An analysis of the relationship between economic development and demographic characteristics in the United States

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Chad M. Heyne
University of Central Florida

AN ANALYSIS OF THE RELATIONSHIP BETWEEN ECONOMIC DEVELOPMENT AND DEMOGRAPHIC CHARACTERISTICS IN THE UNITED STATES

by

CHAD M. HEYNE

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ABSTRACT

Over the past several decades there has been extensive research done in an attempt to determine what demographic characteristics affect economic growth, measured in GDP per capita. Understanding what influences the growth of a country will vastly help policy makers enact policies to lead the country in a positive direction. This research focuses on isolating a new variable, women in the work force. As well as isolating a new variable, this research will modify a preexisting variable that was shown to be significant in order to make the variable more robust and sensitive to recessions.

The intent of this thesis is to explore the relationship between several demographic characteristics and their effect on the growth rate of GDP per capita. The first step is to reproduce the work done by Barlow (1994) to ensure that the United States follows similar rules as the countries in his research. Afterwards, we will introduce new variables into the model, comparing the goodness of fit through the methods of R-squared, AIC and BIC. There have been several models developed to answer each of the research questions independently.

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INTRODUCTION

Changes in the world population demonstrate the importance of fertility/population, and emphasize the need to understand the connection between fertility/population and economic growth. Many studies in the economics literature attempt to explain the relationship between economic development and demographic characteristics or population growth. Some of the factors affecting economic growth that have been explored are the current fertility rate (Brander, Dowrick et al. 1993), lagged fertility rate (Barlow 1994), and age dependency ratio (ADR) (Hondroyiannis and Papapetrou 2005).

The issue of population growth is of growing importance, since as the ADR (the ratio of dependent individuals to the working age populace) increases there is an increased strain on social security systems and the labor force (Hondroyiannis and Papapetrou 2005). According to the Administration of Aging (AOA), the share of old-age population, those over the age of 65, in the United States will increase from 12.9% to 19% by 2030. Evidence of correlation between the size and age composition of population and economic factors is of especially great importance to policy makers. As a result of increased life expectancy and decreased fertility, it is a reasonable expectation that unless policies are put in place to curb the trend, the financial strain of an aging population will have adverse effects on the economic output of the United States. In order to avoid this problem, it is of great importance to implement policy changes with respect to the labor market and pension and healthcare systems for the elderly as well as policy changes to impact fertility rates.

The initial analysis of the effect of population growth on economic growth was done in the 1960s and 1970s, where researchers concluded that aggregate population growth had no significant effect on economic growth. However, it was later shown that current fertility rates contribute negatively to short-term economic development. For this reason Barlow suggested the lagged fertility rate variable for explaining the effects of population growth on long-term economic development. It was shown that there is a statistically significant negative effect of current fertility rates on economic growth and a statistically significant positive effect of lagged fertility (Barlow 1994).

Population growth is affected by a number of different factors including fertility rates, immigration, and mortality. The majority of these factors, such as immigration and the age dependency ratio are influenced mainly by fertility rates. Therefore, it is of interest to understand what affects the fertility rate in order to get a clearer picture of the change in population growth. Knowledge of how fertility rates, lagged and current, affect population growth is necessary in order to enact policy that will bolster the current population growth and counteract the effects of an aging population. Some of the factors affecting fertility rates are the increasing rate of women in the work force (Smith and Ward 1985), the increase in individuals attaining higher education (Ludwig and Vogel), the cost and quality of children (Becker 1960), and technological advances (Galor and Weil 2000).

During the demographic transition towards an older population, the existence of declines in mortality without concurrent reductions in fertility could result in the population outgrowing available fixed factors such as land (the Malthusian theory), or even factors that can be

reproduced such as physical capital (the Solow theory). Technological progress can increase the return to human capital, which in turn can lead to a reduction in fertility as families choose to invest in higher quality of children versus a larger quantity of children (Becker 1960; Barro and Becker 1989; Galor and Weil 2000). A reduction of fertility in this manner contributes positively to economic growth by allowing increased investment in human capital (Galor 2005).

Fertility also has an effect on the population's age structure, due to the fact that decreases in fertility decrease the dependency ratio of youth, which increases the current per capita GDP (Bloom, Canning et al. 2009). In addition to the effect on the age structure, there is a behavioral change of lower fertility owing to the number of women in the work force; a reduction in fertility introduces an increased amount of free time away from child care, which results in an increase in female labor supply. Female labor supply is a function of wage rates of men and women, the infant mortality rate, type of residence (urban versus rural), and women's fertility choice (Bloom, Canning et al. 2009).

PROBLEM

Although the literature in this field is extensive, the models developed mainly involve inflows to the labor force and population, with very weak explanatory variables dealing with outflow from the labor force (Barlow 1994; Hondroyiannis and Papapetrou 2005). Another problem encountered in the literature is the lack of empirical studies on the effects of population growth on economic development, especially of the United States. Even though some of the models utilized are very sophisticated, both statistically and econometrically, they show a glaring weakness in incorporating what theoretically are significant influences (i.e., adjusted ADR, immigration effects, etc).

A particular clear example of a shortcoming in variable definition is the ADR, which uses the ratio of dependents (those below the age of 15 or above the age of 65) to the working age populace (those between the ages of 15 and 65) (Hondroyiannis and Papapetrou 2005). This simple variable has significant explanatory power in understanding the effects of an aging population, but it is not very versatile. The ADR is defined without allowing for different behavior during recessions. That is, the elderly tend to work longer (i.e. they retire later) during recessions to offset their income-losses.

Due to the fact that the United States is a developed country, it has been shown that the United States does not follow the conventional standards of variable significance. Specifically, the Lagged Fertility should contribute positively to the growth of a country. However, due to the vast and lengthy recessions, the Lagged Fertility is actually contributing negatively. This is simply due to the fact that those born 18 years ago are still not contributing positively. In order to

counteract this, we have added Unemployment to the model as a variable. As this method is merely a stopgap to better understand our model, some thought must be given to the analysis of Lagged Fertility in developed countries going through periods of recession and possibly a new convention will arise.

The questions that will be addressed in this thesis deal with the ADR, the prevalence of women in the work force and a comparison between the effects of an increased number of women in the work force and fertility. Specifically, the questions asked are:

1) Does adjusting the upper age limit in the Age Dependency Ratio during recession periods improve our ability to explain per capita GDP growth?
2) Are increased labor force participation rates of women associated with higher growth rates of GDP?
3) Do increased labor force participation rates of women in the work force outweigh the effects of lower fertility rates in the general population?

The goal of this thesis is to answer these questions using statistical models to explain the significance and explanatory power of the variables proposed.

The significance of this research is of great importance, especially to policy makers. Understanding what demographic characteristics influence the economic development of the United States will assist policy makers in creating policies that promote the economic well-being of the country. For instance, is the effect of an aging population so significant that legislation should be passed to raise the retirement age? Is the current fertility rate low enough to be problematic for future generations? This research will not address and answer all of the questions

about population growth and economic development, but it will contribute to the growing wealth of information on these effects, and ultimately could contribute to the decision making process of the policy makers.

Although this research will not answer every question about population growth and economic development - it will provide some crucial groundwork for later research by developing a more sophisticated model depicting the effects of population growth on economic development. The empirical model established will likely be useable by researchers attempting to understand the same relationships for other countries besides the U.S.

DATA

The data were obtained from the World Bank's Data Catalog and the U.S. Census Bureau. The World Bank provided the following data: GDP Growth per Capita, Population Growth, Fertility, Age Dependency Ratio (calculated using the above defined age limits), Unemployment and Percent of Women in the Work Force. The population data used in calculating the adjusted Age Dependency Ratios was obtained from the U.S. Census Bureau, provided was a sum total of United State's Citizens listed by age every year. The adjusted Age Dependency Ratios were calculated by summing those between the ages of 0 and 14 and those over the upper limit, which ranged from 65-70 for our calculations. The data presented from World Bank were compared to our calculations for the base ADR to ensure calculations were identical. Following the calculation, we performed more work on the ADR data to prepare it for use in the models. Since the research question (1) from above asks if adjusting the ADR during periods of recession has an impact, a listing of recessions occurring in the United States between 1970 and 2009 was obtained from the National Bureau of Economics (Research., 2010 #46), then for those years in which a recession occurred the adjusted ADR was used instead of the base ADR. Similarly the lagged fertility variable used the World Bank data for fertility on a 17 year lag. Below is a table listing all variables used in the models, along with a brief description. See Appendix B for descriptive Statistics.

Table 1 - Variable Description

Dependent or Independent?	Variable Name	Description
Dependent	GDP Growth Per Capita	Annual Growth of United States' Gross Domestic Product per Capita measured in Percent
Independent	Fertility	Expected Births per Woman in Lifetime
Independent	Lagged Fertility	Fertility rate lagged 17 years
Independent	Unemployment	Annual Unemployment Rate measured in Percent
Independent	Population Growth	Annual Growth of the United States' Population measured in Percent
Independent	Percent of Women	Percent of Women Employed measured in Percent
Independent	Unmodified ADR	The ratio of population between the ages of 0-14, or 65+ to those between the ages of 15-64
Independent	ADR65	Age Dependency Ratio calculated using 15-65
Independent	ADR66	Age Dependency Ratio calculated using 15-66
Independent	ADR67	Age Dependency Ratio calculated using 15-67
Independent	ADR68	Age Dependency Ratio calculated using 15-68
Independent	ADR69	Age Dependency Ratio calculated using 15-69
Independent	ADR70	Age Dependency Ratio calculated using 15-70

It is understood that the relationships among these variables may exhibit some endogenous and exogenous characteristics that will not be reflected in a standard Ordinary Least Squares regression procedure. However, this is a preliminary analysis from which we will obtain a rudimentary understanding for use in further analysis and experimentation. Below is a time series plot indicating the complex relationships among the fertility rate, percentage of women in the work force, GDP per capita growth and unemployment rate variables (defined in Table 1)

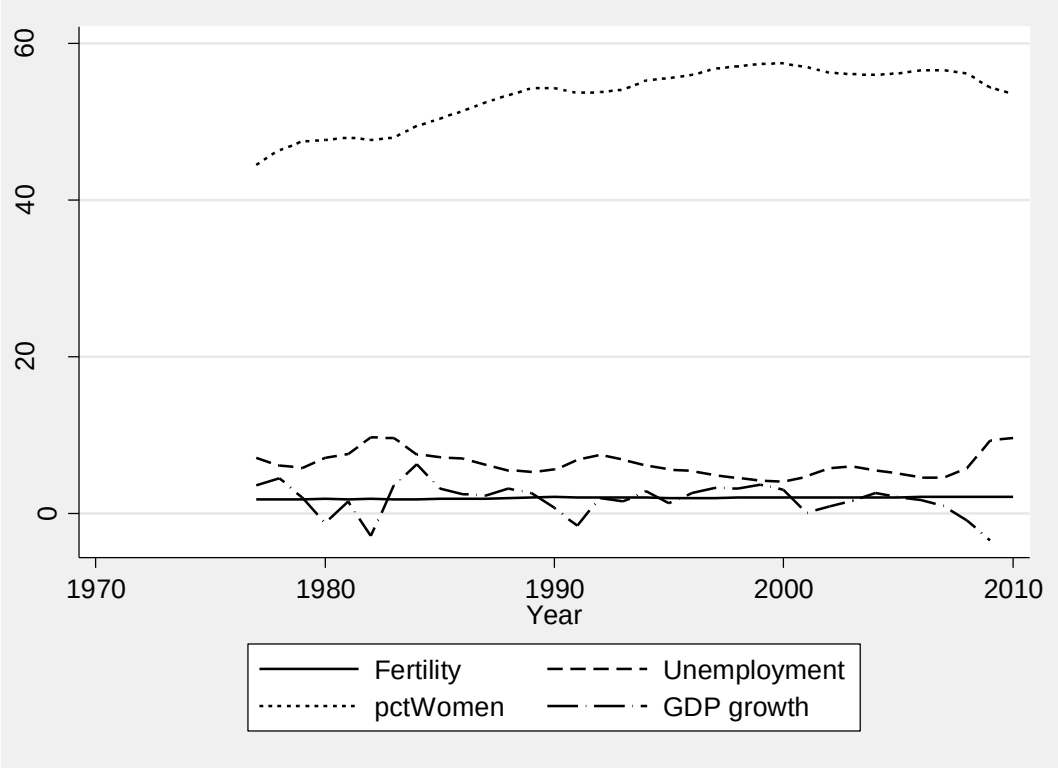

Table 2 – Time Series Plot

MODEL AND METHODOLOGY

When analyzing this data in Stata, we used several different procedures. The primary model upon which we make the inferences is an Ordinary Least Squares (OLS) Regression model with Newey-West Standard Errors. Due to the fact that our data is heavily time series related, there is a problem with autocorrelation. Autocorrelation causes biased and inconsistent estimates of the coefficient standard errors; it does not affect the point estimator or its estimates. The Newey-West procedure adjusts the estimator of those standard errors to give the correct estimated values. Since the methods of comparing models, R^2, AIC, and BIC are based on the data, we are able to use OLS Regression without Newey-West Standard Errors to make inferences about which model is best. The procedure for model selection came down to a two step process: first, perform an OLS Regression and note the R^2, AIC, and BIC; second, perform an OLS Regression with Newey-West Standard Errors. The base model for comparison is provided below; all variables are defined in Table 1. The motivation for the variables incorporated in this model is based on past models in the literature, specifically Barlow, Brander and Hondroyiannis. The initial model is then given by,

Model 1 $$y_t = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5$$

where

y_t is the growth rate of GDP per Capita at time t
x_1 is the fertility rate at time t

x_2 is the lagged fertility rate at time t
x_3 is the unemployment rate at time t
x_4 is the labor force participation rate of women at time t
x_5 is the unmodified Age Dependency Ratio at time t

```
. regress gdpgrowth unmodifiedadr fertility unemployment laggedfertility pctwomen

      Source |       SS       df       MS              Number of obs =      33
-------------+------------------------------           F(  5,    27) =    8.54
       Model |  82.4782584     5  16.4956517            Prob > F      =  0.0001
    Residual |   52.132195    27  1.93082204           R-squared     =  0.6127
-------------+------------------------------           Adj R-squared =  0.5410
       Total |  134.610453    32  4.20657667           Root MSE      =  1.3895

------------------------------------------------------------------------------
  gdpgrowth |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
unmodified~r |   -.2894782   .2523798    -1.15   0.261    -.8073188    .2283623
   fertility |   -18.79967    4.89297    -3.84   0.001    -28.83922   -8.760124
unemployment |   -1.477516   .3585031    -4.12   0.000    -2.213103   -.7419283
laggedfert~y |   -5.775585   1.936214    -2.98   0.006    -9.748367   -1.802803
    pctwomen |   -.8025924   .3962495    -2.03   0.053    -1.615629    .0104444
       _cons |    118.4366   36.06986     3.28   0.003     44.42739    192.4459
------------------------------------------------------------------------------
```

Table 3 – Base Model

```
. newey gdpgrowth unmodifiedadr fertility unemployment laggedfertility pctwomen, lag(0)

Regression with Newey-West standard errors          Number of obs  =        33
maximum lag: 0                                      F(  5,    27)  =     11.54
                                                    Prob > F       =    0.0000

------------------------------------------------------------------------------
             |               Newey-West
  gdpgrowth |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
unmodified~r |   -.2894782   .2292364    -1.26   0.217    -.7598324     .180876
   fertility |   -18.79967   5.070919    -3.71   0.001    -29.20434   -8.395003
unemployment |   -1.477516   .3638919    -4.06   0.000     -2.22416   -.7308713
laggedfert~y |   -5.775585   1.959804    -2.95   0.007     -9.79677   -1.754399
    pctwomen |   -.8025924   .3648123    -2.20   0.037    -1.551125   -.0540594
       _cons |    118.4366   34.50011     3.43   0.002     47.64825     189.225
------------------------------------------------------------------------------
```

Since the data are Time Series, the natural question arises: Does creating a new variable by incorporating a lag into the dependent variable improve the fit of the model? After running a single lag on GDP Growth per Capita, see Model 2 in Appendix A, we concluded that it was not significant.

```
. regress gdpgrowth l2.gdpgrowth unmodifiedadr fertility unemployment laggedfertility pctwomen
```

Source	SS	df	MS		
Model	90.3835372	6	15.0639229	Number of obs	= 33
Residual	44.2269161	26	1.70103524	F(6, 26)	= 8.86
				Prob > F	= 0.0000
Total	134.610453	32	4.20657667	R-squared	= 0.6714
				Adj R-squared	= 0.5956
				Root MSE	= 1.3042

gdpgrowth	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
gdpgrowth L2.	-.3000535	.1391864	-2.16	0.041	-.5861551	-.0139518
unmodified~r	-.3047024	.2369916	-1.29	0.210	-.7918456	.1824409
fertility	-20.43167	4.654571	-4.39	0.000	-29.99927	-10.86406
unemployment	-1.583515	.3400684	-4.66	0.000	-2.282535	-.8844943
laggedfert~y	-5.145508	1.840703	-2.80	0.010	-8.929128	-1.361889
pctwomen	-.6813336	.3761534	-1.81	0.082	-1.454528	.0918608
_cons	115.7976	33.87768	3.42	0.002	46.16102	185.4342

Table 4 - Model 3 – Unmodified ADR

```
. newey gdpgrowth l2.gdpgrowth unmodifiedadr fertility unemployment laggedfertility pctwomen, lag(0)

Regression with Newey-West standard errors          Number of obs  =        33
maximum lag: 0                                      F(  6,    26)  =     12.94
                                                    Prob > F       =    0.0000
```

gdpgrowth	Coef.	Newey-West Std. Err.	t	P>|t|	[95% Conf.	Interval]
gdpgrowth L2.	-.3000535	.1289139	-2.33	0.028	-.5650398	-.0350672
unmodified~r	-.3047024	.1816715	-1.68	0.105	-.6781335	.0687287
fertility	-20.43167	4.161167	-4.91	0.000	-28.98507	-11.87827
unemployment	-1.583515	.3695835	-4.28	0.000	-2.343205	-.823825
laggedfert~y	-5.145508	1.555333	-3.31	0.003	-8.34254	-1.948476
pctwomen	-.6813336	.3014506	-2.26	0.032	-1.300974	-.061693
_cons	115.7976	25.29174	4.58	0.000	63.80968	167.7855

When comparing the fit criterion between the base model (R^2 = .6217) and model 3 (R^2 = .6714), it is clear that adding a two year lag on GDP Growth per Capita increases the fit of the

model. In all subsequent models, the new variable is included for consistency. The inclusion of a two year lag on GDP Growth per Capita yields the following adaptation to model 1

$$y_t = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 y_{t-2}$$

where all variables are consistent with equation 1, except for the inclusion of y_{t-2} which is representative of a two year lag on the dependent variable.

Now that we have built our base model to be used for comparisons, we have the tools to start answering the research questions. In order to ascertain whether modifying the upper age limit of the ADR is beneficial to this model, we must step through each model comparing the R^2. Refer to Appendix B, models 4 through 10 to compare the R^2. After examining the models (See Table 4), we see that Model 9 – ADR70 (R^2 = .7446) increases the explanatory power the most.

Table 5 - Adjusted ADR Fit

Model 3 – Unmodified ADR	R^2 = .6714
Model 4 – ADR65	R^2 = .6552
Model 5 – ADR66	R^2 = .6859
Model 6 – ADR67	R^2 = .7111
Model 7 – ADR68	R^2 = .7269
Model 8 – ADR69	R^2 = .7374
Model 9 – ADR70	R^2 = .7446

```
. regress gdpgrowth l2.gdpgrowth adr70 fertility unemployment laggedfertility pctwomen
```

Source	SS	df	MS		
Model	100.236871	6	16.7061451	Number of obs	= 33
Residual	34.3735828	26	1.32206088	F(6, 26)	= 12.64
				Prob > F	= 0.0000
				R-squared	= 0.7446
				Adj R-squared	= 0.6857
Total	134.610453	32	4.20657667	Root MSE	= 1.1498

gdpgrowth	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
gdpgrowth						
L2.	-.1927634	.1269981	-1.52	0.141	-.4538116	.0682849
adr70	.191618	.0619093	3.10	0.005	.0643617	.3188743
fertility	-11.03183	4.961688	-2.22	0.035	-21.23072	-.832934
unemployment	-.8714704	.2961815	-2.94	0.007	-1.48028	-.2626606
laggedfert~y	-1.563243	1.449096	-1.08	0.291	-4.541902	1.415416
pctwomen	-.2096602	.2789596	-0.75	0.459	-.7830699	.3637495
_cons	34.60478	21.86391	1.58	0.126	-10.33714	79.5467

Table 6 - Model 9 – ADR70

```
. newey gdpgrowth l2.gdpgrowth adr70 fertility unemployment laggedfertility pctwomen, lag(0)
```

```
Regression with Newey-West standard errors          Number of obs  =        33
maximum lag: 0                                      F(  6,    26)  =     13.73
                                                    Prob > F       =    0.0000
```

gdpgrowth	Coef.	Newey-West Std. Err.	t	P>|t|	[95% Conf.	Interval]
gdpgrowth						
L2.	-.1927634	.1831798	-1.05	0.302	-.5692948	.183768
adr70	.191618	.073389	2.61	0.015	.0407648	.3424712
fertility	-11.03183	5.728547	-1.93	0.065	-22.80703	.7433687
unemployment	-.8714704	.3000002	-2.90	0.007	-1.48813	-.2548111
laggedfert~y	-1.563243	1.304725	-1.20	0.242	-4.245144	1.118658
pctwomen	-.2096602	.2195691	-0.95	0.348	-.6609911	.2416706
_cons	34.60478	21.261	1.63	0.116	-9.09783	78.30739

In order to understand whether an increased number of women in the work force increase the fit of the model, we must refer back to Table 3 – Model 3. From there we notice that the p-value and test statistic associated with pctwomen (defined above) in the model using Newey-West Standard Errors is .032 and -2.26, respectively.

We employed a standardized coefficients approach in order to understand the differing impacts of fertility and the number of women in the work force. From the last column in table 6, we see that $\left|\beta_{Fertility}\right| = |-1.107336| < \left|\beta_{pctwomen}\right| = |-1.263725|$.

Table 7 - Beta Model

```
. regress gdpgrowth l2.gdpgrowth   unmodifiedadr fertility unemployment laggedfertility pctwomen, beta

      Source |       SS       df       MS              Number of obs =      33
-------------+------------------------------           F(  6,    26) =    8.86
       Model |  90.3835372     6  15.0639229            Prob > F      =  0.0000
    Residual |  44.2269161    26  1.70103524           R-squared     =  0.6714
-------------+------------------------------           Adj R-squared =  0.5956
       Total |  134.610453    32  4.20657667           Root MSE      =  1.3042

------------------------------------------------------------------------------
   gdpgrowth |      Coef.   Std. Err.      t    P>|t|                     Beta
-------------+----------------------------------------------------------------
   gdpgrowth |
         L2. |  -.3000535   .1391864    -2.16   0.041                -.2756248
             |
unmodified~r |  -.3047024   .2369916    -1.29   0.210                -.1935754
   fertility |  -20.43167   4.654571    -4.39   0.000                -1.107336
unemployment |  -1.583515   .3400684    -4.66   0.000                -1.130103
laggedfert~y |  -5.145508   1.840703    -2.80   0.010                -1.498603
    pctwomen |  -.6813336   .3761534    -1.81   0.082                -1.263725
       _cons |   115.7976   33.87768     3.42   0.002                       .
------------------------------------------------------------------------------
```

RESULTS

We see from the above models that adjusting the upper age limit of the ADR to 70 contributes to an increased explanatory power of the model. The implications of this result are significant to policy makers. As the United States ages, the current population cannot keep up with the Social Security program without some form of revamping. If policy makers use this result to adjust the minimum age for admittance into the Social Security program, it could prove to be a stop-gap until a more permanent solution arises. As the United States is a developed country, we see deviations from Barlow's model where he dealt with developing countries; the element of interest is lagged fertility contributing negatively to the United States economic development contrary to the positive effect shown in Barlow's research. Without further research, we can only present reasonable hypotheses as to why this occurs.

1) Due to the numerous and lengthy recessions over the past 30 years, the ability for citizens 18 years of age to immediately find work.
2) An increased demand for technical and skilled labor, citizens 18 years of age are staying in school longer
3) Fertility rates have been consistently decreasing as the United States economy reaches a state of equilibrium. So, as the economy continues growing, the fertility rates have been declining.

Initially one would intuitively suspect that an increased number of women in the work force to contribute positively to the economic growth of the United States. However, as evidenced by model 3, it is clear that an increased number of women are associated, though not

indicative of lulls in economic development. If we consider that women participate in the work force as a family decision, not an individual decision, we arrive at the conclusion that during times of economic growth more women are likely to return to work and will leave work as the economy reenters a period of growth. Thus, one could conclude that the number of women in the work force is not predictive, but reflective of economic growth. In future research it will be of interest to examine the effect of a lagged number of women in the work force to increase the predictive power.

Finally, to compare the effects of the number of women in the work force and the fertility variables, we employ a standardized coefficient regression. The beta coefficient output from Stata is obtained by standardizing the coefficient to follow a normal distribution with mean 0 and variance 1, particularly; it outputs a standardized Z-score. In order to compare the effects of the two variables, one must compare the absolute value of the two beta coefficients. Referring to Appendix B, Model 10 – Beta Model, we obtain

$$\left|\beta_{Fertility}\right| = |-1.107336| < \left|\beta_{pctwomen}\right| = |-1.263725|$$

from this we infer that the effect of the labor force participation of women in the work force outweighs the effect of lower fertility rates in the general population.

CONCLUSION

We have produced a new, more powerful model for explaining the GDP Growth per Capita in the United States. However, there are still many questions that remain unanswered. In future research it will be of great interest to examine several different facets of the proposed variables in more economic and statistical detail. On top of more in depth research, there are some questions that arose during this research that were unable to be answered here. Some ideas for future research include

1) Testing the lagged fertility variable in developed countries and explain the negative impact compared to Barlow's model.
2) Taking into consideration developed countries put higher value on attaining a higher education when calculating lagged fertility.
3) Is the current fertility rate going to be problematic as the United States continues aging?
4) Is the aging problem so significant that a stopgap should be put into place to raise the retirement age?
5) Understand the reasons behind women entering the work force, which will then lead to an increased understanding of the causality of a growing trend of more working women.

Although we have provided a stepping stone in the process for understanding what has an effect on the economic development of the United States, there are still a lot of questions that

remain in order to truly make predictions based on demographic criterion. We have laid the ground work here for other researchers to build upon.

APPENDIX A: MODELS

```
//Base Model
. regress gdpgrowth unmodifiedadr fertility unemployment laggedfertility pctwomen

      Source |       SS       df       MS              Number of obs =      33
-------------+------------------------------           F(  5,    27) =    8.54
       Model |  82.4782584     5  16.4956517           Prob > F      =  0.0001
    Residual |   52.132195    27  1.93082204           R-squared     =  0.6127
-------------+------------------------------           Adj R-squared =  0.5410
       Total |  134.610453    32  4.20657667           Root MSE      =  1.3895

------------------------------------------------------------------------------
   gdpgrowth |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
unmodified~r |  -.2894782   .2523798    -1.15   0.261    -.8073188    .2283623
   fertility |  -18.79967    4.89297    -3.84   0.001    -28.83922   -8.760124
unemployment |  -1.477516   .3585031    -4.12   0.000    -2.213103   -.7419283
laggedfert~y |  -5.775585   1.936214    -2.98   0.006    -9.748367   -1.802803
    pctwomen |  -.8025924   .3962495    -2.03   0.053    -1.615629    .0104444
       _cons |   118.4366   36.06986     3.28   0.003     44.42739    192.4459
------------------------------------------------------------------------------

. estat ic

-----------------------------------------------------------------------------
       Model |    Obs    ll(null)   ll(model)     df          AIC         BIC
-------------+---------------------------------------------------------------
           . |     33   -70.02195   -54.37001      6       120.74    129.7191
-----------------------------------------------------------------------------
               Note:  N=Obs used in calculating BIC; see [R] BIC note

. newey gdpgrowth unmodifiedadr fertility unemployment laggedfertility pctwomen,
lag(0)

Regression with Newey-West standard errors          Number of obs  =        33
maximum lag: 0                                      F(  5,    27)  =     11.54
                                                    Prob > F       =    0.0000

------------------------------------------------------------------------------
             |             Newey-West
   gdpgrowth |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
unmodified~r |  -.2894782   .2292364    -1.26   0.217    -.7598324     .180876
   fertility |  -18.79967   5.070919    -3.71   0.001    -29.20434   -8.395003
unemployment |  -1.477516   .3638919    -4.06   0.000     -2.22416   -.7308713
laggedfert~y |  -5.775585   1.959804    -2.95   0.007     -9.79677   -1.754399
    pctwomen |  -.8025924   .3648123    -2.20   0.037    -1.551125   -.0540594
       _cons |   118.4366   34.50011     3.43   0.002     47.64825     189.225
------------------------------------------------------------------------------

. //Model 1 - One period lag GDP Growth
. regress gdpgrowth l.gdpgrowth unmodifiedadr fertility unemployment laggedfertility
pctwomen

      Source |       SS       df       MS              Number of obs =      33
-------------+------------------------------           F(  6,    26) =    7.68
       Model |  86.0560703     6  14.3426784           Prob > F      =  0.0001
    Residual |   48.554383    26  1.86747627           R-squared     =  0.6393
-------------+------------------------------           Adj R-squared =  0.5561
       Total |  134.610453    32  4.20657667           Root MSE      =  1.3666

------------------------------------------------------------------------------
   gdpgrowth |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   gdpgrowth |
         L1. |  -.2580668   .1864451    -1.38   0.178    -.6413101    .1251765
             |
```

```
unmodified~r |  -.3592211   .2532681    -1.42   0.168     -.879821    .1613789
   fertility |  -20.25635   4.925776    -4.11   0.000    -30.38143   -10.13128
unemployment |  -1.873715   .4541387    -4.13   0.000     -2.80721   -.9402195
laggedfert~y |  -6.645061   2.005125    -3.31   0.003    -10.76665   -2.523468
    pctwomen |  -1.006553   .4166244    -2.42   0.023    -1.862937   -.1501692
       _cons |   140.6732   38.94153     3.61   0.001     60.62778    220.7187
------------------------------------------------------------------------------

. estat ic

-----------------------------------------------------------------------------
       Model |    Obs    ll(null)   ll(model)     df          AIC          BIC
-------------+---------------------------------------------------------------
           . |     33   -70.02195   -53.19689      7     120.3938    130.8693
-----------------------------------------------------------------------------
               Note:  N=Obs used in calculating BIC; see [R] BIC note

. newey gdpgrowth l.gdpgrowth unmodifiedadr fertility unemployment laggedfertility
pctwomen, lag(0)

Regression with Newey-West standard errors          Number of obs  =        33
maximum lag: 0                                      F(  6,    26)  =      6.74
                                                    Prob > F       =    0.0002

------------------------------------------------------------------------------
             |             Newey-West
   gdpgrowth |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   gdpgrowth |
         L1. |  -.2580668   .1774726    -1.45   0.158     -.622867    .1067334
             |
unmodified~r |  -.3592211   .2410429    -1.49   0.148    -.8546918    .1362497
   fertility |  -20.25635   5.233444    -3.87   0.001    -31.01385   -9.498856
unemployment |  -1.873715   .5518436    -3.40   0.002    -3.008046   -.7393841
laggedfert~y |  -6.645061   2.377369    -2.80   0.010    -11.53181    -1.75831
    pctwomen |  -1.006553   .4644741    -2.17   0.040    -1.961293   -.0518128
       _cons |   140.6732   44.00291     3.20   0.004     50.22397    231.1225
------------------------------------------------------------------------------

. //Model 2 - One and Two period lag GDP Growth
. regress gdpgrowth l.gdpgrowth l2.gdpgrowth unmodifiedadr fertility unemployment
laggedfertility pctwomen

      Source |       SS       df       MS              Number of obs =      33
-------------+------------------------------           F(  7,    25) =    8.53
       Model |  94.8731621     7  13.5533089           Prob > F      =  0.0000
    Residual |  39.7372912    25  1.58949165           R-squared     =  0.7048
-------------+------------------------------           Adj R-squared =  0.6221
       Total |  134.610453    32  4.20657667           Root MSE      =  1.2608

------------------------------------------------------------------------------
   gdpgrowth |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   gdpgrowth |
         L1. |  -.2899826   .1725425    -1.68   0.105    -.6453404    .0653753
         L2. |  -.3178676   .1349624    -2.36   0.027    -.5958278   -.0399074
             |
unmodified~r |  -.3839743    .233895    -1.64   0.113      -.86569    .0977414
   fertility |  -22.16539   4.616117    -4.80   0.000    -31.67247   -12.65832
unemployment |  -2.035006   .4245367    -4.79   0.000    -2.909356   -1.160656
laggedfert~y |  -6.085108   1.865093    -3.26   0.003    -9.926339   -2.243877
    pctwomen |  -.9033194   .3868583    -2.34   0.028    -1.700069   -.1065698
       _cons |   140.6276   35.92648     3.91   0.001     66.63562    214.6196
------------------------------------------------------------------------------

. estat ic

-----------------------------------------------------------------------------
```

```
       Model |    Obs    ll(null)   ll(model)     df          AIC         BIC
-------------+---------------------------------------------------------------
           . |     33   -70.02195   -49.89038      8     115.7808    127.7528
-------------------------------------------------------------------------------
               Note:  N=Obs used in calculating BIC; see [R] BIC note

. newey gdpgrowth l.gdpgrowth l2.gdpgrowth unmodifiedadr fertility unemployment
laggedfertility pctwomen, lag(0)

Regression with Newey-West standard errors          Number of obs  =        33
maximum lag: 0                                      F(  7,    25)  =      6.23
                                                    Prob > F       =    0.0003

------------------------------------------------------------------------------
             |             Newey-West
   gdpgrowth |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   gdpgrowth |
         L1. |  -.2899826   .2090984    -1.39   0.178    -.7206288    .1406636
         L2. |  -.3178676   .1279594    -2.48   0.020    -.5814049   -.0543303
             |
unmodified~r |  -.3839743    .201545    -1.91   0.068     -.799064    .0311153
   fertility |  -22.16539   4.271624    -5.19   0.000    -30.96297   -13.36782
unemployment |  -2.035006   .6287737    -3.24   0.003     -3.32999   -.7400222
laggedfert~y |  -6.085108    2.21091    -2.75   0.011    -10.63856   -1.531654
    pctwomen |  -.9033194   .4489623    -2.01   0.055    -1.827975    .0213359
       _cons |   140.6276   41.68744     3.37   0.002     54.77071    226.4845
------------------------------------------------------------------------------

. //Model 3 - Two Period lag GDP Growth
. regress gdpgrowth l2.gdpgrowth unmodifiedadr fertility unemployment laggedfertility
pctwomen

      Source |       SS       df       MS              Number of obs =      33
-------------+------------------------------           F(  6,    26) =    8.86
       Model |  90.3835372     6  15.0639229           Prob > F      =  0.0000
    Residual |  44.2269161    26  1.70103524           R-squared     =  0.6714
-------------+------------------------------           Adj R-squared =  0.5956
       Total |  134.610453    32  4.20657667           Root MSE      =  1.3042

------------------------------------------------------------------------------
   gdpgrowth |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   gdpgrowth |
         L2. |  -.3000535   .1391864    -2.16   0.041    -.5861551   -.0139518
             |
unmodified~r |  -.3047024   .2369916    -1.29   0.210    -.7918456    .1824409
   fertility |  -20.43167   4.654571    -4.39   0.000    -29.99927   -10.86406
unemployment |  -1.583515   .3400684    -4.66   0.000    -2.282535   -.8844943
laggedfert~y |  -5.145508   1.840703    -2.80   0.010    -8.929128   -1.361889
    pctwomen |  -.6813336   .3761534    -1.81   0.082    -1.454528    .0918608
       _cons |   115.7976   33.87768     3.42   0.002     46.16102    185.4342
------------------------------------------------------------------------------

. estat ic

-------------------------------------------------------------------------------
       Model |    Obs    ll(null)   ll(model)     df          AIC         BIC
-------------+---------------------------------------------------------------
           . |     33   -70.02195    -51.6566      7     117.3132    127.7888
-------------------------------------------------------------------------------
               Note:  N=Obs used in calculating BIC; see [R] BIC note

. newey gdpgrowth l2.gdpgrowth unmodifiedadr fertility unemployment laggedfertility
pctwomen, lag(0)

Regression with Newey-West standard errors          Number of obs  =        33
maximum lag: 0                                      F(  6,    26)  =     12.94
```

```
                                                      Prob > F       =    0.0000

------------------------------------------------------------------------------
             |             Newey-West
   gdpgrowth |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   gdpgrowth |
         L2. |  -.3000535   .1289139    -2.33   0.028    -.5650398   -.0350672
             |
unmodified~r |  -.3047024   .1816715    -1.68   0.105    -.6781335    .0687287
   fertility |  -20.43167   4.161167    -4.91   0.000    -28.98507   -11.87827
unemployment |  -1.583515   .3695835    -4.28   0.000    -2.343205    -.823825
laggedfert~y |  -5.145508   1.555333    -3.31   0.003     -8.34254   -1.948476
    pctwomen |  -.6813336   .3014506    -2.26   0.032    -1.300974    -.061693
       _cons |   115.7976   25.29174     4.58   0.000     63.80968    167.7855
------------------------------------------------------------------------------

. //Model 4 - ADR65
. regress gdpgrowth l2.gdpgrowth adr65 fertility unemployment laggedfertility pctwomen

      Source |       SS       df       MS              Number of obs =      33
-------------+------------------------------           F(  6,    26) =    8.23
       Model |  88.1904798     6  14.6984133           Prob > F      =  0.0000
    Residual |  46.4199736    26   1.7853836           R-squared     =  0.6552
-------------+------------------------------           Adj R-squared =  0.5756
       Total |  134.610453    32  4.20657667           Root MSE      =  1.3362

------------------------------------------------------------------------------
   gdpgrowth |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   gdpgrowth |
         L2. |   -.280909     .14445    -1.94   0.063    -.5778302    .0160122
             |
       adr65 |   .1235955   .2099328     0.59   0.561    -.3079277    .5551186
   fertility |   -18.4667   5.235939    -3.53   0.002    -29.22933   -7.704075
unemployment |    -1.2099   .3767332    -3.21   0.004    -1.984286   -.4355139
laggedfert~y |  -2.923652   1.967871    -1.49   0.149    -6.968669    1.121365
    pctwomen |  -.2859498   .3743232    -0.76   0.452    -1.055382    .4834825
       _cons |   61.64586   35.65022     1.73   0.096    -11.63423    134.9259
------------------------------------------------------------------------------

. estat ic

-----------------------------------------------------------------------------
       Model |    Obs    ll(null)   ll(model)     df          AIC         BIC
-------------+---------------------------------------------------------------
           . |     33   -70.02195   -52.45514      7     118.9103    129.3858
-----------------------------------------------------------------------------
               Note:  N=Obs used in calculating BIC; see [R] BIC note

. newey gdpgrowth l2.gdpgrowth adr65 fertility unemployment laggedfertility pctwomen,
lag(0)

Regression with Newey-West standard errors          Number of obs  =        33
maximum lag: 0                                      F(  6,    26)  =     11.77
                                                    Prob > F       =    0.0000

------------------------------------------------------------------------------
             |             Newey-West
   gdpgrowth |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   gdpgrowth |
         L2. |   -.280909   .1670065    -1.68   0.105    -.6241958    .0623778
             |
       adr65 |   .1235955   .2082544     0.59   0.558    -.3044777    .5516686
   fertility |   -18.4667   5.457625    -3.38   0.002    -29.68501   -7.248394
unemployment |    -1.2099   .3645631    -3.32   0.003     -1.95927     -.46053
laggedfert~y |  -2.923652   1.660219    -1.76   0.090    -6.336281    .4889761
```

```
    pctwomen |  -.2859498   .2897498    -0.99   0.333    -.8815391    .3096395
       _cons |   61.64586   31.09919     1.98   0.058    -2.279441    125.5712
------------------------------------------------------------------------------

. //Model 5 - ADR66
. regress gdpgrowth l2.gdpgrowth adr66 fertility unemployment laggedfertility pctwomen

      Source |       SS       df       MS              Number of obs =      33
-------------+------------------------------           F(  6,    26) =    9.46
       Model |   92.332593     6  15.3887655           Prob > F      =  0.0000
    Residual |  42.2778604    26  1.62607155           R-squared     =  0.6859
-------------+------------------------------           Adj R-squared =  0.6134
       Total |  134.610453    32  4.20657667           Root MSE      =  1.2752

------------------------------------------------------------------------------
   gdpgrowth |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   gdpgrowth |
         L2. |    -.24152   .1395325    -1.73   0.095    -.5283333    .0452932
             |
       adr66 |    .258742   .1512133     1.71   0.099    -.0520814    .5695653
   fertility |   -14.9781   5.322158    -2.81   0.009    -25.91795   -4.038245
unemployment |  -.9715815   .3566876    -2.72   0.011    -1.704763   -.2383996
laggedfert~y |  -1.775564   1.802724    -0.98   0.334    -5.481116    1.929989
    pctwomen |  -.1472304    .336766    -0.44   0.666     -.839463    .5450021
       _cons |   36.53665   30.94522     1.18   0.248    -27.07217    100.1455
------------------------------------------------------------------------------

. estat ic

-----------------------------------------------------------------------------
       Model |    Obs    ll(null)   ll(model)     df          AIC          BIC
-------------+---------------------------------------------------------------
           . |     33   -70.02195   -50.91295      7     115.8259    126.3014
-----------------------------------------------------------------------------
               Note:  N=Obs used in calculating BIC; see [R] BIC note

. newey gdpgrowth l2.gdpgrowth adr66 fertility unemployment laggedfertility pctwomen,
lag(0)

Regression with Newey-West standard errors          Number of obs  =        33
maximum lag: 0                                      F(  6,    26)  =     12.13
                                                    Prob > F       =    0.0000

------------------------------------------------------------------------------
             |             Newey-West
   gdpgrowth |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   gdpgrowth |
         L2. |    -.24152   .1873034    -1.29   0.209    -.6265277    .1434877
             |
       adr66 |    .258742   .1712212     1.51   0.143    -.0932081    .6106921
   fertility |   -14.9781   6.041044    -2.48   0.020    -27.39564   -2.560553
unemployment |  -.9715815   .3582246    -2.71   0.012    -1.707923   -.2352404
laggedfert~y |  -1.775564    1.63287    -1.09   0.287    -5.131976    1.580849
    pctwomen |  -.1472304   .2644237    -0.56   0.582    -.6907612    .3963003
       _cons |   36.53665   30.82101     1.19   0.247    -26.81684    99.89014
------------------------------------------------------------------------------

. //Model 6 - ADR67
. regress gdpgrowth l2.gdpgrowth adr67 fertility unemployment laggedfertility pctwomen

      Source |       SS       df       MS              Number of obs =      33
-------------+------------------------------           F(  6,    26) =   10.67
       Model |  95.7204043     6  15.9534007           Prob > F      =  0.0000
    Residual |   38.890049    26  1.49577112           R-squared     =  0.7111
-------------+------------------------------           Adj R-squared =  0.6444
       Total |  134.610453    32  4.20657667           Root MSE      =   1.223
```

```
------------------------------------------------------------------------------
   gdpgrowth |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   gdpgrowth |
         L2. |  -.2181363   .1345236    -1.62   0.117    -.4946535    .0583809
             |
       adr67 |   .2611783   .1118984     2.33   0.028     .0311679    .4911888
   fertility |  -13.00203   5.219772    -2.49   0.019    -23.73142   -2.272633
unemployment |  -.8915726   .3327291    -2.68   0.013    -1.575507   -.2076383
laggedfert~y |  -1.480554   1.654102    -0.90   0.379    -4.880609      1.9195
    pctwomen |  -.1406916   .3103563    -0.45   0.654    -.7786381    .4972549
       _cons |   31.09609   27.05655     1.15   0.261    -24.51944    86.71163
------------------------------------------------------------------------------

. estat ic

-----------------------------------------------------------------------------
       Model |    Obs    ll(null)   ll(model)     df          AIC          BIC
-------------+---------------------------------------------------------------
           . |     33   -70.02195   -49.53478      7     113.0696    123.5451
-----------------------------------------------------------------------------
               Note:  N=Obs used in calculating BIC; see [R] BIC note

. newey gdpgrowth l2.gdpgrowth adr67 fertility unemployment laggedfertility pctwomen,
lag(0)

Regression with Newey-West standard errors          Number of obs  =        33
maximum lag: 0                                      F(  6,    26)  =     12.60
                                                    Prob > F       =    0.0000

------------------------------------------------------------------------------
             |             Newey-West
   gdpgrowth |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   gdpgrowth |
         L2. |  -.2181363   .1903216    -1.15   0.262     -.609348    .1730754
             |
       adr67 |   .2611783   .1314231     1.99   0.058    -.0089657    .5313224
   fertility |  -13.00203    6.07105    -2.14   0.042    -25.48125   -.5228065
unemployment |  -.8915726   .3383438    -2.64   0.014    -1.587048   -.1960971
laggedfert~y |  -1.480554   1.510222    -0.98   0.336     -4.58486    1.623751
    pctwomen |  -.1406916   .2415208    -0.58   0.565    -.6371447    .3557615
       _cons |   31.09609   27.40366     1.13   0.267    -25.23293    87.42511
------------------------------------------------------------------------------

. //Model 7 - ADR68
. regress gdpgrowth l2.gdpgrowth adr68 fertility unemployment laggedfertility pctwomen

      Source |       SS       df       MS              Number of obs =      33
-------------+------------------------------           F(  6,    26) =   11.53
       Model |   97.844286     6   16.307381           Prob > F      =  0.0000
    Residual |  36.7661674    26  1.41408336           R-squared     =  0.7269
-------------+------------------------------           Adj R-squared =  0.6638
       Total |  134.610453    32  4.20657667           Root MSE      =  1.1892

------------------------------------------------------------------------------
   gdpgrowth |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   gdpgrowth |
         L2. |  -.2055898    .131088    -1.57   0.129    -.4750451    .0638655
             |
       adr68 |   .2371927   .0880031     2.70   0.012     .0562998    .4180856
   fertility |  -11.98894   5.112952    -2.34   0.027    -22.49876   -1.479116
unemployment |  -.8707341   .3159877    -2.76   0.011    -1.520256   -.2212122
laggedfert~y |  -1.454531   1.558269    -0.93   0.359    -4.657599    1.748537
    pctwomen |  -.1626759   .2950259    -0.55   0.586    -.7691103    .4437584
       _cons |   31.35879   24.59523     1.27   0.214    -19.19742    81.91501
```

```
------------------------------------------------------------------------------

. estat ic

-----------------------------------------------------------------------------
       Model |    Obs    ll(null)   ll(model)     df          AIC         BIC
-------------+---------------------------------------------------------------
           . |     33   -70.02195   -48.60813      7     111.2163    121.6918
-----------------------------------------------------------------------------
               Note:  N=Obs used in calculating BIC; see [R] BIC note

. newey gdpgrowth l2.gdpgrowth adr68 fertility unemployment laggedfertility pctwomen,
lag(0)

Regression with Newey-West standard errors          Number of obs  =        33
maximum lag: 0                                      F(  6,    26)  =     13.03
                                                    Prob > F       =    0.0000

------------------------------------------------------------------------------
             |             Newey-West
   gdpgrowth |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   gdpgrowth |
         L2. |  -.2055898    .188347    -1.09   0.285    -.5927427    .1815631
             |
       adr68 |   .2371927   .1042864     2.27   0.031      .022829    .4515564
   fertility |  -11.98894   5.958327    -2.01   0.055    -24.23646    .2585778
unemployment |  -.8707341   .3216136    -2.71   0.012     -1.53182   -.2096479
laggedfert~y |  -1.454531   1.418721    -1.03   0.315    -4.370753    1.461691
    pctwomen |  -.1626759   .2304503    -0.71   0.487    -.6363732    .3110214
       _cons |   31.35879   24.65209     1.27   0.215    -19.31429    82.03188
------------------------------------------------------------------------------

. //Model 8 - ADR69
. regress gdpgrowth l2.gdpgrowth adr69 fertility unemployment laggedfertility pctwomen

      Source |       SS       df       MS              Number of obs =      33
-------------+------------------------------           F(  6,    26) =   12.17
       Model |  99.2634842     6   16.543914           Prob > F      =  0.0000
    Residual |  35.3469691    26  1.35949881           R-squared     =  0.7374
-------------+------------------------------           Adj R-squared =  0.6768
       Total |  134.610453    32  4.20657667           Root MSE      =   1.166

------------------------------------------------------------------------------
   gdpgrowth |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   gdpgrowth |
         L2. |  -.1976997   .1287009    -1.54   0.137    -.4622481    .0668488
             |
       adr69 |   .2123067   .0723955     2.93   0.007     .0634956    .3611178
   fertility |  -11.39158    5.02815    -2.27   0.032    -21.72709   -1.056071
unemployment |  -.8687209   .3042182    -2.86   0.008     -1.49405   -.2433914
laggedfert~y |  -1.506078   1.492698    -1.01   0.322    -4.574362    1.562206
    pctwomen |  -.1888217    .285226    -0.66   0.514     -.775112    .3974687
       _cons |   32.98053    22.9502     1.44   0.163    -14.19429    80.15534
------------------------------------------------------------------------------

. estat ic

-----------------------------------------------------------------------------
       Model |    Obs    ll(null)   ll(model)     df          AIC         BIC
-------------+---------------------------------------------------------------
           . |     33   -70.02195   -47.95861      7     109.9172    120.3928
-----------------------------------------------------------------------------
               Note:  N=Obs used in calculating BIC; see [R] BIC note

. newey gdpgrowth l2.gdpgrowth adr69 fertility unemployment laggedfertility pctwomen,
lag(0)
```

```
Regression with Newey-West standard errors          Number of obs  =        33
maximum lag: 0                                      F(  6,    26)  =     13.41
                                                    Prob > F       =    0.0000

------------------------------------------------------------------------------
             |              Newey-West
  gdpgrowth |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  gdpgrowth |
         L2. |  -.1976997   .1856457    -1.06   0.297    -.5792999    .1839006
             |
       adr69 |   .2123067   .0859913     2.47   0.020      .035549    .3890644
  fertility |  -11.39158   5.835786    -1.95   0.062    -23.38721    .6040482
unemployment |  -.8687209   .3090951    -2.81   0.009    -1.504075   -.2333669
laggedfert~y |  -1.506078   1.351969    -1.11   0.275     -4.28509    1.272934
    pctwomen |  -.1888217   .2239031    -0.84   0.407     -.649061    .2714177
       _cons |   32.98053   22.65798     1.46   0.157    -13.59363    79.55468
------------------------------------------------------------------------------
```

```
. //Model 9 - ADR70
. regress gdpgrowth l2.gdpgrowth adr70 fertility unemployment laggedfertility pctwomen

      Source |       SS       df       MS              Number of obs =      33
-------------+------------------------------           F(  6,    26) =   12.64
       Model |  100.236871     6  16.7061451           Prob > F      =  0.0000
    Residual |  34.3735828    26  1.32206088           R-squared     =  0.7446
-------------+------------------------------           Adj R-squared =  0.6857
       Total |  134.610453    32  4.20657667           Root MSE      =  1.1498

------------------------------------------------------------------------------
  gdpgrowth |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  gdpgrowth |
         L2. |  -.1927634   .1269981    -1.52   0.141    -.4538116    .0682849
             |
       adr70 |    .191618   .0619093     3.10   0.005     .0643617    .3188743
  fertility |  -11.03183   4.961688    -2.22   0.035    -21.23072    -.832934
unemployment |  -.8714704   .2961815    -2.94   0.007     -1.48028   -.2626606
laggedfert~y |  -1.563243   1.449096    -1.08   0.291    -4.541902    1.415416
    pctwomen |  -.2096602   .2789596    -0.75   0.459    -.7830699    .3637495
       _cons |   34.60478   21.86391     1.58   0.126    -10.33714     79.5467
------------------------------------------------------------------------------

. estat ic

-----------------------------------------------------------------------------
       Model |    Obs    ll(null)   ll(model)     df          AIC         BIC
-------------+---------------------------------------------------------------
           . |     33   -70.02195   -47.49785      7     108.9957    119.4713
-----------------------------------------------------------------------------
               Note:  N=Obs used in calculating BIC; see [R] BIC note

. newey gdpgrowth l2.gdpgrowth adr70 fertility unemployment laggedfertility pctwomen,
lag(0)

Regression with Newey-West standard errors          Number of obs  =        33
maximum lag: 0                                      F(  6,    26)  =     13.73
                                                    Prob > F       =    0.0000

------------------------------------------------------------------------------
             |              Newey-West
  gdpgrowth |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
  gdpgrowth |
         L2. |  -.1927634   .1831798    -1.05   0.302    -.5692948     .183768
             |
       adr70 |    .191618    .073389     2.61   0.015     .0407648    .3424712
```

```
   fertility |  -11.03183   5.728547    -1.93   0.065    -22.80703    .7433687
unemployment |  -.8714704   .3000002    -2.90   0.007     -1.48813   -.2548111
laggedfert~y |  -1.563243   1.304725    -1.20   0.242    -4.245144    1.118658
    pctwomen |  -.2096602   .2195691    -0.95   0.348    -.6609911    .2416706
       _cons |   34.60478     21.261     1.63   0.116     -9.09783    78.30739
------------------------------------------------------------------------------

. //Model 10 - Beta Coefficient
. regress gdpgrowth l2.gdpgrowth unmodifiedadr fertility unemployment laggedfertility
pctwomen, beta

      Source |       SS       df       MS              Number of obs =      33
-------------+------------------------------           F(  6,    26) =    8.86
       Model |  90.3835372     6  15.0639229           Prob > F      =  0.0000
    Residual |  44.2269161    26  1.70103524           R-squared     =  0.6714
-------------+------------------------------           Adj R-squared =  0.5956
       Total |  134.610453    32  4.20657667           Root MSE      =  1.3042

------------------------------------------------------------------------------
   gdpgrowth |      Coef.   Std. Err.      t    P>|t|                     Beta
-------------+----------------------------------------------------------------
   gdpgrowth |
         L2. |  -.3000535   .1391864    -2.16   0.041                -.2756248
             |
unmodified~r |  -.3047024   .2369916    -1.29   0.210                -.1935754
   fertility |  -20.43167   4.654571    -4.39   0.000                -1.107336
unemployment |  -1.583515   .3400684    -4.66   0.000                -1.130103
laggedfert~y |  -5.145508   1.840703    -2.80   0.010                -1.498603
    pctwomen |  -.6813336   .3761534    -1.81   0.082                -1.263725
       _cons |   115.7976   33.87768     3.42   0.002                       .
------------------------------------------------------------------------------

. estat ic

-----------------------------------------------------------------------------
       Model |    Obs    ll(null)   ll(model)     df          AIC         BIC
-------------+---------------------------------------------------------------
           . |     33   -70.02195    -51.6566      7     117.3132    127.7888
-----------------------------------------------------------------------------
               Note:  N=Obs used in calculating BIC; see [R] BIC note

. newey gdpgrowth l2.gdpgrowth unmodifiedadr fertility unemployment laggedfertility
pctwomen, lag(0)

Regression with Newey-West standard errors          Number of obs  =        33
maximum lag: 0                                      F(  6,    26)  =     12.94
                                                    Prob > F       =    0.0000

------------------------------------------------------------------------------
             |             Newey-West
   gdpgrowth |      Coef.   Std. Err.      t    P>|t|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
   gdpgrowth |
         L2. |  -.3000535   .1289139    -2.33   0.028    -.5650398   -.0350672
             |
unmodified~r |  -.3047024   .1816715    -1.68   0.105    -.6781335    .0687287
   fertility |  -20.43167   4.161167    -4.91   0.000    -28.98507   -11.87827
unemployment |  -1.583515   .3695835    -4.28   0.000    -2.343205    -.823825
laggedfert~y |  -5.145508   1.555333    -3.31   0.003     -8.34254   -1.948476
    pctwomen |  -.6813336   .3014506    -2.26   0.032    -1.300974    -.061693
       _cons |   115.7976   25.29174     4.58   0.000     63.80968    167.7855
------------------------------------------------------------------------------
```

APPENDIX B: SUMMARY STATISTICS

```
. summarize  year unmodifiedadr adr65 adr66 adr67 adr68 adr69 adr70 fertility
laggedfertility unemployment pc
> twomen gdpgrowth if year > 1976

    Variable |       Obs        Mean    Std. Dev.       Min        Max
-------------+--------------------------------------------------------
        year |        34      1993.5    9.958246       1977       2010
unmodified~r |        34    51.14086    1.313688   48.98856   53.20976
       adr65 |        34    50.59788    1.765318   47.24364   53.20976
       adr66 |        34    50.08768    2.395611   45.58851   53.20976
       adr67 |        34    49.60895    3.059946   44.04935   53.20976
-------------+--------------------------------------------------------
       adr68 |        34    49.16474    3.705313   42.61328   53.20976
       adr69 |        34    48.74118    4.334495    41.2435   53.20976
       adr70 |        34     48.3469    4.929555   39.94954   53.20976
   fertility |        34      1.9653    .1120184       1.76     2.1132
laggedfert~y |        34    2.249735    .5896263      1.738      3.654
-------------+--------------------------------------------------------
unemployment |        34         6.3    1.554856          4        9.7
    pctwomen |        34    53.29118    3.746462       44.5       57.5
   gdpgrowth |        33    1.790203    2.050994   -3.46688   6.271139
```

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