Is Growth Good for Women?

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Abstract

Using cross-country data, we find that attitudes towards women are more progressive as income rises and that the quality and quantity of women's human capital increases with income. Prior to presenting these empirical results, we first demonstrate the importance of these relationships with a simple model that shows how a feedback loop between attitudes towards women, investment in women's human capital, and income affects the dynamic path of the economy. Depending on the nature of the relationship betweem income and attitudes towards women, we identify the possibility of a gender equity poverty trap.

Key words: attitudes, growth, gender equity, human capital

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1 Introduction

This paper has two purposes. First, we theoretically explore the implications of the joint determination of attitudes towards women and income for the development of the economy. Second, we empirically examine how life changes for women as per capita income grows. Specifically, we are interested in examining whether attitudes towards women and economic outcomes change with higher per capita income. Overall, using several different measures of the quantity and quality of women's human capital, we find evidence that women's standard of living improves relative to men's as per capita income increases. Furthermore, we find evidence that attitudes towards women are more progressive as income rises; societies value women more when income is higher. Prior to presenting these empirical results, we first demonstrate the importance of these relationships with a simple model that shows how a feedback loop between attitudes towards women, investment in women's human capital, and income affects the dynamic path of the economy. Depending on the nature of the relationship from income to attitudes, we identify the possibility of a gender equity poverty trap.

Many theories have been developed to explain a causal relationship between gender equity and growth, especially as it relates to investment in women's education. Perhaps most obvious is the idea that gender inequity with respect to human capital accumulation underutilizes an important resource in the economy, the female labor force. (See for example, Shultz 1993, 2002, or Dollar and Gatti 1999.[1]) Others have linked low rates of female education to low opportunity costs of women's time and higher fertility rates. (See, for example, Iyigun, 2000, or Kremer and Chen 2002) Increased education for women is also associated with lower child mortality and better nutrition. (See, for example, Frenzen and Hogan, 1982 or Wickrama and Lorenz, 2002.) Finally, better living standards for women can be a goal in and of itself, along with higher per capita incomes.

[1] In contrast, Barro and Lee (1994) present findings that lower initial values for female education are associated with higher growth. Their interpretation is not, however, that uneducated women are good for growth, but that after controlling for male education, low initial levels of female education are proxying for other features of the economy that would imply faster growth under a convergence hypothesis.

Others have studied the relationship between growth and women's status in the economy, examining the causation running the other way—from higher income to women's standard of living. For example, Galor and Weil (1996) develop a model in which women's wages relative to men's increase as the importance of physical strength declines when the economy develops. Dollar and Gatti (1999) empirically examine how some measures of women's status in an economy are associated with per capita income and argue that higher incomes lead to better economic and social outcomes for women. Finally, although the focus of their paper is on religion and economic attitudes, Guiso, Sapienza, and Zingales (2003) document with microeconomic data that individuals that have higher incomes generally have more progressive attitudes towards women in the labor force.[2]

Although our model features a mechanism through which greater investment in women's human capital affects growth, the contribution of this paper is more closely related to this second strand of literature that examines how higher per capita income affects women's welfare. We differ from previous studies in several ways. First, our work emphasizes theoretically and empirically the relationship between a broad spectrum of attitudes towards women and income per capita at the macro level. Second, we use several different measures of women's economic welfare and human capital and show how the relationship between men's and women's economic welfare changes as per capita income grows. We show these relationships are robust to several different estimation strategies including fixed effects panel estimation, dynamic panel estimation, and instrumental variables estimation in a panel setting. Methodologically, some of our empirical work is similar to Easterly (1999) and Dollar and Kraay (2002). Although Easterly (1999) does not focus on the issue of women's welfare, he does use a fixed-effects panel setting to examine the overall question of how welfare changes as income grows.[3] Dollar and Kraay (2002), however, examine how growth affects one specific demographic group—the poor. Our

[2]Others have also examined the relationship running from growth to human capital accumulation in general. See, for example, Bils and Klenow (2000).
[3] Easterly's investigation does include some measures of women's welfare related to school enrollment rates and literacy.

work builds on this work and focuses on a different demographic group and different measures of welfare.

Of course, the issue of the direction of causation is an important one and we argue that there is evidence that the causation runs both ways: Greater investment in women's human capital causes growth, but higher incomes also lead to more progressive attitudes towards women and greater investment in women's human capital. We support this claim by showing that our conclusions are robust to alternative estimation strategies that attempt to deal with the endogeneity of income and human capital outcomes for women.

Our results are presented in the following four sections. In section 2, we first present a simple OLG model in which greater investment in women's human capital causes higher income and higher income causes higher levels of investment in women because of a change in attitudes towards women. Section 3 presents the data and the methods that we use to empirically document the relationship between women's human capital and higher incomes and provides support for the major conclusions and assumptions of the model. In Section 4 we present our empirical results, and Section 5 concludes.

2 A Simple Model of Gender Equity and Growth

In this section, we use a simple OLG model to demonstrate the impact of attitudes towards women on growth and how a feedback loop from income to attitudes can affect the dynamic evolution of the economy. In the following sections, we will provide empirical evidence for the existence of this feedback loop and show that the welfare of women evolves with income as the model predicts.

Consider an economy in which production is simply a function of human capital and human capital is the result of resources spent on the education of the young. Specifically, income per capita at time t is given by

(1) $$y_t = Ah_t$$

where $A > 0$ is constant through time, and h_t is the average level of human capital at time t. Human capital for individual i is given by

(2) $$h_{t+1}^{i} = e(x_t^{i})$$

where x_t^i is the amount of resources spent on education by individual i at time t and e() is assumed to satisfy the standard Inada conditions.

Individuals live for two periods. In the first period, when they are children, they take resources from their parents to obtain an education. In the second period, they work, consume, have children, and provide for their children's education. There is no population growth, and we assume that each couple has one boy child, one girl child, and household income $Y_t=2y_t$.[4] Taking Y_t as given, parents maximize household utility

(3) $$U_t = \ln(c_t) + \gamma_t \ln(x_t^b) + (1-\gamma_t)\ln(x_t^g)$$

where c_t is consumption of the household, x_t^b is the amount of resources spent on the boy's education and x_t^g is the amount of resources spent on the girls education.[5] The relative weight of girl's and boy's education, g_t, depends on income. Specifically, we assume

(4) $$\gamma_t = g(y_t)$$

where $\lim_{y\to 0} g(y) = 1;\ \lim_{y\to\infty} g(y) = .5;\ g' < 0\ \ g'' < 0$

Thus, equations 3 and 4 embed a critical assumption: parental preferences for gender equity increase with income. In Section 4, we provide empirical evidence supporting this assumption by showing that attitudes towards women are more progressive in high income countries, but, theoretically, we motivate this with the claim that preferences and attitudes can evolve as individuals gain more experience with women taking on different roles in the economy and in society. The evolution of women's roles with income can be caused in a variety of ways. For example, as an economy grows, the nature of work may

[4] By making these simplifying assumptions, we assume away several linkages between gender equity and growth that have been made in previous literature. First, we assume that both men and women work, that there is no cost to child rearing, and that fertility is unaffected by income. Allowing for any of these effects would strengthen the relationship between gender equity and growth.

[5] For simplicity, we assume a "joy of giving" bequest motive. Given the simplicity of the model, alternative assumptions about parental altruism (i.e., caring about income or utility of children) would result in similar qualitative conclusions.

put less emphasis on physical strength, changing the role that women are able to play in the workforce and making education for women more valuable (as in Galor and Weil 1996). Alternatively, more developed economies may develop services and technology that de-emphasize the role of women in the home (e.g., dishwashers, vacuum cleaners, microwaves, housekeeping and daycare services) and encourage individuals to change their view of appropriate activities for women. (See, for example, Greenwood, Sheshadri and Yorukoglu, 2002.) Lagerlof (2003) contains an alternative mechanism that would result in the same outcome in which families, who care about total household income, play a coordination game against one another in which girls end up with less education than boys. Growth of income may also be associated with greater interaction with other countries that have more progressive attitudes towards women. In this case, higher income will be associated with changing values. Finally, increased integration into the world economy associated with higher incomes could cause competitive pressures that would reduce discrimination. (See, for example, Brainerd and Black, 2004.) All of these mechanisms would elevate women's status in the economy and we assume that these experiences influence the prevalent attitudes towards women.

Because individuals work, consume and die all in the same period, there is not a role for credit markets, so individuals maximize (3) subject to the household budget constraint

$$Y_t = c_t + x_t^g + x_t^b \tag{5}$$

The solution to this maximization problem yields

$$\begin{aligned} x_t^b &= \frac{\gamma_t Y_t}{2} = \gamma_t y_t \\ x_t^g &= \frac{(1-\gamma_t) Y_t}{2} = (1-\gamma_t) y_t \\ c_t &= \frac{Y_t}{2} = y_t \end{aligned} \tag{6}$$

Thus, as γ decreases, more resources are allocated to girls' education.

Equation 6 highlights the relationship from income to gender equity, but the relationship from equity to higher income can be seen by combining (6) and (1) and noting that average human capital is a

weighted average of girl's and boy's human capital. Specifically, per capita income can now be expressed

$$(7) \qquad y_{t+1} = A\left[\frac{1}{2}e(x_t^b) + \frac{1}{2}e(x_t^g)\right]$$

Because e'(x) > 0 and e''(x) < 0, it is clear that given y_t, human capital is maximized when resources are split equally between boys and girls. Equation 7, then, highlights the relationship from gender equity to income.

The dynamics of the model can be explored by noting from (4), (6) and (7) that

$$(8) \qquad y_{t+1} = A\left[\frac{1}{2}e(g(y_t)y_t) + \frac{1}{2}e\big((1-g(y_t))y_t\big)\right] \equiv \phi(y_t)$$

Given the properties of e(x) and g(y) noted above, $\phi(y)$ is continuous, $\phi'(y) > 0$, $\phi''(y) < 0$, and $\lim_{y\to 0}\phi(y) = \infty$. It is, therefore, straightforward to conclude that a unique steady state exists. (See Figure 1.) Along the transition to the steady state, growth is caused by increased investment in education as well as an efficient reallocation of that investment to a more equitable allocation between boys and girls.

Of course, the conclusion that there is a unique steady state depends on the properties of g(y). It is easy to see that multiple equilibria are possible if g(y) displays some nonconvexities. As an example, consider a different specification for g(y) such that

$$(9) \qquad \gamma_t = g(y_t) = \begin{cases} 1 & when\ y < \tilde{y} \\ .5 & when\ y \geq \tilde{y} \end{cases}$$

Then

$$(10) \qquad \phi(y_t) = \begin{cases} A\frac{1}{2}(e(y_t)) & when\ y < \tilde{y} \\ A\left[\frac{1}{2}e(.5y_t) + \frac{1}{2}e(.5y_t)\right] & when\ y \geq \tilde{y} \end{cases}$$

When g(y) is described by (9), then multiple equilibria may exist. To see this, note that, given e'(x) > 0, e''(x) < 0

(11) $e(.5y_t) + e(.5y_t) > e(y_t)$

Therefore, there is a discrete jump in $\phi(y)$ at $\tilde{y}$. Whether or not multiple steady states exists depends on the size of $\tilde{y}$. If $\tilde{y}$ is small, then the switch to gender equity comes before a low income steady state is established. If it is too large, then a high income steady state with gender equity is not guaranteed. However, for intermediate values of $\tilde{y}$, multiple steady states exist. (See figure 2.) The low income steady state features gender inequity while the high income steady state features equal investment in boys and girls.

This section has presented a simple model that demonstrates the importance of the feedback loop between attitudes towards women and income.[6] In the next section we present empirical evidence that supports the major assumptions and conclusions of the model. We show that women's human capital increases relative to men's and that attitudes towards women become more progressive when income increases.

3 Methods and Data

In this section, we explore two different aspects of the impact of higher income on women. First, we examine how income affects various indicators of women's human capital accumulation (enrollment rates, literacy rates, life expectancy, unemployment rates, and nature of work) relative to men's human capital. While others have stressed the evidence from gender equity to income, our empirical work focus on the relationship in the opposite direction. This first set of results corroborates the empirical prediction of the model in Section 2 that investment in women's human capital and the welfare of women increases with income. Second, we investigate the relationship between attitudes towards women and per capita income. This second set of results provide support for a critical assumption of the model. Specifically, by demonstrating that attitudes towards women are more progressive in high income countries, we

[6]In both cases presented here, growth occurs along the transition to the steady state, but there is no growth in the steady state. Steady state growth could be achieved by allowing growth of A to be a function of h. In that case, the high income steady state with gender equality would also feature faster steady state growth.

provide some empirical support for the assumptions established in equations 3 and 4. Each question requires a different data set and, because of the characteristics of the data available, requires slightly different methodology. In this section we will explain our approach to the data and provide some descriptive statistics.

Our first set of empirical results examines whether women's human capital increases with income as the model predicts. To do this, we use panel data from 154 countries , with observations every five years from 1960 to 2000, and estimate

$$Womenshc_t = \alpha_i + \lambda_t + \beta_1 \ln(GDP_{t-1}) + \beta_2 Menshc_t + \beta_3 \ln(GDP_{t-1}) * Menshc_t + \beta_4 OPENNESS_t + \varepsilon_{i,t} \quad (12)$$

where Womenshc is equal to one of five different measures of economic outcomes for women related to their human capital stock (secondary school enrollment rate, life expectancy, literacy rate, unemployment rate, and the percent of working women in agriculture), Menshc is the corresponding outcome for the male population, GDP is per capita GDP and OPENNESS is (exports + imports)/GDP. Initially, we estimate equation (12) with a fixed effects model that includes both country and time-specific effects. In the first set of results that we present, we attempt to deal with the issue of causation by using lagged values of GDP as explanatory variables. (Later we present alternative methods.) In addition, by also including a country-specific fixed effect and the corresponding Menshc measure, we should be controlling for possible omitted variables that are either constant over time or are related to trends in the economy related to this specific human capital indicator for the economy as a whole. We have also included a measure of OPENNESS on the right hand side on the idea that gender equity might be influenced by a country's interactions with the rest of the world. As this variable has considerable variation within countries over time, its effect would not be accounted for in the country fixed effect. However, other cultural or geographic features of the economy that do not change over time should be controlled for in the fixed effect.

This formulation allows us to specifically examine how Womenshc changes as GDP changes because

$$(13) \qquad \frac{\partial Womenshc}{\partial \ln(GDP)} = \beta_1 + \beta_3 Menshc$$

It also allows us to see how the relationship between Menshc and Womenshc changes with GDP. Specifically,

$$(14) \qquad \frac{\partial Womenshc}{\partial Menshc} = \beta_2 + \beta_3 \ln(GDP)$$

Therefore, when increases in our human capital indicator are associated with better living standards for women, a positive coefficient on the interaction term of GDP and Menshc suggests that growth is particularly good for women: Higher GDP is associated with better human capital outcomes for women, and in countries with higher incomes, changes in men's human capital are likely to be met with bigger changes in women's human capital.[7] Thus, equation (14) allows us to test one of the predictions of our model—that when incomes are higher, more equal resources are likely to be invested in men's and women's human capital accumulation. Of course, if β_2 equals one, then men's and women's welfare move together.

The data we use to implement this first estimation is derived from the 2004 World Development Indicators. The five different indicators of human capital that we examine are secondary school enrollment rates, literacy rates, life expectancy, unemployment rates, and the percent of female workers employed in agriculture. The first three measures are traditionally associated with the quantity of human capital accumulated while we employ the last two as alternative means of measuring the quality of human capital. Higher unemployment rates for women should be associated with a lower quality of human capital and a larger percent of women in agriculture may also indicate low quality of female human capital. Women who are more educated and have longer life expectancies should have a higher quality of life. Lower unemployment rates would also be associated with a better quality of life. Although unemployment rates are likely to be cyclical, we interpret a β_1 greater than one as an indicator of gender inequality—i.e., when male unemployment increases, female unemployment increases by more. Finally,

[7] Higher secondary schooling rates, literacy rates, and life expectancies indicate higher welfare for women, while we associate higher unemployment and a larger percentage of the women workers in agriculture with reduced welfare.

the percent of the female labor force employed in agriculture may also describe how growth affects women relative to men. If β_3 is positive, then this indicates that in higher income countries, the change in women employed in agriculture is more responsive to a change in men's employment.

The second question we examine is if higher incomes are associated with more progressive and egalitarian attitudes towards women. While assessing human capital outcomes for women allows us to determine if the predictions of our model are consistent with the data, this second question allows us to test a critical assumption of the model more directly (i.e., equations 3 and 4). In order to obtain an assessment of a country's attitudes towards women, we use data provided by the 1995 World Values Survey, aggregated at the country level. Because the World Values Survey does not provide us with panel data for the questions in which we are interested, we confine this aspect of our estimation to a cross-country regression.[8] Specifically, we estimate

$$(15) \qquad Attitude = \beta_0 + \beta_1 \ln(GDP) + \beta_2 CivilLiberties + \beta_3 Openness + \beta_4 \mathrm{Re}ligion + \varepsilon$$

where GDP and OPENNESS are defined as above, CIVILLIBERTIES is an index of civil liberties from The Freedom House, RELIGION is a vector of variables indicating the percent of the population that is Judeo-Christian, Mulim, Hindu, and Buddhist and epsilon is a mean zero, normal disturbance term. The dependent variable, ATTITUDES, is the percent of the population that has a specific belief about the value of women. While we discuss these attitudes in more detail below, in general, the beliefs that we use in our estimations would be considered to be more progressive attitudes towards women. Therefore, a positive coefficient on ln(GDP) would indicate that higher incomes in a country are associated with a larger percentage of the population having more progressive attitudes towards women. In our first set of estimations, the relationships we examine are all contemporaneous. We also explore the relationship between lagged values of GDP and Attitudes and lagged Attitudes and GDP for a subset of our sample for which the data is available.

[8] A few of the questions on which we focus our analysis are asked in some of the countries in both 1990 and 1995. We exploit this additional data in some supplementary analysis described in section 4.

Several of the questions from the WVS that we use inherently compare the value of women to men so we do not also include a corresponding variable indicating attitudes towards men. In addition, because this analysis uses cross-country data, it is more important to include additional variables that might proxy for cultural features of the economy that affect gender equity. Therefore, we include variables that describe religious preferences and civil liberties as these variables may capture important environmental factors in the country that would ordinarily be absorbed in a fixed effect. However, we must take care that our regression remains parsimonious as we have a maximum of only 42 countries for which all the data is available. (See the Appendix for a list of countries used in the WVS estimations.)

To examine attitudes towards women, we draw on nine questions asked in the 1995 WVS. Respondents to the WVS were asked how strongly they agreed with the following statements: 1) men should have more right to a job than women when jobs are scarce, 2) it is necessary for a woman to have a child to be fulfilled, 3) if they preferred a boy or a girl child if they could only have a single child, 4) a working mother can establish just as warm and secure a relationship with her children as a mother who does not work, 5) being a housewife is just as fulfilling as working for pay, 6) both the husband and wife should contribute to household income, 7) men make better political leaders than women do, 8) if a women earns more money than her husband, its almost certain to cause problems, 9) a university education is more important for a boy than for a girl. We coded all of the individual responses to each of these questions so that a one indicates that the individual had the more progressive attitudes towards women (see Table 1 for more specific data descriptions). Using the weighting variable provided by the WVS, we then averaged the individual responses to obtain a percentage of the population that had the more progressive beliefs.

The resulting data from the WVS are summarized in Table 1, along with summary statistics for the sample from the World Development Indicators used to estimate equation 12. There is considerable variation in welfare outcomes for women and attitudes for women across countries. For example, in the average country, 48 percent of the population disagrees with the statement that men make better politicians than women, however, in Armenia only 16 percent of the population disagree with this

statement while in Norway the corresponding figure is 83 percent. Sixty-six percent is the average for the percent of the population that does not prefer a boy child. In Venezuela only 38 percent of the population does not state a preference for a boy child, but in Switzerland 85 percent of the population either prefer a girl or are indifferent.

Descriptive statistics in Table 2 present a preliminary look at the relationship between women's human capital indicators, attitudes towards women, and income by reporting the mean for these variables by high and low income groups. (The sample was split at the average per capita income of $5,500). Women in the high income group have higher levels and quality of human capital than those in the low income group; and, in all but three cases, attitudes towards women are more progressive in high income countries. Interestingly, the three attitudes for which there is not a statistically significant difference between high and low income countries are all associated with married women participating in the labor force. In both high and low income countries, a relatively large percentage of the population agreed that a working mother can have a warm relationship with her children, that being a housewife is just as fulfilling as working for pay, and that men and women should both contribute towards household income. In low income countries, these attitudes may reflect the necessity of married women contributing to household income while in high income countries, it may reflect different benefits of married women in the labor force. That said, it is important to note that for attitudes that compare women's place in the labor force relative to men's (JOBRIGHT and MONEYPROB), there remains a large and statistically significant difference in high and low income countries.

The descriptive statistics presented in Table 2 suggest that there is a relationship between income of a country, women's human capital, and attitudes towards women. In the next section we explore these correlations further and attempt to present more systematic evidence that suggests that at least part of these correlations can be explained by a causal relationship between higher income and more progressive attitudes towards women.

4 Results

4.1 Women's Human Capital Indicators

In this section, we present evidence for one of the predictions of the model: women's welfare (measured by human capital indicators) does increase with income. The results from estimating equation (12) appear in Table 3. Each of the columns presents results using a different indicator of women's human capital, and in general, these results support the idea that higher incomes are associated with higher levels of women's human capital. The first column of Table 3 presents the coefficients of equation (12) when secondary schooling enrollment rates are used as the welfare indicator. The fact that the coefficient on male secondary schooling is less than one is indicative of gender inequality. However, the interaction of male secondary schooling and GDP is positive, indicating that as GDP increases, male and female enrollment ratios become more equal. The effect of increases in GDP is notable, but not overwhelming. The results in column 1 of Table 3 indicate that a one standard deviation increase in ln(GDP) increases the responsiveness of female secondary enrollment rates to changes in male enrollment rates by .046. It is only for the highest income countries in the sample that male and female secondary enrollments move together (i.e., $\beta_2 + \beta_3 * \ln(GDP) = 1$).

The results for two additional human capital variables are presented in columns 2 and 3 of Table 3. Results in column 2 show how female life expectancy changes as the economy develops. In almost all countries, female life expectancy is longer than male life expectancy so the coefficient on the male life expectancy variable, LIFEXM, is greater than one. The fact that the interaction of male life expectancy and GDP is negative does argue for gender equity as it indicates that male and female life expectancies converge as income increases. Results in column 3 examine how female literacy responds to higher income. Although the coefficient on lagged GDP is negative and significant, to determine the total effect of GDP on female literacy, one must also consider the interaction term with male literacy. Doing so, yields a more sensible conclusion that, for the average country, increases in GDP are associated with increases in female literacy. However, these results do suggest that for the poorest countries (i.e., the

bottom quartile) increases in GDP are not associated with greater female literacy after the level of male literacy is taken into account.

Results in columns 4 and 5 of Table 3 describe two aspects of female labor force participation. Column 4 presents results for the percent of the female labor force employed in agriculture and shows that as GDP grows, a smaller percentage of women are employed in agriculture. Interestingly, these results suggest that as the percentage of the male labor force employed in agriculture increases, the percentage of the female labor force in agriculture decreases. Higher levels of GDP, however, mitigate this effect. In fact, for the highest income countries in our sample, $\beta_2 + \beta_3 * \ln(GDP)$ is close to one, suggesting that male and female participation in agriculture are similar. Finally, column 5 examines how female unemployment responds to changes in GDP and in male unemployment. The fact that the coefficient on male unemployment is close to 3 indicates that female employment is greater than male employment, however, the negative coefficient on the interaction of male unemployment and GDP suggests that the gap between male and female unemployment narrows as GDP grows. Using the point estimates in column 5, one can calculate that a one standard deviation increase in ln(GDP) decreases the unemployment gap by .31. Somewhat surprisingly, the increases in GDP are associated with higher female unemployment rates, however, these effects may be confounded by the fact that fewer women participate in the formal sector in developing countries. Overall, these results indicate that the amount and quality of human capital accumulated by females is more like that of males when income is higher.

4.2 Dynamic Panel Estimation and Instrumental Variables

Although we argued earlier that including country-specific effects and a corresponding male welfare indicator should mitigate concerns about omitted variables in Equation 12, in this section we modify our specification to address this concern in a different way. Specifically, we include a lagged value of the welfare indicator on the right hand side on the idea that this lagged value will capture the effects of omitted variables that change over time. In adding this lagged value, we estimate a dynamic

panel model employing the methods of Arellano and Bond (1991).[9] In this GMM estimation, we add a lagged value of the dependent variable to the right hand side of equation 12, first difference the new equation to remove the fixed effect, and then instrument for the difference in the dependent variable with lagged values. In order to do this, of course, we lose data for two time periods so our resulting sample sizes are smaller. In the case of female unemployment and females in agriculture, the reductions in sample size are the most dramatic.

The results from this new specification are in Table 4. The results for female secondary schooling (column 1), female life expectancy (column 2) and for female literacy (column 3) parallel those reported earlier. Although the signs on the GDP variables and their interaction with the male human capital indicator in the agriculture estimation (column 4) are consistent with those reported earlier, they are no longer statistically significant. (The p-value for the interaction of male workforce in agriculture and GDP is .14) In column 5, the coefficient on male unemployment remains positive, significant and greater than one. However, the coefficient on the interaction of male unemployment with GDP remains negative, but is no longer statistically significant. The reduced significance of the results in the last two columns could be due to the smaller sample generated by the Arellano-Bond technique. In fact, when we replicate the specification in Table 3 on the smaller sample, we obtain statistically insignificant results for AGRF. However, for female unemployment, our results from Table 3 continue to hold even on the smaller sample. Therefore, some of the differences in results for this variable are likely due to the inclusion of the lagged value.

One final issue that we will address prior to discussing the relationship between income and attitudes is the issue of causation between GDP and women's welfare. While including the lagged value of the dependent variable as an explanatory variable increases our confidence that there is a relationship running from increases in GDP to increases in women's welfare, we also examine this issue by estimating equation 12 directly with an instrumental variables technique. Specifically, we modify equation 12 by replacing the lagged value of GDP with contemporaneous values of GDP, but instrument for GDP with

[9] See Judson and Owen (1999) for a discussion of estimating dynamic panel models with macroeconomic data.

lagged values (10-year lag or two time periods). The results from this exercise are reported in Table 5. As can be seen in all of the results reported here, the results for the coefficient on GDP, men's human capital and the interaction of the two are consistent with those reported in Table 3. These results provide additional evidence that at least part of the relationship between GDP and women's human capital can be explained by higher incomes causing increases in the quality of life for women.

Although results from our dynamic panel model cast some doubt on the relationship between GDP and female unemployment, we conclude from the estimations reported in this section that higher incomes are associated with improved human capital for women and that at least some of this association can be explained by higher income causing higher welfare. In the next section, we take up a parallel question: How does higher income affect attitudes towards women?

4.3 Income and Attitudes Towards Women

It is also important to explore how attitudes towards women are influenced by the income of the country. The evolution of attitudes and preferences towards women is a critical assumption of our model and, in this section, we provide evidence on this question, using attitudes measured by the World Values Survey. Our methods and data are explained in Section 3, and the results from our initial estimation of Equation 15 are presented in Table 6. Recalling that all our variables are coded so that increases in these variables indicate that a greater percentage of the population holds progressive attitudes towards women, these results generally support that higher income countries have more progressive attitudes. There are three exceptions to this conclusion, HWFULFILL, WORKINGMOTHER, and BOTHINC. All three of these questions deal with the appropriate gender role for women in the workforce—valuing housework, the ability of working mothers to establish good relationships with their children, and the necessity of both husband and wife contributing to household income. These variables do not necessarily tell us how attitudes towards women are changing relative to attitudes towards men. Individuals in both high and low income countries may feel that both husbands and wives should contribute to household income for different reasons and the desirability of housework or the ability of working mothers to establish relationships with their children may not change as income grows.

The remaining variables may be better suited to examine how attitudes towards women relative to men respond to higher income. Except for CHILDFULFILL, the remaining attitude variables inherently compare the value and rights of women to those of men. JOBRIGHT compares the rights of women to have a job relative to men, BOYGIRL compares preferences for a boy child relative to a girl child, POLITIC compares the qualifications of women to be politicians relative to men, UNIEDUGIRL compares the importance of university education for women relative to men, and MONEYPROB asks about the appropriateness of the bread-winner role for women vs. men. Thus, we interpret the result in Table 6 as supporting the idea that in higher income countries, attitudes towards women relative to men are more progressive.

Surprisingly, the civil liberties index never enters the estimations significantly and neither does the openness variable. The religion variables sporadically enter the estimations , but no consistent conclusion can be drawn about the percent of the population professing any of these four major religions and attitudes towards women. The religion variable that enters significantly most often (6/9 estimations) is the percent of the population that is Buddhist and generally enters with a negative sign, indicating that this is associated with less progressive attitudes towards women. These results should be interpreted cautiously, however, as several countries in the sample have a very small Buddhist population.

The impact of increased GDP on attitudes towards women is notable. For example, a one standard deviation increase in ln(GDP) results in an increase of 11 percentage points for people disagreeing that a university education is more important for a boy than a girl (UNIEDUGIRL), an increase of 17 percentage points for people disagreeing that men make better politicians than women (POLITIC), and an increase of 6 percentage points for people expressing indifference or preference for a girl child over a boy.

As before, however, we continue to wrestle with which way the causation runs. Do attitudes cause higher GDP or does higher GDP cause a change in attitudes? While many of the questions on which we focus were not asked in more than one wave of the WVS, a few of them were asked in both wave 2 (1990) and wave 3 (1995) in a smaller sample of countries. The questions needed to construct

HWFULFILL, JOBRIGHT, WORKINGMOTHER, CHILDFULFILL were asked in both waves for between 21 and 24 countries. While this is not sufficient to do a reliable panel instrumental variables estimation, we do use the lagged values contained in this smaller sample to implement a test for Granger causality. Specifically, we estimate

$$\begin{aligned} Attitude_t &= \alpha_0 + \alpha_1 Attitude_{t-1} + \alpha_2 \ln(GDP_{t-1}) + \varepsilon_t \\ \ln(GDP_t) &= \gamma_0 + \gamma_1 \ln(GDP_{t-1}) + \gamma_2 Attitude_{t-1} + \upsilon_t \end{aligned} \tag{16}$$

Because we have included the lagged values of the dependent variable on the right hand side and due to the small sample size, we do not add additional control variables to the estimation of Equation (16). Essentially we are interested in the coefficients, α_2 and γ_2. If α_2 is positive and significant, then this indicates that GDP Granger causes progressive attitudes towards women. If γ_2 is positive and significant, then progressive attitudes towards women Granger cause GDP. If both coefficients are significant, then there is evidence that the causation between attitudes and income runs both ways.

Table 7 presents the results for the estimation of equation 16 for the four different attitudes measures for which we have data. Except for the case of CHILDFULFILL, these results provide evidence that higher GDP does Granger cause more progressive attitudes towards women.[10] Interestingly, once we control for the lagged values of the attitude variables, the previously insignificant GDP coefficient in the HWFULFILL estimation and the WORKINGMOTHER estimation now become significant. One possible explanation for this result is that omitted variables plague the cross-section estimation for these attitudes and that it is only after controlling for the lagged value of these attitudes are we able to uncover a relationship between attitudes and GDP. It is also interesting to note that lagged values of these two attitudes are not good predictors of future GDP, while the other two attitudes are. Thus, the weaker cross-section relationship reported in Table 6 could be a result of the fact that these particular attitudes do not cause GDP.[11]

[10] The p-value for the coefficient on lagged GDP in column 8 is .13.
[11] Of course, one possibility for the different results could be the different sample, however, we verified that our previous cross-section results reported in Table 6 are maintained even in the different sample used for the estimations in Table 7.

Overall, these results suggest that the relationship between progressive attitudes towards women and higher GDP is a two-way street. We find evidence that progressive attitudes towards women are associated with higher GDP in an economically meaningful way. Furthermore, the Granger causality tests suggest that progressive attitudes cause higher GDP and higher GDP cause progressive attitudes.

5 Conclusion

In this paper, we develop a simple model that describes how the status of women is both caused and affected by growth of income and how this dynamic interplay generates growth to the steady state. Under some circumstances, this feedback loop may be responsible for the development of poverty traps. We then present empirical results consistent with the conclusions and assumptions of the model. Both the human capital of women and attitudes towards women is affected by higher GDP.

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Table 1: Descriptive Statistics and Data Definitions

Variable Name	Obs.	Mean	S.D.	Definition
GDP	1265	5,471	8,448	GDP per capita in constant 1995 $US
OPENNESS	791	63.72	46.26	(Exports + Imports)/GDP
UF	324	10.12	8.21	Female Unemployment Rate
UM	324	7.53	5.66	Male Unemployment Rate
LITF	840	62.95	30.26	Female Literacy Rate
LITM	840	75.38	22.20	Male Literacy Rate
SECF	1,013	51.31	36.23	Female Secondary School Enrollment Rate (Gross)
SECM	1,012	54.57	32.42	Male Secondary School Enrollment Rate (Gross)
LIFEXF	1,608	63.09	12.80	Female Life Expectancy (Years)
LIFEXM	1,608	58.77	11.40	Male Life Expectancy (Years)
AGRF	375	28.16	33.05	% of Female Workers in Agriculture
AGRM	375	27.27	25.49	% of Male Workers in Agriculture
JOBRIGHT	43	.410	.206	% of population that disagrees that men should have more right to a job than women
CHILDFULFILL	42	.340	.200	% of population that says it is not necessary for a woman to have a child to be fulfilled
BOYGIRL	39	.664	.104	% of population that does not say it would prefer a boy over a girl child
HWFULFILL	42	.620	.154	% of population that says being a housewife is just as fulfilling as working for pay
WORKINGMOTHER	42	.670	.138	% of population that says a working mother can establish a warm and secure relationship with her children
BOTHINC	42	.826	.136	% of population agreeing that both husband and wife should contribute to family income
POLITIC	41	.453	.169	% of population disagreeing that men make better politicians than women
UNIEDUGIRL	42	.687	.138	% of population disagreeing that a university education is more important for a boy than for a girl
MONEYPROB	42	.474	.127	% of population disagreeing that it's almost certain to cause problems if a women earns more money than her husband
CIVIL LIBERTIES	45	3.22	1.6	Level of civil liberty on scale of 1 to 7, 1=free, 7=not free
JUDEOCHRISTIAN	55	.632	.351	% of population that is Jewish or Christian
MUSLIM	55	.054	.163	% of population that is Muslim
HINDU	55	.021	.107	% of population that is Hindu
BUDDHIST	55	.014	.054	% of population that is Buddhist

Table 2: Womens Welfare Outcomes and Attitudes towards Women By Income of Country

Variable	High Income Mean	Low Income Mean	Difference
SECF	68.09	38.74	29.35**
LIFEXF	67.12	59.29	7.82**
LITF	69.60	59.26	10.34**
AGRF	15.06	41.48	26.43**
UF	9.05	11.61	2.55**
JOBRIGHT	.54	.36	.17**
CHILDFULFILL	.52	.26	.26**
BOYGIRL	.69	.63	.06*
WORKINGMOTHER	.70	.65	.05
HWFULFILL	.60	.60	.00
BOTHIN	.81	.83	.02
POLITIC	.59	.39	.19**
MONEYPROB	.53	.45	.08**
UNIEDUGIRL	.76	.65	.11**

High Income Countries have per capita income > $5,500.
** indicates difference is statistically significant at the 5% level
*indicates difference is statistically significant at the 10% level

Table 3: Fixed Effects Estimation—Women's Welfare

	(1)	(2)	(3)	(4)	(5)
	SECF	LIFEXF	LITF	AGRF	UF
ln(LAGGDP)	-1.396	2.034	-8.869	-8.109	4.699
	(1.31)	(4.14)**	(5.86)**	(2.79)**	(3.74)**
SECM	0.670				
	(8.06)**				
SECM*ln(LAGGDP)	0.030				
	(3.15)**				
OPENNESS	0.008	-0.000	0.004	-0.042	0.004
	(0.72)	(0.16)	(0.55)	(1.44)	(0.27)
LIFEXM		1.248			
		(24.17)**			
LIFEXM*ln(LAGGDP)		-0.023			
		(3.17)**			
LITM			0.313		
			(2.90)**		
UM					2.903
					(7.02)**
UM*ln(LAGGDP)					-0.199
					(4.00)**
AGRM				-0.946	
				(2.24)**	
AGRM*ln(LAGGDP)				0.197	
				(3.35)**	
LITM*ln(LAGGDP)			0.119		
			(6.94)**		
Observations	551	639	442	283	254
Number of countries	149	154	105	108	84
R-squared	0.93	0.95	0.92	0.32	0.69

All estimations include year and country specific fixed effects.
Absolute value of t statistics in parentheses
** significant at 5%; * significant at 10%

Table 4: Dynamic Panel Estimations—Women's Welfare

	(1)	(2)	(3)	(4)	(5)
	SECF	LIFEXF	LITF	AGRF	UF
SECF	0.075				
	(0.84)				
ln(GDP)	-1.949	1.161	-2.723	-6.577	9.181
	(1.68)*	(2.58)**	(3.73)**	(1.78)*	(4.12)**
SECM	0.673				
	(6.34)**				
SECM*ln(GDP)	0.025				
	(2.02)**				
OPENNESS	-0.009	0.000	0.003	0.009	0.010
	(0.73)	(0.21)	(1.04)	(0.31)	(0.63)
LAGLIFEXF		0.065			
		(2.07)**			
LIFEXM		1.120			
		(20.55)**			
LIFEXM*ln(GDP)		-0.010			
		(1.65)*			
LAGLITF			0.645		
			(35.59)**		
LAGUF					0.571
					(5.23)**
UM					1.162
					(1.81)*
UM*ln(GDP)					-0.011
					(0.15)
LAGAGRF				0.812	
				(4.42)**	
AGRM				-0.050	
				(0.11)	
AGRM*ln(GDP)				0.093	
				(1.47)	
LITM			0.346		
			(7.47)**		
LITM*ln(GDP)			0.033		
			(3.95)**		
Observations	369	477	336	83	104
Number of countries	134	149	103	39	48

Estimation method is from Arellano and Bond (1991)
Includes time and country-specific effects
Absolute value of z statistics in parentheses
** significant at 5%; * significant at 10%

Table 5: Instrumental Variables Estimation

	(1)	(2)	(3)	(4)	(5)
	SECF	LIFEXF	LITF	AGRF	UF
ln(GDP)	-0.179	1.935	-7.479	-7.665	15.275
	(0.05)	(2.63)**	(3.23)**	(1.10)	(4.17)**
SECM*ln(GDP)	0.026				
	(1.67)*				
SECM	0.707				
	(5.46)**				
OPENNESS	0.010	-0.000	-0.002	-0.042	-0.014
	(0.73)	(0.17)	(0.24)	(1.28)	(0.93)
LIFEXM*ln(GDP)		-0.018			
		(2.16)*			
LIFEXM		1.210			
		(20.46)**			
LITM*ln(GDP)			0.124		
			(5.92)**		
UM*ln(GDP)					-0.151
					(2.71)**
UM					2.690
					(5.96)**
AGRM*ln(GDP)				0.232	
				(3.00)**	
AGRM				-1.188	
				(2.17)*	
LITM			0.303		
			(2.27)*		
Observations	516	595	413	274	242
Number of countries	144	152	103	106	80

Country and time-specific fixed effects included. Ln(GDP(t)) instrumented with ln(GDP(t-2)) in both the stand-alone term and in the interaction with the men's welfare indicator

Absolute value of z statistics in parentheses

* significant at 5%; ** significant at 1%

Table 6: Cross Country Estimation—using 1995 World Values Survey

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	UNIEDUGIRL	POLITIC	BOYGIRL	BOTHINC	MONEYPROB	HWFULFILL	WORKMOTHER	CHILDFULFILL	JOBRIGHT
GDP	0.078	0.119	0.040	0.031	0.062	0.048	0.043	0.135	0.068
	(2.97)**	(5.50)**	(4.02)**	(0.86)	(2.22)**	(1.17)	(1.17)	(7.40)**	(2.12)**
CL	0.010	0.019	-0.015	0.022	0.024	0.027	0.018	0.016	-0.022
	(0.41)	(0.81)	(1.34)	(1.11)	(0.97)	(0.88)	(0.82)	(1.10)	(0.68)
OPEN	-0.000	0.000	0.001	0.001	0.001	0.000	0.000	0.001	0.001
	(0.38)	(0.22)	(1.04)	(0.74)	(0.72)	(0.08)	(0.02)	(1.01)	(0.63)
JCHRISTIAN	0.128	0.172	0.021	0.099	0.061	0.029	-0.078	0.130	0.141
	(1.77)*	(3.03)**	(0.62)	(1.28)	(0.79)	(0.34)	(1.08)	(3.02)**	(1.47)
MUSLIM	0.171	0.095	0.125	0.084	-0.011	0.149	-0.069	0.218	0.147
	(1.47)	(0.94)	(3.17)**	(0.82)	(0.09)	(1.57)	(0.38)	(1.48)	(1.05)
HINDU	0.122	0.344	-0.094	-0.119	0.010	-0.072	-0.208	0.184	0.218
	(1.35)	(5.65)**	(2.40)**	(0.92)	(0.10)	(0.54)	(1.63)	(3.34)**	(2.07)**
BUDDHIST	-0.706	-0.921	-0.392	-0.806	-0.507	0.589	0.194	-0.855	-1.014
	(2.50)**	(3.12)**	(2.72)**	(1.53)	(1.85)*	(1.47)	(0.89)	(2.54)**	(2.75)**
Observations	41	40	38	41	41	41	41	41	42
R-squared	0.55	0.73	0.57	0.29	0.28	0.19	0.21	0.79	0.46

All estimations include a constant
Robust t statistics in parentheses
** significant at 5%; * significant at 10%

Table 7: Granger Causality—Using 1990 & 1995 WVS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	GDP	HWFULFILL	GDP	JOBRIGHT	GDP	WORKINGMOTHER	GDP	CHILDFULFILL
LAGGDP	1.004	0.046	0.980	0.070	0.996	0.032	0.952	0.044
	(33.63)**	(3.87)**	(29.38)**	(2.24)**	(30.86)**	(2.24)**	(30.52)**	(1.58)
LAGHWFULFILL	-0.296	0.474						
	(0.78)	(3.52)**						
LAGJOBRIGHT			0.445	0.168				
			(2.11)**	(0.76)				
LAGCHILDFULFILL							0.585	0.624
							(2.97)**	(4.33)**
LAGWORKINGMOTHER					0.611	0.281		
					(1.19)	(1.43)		
Observations	35	21	37	23	35	21	38	24
R-squared	0.97	0.51	0.97	0.26	0.97	0.35	0.98	0.85

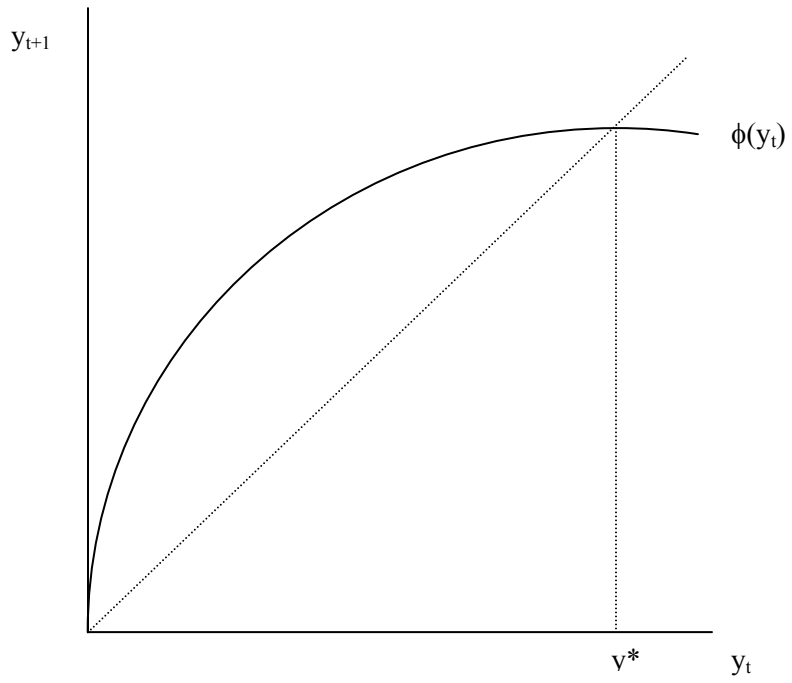
All estimations include a constant.

Robust t statistics in parentheses
** significant at 5%; * significant at 10%

Appendix: List of countries used in World Values Survey estimations

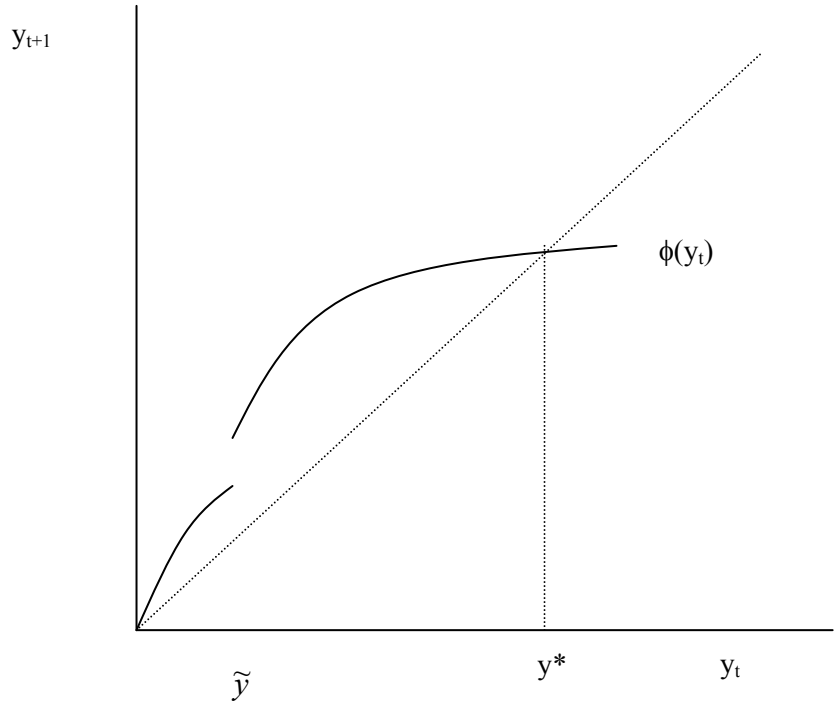
Argentina
Armenia
Australia
Azerbaijan
Bangladesh
Belarus
Bosnia
Brazil
Bulgaria
Chile
China
Colombia
Croatia
Dominican Republic
Estonia
Finland
Georgia
Ghana
India
Japan
Latvia
Lithuania
Macedonia
Mexico
Moldova
Nigeria
Norway
Peru
Philippines
Poland
Russia
South Africa
South Korea
Slovenia
Spain
Sweden
Switzerland
Turkey
Ukraine
Uruguay
Venezuela

Fig 1



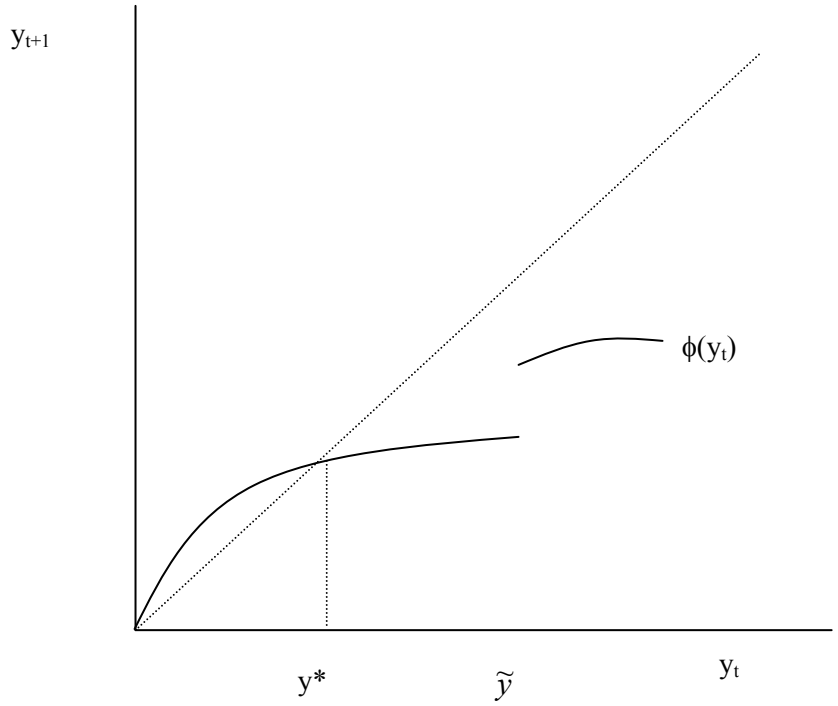
Existence of a unique steady state

Figure 2A



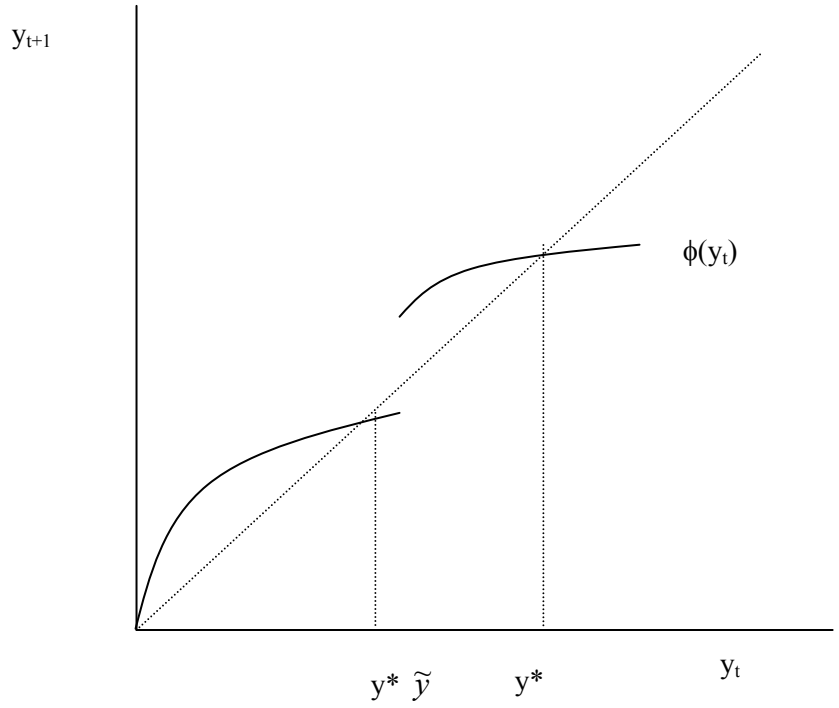
When $\tilde{y}$ is low, only the high income, gender equal steady state exists.

Figure 2B



When $\tilde{y}$ is high, only the low income, unequal steady state exists.

Figure 2C



For intermediate values of $\tilde{y}$, multiple steady state exists.