Guety Rukashaza

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Professor Abassi

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Homework 5 : Change in Total Fertility Rates and Exposure to Family Planning Messages

"Population Control Policies and Fertility Convergence," written by economist and consultant Tiloka de Silva and Silvana Tenreyro, a professor of economics at the London School of Economics, is a study that analyzes the effect of policies on the total fertility rates. The research argues that the population control policies implemented in developing countries played a central role in the global decline in fertility rates and explain some patterns in the fertility decline that are not accounted for by other socioeconomic factors.

Introduction:

With many developing countries experiencing significant population growth, a result of an increase in life expectancy and increasing fertility rates, many feared a population explosion, leading to an overgrown population. To combat this, nations like the United States, India, Sweden, and more began setting up private, national, and non government institutions to set up policies and reduce fertility rates.

These population control programs are structured around two pivotal components: first, the augmentation of information dissemination and accessibility of contraceptives, and second, the implementation of public campaigns designed to establish a new societal norm that normalizes smaller families. These concerted efforts play a role in reinforcing and

complementing awareness surrounding contraceptives. The effectiveness of these programs is examining the relationship between various metrics of family planning program intensity and the decline in fertility. This analysis takes into account explanatory variables such as GDP, schooling, urbanization, and mortality rates, providing a comprehensive evaluation of the multifaceted dynamics at play within family planning initiatives.

Following the end of the second World War, many nations feared the levels of population growth would increase. As a means to combat this, a population control initiative, led by John D Rockefeller began. Rockefeller founded the Population Council in 1952, which marked a pivotal moment in the global discourse on population control. India took the lead in establishing the world's first national population program, setting the stage for international initiatives. The International Planned Parenthood Federation emerged, advocating for reproductive health on a global scale. A significant development occurred with a U.S. government report suggesting support for countries grappling with population challenges. USAID and the World Bank joined forces, providing financial backing and assistance for family planning programs worldwide.

The advent of the intrauterine device (IUD) and oral contraceptive pill revolutionized contraception, offering accessible and effective methods for the public. However, implementation faced challenges in certain countries, where cultural inhibitions, religious opposition to birth control, insufficient funding, and inadequate transport hindered progress. In 1976, approximately one-third of East Asian countries, a quarter of Latin American and Caribbean nations, and nearly two-thirds of South Asian countries had explicit policies to limit fertility.

Family planning organizations adopted impactful slogans, such as Indonesia's "Have only two or three children, that’s enough," prominently displayed on billboards and buildings. In

India, slogans like "A small family is a happy family" and "Big family: problems all the way; small family: happiness all the way" were used in advertisements to encourage smaller families and promote contraceptive use. Concurrently, religious figures advocated for abstinence as part of the discourse surrounding population control. These multifaceted efforts reflected a global commitment to addressing population challenges through a combination of policy, awareness campaigns, and accessible contraceptive options.

In tandem with efforts to enhance information dissemination and accessibility to family planning methods, strategies were implemented to defer marriage and childbirth or promote increased spacing between births as mechanisms for fertility control. Notably, legal age requirements for marriage underwent significant changes in different countries. In India, the legal age for marriage increased to 18 for women and 21 for men, while in Tunisia, it rose to 17 for women and 20 for men. China, both in urban and rural areas, witnessed adjustments in legal marriage ages, set at 25 years for women and 28 years for men in urban zones, and 23 years for women and 25 years for men in rural regions. Furthermore, China introduced measures mandating a minimum gap of three to four years between childbirths and limiting the number of children to three per couple, a policy that endured until the adoption of the stringent one-child policy in 1979. These legal and policy changes reflect diverse attempts to exert control over population growth by influencing marriage age and birth spacing.

The Data:

In the conducted experiment, the primary explanatory variables include infant mortality rate, GDP, schooling, years of education, percentage of women with exposure to family planning messages, and urbanization. The control variables include funds allocated for family planning per capita, and a family planning program effort score. This comprehensive approach, integrating

both main explanatory and control variables, allows for a nuanced exploration of the experiment's dynamics and contributes to a more robust understanding of the factors influencing the observed changes

Through experiments, de Silva Tenreyro argues that the global decline in fertility rates is undoubtedly influenced by socioeconomic factors, but these factors alone cannot fully explain the precise timing and pace of this decline. Cross-country data reveals a negative correlation between per capita income and fertility rates, indicating that income levels are not a direct determinant of fertility. Strikingly, fertility rates exhibit a consistent decline irrespective of income levels, challenging the notion that higher incomes correlate with higher fertility. Over the years, this relationship has shifted downward, with the average woman today having two fewer children than her counterpart in a similarly developed country in 1960. Population control programs, marked by increased contraceptive information and availability, along with public campaigns promoting smaller families, have played a crucial role in shaping societal norms. These efforts, particularly the normalization of smaller families, have proven instrumental in complementing awareness about contraceptives. Analyzing the relationship between family planning program intensity and declining fertility, considering variables such as GDP, education, urbanization, and mortality rates, is crucial. Despite the cross-sectional relationship between fertility and income in 1960 predicting a total fertility rate of approximately 4 at the average per capita GDP for 2013, the actual rate stands at a significantly lower 2.5 children per woman, underscoring the complex interplay of factors in shaping fertility dynamics.

Results :

Excluding control variables and replicating Table 5

	Absolute Values(Coefficient, STD. Error, T-test)	Percentage Values (Coefficient, STD. Error, T-test)
Exposure	--0.0501637 | 0.0116619 | -4.30	-0.4487411 | 0 .1577563 | -2.84
Change in education	0.0542766 | 0.1514325 | 0.36	0 .001063 | .0032964 | 0.32
Change in urban	-0.0353677 | 0 .0193643 | -1.83	-.00154702 | 0.0126971 | -1.22
Change in ln gdp	-0.5290709 | 0.354303 | -1.49	-0.3787111 | 0.2985066 | -1.27
Infant Mortality	0 .0017219 | 0.004959 | 0.35	-.5507735 | -.222149 | 2.48

Including control variables

	Absolute Values(Coefficient, STD. Error, T-test)	Percentage Values (Coefficient, STD. Error, T-test)
Exposure	-0.0497673 | 0.0137216 | -3.63	-0.2150197 | 0.1511174 | -1.42
Change in education	0.2168781 | 0.2277704 | 0.95	0.0000912 | 0.0025566 | 0.04
Change in urban	-0.037139 | 0.0189729 | -1.96	-0.0029626 | 0 .0116184 | -0.25
Change in ln gdp	-0.1762314 | 0.413469 | -0.43	-0.1805996 | 0 .2887687 | -0.63
Infant Mortality	0.0082438 | 0.0053713 | 1.53	0.7710411 | 0.1706856 | 4.52
Effort	0.0014243 | 0.0246376 | 0.06	0.1937541 | 0.2538184 | 0.76
Fundr	-0.0088971 | 0.0074803 | -1.19	-0.1768518 | 0 .0830273 | -2.13

First regression without controls using absolute values

```
regress abs_changefertility expo abs_change_in_education abs_change_urban
abs_change_ln_gdp  inf _mort

      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(5, 24)        =      6.28
       Model |  27.7876367         5  5.55752733   Prob > F        =    0.0007
    Residual |  21.2321489        24   .88467287   R-squared       =    0.5669
-------------+----------------------------------   Adj R-squared   =    0.4766
       Total |  49.0197855        29  1.69033743   Root MSE        =    .94057

------------------------------------------------------------------------------
   abs_changefertility | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-----------------------+------------------------------------------------------------------
                  expo |  -.0501637   .0116619    -4.30   0.000    -.0742327   -.0260948
abs_change_in_education |   .0542766   .1514325     0.36   0.723    -.2582647    .3668179
      abs_change_urban |  -.0353677   .0193643    -1.83   0.080    -.0753338    .0045983
     abs_change_ln_gdp |  -.5290709    .354303    -1.49   0.148    -1.260316    .2021745
              inf_mort |   .0017219    .004959     0.35   0.731    -.0085131    .0119568
                 _cons |   .7074009   1.121174     0.63   0.534    -1.606589    3.021391
------------------------------------------------------------------------------
```

The regression output suggests that the coefficient for the variable exposure is -0.0501637, and it is statistically significant ($p < 0.001$). This negative coefficient suggests that,

on average, a one-unit increase in the percentage of women exposed to family planning messages is associated with an absolute decrease of 0.050 in the Total Fertility Rate. However, the coefficients for the other independent variables (Absolute Change in Education, Absolute Change in Urbanization, Absolute Change in ln(GDP per capita), and Absolute Change in Infant Mortality) are not statistically significant, as their p-values are greater than the conventional threshold of 0.05. Overall, the results suggest that exposure to family planning messages is a significant predictor of the absolute change in Total Fertility Rates, while other variables in the model do not demonstrate statistical significance.

Absolute regression with controls

```
 regress abs_changefertility expo abs_change_in_education abs_change_urban
abs_change_ln_gdp inf
> _mort effort fundr

      Source |       SS           df       MS      Number of obs   =        22
-------------+----------------------------------   F(7, 14)        =      3.40
       Model |  15.9321177         7  2.27601681   Prob > F        =    0.0246
    Residual |  9.38440495        14   .67031464   R-squared       =    0.6293
-------------+----------------------------------   Adj R-squared   =    0.4440
       Total |  25.3165226        21   1.2055487   Root MSE        =    .81873

------------------------------------------------------------------------------
abs_changefertility | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
```

```
-----------------------+------------------------------------------------------------------
                  expo |  -.0497673   .0137216    -3.63   0.003    -.0791971   -.0203374
abs_change_in_education |   .2168781   .2277704     0.95   0.357    -.2716408    .7053971
      abs_change_urban |   -0.037139   .0189729    -1.96   0.071    -.0778319    .0035539
     abs_change_ln_gdp |  -.1762314    .413469    -0.43   0.676    -1.063034    .7105715
             inf_mort |   .0082438   .0053713     1.53   0.147    -.0032765    .0197642
               effort |   .0014243   .0246376     0.06   0.955    -.0514182    .0542667
                fundr |  -.0088971   .0074803    -1.19   0.254    -.0249406    .0071465
                _cons |   .5822345    1.30589     0.45   0.663    -2.218622    3.383091
------------------------------------------------------------------------------------------
```

A one-unit increase in exposure is associated with a statistically significant absolute decrease of 0.0497 in TFR. However, the absolute changes in education, urbanization, ln(GDP per capita), infant mortality, effort, and fundraising are not statistically significant predictors of absolute changes in TFR.

Percentage change without controls

regress perc_changefertility expo perc_change_edu perc_change_urban perc_change_ln_gdp infant_mort

```
      Source |       SS           df       MS      Number of obs   =        30
-------------+----------------------------------   F(5, 24)        =      8.22
       Model |  6100.68716         5  1220.13743   Prob > F        =    0.0001
    Residual |  3563.66811        24  148.486171   R-squared       =    0.6313
-------------+----------------------------------   Adj R-squared   =    0.5544
```

```
      Total |  9664.35527        29   333.25363   Root MSE       =    12.185

------------------------------------------------------------------------------
perc_changeferti~y | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------------+----------------------------------------------------------------
              expo |  -.4487411   .1577563    -2.84   0.009    -.7743341   -.1231481
    perc_change_edu |    .001063   .0032964     0.32   0.750    -.0057404    .0078663
 perc_change_urban |  -.0154702   .0126971    -1.22   0.235    -.0416758    .0107355
perc_change_ln_gdp |  -.3787111   .2985066    -1.27   0.217    -.9947985    .2373763
       infant_mort |   .5507735    .222149     2.48   0.021     .0922805    1.009266
             _cons |   23.25239   15.16475     1.53   0.138    -8.046117     54.5509
------------------------------------------------------------------------------
```

The main explanatory variable, "expo" (% of women with exposure to family planning messages on mass media), is significant and negatively associated with the percentage change in fertility (Coefficient: -0.4487411, p = 0.009). This suggests that a higher percentage of women exposed to family planning messages is associated with a decrease in the percentage change in fertility. However, other factors, including the percentage change in education, urbanization, ln(GDP per capita), and infant mortality rate, do not show statistically significant associations with the percentage change in fertility in this model.

Percentage change with control

```
regress perc_changefertility expo perc_change_edu perc_change_urban perc_change_ln_gdp
infant_mort  effort fundr


      Source |       SS           df       MS      Number of obs   =        22
-------------+----------------------------------   F(7, 14)        =      8.07
       Model |  3963.74257         7  566.248938   Prob > F        =    0.0005
    Residual |  981.921757        14  70.1372684   R-squared       =    0.8015
-------------+----------------------------------   Adj R-squared   =    0.7022
       Total |  4945.66433        21  235.507825   Root MSE        =    8.3748

------------------------------------------------------------------------------
perc_changeferti~y | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------------+----------------------------------------------------------------
              expo |  -.2150197   .1511174    -1.42   0.177    -.5391342    .1090949
   perc_change_edu |   .0000912   .0025566     0.04   0.972    -.0053922    .0055746
 perc_change_urban |  -.0029626   .0116184    -0.25   0.802    -.0278816    .0219564
perc_change_ln_gdp |  -.1805996   .2887687    -0.63   0.542    -.7999469    .4387477
       infant_mort |   .7710411   .1706856     4.52   0.000     .4049569    1.137125
            effort |   .1937541   .2538184     0.76   0.458    -.3506323    .7381404
             fundr |  -.1768518   .0830273    -2.13   0.051    -.3549276    .0012241
             _cons |   19.42823   13.68918     1.42   0.178    -9.932135     48.7886
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```

Expo exhibits a negative coefficient, suggesting that an increase in exposure is associated with a decrease in fertility rates, though the result is not statistically significant. Other variables, such as

changes in education, urbanization, and infant mortality, also play crucial roles in shaping fertility outcomes. Notably, the positive coefficient for "infant_mort" implies that an increase in infant mortality is associated with higher fertility rates.

Conclusion:

In summary, exposure, change in urban, and fundraising efforts show potential associations with a decline in fertility rates, while changes in education, ln GDP, and infant mortality exhibit mixed or nonsignificant associations. Like da Silva and Tenreyro‘s study, the following regressions and data analysis confirms the main conclusion made in the study, that the decline in fertility is not a result of economic growth, fundraising, and several other factors. While exposure might lead to a decline in fertility rate there are other social reasons why fertility may decline. As time progresses and social issues and morals change, social norms begin to change as things become different. In past generations, especially in the United States, the perfect American family includes a hardworking father, and a wife who works from home, cooks and cleans, and takes care of their children. However, this “American Dream” has heavily changed. Over the last few years, divorce rates have declined while women gain more rights and freedoms, especially in stricter nations, work in diverse professions, and make more money.

With women delaying childbirth to pursue personal and professional goals, there is a natural consequence of reduced fertility rates. Moreover, as women gain more rights and control over their reproductive choices, they are empowered to make decisions aligned with their individual aspirations. This combination of factors signifies a paradigm shift in societal values, where individuals prioritize personal fulfillment and career ambitions over traditional family models, contributing to the observed decline in fertility rates.