bangladesh=s externally funded family planning initiatives.

longevity by an estimated 0.3 BB 0.4 years. The estimated values are consistent with Preston (1976), who estimates that maternal mortality decreases life expectancy by 0.5 years for a female life expectancy of 45 years (cited in Ruzicka and Hansluwka, 1982, 581).

The spread of HIV affects female longevity more than that of males: A one percent increase in the prevalence of HIV reduces female longevity by about 0.1 years relative to that of males. Increased income appears to favor males disproportionately, though the difference is slight: A $1000 increase in per capita income increases the relative longevity of males by an estimated 0.01 to 0.06 years.[13] Urbanization appears to favor females: A one-percent increase in urbanization is estimated to add about 0.01 BB 0.02 years to the relative longevity of females.

[13]Observations regarding the effect of improved neonatal care on the relative mortality of male and female infants might pertain here.

A striking result is that in countries that comprised the former USSR the relative longevity of females is dramatically higher than elsewhere even after other features are accounted for. The estimated difference varies depending on specification (and, therefore, on the sample of countries considered). Its lowest value is 1.3 years in specification 4. This specification includes all countries in the larger model but not Bangladesh, China, and India. The full sample also resulted in a relatively low estimated value of 1.6 years. The highest estimates occurred in those countries for which freedom index values but not contraceptive data were available, with values of 1.9 years when Bangladesh, China, and India are included and 2.1 when they are excluded.

The evidence supports the hypothesis that increased economic freedom redounds disproportionately to the advantage of females, though the support is weak. The estimated coefficient on this binary variable is consistently positive across all specifications. The estimate is largest in the subset of data for which data exist for both the freedom index and contraceptive use, including Bangladesh, China, and India.

Isolating the effect of economic freedom on relative longevity is difficult for at least two reasons. One possible confounding factor in discovering any effect of economic freedom on relative longevity using cross-section data relates to the possibility that countries like Cuba that have less economic freedom might also have more government-provided health care. If such government-provide health care focuses on prenatal and neonatal care, it could lead to increased life expectancy among females, masking other effects of economic freedom on relative female longevity (Maine, *et al.*, 1990, 90-91). A related complicating factor is that some countries have a high degree of economic freedom, but this does not extend to prenatal and neonatal care.

Furthermore, for reasons noted above, a significant degree of multicollinearity between economic freedom and other explanatory

variables is likely to pertain. Freer countries provide more opportunities for females, thus potentially reducing fertility. Likewise, freer countries are disproportionately urbanized, and are countries with higher income levels. The correlation coefficients between the freedom index and these variables are -0.51 (FertRate), 0.57 (PctUrb), and 0.75 (Income).

The estimates provide strong evidence that government policy affects the relative longevity of females. Other things equal, females in those countries in which the government considers population too large live about a year less, relative to men, than in countries in which government views population size as appropriate.

Likewise, where government views population as too small, the relative longevity of females increases by about one year, other things equal. This suggests that any improvement in the relative well-being of male infants in response to improved neonatal care is more than offset by the mothers= gains from the same improvements.

Conclusion

The longevity of females relative to that of males in a country is affected by that country=s history and by the stance of the government regarding population. In particular, relative life expectancy is dramatically higher in countries of the former USSR, apparently because of reduced life expectancy among males. Where the government perceives that the country=s population is too large, the relative life expectancy of females tends to fall, and where government perceives the population is too small the relative life expectancy tends to increase. The evidence in regards to these aspects of countries= social/political/historical landscape is clear.

Less clear is the effect of economic freedom on the relative longevity of females. The evidence supports the hypothesis that females gain disproportionately from increased economic freedom. The evidence, however, is relatively weak, failing to meet the standard criteria for significance in most specifications.

Table 2. Coefficient Estimates*Dependent variable: LifeDiff

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Const	5.697[a]	3.688[b]	3.093	6.422[a]	4.029[b]	4.418[b]
FertRate	-0.301[b]	-0.278[b]	-0.412c	-0.452[a]	-0.263[b]	-0.418[c]
PctHIV	-0.119[a]	-0.124[a]	-0.112[a]	-0.119[a]	-0.140[a]	-0.117[a]
Income	-0.010	-0.053[b]	-0.100[a]	-0.028	-0.037	-0.063[b]
PctUrb	0.009	0.025[a]	0.019[b]	0.008	0.021[b]	0.013
PctContr	---	---	0.006	---	---	0.005
FreeIndx	---	0.228[d]	0.484[b]	---	0.167[e]	0.258[f]
OldUSSR	1.571[a]	1.866[a]	1.618[a]	1.301[a]	2.141[a]	1.880[a]
GovtHigh	-0.990[b]	-1.249[a]	-1.760[a]	-0.993[b]	-1.054[b]	-1.367[a]
GovtLow	1.268[a]	1.097[a]	1.099[a]	1.312[a]	1.081[a]	1.197[a]
N =	134	107	89	131	104	86
R^2 =	0.681	0.817	0.867	0.717	0.797	0.824
F-Statistic =	38.518[a]	54.601[a]	57.339[a]	44.537[a]	46.514[a]	39.637[a]

*Heteroskedasticity-corrected estimates. See Ramanathan (2002).

a, b, c, indicate significance 1%, 5%, and 10% respectively (two-tail tests)
d: p-value = 0.263
e: p-value = 0.422
f: p-value = 0.268

Model
1. All Countries
2. All Countries with Freedom Index Data
3. All Countries with Freedom Index Data and Percent Contraceptives Data
4: Model 1 without Bangladesh, China, and India
5: Model 2 without Bangladesh, China, and India
6: Model 3 without Bangladesh, China, and India

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