The Effect of Education Expenditure on Adolescent Fertility Rates

Georgia Institute of Technology

ECON 3161

Fall 2022

Prof. Shatakshee Dhongde

Isadorah Amazan & Hana Weji

Abstract:

This paper analyzes the relationship between education expenditure and the adolescent fertility rate through a cross-country analysis of 169 countries. The other factors that this paper will consider are life expectancy at birth, national income per capita, health expenditure, income inequality, and contraceptive prevalence. In addition to discovering a significant negative correlation between education expenditure and the adolescent fertility rate, we expect to use these results to justify the expansion of government spending on education expenses in countries with high adolescent fertility.

I. Introduction

According to the World Health Organization, teenage pregnancies account for 11% of all pregnancies worldwide, with approximately 16 million women between the ages of 15-19 becoming pregnant each year. The perspective toward this phenomenon varies due to each nation's unique cultural views and political structures. Although these nations have differing stances, a neutralizing topic that can be manipulated to decrease adolescent pregnancies is education. Since education is particularly crucial in the formative years of these young mothers, it leads us to question: what changes in education expenditure should be inaugurated to increase the attainability of higher levels of education for these women and thus, reduce the incidence of adolescent fertility?

When discussing the advancement of economic development, the topics of a rapidly growing population rate and an inefficient productive economy are at the root. As quickly as a large population can fuel an economy, unrestrained growth can lead to disproportionate poverty levels. Thus, the oversight of fertility rates is rationalized. Chung (2018) studies the risk and protective factors of adolescent pregnancy and supports that heightened education levels lessen adolescent births. Furthermore, teenage fertility impacts other economic factors that hinder growth, such as increased inequality and lower GDP, by affecting the quality of a country's labor supply. In addition to the economic effects, there is a growing concern about the adverse health outcomes of childbearing during adolescence and its impact on the life expectancy of the youth.

Thus, this paper will further discuss the importance of increasing government investments in education in countries with high fertility and its impact on decreasing adolescent fertility rates. Additionally, this paper contains other socioeconomic variables that could influence the rate of teenage fertility rates and potentially shed insight into other potential explanations. The implications of our findings are to justify possible education policy reforms and fiscal policies on preventative adolescent fertility solutions. For instance, nations enacting policies to foster the continuation of secondary education of women and girl, encouraging vocational training opportunities for dropouts, or providing better sex education to facilitate informed decisions.

II. Literature Review

Pradhan and Canning (2016) conducted a regression analysis of the effect of female schooling on teenage fertility by utilizing an established 1994 education reform in Ethiopia. The introduction of this reform increased total government expenditure on education from 8% in 1990 to 13% by 1995. The reform included a school feeding program, rescinding registration and tuition fees for students in grades 1-10, teachings using local languages, and increased public school funding, which led to a substantial increase in enrollment. They concluded that each additional year of schooling lowers the probability of adolescent childbearing and teenage marriage by about six percent. The variables the paper used are teenage birth, teenage marriage, teenage sex, years of schooling, exposure to policy, religion, ethnicity, and the number of siblings. However, an intriguing aspect of these results is that education reduces fertility in uneducated women but has little impact on women with formal education; it acts as a substitute rather than a complementary good. Overall, this paper's findings support our hypothesis that increasing government education spending can reduce adolescent fertility rates.

Klepinger, D., Lundberg, S., & Plotnick, R. (1999) focuses on the correlation between teenage fertility, human capital, and wages in early adulthood. The circumstance of teenage pregnancy not only reduces the years of formal education but also limits human capital investment activities. These reductions at an earlier rate led to long-term consequences on the mother's ability to provide, via earnings, employability, and wages. The paper presents a model of a teenager's decision to become a mother and invest in human capital through work experience and education to contrast the optimal human capital investment between an adolescent mother and a childless teenager. This paper used an intriguing variable of race; among whites, 16 percent were teenage mothers; among blacks, 38 percent. The conclusion was that young white mothers earn less due to their lack of formal education and work experience. However, there is no impact on their rates of return on these investments. Also, the paper indicates the average effects of adolescent childbearing on wage changes very little for young white women but significantly falls for black women; it reduces white women's wages by 13% and black women's wages by 23%. The results conclude that adolescent childbearing has significant adverse socioeconomic consequences, and actions to reduce these pregnancies will positively affect young women's economic opportunities.

Gunes, P.M. (2016) analyzes the relationship between teenage fertility and education by manipulating a change in compulsory schooling law (CSL) in Turkey. In 1997 Turkey implemented a nationwide reform on education, which extended the essential education requirement from five to eight years. This policy's effects were a significant increase in education levels and a 21% increase in enrollment levels of primary school students. The paper determined that CSL increased female students' primary school completion by six percent and that primary school education completion reduces adolescent fertility by 0.37 births. In addition to the reduction of teenage fertility, the implications of these findings show that improving females' education is associated with improvements in productive labor markets, health, and female empowerment, an issue prevalent in MENA countries such as Turkey. A distinctive factor discussed in this paper is their emphasis on targeting subpopulations, such as areas with high agricultural activity and low income, where the impact of increased education expenditures has a considerable significant influence on reducing the teenage fertility rate. More specifically, a ten percentage-point increase in the likelihood of completing primary school decreases fertility before 18 by around 44%. Like all the papers discussed, their analysis has a collective assumption: education negatively correlates with the adolescent fertility rate, providing us with a guideline for our paper's analysis.

The central distinguishing aspect of our paper is that it is a cross-country analysis of nations with varying cultural and economic standings, allowing us to examine other contributing economic factors. For instance, we could visualize a trend of the adolescent birth rates to socioeconomic indicators, such as GDP per capita and health expenditures by region, and make assumptions about why some countries outperform others. However, since the population size of the analysis is substantial, we cannot take into account current or former implementations of educational policy reforms in each nation. Despite this limitation, our paper adds additional support to evidence indicating that increasing educational spending reduces adolescent fertility, ultimately promoting economic development by creating a productive labor force.

III. Data

Independent Variable: Adolescent fertility rate, births per 1,000 women ages 15-19 (2018)

The dataset comes from the United Nations Population Division, World Population Prospects. It includes the number of births per woman between the ages of 15 and 19 for 217 countries.

Dependent Variable: Adjusted savings: education expenditure, current US dollars (2018)

The dataset comes from The World Data Bank utilizing data from the United Nations Statistics Division's Statistical Yearbook and the UNESCO Institute for Statistics database. It includes the current educational operating expenditures, including wages and salaries for 217 countries. Capital education expenditures (investments) are not included in this metric.

Explanatory Variables:

a. Life expectancy at birth, years (2018)

Areas with lower life expectancies may compensate by bearing children earlier in life. Therefore, it is important to account for this confounding factor in determining the effect education expenditure has on adolescent fertility rates. Nicola Bulled and Richard Sosis, in a paper titled *Examining the Relationship between Life Expectancy, Reproduction, and Educational Attainment,* introduce the concept of life history theory. Life history theory "explains the relationship between life events, recognizing that the fertility and growth schedules of organisms are dependent on environmental conditions and an organism's ability to extract resources from its environment" (2010). It is with this definition that they derive the partial hypothesis of life expectancy and adolescent reproduction being negatively related. At any given time, an organism is tasked with deciding between current and future investments. Should one fulfill present and personal needs or allocate resources to promote generational prosperity? In environments of surplus and stability, one is more incentivized to satisfy current desires as there is a less extreme trade-off between now and later. In less favorable environments characterized by insecurity and short-lived organisms, the yield of current investments isn't promised. Therefore, we see increased reproductive efforts. Now, in the context of human organisms and economic indicators, life expectancy serves as a means to distinguish these two environments. The dataset comes from the United Nations World Population Division and includes data for all available countries. Life expectancy here refers to the number of years a newborn infant would live if prevailing patterns of morality at the time of birth remained the same throughout its life.

b. Adjusted net national income per capita in current US dollars (2018)

Lower-income areas may be burdened with limited access to education and, thus, a higher prominence of adolescent births. This could result from a lack of sex education, a lack of opportunity for women, or a combination of the two. Higher-income areas where individuals have greater access to education may have a better understanding of birth control and contraceptive use through sex education. In addition to this and in terms of general life cycles, women and girls who are enrolled in school, especially in their adolescent years, are more likely to postpone childbearing. In a study conducted by researchers at Columbia University's Mailman School of Public Health, income, income inequality, and adolescent childbearing were analyzed across 142 nations. According to John Santelli, the lead professor behind this study, lower-income areas saw greater adolescent childbearing and higher-income areas saw less adolescent childbearing. The data comes from The World Data Bank and includes the adjusted net national income (GNI minus consumption of fixed capital and natural resource depletion).

c. Current health expenditure, % of GDP (2018)

Higher health expenditures may result in better access to abortion or contraceptive prevalence especially in progressive areas. In conservative regions, health expenditures in terms of contraceptives may not show significance however it still may impact adolescent childbearing through a lack of public health and social resources. The data comes from the World Health Organization's Global Health Expenditure Database and includes the current level of health expenditures expressed as a percentage of GDP. Health expenditures include healthcare goods and services consumed during each year. Capital expenditures such as buildings, machinery, IT, and stocks of vaccines for emergency outbreaks are not included in this indicator.

d. Gini Index (2018)*

Income inequality may contribute to the impact income alone has on adolescent fertility. For example, in terms of income per capita, the top 5 countries are Luxembourg, Norway, Switzerland, Iceland, and the United States. Among these countries, the United States has the highest income inequality with a Gini index of 41.1. This compares to Luxembourg's 35.4, Norway's 27.6, Switzerland's 33.1, and Iceland's 26.1. Among these five countries, the United States also has the highest adolescent fertility rate, 18.6. This is considerably higher than the rest of the group who together average 4.6 births per 1000 adolescents. The data come from the World Bank, Poverty and Inequality Platform. This index measures the distribution of income among individuals and households. A Gini index of 0 represents perfect equality, while an index of 100 indicates perfect inequality.

e. Contraceptive prevalence, any method, % of married women ages 15-49 (2018)*

Contraceptive prevalence speaks to the autonomy of family planning and the cultural differences regarding birth control. A country with a high prevalence will likely utilize more tools to avoid adolescent childbearing. A country with a very low prevalence may have bias against contraceptives and/or measures in place to prevent its use resulting in a higher incidence of adolescent fertility. For example, Chad has the lowest contraceptive prevalence at 8.1% and one of the highest rates of adolescent fertility at 157.9 per 1000 adolescents. On the other hand, Finland has the highest contraceptive prevalence at 85.5% and one of the lowest adolescent fertility rates, 5.7/1000. The data comes from household surveys compiled by the United Nations Population Division. It includes the percentage of married women ages 15-49 who are practicing, or whose sexual partners are practicing any method of contraception (modern or traditional). Here, modern methods include sterilization, hormonal pills, IUDs, condoms, injectables, implants, and emergency contraception. Traditional methods include fertility awareness, periodic abstinence, and withdrawal.

**Due to missing values and for a more accurate analysis, the 2018 time series was supplemented with the most recent data available after 2015.*

Variable Summaries

Variable	**N**	**Mean**	**Std. Dev.**	**Min**	**Max**
*adolescent fertility***	169	48.70	40.62	1.32	183.51
education expenditure	169	1.95E+10	7.76E+10	1.43E+07	9.19E+11
life expectancy	169	72.22	7.55	52.81	84.21
*income per capita***	169	11310.57	15356.73	175.00	69218.72
health expenditure *(% of GDP)*	169	6.40	2.65	1.94	16.69
Gini index	119	36.84	7.26	24.60	59.10
contraceptive prevalence	100	47.47	20.95	8.10	85.50

***Level values are summarized in the above table. Log values are utilized in regression analysis*

Correlation Table

Variable	*fertility*	*leduc*	*life*	*linc*	*health*	*gini*	*contra*
fertility	1						
leduc	-0.40	1					
life	-0.76	0.55	1				
linc	-0.67	0.65	0.85	1			
health	-0.28	0.12	0.35	0.45	1		
gini	0.42	0.06	-0.14	-0.10	-0.02	1	
contra	-0.57	0.62	0.72	0.63	0.35	0.16	1

Before conducting simple and multiple linear regression models, the data above must satisfy the following assumptions:

1. The model is linear in parameters

Our multiple linear regression models follow the format, $y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \ldots + \beta_k x_k + u$ Therefore, this assumption is satisfied.

2. Random sampling was used in the data selection

Data was gathered from official government sources. No edits were made other than omitted data to ensure a symmetrical analysis. Thus, there was no bias in sampling, and this assumption was met.

3. No perfect collinearity in explanatory variables

The correlation table above proves that there is no perfect collinearity among the independent variables.

4. Zero conditional mean

The error term, u, is included in regression formulas. However, it cannot be included in estimated formulas, as other variables not accounted for could impact the level of adolescent fertility. As a simplification, we assume that the expected value of u, given any value of the independent variables, is equal to zero. In other words, $E(u \mid x_1, x_2, \ldots, x_k) = 0$.

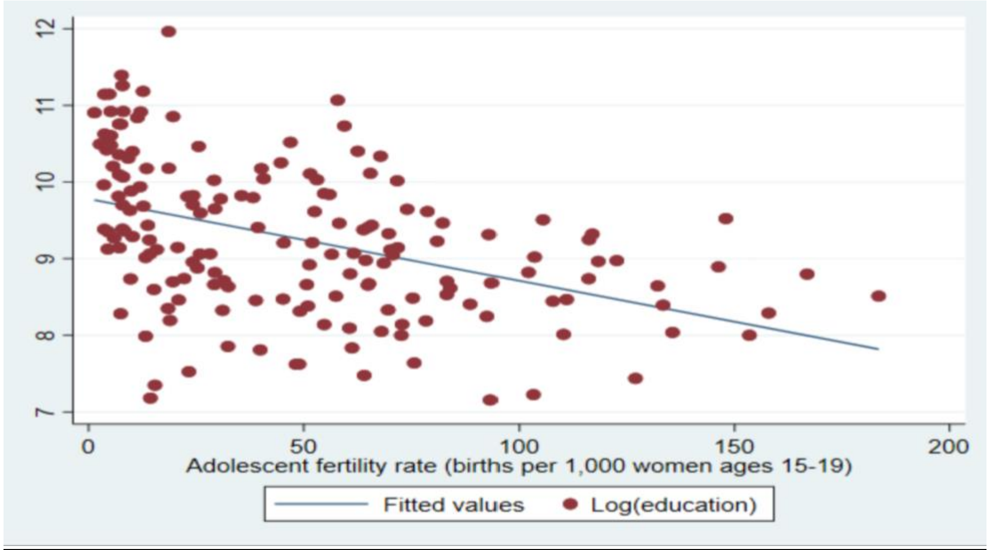
5. Homoscedasticity

The variance of the error term, u, is expected to be held constant. In the scatterplot above that places adolescent fertility against education expenditures, the points are not uniformly scattered. Thus, variance exists, and this assumption is met.

6. Normality of error term

It is difficult to measure the catch-all term, u. Therefore, we included more explanatory variables to evaluate the dependent variable better. Since we are assuming u equals zero, we will also assume that the mean and variance are also equal to zero

<u>(Level-Log) Simple Regression Model:</u>



III. Results

Model I:

This simple regression formula will be used to analyze the effect of education expenditures on adolescent fertility rates.

Simple Regression Formula:

$$fertility = \beta_0 + \beta_1(leduc) + u$$

Estimated Formula:

$$\widehat{fertility} = 216.59 - 18.13\ leduc + u$$

As expected, we see a negative relationship between education expenditure and adolescent fertility. This model estimates that a 1% increase in education expenditure results in a 0.1813 decrease in adolescent fertility. The R^2 value of 0.19 indicates a weak correlation and that only 19% of the variation is explained by the model. This makes sense given the notable deviation from the line of best fit in our Simple Regression Model scatter plot. The P-value of this model is equal to 0, meaning that the estimation is significant at the 1% level. Consequently, the isolated effect education expenditure has on adolescent fertility is both significant and minimal. Still, this model serves as a basis for interpreting future models.

Model II:

In this model, fertility is regressed against all explanatory variables: education expenditure, income, life expectancy, health expenditure, income inequality (Gini Index), and contraceptive prevalence.

Multiple Linear Regression Formula:

$$fertility = \beta_0 + \beta_1(leduc) + \beta_2(linc) + \beta_3(life) + \beta_4(health) + \beta_5(gini) + \beta_6(contra) + u$$

Estimated Formula:

$$\widehat{fertility} = 163.20 + 4.64\ leduc - 17.03\ linc - 2.22\ life + 0.86\ health + 2.52\ gini - 0.61\ contra$$

This model estimates the following: a 1% increase in *leduc* results in a 0.0464 increase in adolescent fertility; a 1% increase in *linc* results in a 0.1703 decrease in *fertility*; a one-year increase in life expectancy decreases *fertility* by 2.22/1000; a one unit increase in *health* increases *fertility* by 0.86 parts per 1000; a one unit increase in the Gini index results in a 2.52 increase in *fertility*; and a 1% increase in contraceptive prevalence leads to a 0.61 decrease in *fertility*. The R^2 value here is equal to 0.70 indicating a strong correlation among variables. The results of this model do not fully support our hypothesis. This model unexpectedly estimates a positive relationship between fertility, education expenditure, and health expenditure. Given that the opposite occurs when these variables are individually correlated (see Correlation Table page 5), we suspect a level of multicollinearity between *linc* and *life* and between *life* and *contra*, causing this model to be inaccurate and difficult to interpret. This is further explored in section iv. via F-tests.

Model III:

In this model, *linc*, *health*, and *contra* are removed from the above model.

Multiple Linear Regression Formula:

$$fertility = \beta_0 + \beta_1(leduc) + \beta_2(life) + \beta_3(gini) + u$$

Estimated Formula:

$$\widehat{fertility} = 280.18 - 0.17\ leduc - 3.87\ life + 1.37\ gini$$

According to this model, there is a negative relationship between adolescent fertility and education expenditure where a 1% increase in *leduc* results in a 0.0017 decrease in fertility. The negative coefficient on *life* once again indicates a negative relationship between adolescent fertility and life expectancy where a one-year increase in life expectancy corresponds to 3.87 fewer pregnancies per 1000 adolescents. As for the Gini index, a positive relationship between income inequality and fertility is illustrated where a 1-point increase in the index corresponds to a 1.37/1000 increase in adolescent fertility. The R^2 value for this model is 0.68 implying a strong correlation among the variables. The results and significance of this model align with our hypothesis: better education opportunities postpone childbearing beyond adolescent years, increased life expectancy being negatively related to fertility rates supports life history theory in that a better life outlook lessens the need for early reproductive efforts and increasing income inequality increases adolescent fertility likely through the inefficient and disproportionate distribution of resources. In this model, life expectancy and income inequality are significant at the 1% level, while education expenditure is statistically insignificant.

Model IV:

In this model, fertility is looked at as a function of education, health expenditure, and contraceptive prevalence.

Multiple Linear Regression Formula:

$$fertility = \beta_0 + \beta_1(leduc) + \beta_2(health) + \beta_3(contra) + u$$

Estimated Formula:

$$\widehat{fertility} = 166.72 - 6.19\ leduc - 1.89\ health - 0.77\ contra$$

This model estimates that a 1% increase in education expenditure results in a 0.0619 decrease in fertility. Secondly, if health expenditure as a percent of GDP increases by one, *fertility* is estimated to fall by 1.89 per 1000 adolescents. As for contraceptive prevalence, a 1% increase results in a 0.77/1000 decrease in *fertility*. The R^2 value is equal to 0.28 indicating a weak correlation among the variables. In addition, only contraceptive prevalence is significant at the 1% level, while *health* and *leduc* are insignificant. Nonetheless, the results of this model align with our hypothesis: increased education and health expenditures decrease adolescent fertility and contraceptive prevalence is negatively related to *fertility*.

Regression Model Summary:

Dependent Variable: Adolescent Fertility				
Independent Variables	Model (1)	Model (2)	Model (3)	Model (4)
Log(education expenditures)	-18.13*** (2.86)	4.64 (4.52)	-0.19 (2.75)	-6.19 (4.60)
Life expectancy	–	-2.22** (0.85)	-3.87*** (0.38)	–
Log(income)	–	-17.03 (12.49)	–	–
Inequality Index	–	2.52*** (0.48)	1.37*** (0.32)	–
Health expenditures	–	0.86 (1.33)	–	-1.89 (1.38)
Contraceptive Prevalence	–	-0.61** (0.24)	–	-0.77*** (0.22)
Intercept	216.59*** (26.66)	163.20*** (53.38)	280.18*** (29.23)	166.72*** (37.91)
No. of obs.	169	73	119	100
R-square	0.19	0.70	0.67	0.28

**10%, **5%, ***1% significance levels*

IV. Extensions

Model V: Addition of Dummy Variable

To further explore the reasons behind adolescent fertility, we added a dummy variable to evaluate whether women in parliament in the nation would have a significant impact. The rationale behind this lies in the potential for women in parliament to represent and advocate for policy designed to promote opportunities for women and girls. The model is an extension of the second multiple-regression model, with the addition of *win* (women in parliament). The data for this variable comes from a figure titled *Women in Politics* from the United Nations Entity for Gender Inequality and the Empowerment of Women (2021).

In this model:

win = 0, if less than 35% of the parliament (upper or lower) are women

win = 1, if more than 35% of the parliament (upper or lower) are women

Multiple Linear Regression Formula (dummy):

$$fertility = \beta_0 + \beta_1(leduc) + \beta_2(linc) + \beta_3(life) + \beta_4(health) + \beta_5(gini) + \beta_6(contra) + \beta_7(win) + u$$

Estimated Formula:

$$\widehat{fertility} = 163.68 + 4.61\, educ - 16.97\, linc - 2.22\, life + 0.85\, health + 2.53\, gini - 0.61\, contra + 0.66\, win$$

This model predicts that if a country has at least 35% female representation in parliaments there is a 0.66 increase in adolescent fertility. This positive correlation between female representation in government and adolescent fertility rate goes against what was intuitively assumed. This model has an R^2 value of 0.70 indicating a strong correlation among variables however, the dummy variable *win* is greatly insignificant with the P-value of 0.94. Therefore, we conclude that even though a nation could have a significant number of women in parliament it would have close to no effect on the rates of fertility among adolescents.

F-Test:

As shown in the correlation table, the explanatory variables, life expectancy, and income share high collinearity of 0.85, signaling multicollinearity in the model. It also shows this collinearity with the life expectancy and contraceptive variable (0.72). Due to these circumstances, we decided to drop the income variable in model III and the life expectancy variable in model IV.

Life expectancy and income

The null hypothesis that the variables, life expectancy, and income are jointly insignificant can be stated as:

H_0: $\beta_2 = 0,\ \beta_3 = 0$

The alternative hypothesis states that the variables, life expectancy, and income are jointly significant and can be stated as:

H_1: $H_0 = false$

$$F = \frac{(R^2_{UR} - R^2_R)/q}{(1 - R^2_{UR})/(n-k-1)} = \frac{\left[\frac{0.7049-0.6806}{3}\right]}{\left[\frac{1-0.7049}{73-6-1}\right]} \approx 1.81$$

The F-value of 1.81 was calculated and the critical value at the 10% significance level is 2.18. The F-value is smaller than the critical value, so we fail to reject the null hypothesis and find that life expectancy and income are jointly insignificant in affecting adolescent fertility rates.

Life expectancy and contraceptive prevalence

The null hypothesis that life expectancy and contraceptive prevalence are jointly insignificant can be stated as:

H_0: $\beta_3 = 0, \ \beta_6 = 0$

The alternative hypothesis states that life expectancy and contraceptive prevalence are jointly significant and can be stated as:

H_1: $H_0 = false$

$$F = \frac{(R^2_{UR} - R^2_R)/q}{(1 - R^2_{UR})/(n-k-1)} = \frac{\left[\frac{0.7049-0.2759}{3}\right]}{\left[\frac{1-0.7049}{73-6-1}\right]} \approx 31.99$$

The F-value of 31.99 was calculated and the critical value at the 10% significance level is 2.18. The F-value is larger than the critical value, so we reject the null hypothesis and find that life expectancy and contraceptives are jointly significant for affecting adolescent fertility rates.

A limitation of this analysis was that we were unable to have a consistent number of observations within the unrestricted and restricted models, without having a major effect on the coefficients of our variables. Although this signals that our F tests are unfitting, we estimate that this correction would not have a major effect on our values in relation to their critical values.

V. Conclusions

In conclusion, the initial hypothesis of an increase in education expenditures leading to a decrease in adolescent fertility rates proved to be true in all but one of our regressions. The second model showed the opposite with a positive relationship between education expenditure and adolescent fertility. Reasons for this could be the limited data points, the insignificance of *leduc*, and collinearity between datasets. Moreover, many variables proved to be statistically significant at the 1% level. For example, income inequality showed significance at the 1% level in both models II ($R^2 = 0.70$) and III ($R^2 = 0.67$). Once again aligning with our initial hypothesis stating that income inequality creates conditions that promote adolescent fertility. In addition, contraceptive prevalence is consistent in its negative relationship with fertility and showed significance at the 1% level in model IV (at the 5% level in model II). Interestingly, the regression estimate on *leduc* was insignificant for all but the first model. Although the direction of its relationship aligned with our hypothesis, such high P-values speak to the complexity of the issue of adolescent fertility. Another outcome from this study is that Model III was our strongest, supported by a high R^2 and the most significant variables. It shows that increased education expenditure and life expectancy, along with decreased income inequality, leads to a lower adolescent fertility rate. Obtaining more data for more countries over an extended period would be necessary to investigate further, the scope and determinants of adolescent fertility.

References

Bulled, N. L., & Sosis, R. (2010). Examining the Relationship between Life Expectancy, Reproduction, and Educational Attainment. Human Nature, 21(3), 269–289. https://doi.org/10.1007/S12110-010-9092-2

Chung, H. W., Kim, E. M., & Lee, E. (2018). Comprehensive understanding of risk and protective factors related to adolescent pregnancy in low- and middle-income countries: A systematic review. *Journal of Adolescence*, *69*, 180-188. https://doi.org/10.1016/j.adolescence.2018.10.007

Elina Pradhan & David Canning, 2016. "The Effect of Schooling on Teenage Fertility: Evidence from the 1994 Education Reform in Ethiopia," PGDA Working Papers 12816, Program on the Global Demography of Aging.

Gunes, P.M. (2016). The Impact of Female Education on Teenage Fertility: Evidence from Turkey. *B E Journal of Economic Analysis & Policy, 16*, 259-288.

Klepinger, D., Lundberg, S., & Plotnick, R. (1999). How Does Adolescent Fertility Affect the Human Capital and Wages of Young Women? *The Journal of Human Resources*, *34*(3), 421–448. https://doi.org/10.2307/146375

Santelli, John S. et al. (2017). Global Trends in Adolescent Fertility, 1990–2012, in Relation to National Wealth, Income Inequalities, and Educational Expenditures, 60(2), 161-168. https://doi.org/10.1016/j.jadohealth.2016.08.026

United Nations Entity for Gender Inequality and the Empowerment of Women. (2021). Women in Politics. *UN Women*. https://www.unwomen.org/sites/default/files/Headquarters/Attachments/Sections/ Library/Publications/2021/Women-in-politics-2021-en.pdf

World Data Bank, World Development Indicators. (2022). *DataBank*. https://databank.worldbank.org/source/world-development-indicators#

World Health Organization. Adolescent pregnancy. (n.d.). *World Health Organization*. https://www.who.int/news-room/fact-sheets/detail/adolescent-pregnancy#:~:text=Key%20facts%201%20As%20of%202019%2C%20adolescents%20aged

Appendix

```
. corr fertility educ life income  health gini contra
(obs=73)
```

	fertil~y	educ	life	income	health	gini	contra
fertility	1.0000						
educ	-0.4000	1.0000					
life	-0.7558	0.5549	1.0000				
income	-0.6733	0.6497	0.8457	1.0000			
health	-0.2801	0.1151	0.3538	0.4555	1.0000		
gini	0.4162	0.0599	-0.1357	-0.1048	-0.0176	1.0000	
contra	-0.5650	0.6156	0.7229	0.6308	0.3548	0.1579	1.0000

```
. regress fertility educ
```

Source	SS	df	MS			
				Number of obs	=	169
				F(1, 167)	=	40.09
Model	53673.041	1	53673.041	Prob > F	=	0.0000
Residual	223557.294	167	1338.66643	R-squared	=	0.1936
				Adj R-squared	=	0.1888
Total	277230.335	168	1650.18056	Root MSE	=	36.588

fertility	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
educ	-18.13115	2.863409	-6.33	0.000	-23.7843	-12.478
_cons	216.5911	26.66349	8.12	0.000	163.9501	269.232

```
. regress fertility educ income life health gini contra

      Source |       SS           df       MS      Number of obs   =        73
-------------+----------------------------------   F(6, 66)        =     26.28
       Model |  100919.835         6  16819.9726   Prob > F        =    0.0000
    Residual |  42242.1331        66   640.03232   R-squared       =    0.7049
-------------+----------------------------------   Adj R-squared   =    0.6781
       Total |  143161.969        72  1988.36067   Root MSE        =    25.299

------------------------------------------------------------------------------
   fertility | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
        educ |   4.635171   4.515894     1.03   0.308    -4.381102    13.65144
      income |  -17.02542   12.49431    -1.36   0.178    -41.97112    7.920269
        life |  -2.215567   .8514975    -2.60   0.011    -3.915637   -.5154979
      health |   .8567942   1.332688     0.64   0.523    -1.804003    3.517592
        gini |    2.52499   .4811556     5.25   0.000     1.564332    3.485649
      contra |  -.6073973   .2397645    -2.53   0.014    -1.086103    -.128692
       _cons |   163.2021   53.38079     3.06   0.003     56.62395    269.7803
------------------------------------------------------------------------------
```

```
. regress fertility educ life gini

      Source |       SS           df       MS      Number of obs   =       119
-------------+----------------------------------   F(3, 115)       =     81.66
       Model |  140600.961         3  46866.9871   Prob > F        =    0.0000
    Residual |  65997.9908       115  573.895572   R-squared       =    0.6806
-------------+----------------------------------   Adj R-squared   =    0.6722
       Total |  206598.952       118  1750.83858   Root MSE        =    23.956

------------------------------------------------------------------------------
   fertility | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
        educ |  -.1859276    2.74638    -0.07   0.946    -5.625978    5.254123
        life |  -3.865388   .3756905   -10.29   0.000    -4.609558   -3.121217
        gini |   1.365263   .3234475     4.22   0.000     .7245753     2.00595
       _cons |   280.1828   29.23097     9.59   0.000     222.2818    338.0837
------------------------------------------------------------------------------
```

```
. regress fertility educ health contra

      Source |       SS           df       MS      Number of obs   =       100
-------------+----------------------------------   F(3, 96)        =     12.19
       Model |  48510.4153         3  16170.1384   Prob > F        =    0.0000
    Residual |  127326.015        96  1326.31265   R-squared       =    0.2759
-------------+----------------------------------   Adj R-squared   =    0.2533
       Total |   175836.43        99  1776.12556   Root MSE        =    36.419

------------------------------------------------------------------------------
   fertility | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
        educ |  -6.188534   4.596441    -1.35   0.181     -15.3124    2.935329
      health |   -1.89419    1.38251    -1.37   0.174     -4.63845    .8500706
      contra |  -.7650889   .2249212    -3.40   0.001    -1.211554   -.3186239
       _cons |   166.7221   37.90774     4.40   0.000     91.47579    241.9683
------------------------------------------------------------------------------


. regress fertility educ income life health gini contra win

      Source |       SS           df       MS      Number of obs   =        73
-------------+----------------------------------   F(7, 65)        =     22.19
       Model |   100924.23         7  14417.7472   Prob > F        =    0.0000
    Residual |  42237.7382        65  649.811356   R-squared       =    0.7050
-------------+----------------------------------   Adj R-squared   =    0.6732
       Total |  143161.969        72  1988.36067   Root MSE        =    25.491

------------------------------------------------------------------------------
   fertility | Coefficient  Std. err.      t    P>|t|     [95% conf. interval]
-------------+----------------------------------------------------------------
        educ |   4.616237   4.556082     1.01   0.315    -4.482887    13.71536
      income |  -16.97483   12.60442    -1.35   0.183    -42.14759     8.19794
        life |  -2.223303   .8631184    -2.58   0.012    -3.947069   -.4995366
      health |   .8470492   1.348048     0.63   0.532    -1.845189    3.539288
        gini |   2.526836   .4853368     5.21   0.000     1.557552    3.496121
      contra |   -.608842    .242227    -2.51   0.014    -1.092603   -.1250812
         win |   .6628673   8.060114     0.08   0.935    -15.43429    16.76003
       _cons |   163.6819   54.10247     3.03   0.004     55.63181     271.732
------------------------------------------------------------------------------
```