The Modern-Day Female Labor Force Function

An Analysis of the Robustness of the U-Shaped Female Labor Force Function

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Abstract

The questions that this paper intends to answer are: 1) Is there a U-shaped relationship between the female labor force participation (FLFP) rate and development in the present day? And 2) If we group countries geographically, will we see the U-shaped function outlined as development occurs over time? The U-shaped function is important because it allows us to predict the direction that the FLFP rate will move, dependent on a country's level of development. This prediction is crucial because there are endless gains of increased FLFP to both women and to society at large. Previous research has shown that in a snapshot in time (1985), there was evidence of the U-shaped function. However, there has been little research on how the function has played out throughout the past 30+ years. This paper finds that the U-shaped function remains robust to present day data. However, grouping countries geographically does not always produce results that support movement along the U-shaped function. Having a clearer understanding of the trends that FLFP follows through development will allow us to more successfully monitor and create policy to help women and society at large reap the benefits of increased women in the workforce.

1 Introduction

Economies across nations vary astronomically. In some of the most poverty-stricken countries, hundreds of millions of people fight daily to maintain the health and nutrition of their families. Meanwhile, rich countries waste an average of 222 million tons of food each year. This obscene amount of waste, from wealthy countries, is almost as high as the total net food production in Sub-Saharan Africa.[1] Although people who live in different countries face vastly different circumstances, as of the 1980's, one characteristic that remained fairly equal between the poorest nations and the wealthiest, was the female labor force participation rates (FLFP). For example, Nepal, which was one of the poorest countries in 1985, had a FLFP rate of about 51%,[2] while in the United States, one of the wealthiest countries in the world, the FLFP rate was 54.5%.[3] Regions of the world that are on opposite ends of the spectrum, in terms of economic outcomes, face almost equal percentages of women in their work forces. However, interestingly, as of 1985, the majority of middle-income countries faced a much lower FLFP rate than that of higher and lower-income countries. In combination, these statistics outline a U-shaped relationship between FLFP and development across countries (see **Appendix 9.1**). This finding was initially popularized by Harvard University professor Claudia Goldin in the early 1990's.

[1] See "Key Facts on Food Loss and Waste You Should Know", Food and Agriculture Organization of the United Nations, 2019, http://www.fao.org/save-food/resources/keyfindings/en/.
[2] See "Nepal - Labor Force Participation rate", International Labour Organization, November 2017, https://www.indexmundi.com/facts/nepal/labor-force-participation-rate.
[3] See "Gender Statistics", World Bank, April 2019, https://datacatalog.worldbank.org/dataset/gender-statistics.

1.1 Introducing Claudia Goldin

This paper will closely follow Goldin's original work "The U-Shaped Female Labor Force Function in Economic Development," (1994). Goldin is a world-renowned economist, having received a degree from Cornell University and a doctorate in economics from the University of Chicago. She was the first woman to gain tenure in the economics department at Harvard University and is best known for her work on women in economic history, labor economics, gender economics, and economics of work, family, and education. Goldin has won numerous awards in her field. Most recently she won the IZA Prize in Labor Economics "for her career-long work on the economic history of women in education and the labor market."[4]

1.2 Thesis Statement

Within this paper, I will be analyzing predictions posed in Goldin's original work regarding the U-shaped FLFP function. These predictions were made over 20 years ago. The first prediction was, that on average, countries would follow the U-shape FLFP curve, so that as development occurs (on a mass scale and over time) movement along the U will be visible and the U will remain present. Another prediction was that when aggregating regions by geography and looking at their FLFP trend, that trend should follow the U-shape over time. Based off of these predictions, the questions that this paper will be analyzing are:

1. When graphed using modern day data, does the FLFP rate maintain the U-shaped function as countries have become more developed?

[4] See "Claudia Goldin", The National Bureau of Economic Research, 2019, https://www.nber.org/people/claudia_goldin.

And secondly,

2. Over time, as geographic regions of the world become more developed, does their FLFP rate follow along the U-shaped function?

Answering these questions will allow us to understand whether or not the U-shaped female labor force function is able to help us predict the future FLFP rates of countries as they become more developed. If the curve remains robust to the present, we may expect to see that the least developed countries FLFP rates will drop initially with development, and eventually begin to rise as they become more developed countries.

1.3 Summary of Findings

I find that the U-shaped curve remains robust to data from 2010 and to data from 2014. These findings show that the U-shaped function is not present as solely a snapshot in time, but rather a trend that remains robust to over 30 years of economic, political, and cultural progression. Additionally, I find that, over the past 30 years, only some regions have moved along the U as predicted. This last finding suggests that either some regions have not seen much development over the last 30 years or grouping countries based off of geography no longer is sufficient when measuring economic development or economic growth.

Although many geographically neighboring countries have similar levels of development, running an analysis of development trends solely by a country's geography misses many factors. For example, over the past 30 years, China has been developing at an extreme rate. Because China has gone through development faster than its neighboring countries, it will not show

robustness to the U when graphed with countries that have fallen behind in terms of development. In China's case, it should be grouped with a different set of countries; other countries that face rapid development. The findings mentioned above may imply that geographical characteristics have less to do with FLFP and development than initially predicted.

The findings suggest that there is a strong U-shaped relationship between cross-country FLFP and level of development. It also suggests that the U-shaped relationship transcends time. Using these findings, we are able to better predict the direction of future levels of FLFP. Having a clearer understanding of the trends that FLFP follow through development will allow us to more successfully monitor and create policy to enable women and society at large to reap the benefits of increases in the FLFP rate.

1.4 Benefits of an Increase in FLFP

To truly understand the significance of the U-shaped function, it is important to first understand why tracking FLFP rates is crucial. The amount of women in the workforce not only impacts the quality of life for women, but also affects societies at large. Some of the most notable benefits that women gain from higher rates of FLFP include:

1. Increases in intra-household bargaining power
2. Higher rates of consumption
3. More opportunities for education

Some of the most notable benefits to society at large include:

1. More competitive markets
2. Lower fertility rates
3. Increased worker productivity
4. Healthier children
5. A more informed population
6. Increased total family income
7. Easier access to medical care
8. Increased investment in daughters

Women who have more labor market opportunities see an increase in intra-household bargaining power. This is likely because as a woman is bringing in her own income, she is more easily able to choose where the income is spent. Without an income, women are often subject to asking their spouse for money whenever they intend to consume or invest. This burden often discourages women from spending as they truly desire.[5] There is much evidence that when women choose where the household money is allocated, more resources go to investment in children as well as health. The effect on health is further increased by the increase in average family income. With the additional income, families are able to better afford medical care; both preventative and curative. Increases in FLFP will also increase educational opportunities for children of both sexes. Both children receive more investment and resources, often in the form of education. Girls will reap an additional benefit because as more women enter the labor force, the opportunity cost of not gaining an education for girls increases. There is strong evidence that

[5] See Majlesi Keveh, "Labor Market Opportunities and Women's Decision Making Power within Households", School of Economics and Management, 2014.

increases in FLFP are usually accompanied by increases in education for women as well. In theory, if a woman has a higher education she will be more capable of teaching her children in any department that their formal education lacks.[6] As the number of women in the labor force increases, firms will become more competitive and therefore, presumably more productive per capita. The increase in competition begins by the initial surplus of labor supply when women enter the workforce. As the opportunity cost of working increases, there will be delays in fertility rates. Therefore, the population growth in the developing countries will stagnate. This is particularly important for developing countries because in a majority of developing countries, there are not enough resources for such a vastly growing population.[7]

1.5 Contribution

In Goldin's initial work from 1985, we were able to see a strong U-shaped relationship between FLFP and level of development. However, as promising as the U-shaped function seems, we were only able to claim that the relationship between FLFP and development followed the U in a snapshot of time or a single year. We were not able to distinguish if this trend remains robust today, or if countries or regions move along the curve as they become more developed.

To begin to fill these gaps, I first inspect whether the U-shape is present using modern data. In doing this, I pay special attention to my method to ensure that I do not stray far from Goldin's. To find out if the original U is robust, I must follow as much of Goldin's method as possible. I extracted cross-country, World Bank data, just as Goldin had done over 20 years before. I hold the data source constant to ensure that each variable is measured as it was in the

[6] See Forum for African Women Educationalists, 2019, http://fawe.org/home/.
[7] See Heath, Rachel and Jayachandran, Seema, "The Causes and Consequences of Increased Female Education and Labor Force Participation in Developing Countries", The National Bureau of Economic Research, 2017.

original research. Next, I group geographically neighboring regions and watch if their levels of develop remain similar as they move along the U. Lastly, to help further distinguish if the U transcends time, I group regions based on level of development. I watch the FLFP tends of each grouping to test for movement along the U.

2 Literature Review

2.1 The U-Shaped Female Labor Force Function in Economic Development [8]

Claudia Goldin's highly acclaimed work "The U-Shaped Female Labor Force Function in Economic Development," gives a lot of background on where, geographically, women are reaping the benefits of high FLFP rates and the philosophy behind why these benefits are dispersed by region. Goldin looks at the relationship between development and female labor force participation and finds that as development increases, FLFP follows a U-shape. Goldin begins by outlining the theory behind this trend. She finds that in countries with lower levels of development, women tend to be in the workforce in high numbers. At this stage, a majority of women work in home-agriculture or home-businesses and are often unpaid. At the lowest levels of development, households benefit greatly from having two incomes to sustain the home. As development increases, wages rise and the income effect begins to take over. In this circumstance, the income effect is best defined as; "a target income has been reached and people prefer spending less time earning more income,".[9] At this stage, women begin to drop out of the

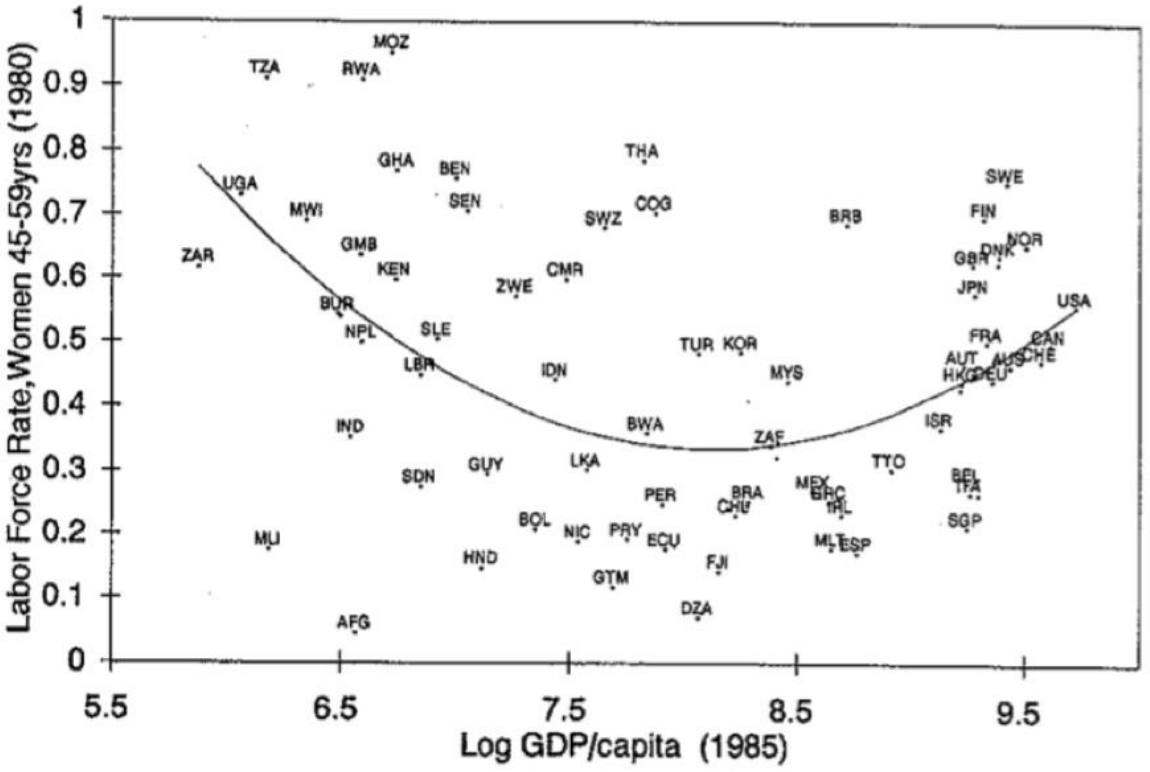
[8] See Goldin, Claudia, "The U-Shaped Female Labor Force Function in Economic Development and Economic History", The National Bureau of Economic Research, 1994.
[9] See "Wage Rises – Income & Substitution Effects (Labour Markets)", 2018, https://www.tutor2u.net/economics/reference/income-substitution-effects-of-wage-rise.

labor force. Goldin explains that this is often due to an increase in technology causing a shift in the demand of labor from agriculture to blue collar work. In many regions, blue collar employers have a preference for men and there is a stigma against women in this sector; hence women retreat back to their households. In this middle level of development, it is common that education levels increase; however, in greater quantity for men than for women. The disparity in education between men and women will cause women's relative productivity to be much lower than men's. It is not until higher levels of development are achieved that women's education on average begins to rise. The increase in education often enables women to enter the white-collar sector and hence have higher wages. This increased wage causes the opportunity cost of not working to increase. With the increased opportunity cost, the substitution effect begins to take over and women begin to enter the labor force once again. At this stage, the substitution effect is best defined as; "a rise in the real wage increases the opportunity cost of leisure,".[10]

To find the U-shaped function, Goldin uses cross-country data from the World Bank. As shown in **Figure 1**, the labor force rate of women 45-59 years old is graphed on the y-axis against the log of per capita GDP on the x-axis. Goldin chose to focus on women aged 45-59 to avoid effects of unmarried women and those who will factor fertility into their employment decisions. A notable finding that Goldin emphasizes is how little variation there is in income and FLFP between countries in the same regions. For example, at the upper left portion of the curve, or the lowest levels of development are countries in East, Middle, and West African regions while western Europe, northern Europe, North America, and portions of the Pacific are grouped in the highest levels of development in the upper right section of the U (see **Appendix 9.3**). Geographical clumping is visible along the entirety of the U-Shaped curve.

[10] See "Wage Rises – Income & Substitution Effects (Labour Markets)", 2018, https://www.tutor2u.net/economics/reference/income-substitution-effects-of-wage-rise.

Figure 1: *The Original U-Shaped Function*

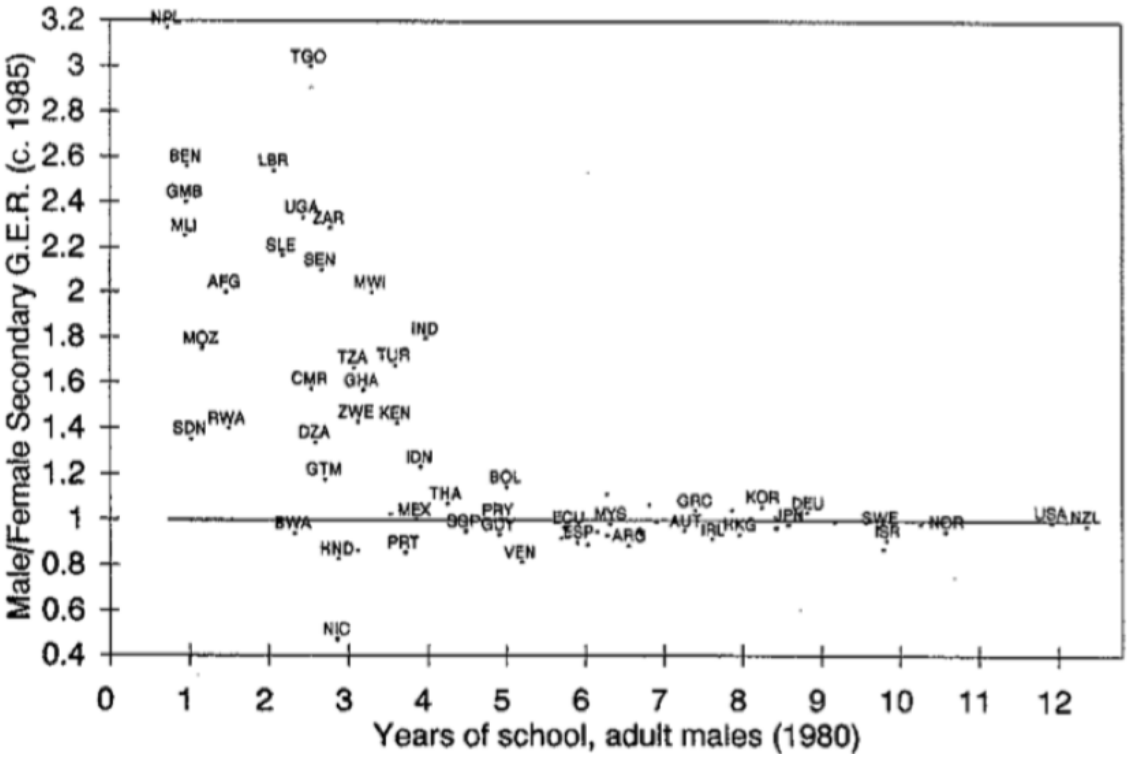


Source: The U-Shaped Female Labor Force Function in Economic Development

Education as a bridge to increased FLFP brings up an additional argument that further explains the U-shaped relationship between development and FLFP. There is a strong correlation between average years of schooling and a country's development[11]. As shown in **Figure 2**, lower levels of male education are associated with a larger disparity in the average schooling of men and women. This suggests that when male education has increased and there is still a large disparity between female and male education, women's relative productivity will be much lower than men's. This disparity will have the power to drive women out of the workforce, which supports the declining portion of the U-shaped curve.

[11] See Heath, Rachel and Jayachandran, Seema, 2017.

Figure 2: *Male Years of Schooling and the Sex Ratio of Secondary Education*



Source: The U-Shaped Female Labor Force Function in Economic Development

To test this theory out, Goldin completed a regression that looked at the impact on the sex ratio of clerical workers, which is a high skill job, from the disparity of male to female education (see **Table 1)**. She found that larger disparities in education have a negative impact on the female to male ratio for clerical workers. Additionally, in **Table 2**, Goldin looked at the impact of the male labor force participation rate in the white-collar sector on the female labor force participation rate. The results show that if more men are working in the white-collar sector, then less women are in the workforce. As mentioned previously, the relative productivity of women to men is lowered when women have less education than men. The disparity in productivity disincentivizes women from working.

Table 1: *Sex Ratio of Clerical Workers*

Dependent Variable: (Female/Male) Clerical Workers	
Log (male/female years of education)	−0.375 (1.84)
Percent females with secondary education	0.0315 (6.23)
Constant	0.523 (3.03)
adjusted R^2 = 0.47; number of observations = 83	
Ordinary least squares estimation; *t*-statistics in parentheses	

Sources: Occupational distribution and labor force participation rates c. 1980: United Nations (1992); years of school for the adult (> 25 years) female and male populations in 1980: Barro and Lee (1993).

Source: The U-Shaped Female Labor Force Function in Economic Development

Table 2: *Male White-Collar Work and Female Labor Force Participation*

Dependent Variable: Female Labor Force Participation Rate of 45- to 59-Year-Olds	
Percent male labor force in white-collar sector	−0.793 (2.16)
Percent of female labor force in clerical sector (%FCLER)	−1.25 (2.16)
Years of schooling of adult women (FSCHL)	0.0153 (0.83)
%FCLER × FSCHL	0.168 (2.25)
Constant	0.514 (8.59)
adjusted R^2 = 0.18; number of observations = 82	
Ordinary least squares estimation; *t*-statistics in parentheses	

Sources: Occupational distribution and labor force participation rates c. 1980: United Nations (1992); years of school for the adult (> 25 years) female population in 1980: Barro and Lee (1993).

Source: The U-Shaped Female Labor Force Function in Economic Development

In Goldin's concluding remarks she mentions that in general the female labor force participation rate is U-shaped as economic development increases. She looked at the U-shape on a world-wide scale and also was able to break down the U-shape for the United States over time. She found that her model was robust to cross-country data as well as to historical data on a single country. Although the U is present when looking at US historical data, it is unlikely that a majority of individual countries will see this U-shape. Instead, Goldin predicts that clumping regions and looking at their trend together should show the U-shape over time. Goldin suggests the clumping method because there are many factors that will play into the shape of the curve. Looking at regions rather than individual countries will numb out the effects from these various other variables and reveal the U-shaped curve.

2.2 The Causes and Consequences of Increased Female Education and Labor Force Participation in Developing Countries [12]

Throughout history women and their allies have been making advancements to tighten the gender gap between women and men. We see this gap in numerous industries such as in wages, education, bargaining power, labor force participation rate, etc. In general, the gender gap between men and women appears stronger in lesser developed countries than in more developed countries. More often than not, when the gap in one of these industries is able to tighten, then the gap between men and women in the other industry sees a tightening as well. This tightening that spans multiple industries could have multiple potential causes. This correlation could come from a third variable that affects women in both of the industries, also known as third variable bias or

[12] See Heath, Rachel and Jayachandran, Seema, 2017.

it could come from a direct correlation between a reduced gap between one industry and the other. This correlation is particularly strong when looking at an increase in female education and the female work force participation rate.

Rachel Heath and Seema Jayachandran discuss in depth the female work force participation rate, and benefits caused by its increases, in their paper "The Causes and Consequences of Increased Female Education and Labor Force Participation in Developing Countries*,"* (2017).

Heath and Jayachandran explain that in recent years both female education and female work force participation rates have increased, causing the gender gap to tighten. The article suggests that the recent increase in female education has augmented the demand for women in the workforce, suggesting that the increase in education causes the increase in labor force participation. However, the paper also mentions that with improved labor market opportunities for women, there is more incentive for women to become more educated. Overall, either improved labor opportunities for women or increased amounts of education will result in a cyclical pattern. In other words, increase in education will cause an increase in female labor force participation, which in turn will incentivize an even further increase in education for women. Both of these increases described previously are positive outcomes for women. Heath and Jayachandran describe that the most common way developing countries begin this process is through policy intervention. In terms of helping increase the female education rate, the paper offers policy programs such as: "providing cash or in-kind benefits to parents who keep their daughters in school, building schools or improving facilities, and developing programs to reduce general gender disparities can all lead to increases in girls' education". The article mentions that if the onset of the cycle would be an increase in the female labor force participation rate then the

most predominantly accepted start would be overall development, as measured through Goldin's U-shaped curve that was initially developed in the 1990's.

2.3 Women's Work and Economic Development [13]

Another paper that helps to outline some of the background regarding women's education and the workforce participation rate is from the Journal of Economic Perspectives. The article, "Women's Work and Economic Development", is written by Princeton economics graduate student, Kristin Mammen and Princeton professor of economics and public affairs, Christina Paxson. Mammen and Paxson discuss the increase in both women's education and in the female labor force participation rate as countries become more developed. This trend suggests that this paper has a focus on the upward sloping portion of the U-shaped FLFP function. The main theme of this paper is to test the well-being of women as economic development increases. They test various factors in an attempt to measure where women are the most well off in terms of their country's development. This paper found that typically, women are more well off when a country is more developed.

The article begins by explaining the textbook example of women's work and economic development. The first step is to qualify what factors play a role in the women's decision to work. The article explains that the two most important factors to this formula will be the opportunity cost of the women's time and the amount of income that the women has access to

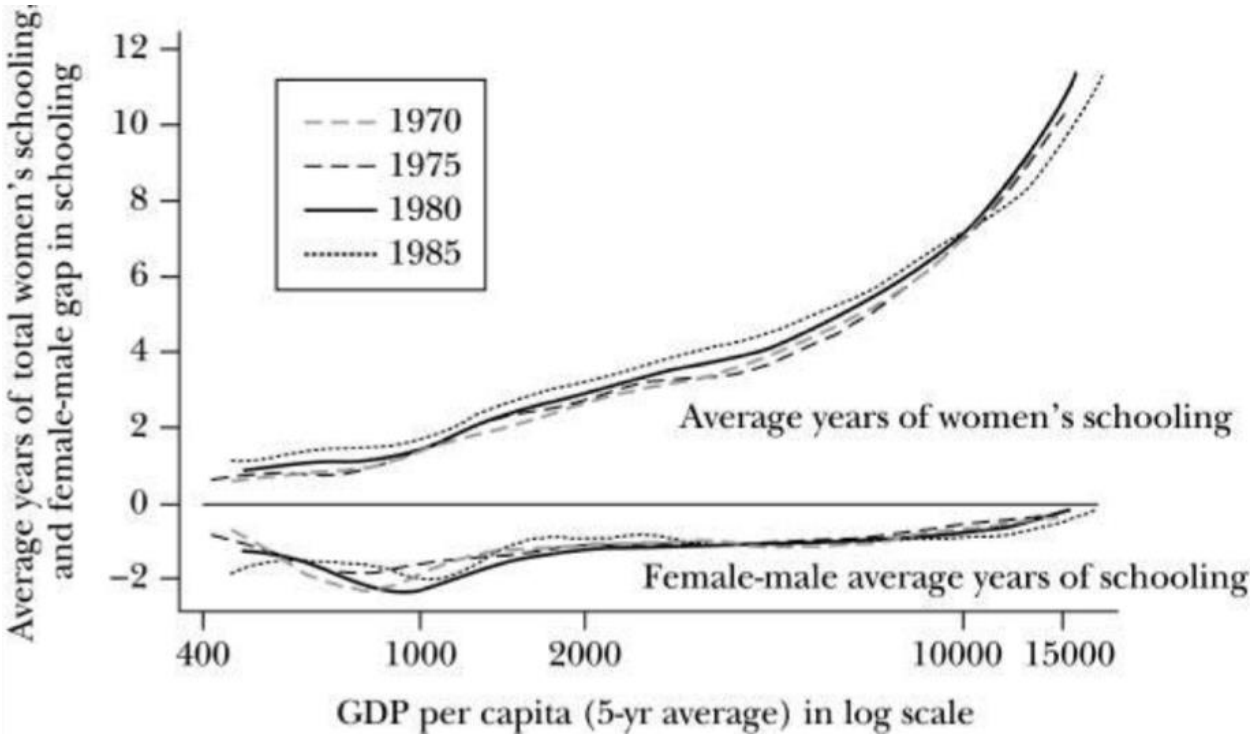
[13] See Mammen, Kristin and Paxson, Christina, "Women's Work and Economic Development", American Economic Association, 2000.

that she has not earned herself, usually her husband's income. As either of these variables increase, the woman will be less likely to participate in the workforce. When looking at a model such as the one explained above, we can infer that if male productivity or earnings increase at a faster rate than women's, then women will begin to drop out of the labor market. Because much of the supply of women in the workforce is dependent on the earnings of men, we can view the two as substitutes for one another. However, in the context of developing countries there may be an added variable that is important to consider; the added costs of women working outside of the home. This additional variable indicates that more women will be working for family businesses. Therefore, increases in particular sectors of the economy will have very different effects on men vs. women. For example, if women are mostly working for home businesses, an increase in manufacturing will increase men's opportunities and wages more than women's. This in turn will drive more women out of the workforce due to the substitution effect discussed earlier. As Shultz (1988, p.604) explains "until women can acquire the requisite schooling and transferable skills to find suitable employment in firms in expanding sectors of the modern economy, the opportunity value of women's time relative to men's time may decline". This phenomena as a whole, leads Mammen and Paxson to support the U-shaped curve for women's labor force participation rate as economic development increases. Similar to both Heath and Jayachandran's and Goldin's findings, in very early stages of development women and men both have high labor force participation rates. As development continues, due to the opportunity cost of women working, the amount of income coming in from the women's husband, and the added costs due to factors such as social norms, women begin to drop out of the workforce. As development advances even further, women gain the necessary tools, (education or other skills that are transferable to the employment sector of the economy) to increase the opportunity cost of not working.

Mammen and Paxson dedicate an additional section to discuss their work using cross-country data. They aim to find the relationship between economic development and multiple other variables of women's status including investment in education, labor force participation, participation in wage work, and fertility. They find that as development increases, education increases in absolute terms and in terms relative to men. They also find that fertility drops as a country becomes more developed.

Figure 3 below is created from Mammen and Paxson's findings using data on 90 countries including all income levels, with information on average years of education for 1970, 1975, 1980, and 1985. For each year, a regression of average years of female education on the logarithm of a five-year average of real GDP per capita is taken. According to the regression, an increase in real GDP per capita, of $1,000 USD to $10,000 USD is associated with an increase of six years in average education. This positive correlation suggests that education is a normal consumer good. The bottom curves, in **Figure 3**, show a regression for the female-male education gap. The figure measures the gap as average years of adult female minus adult male schooling. Although, over time there is no change in the gap seen, we are able to see the gap shrink as the country's income levels increase.

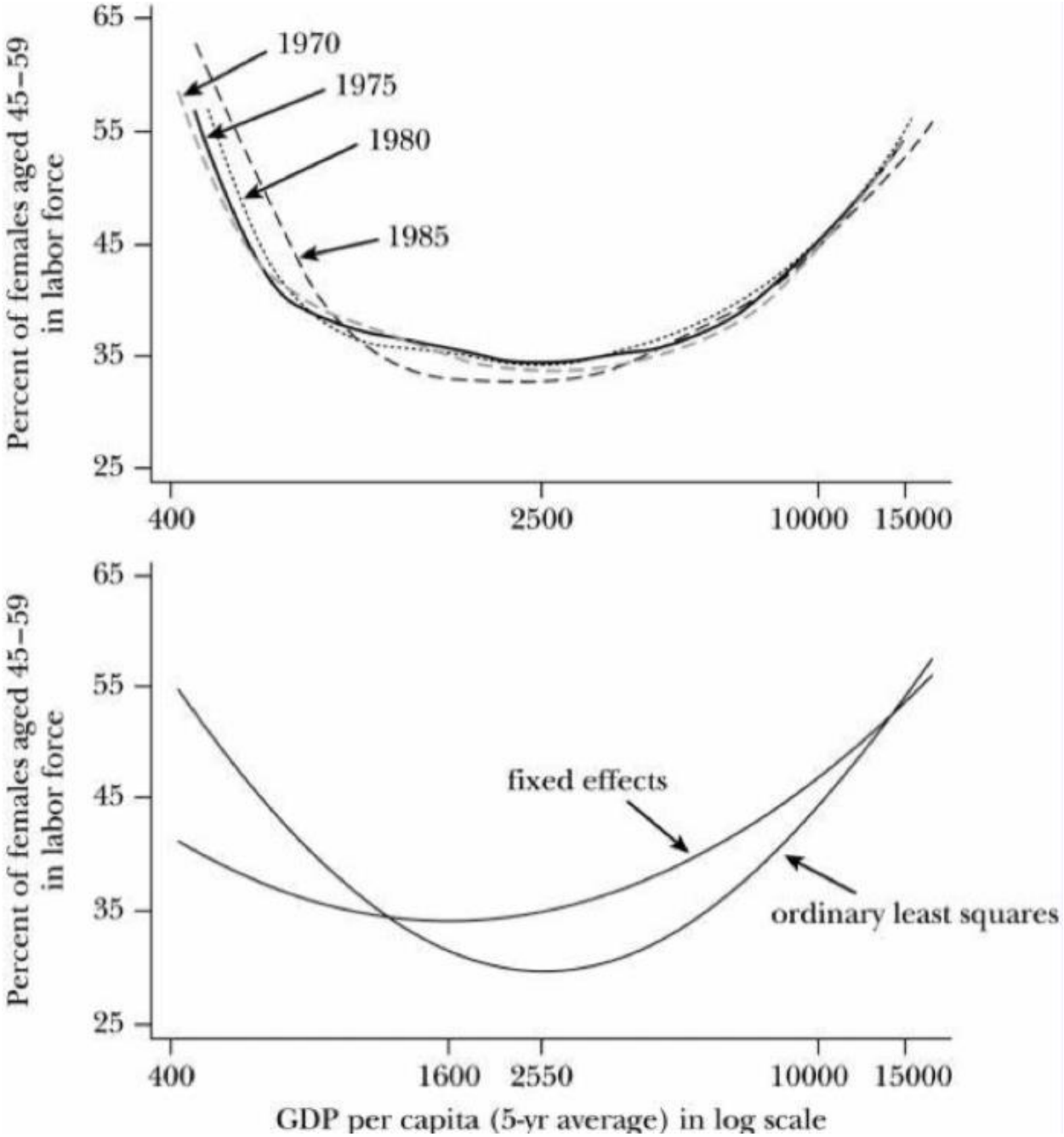
Figure 3: *Women's Schooling and Female-Male Gaps in Schooling Along Development*



Source: Women's Work and Economic Development

Additionally, Mammen and Paxson dig deeper into Goldin's U-shaped female labor force participation curve by looking at single countries throughout multiple years. They do this to see what happens to these countries as they grow. They start by estimating a quadratic regression, with labor force participation regressed on the logarithm of per capita GDP and log of per capita GDP square, with and without a set of country specific "fixed effects", or intercepts. As seen in **Figure 4** below, the U-shaped curve remains robust. However, the results suggest that when considering the fixed effects on individual countries, they estimate a smaller effect of increases of per capita GDP on female labor force participation rates.

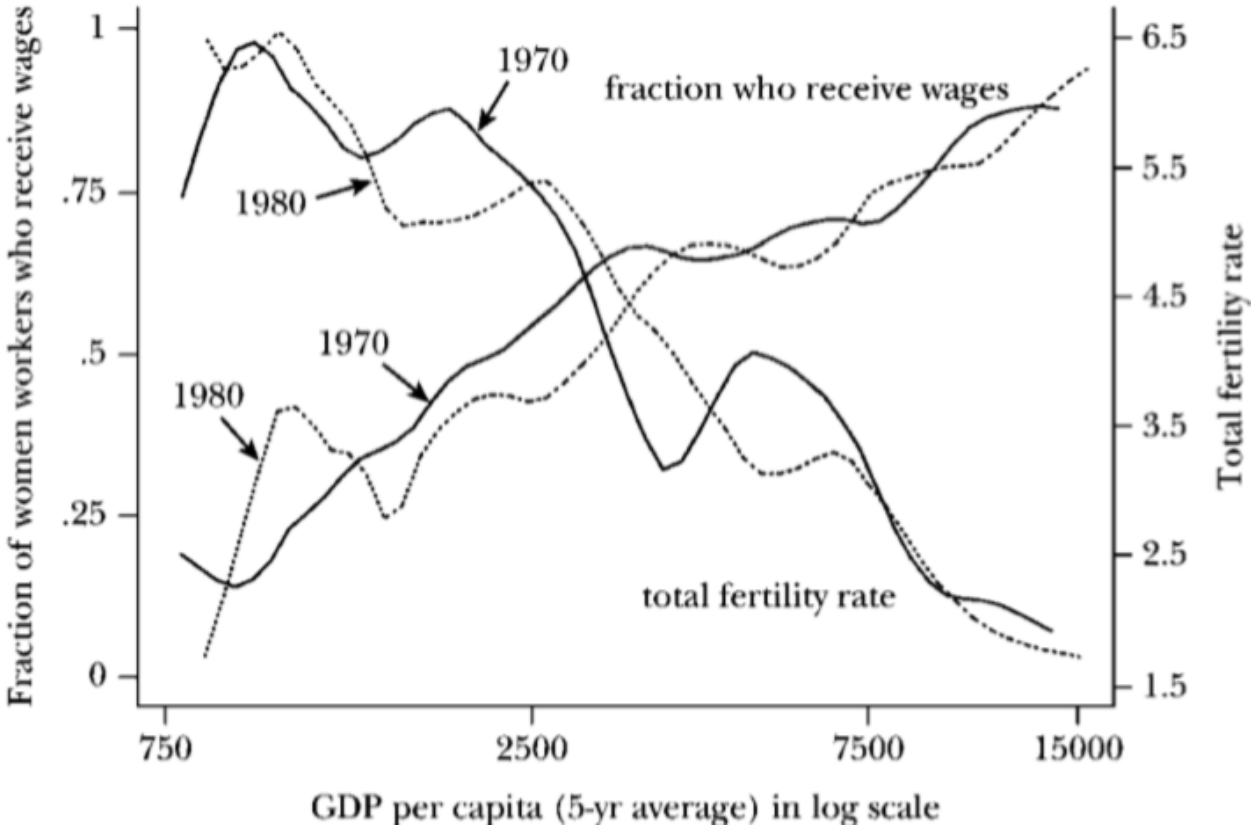
Figure 4: *The U-Shaped Function (Fixed Effects and OLS)*



Source: Women's Work and Economic Development

Figure 5 shows the regression of the fraction of working women who recieve a wage on the 5-year average of the log of per capita GDP. Additionally, the downward sloping curve shows the total fertility rate. As depicted in the graph, as women earn more, their demand for children decreases. Assuming that children are normal goods, when a women's wage increases you would expect that her demand for children increase. However, the women's opportunity cost of time is now much higher, which drives the demand for children down. The decrease in demand shows that this effect is much stronger than the income effect. In this case, children would be considered Giffen goods. Another factor that may drive the demand for children down as incomes increase is the possibility of savings and pensions.

Figure 5: *Women with Wages and GDP per Capita*



Source: Women's Work and Economic Development

Lastly Mammen and Paxson discuss two case studies, one in Thailand and the other in India. They choose these two regions because they want to compare two countries with vastly different economic and social norms and trends. Thailand's quantity of land is plentiful and relatively evenly distributed while India's is not. Additionally, historically, Thailand has had a high women labor force participation while India has not.

For data on Thai household's Mammen and Paxson use the Socioeconomic Surveys from 1981, 1986, 1988, 1990, 1992, 1994, and 1996. These cross-sectional surveys allow them to track birth cohorts, labor force participation and work activities of women over time. For India, Mammen and Paxon use data from the 1993-1994 National Sample Survey to look into work activities and household expenditure.

Mammen and Paxon also show the fraction of Thai women in the workforce by separate age brackets. The results show that the younger cohorts are less likely to work. As supported by the earlier section, this is possibly due to the income effect. Because of economic development, the younger cohorts may have more income coming in from other members of the households, or their husbands. As described by the U-shaped curve, this will drive women out of the workforce. They also discuss the percent of women in each cohort that work for wages. They discover that although less women in younger cohorts are working, an increase in development and therefore an increase in women's education on average has allowed them to be more likely to receive wages for their work. Another important finding of Mammen and Paxson is that women in Thailand over time have begun to move more heavily into non-manual labor, where in contrast, men have shifted into more manual labor.

Next, Mammen and Paxon begin to investigate the impact of women's education and the education of their spouses on women's labor force participation rates in both India and Thailand.

Because in Thailand there is less of a stigma surrounding women in the workforce, we may expect to see that as education increases for both men and women, the work force participation rate will increase for both men and women. This would be due to people being more qualified and skilled working for higher wages than before. Whereas in India as education increases, we will expect the female labor force participation rate to decrease, due to the substitution effect. As shown in **Table 3**, this hypothesis proves to be correct. Higher spousal education in Thailand is associated with higher percentage of women working as employees. In India, the opposite is true. In both countries, more educated women are more likely to work for wages. Increased education also causes more women to work in non-manual labor jobs. This implies that the social stigma of women working in India is not attached to all types of jobs. Once again as supported by Goldin's U-shaped curve, initial increases in both women and men's education decreases the number of women in the workforce, whereas increases above the secondary level of education lead to increases in labor force participation.

Table 3: *Women's Labor Force Participation and Types of Employment*

Women's Labor Force Participation and Types of Employment
(married women aged 22–65; linear probability models)

	Labor Force Participation	*Employee*	*Nonfarm Nonmanual Worker*
	Indian Women (obs = 84,573)	*Working Indian Women (obs = 23,856)*	
Completed secondary schooling	0.051	0.369	0.533
Completed postsecondary schooling	0.254	0.512	0.587
Spouse completed secondary schooling	−0.150	−0.188	0.047
Spouse completed postsecondary schooling	−0.186	−0.126	0.086
Rural	0.163	−0.070	−0.285
In scheduled caste or tribe	0.110	0.218	−0.014
	Thai Women (obs = 68,432)	*Working Thai Women (obs = 52,425)*	
Has secondary schooling	−0.004	0.145	0.226
Has postsecondary schooling	0.231	0.530	0.451
Spouse has secondary schooling	−0.114	0.027	0.170
Spouse has postsecondary schooling	−0.181	0.055	0.210
Rural	0.202	−0.164	−0.333

Source: Women's Work and Economic Development

Mammen and Paxson do a thorough job of discussing multiple labor force participation rate trends for women as development increases. Overall, in lesser developed countries women receive less education than men, they have higher mortality, and less status in society. They finish by pointing out that although overall women benefit from development, the benefits are not equally distributed. Benefits are particularly sparse for rural poor women.

Mammen and Paxon do a thorough job of explaining where, in terms of economic development, women are the best off. This discussion is particularly important because it validates the importance of tracking the FLFP rate throughout development.

3 The Data and Basic Trends

For my analysis, I used the 2018 edition of the "Gender Statistics Report". The Gender Statistics Report is an existing time series dataset created by the World Bank on a quarterly basis. As highlighted on the World Bank's website, the database is a "comprehensive source for the latest sex-disaggregated data and gender statistics covering demography, education, health, access to economic opportunities, public life and decision-making, and agency,".[14] The report includes numerous variables including both household survey style variables and economic indicator variables. The database allows me access to annual data on 217 countries and regions, covering years 1960 to 2018. The Gender Statistics report is particularly well suited for my research because it contains gender specific data that is representative of countries in every stage of development. The large number of countries and years enables me to better track trends in FLFP over time. Also, with such a large time series dataset, I have enough data points to aggregate groups of countries based on characteristics, such as geography, to determine whether or not they are following the U-shaped function.

3.1 Limitations

Although the database has information on over 200 regions, the variables are all collected from the individual countries or regions. Self-reported data implies that there may be inconsistencies in the ways that different countries calculate the FLFP rate or other variables within my research. Additionally, because many lesser developed countries have only recently started tracking their FLFP, there is less information on the FLFP in many of these countries. I

[14] See World Bank. 2018.

remain aware of this issue as a potential bias in my analysis. Although the Gender Statistics Report has these limitations, the massive size will help mitigate the impact of much of this error.

3.2 Key Variables

I will be analyzing the direction that the FLFP rate moves as development increases. Using this dataset, I had the option of two dependent variables. Both variables represent the countries FLFP rate; however, one is the national estimate, while the other is the International Labour Office's estimate. The International Labour Office created a standardized method to calculate countries FLFP rates. However, their calculations only go back to the year 2002. In order to track development over a longer period of time, I choose the national estimates version of FLFP.

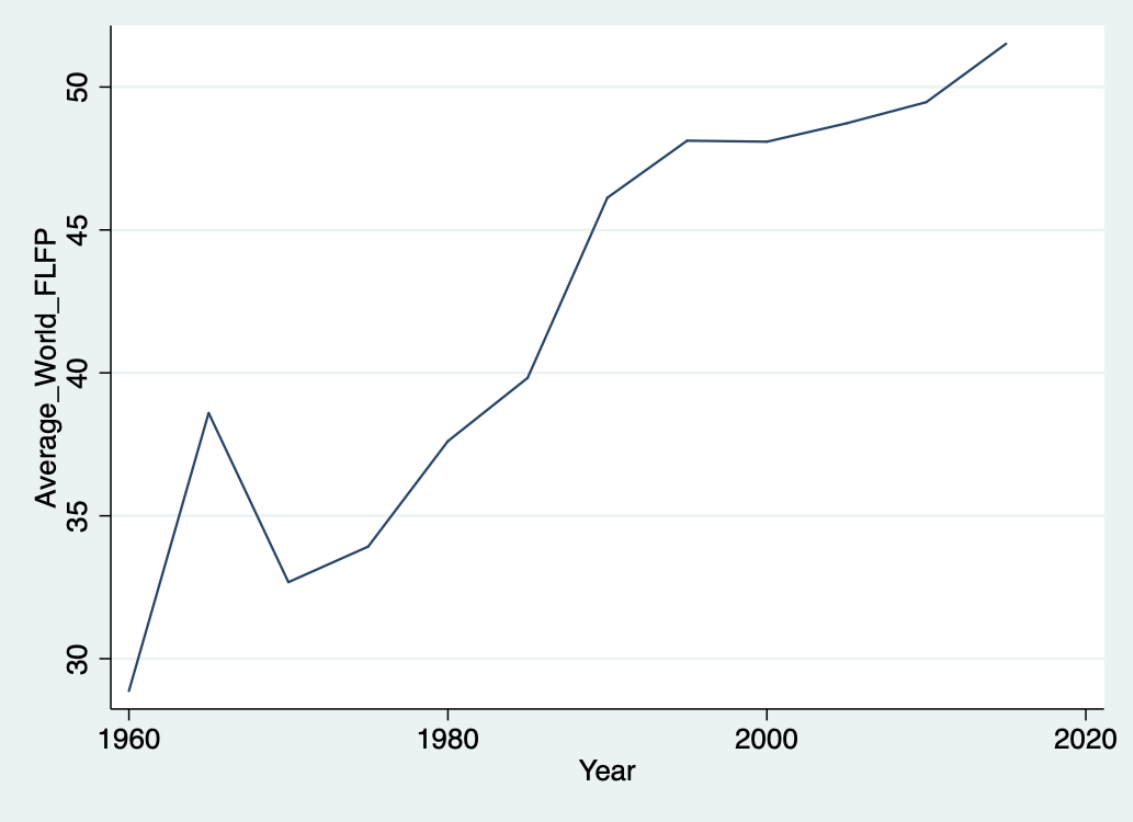
The key right-hand side variable is each country's level of development. The World Bank report offered many measures of development. However, to align with the original work from Goldin, I choose to include the GDP per capita. A country's GDP is a measure of the economy's total income and total expenditure on goods and services. A rational individual prefers higher income and higher expenditure, therefore, GDP per capita is a good measurement of individuals' economic well-being. Using GDP per capita as the measure of development allows us to define whether there is a positive correlation between economic well-being and more women in the workforce.

4 Descriptive Patterns

4.1 Female Labor Force Participation

The most important variable in this research is the female labor force participation rate. The average FLFP rate among all countries and regions and across all years is 46%. However, the world average has increased from about 29% to about 50% from the time the report began in 1960 to 2017. It is important to note that in 1960, the report only captured data on the FLFP rate from 62 countries and regions. By 2017, the report was able to capture data from 109 countries and regions. When measuring the average of all countries over all years, the average will be reported higher than the actual average because more weight is put on recent years. Regardless, as shown in **Figure 6**, in general, a higher percent of women are entering the labor force today than have in the past.

Figure 6: *Female Labor Force Participation (1960-2018)*



Source: The World Bank

The use of general percentages of FLFP of each income bracket may show preliminary evidence of the U-shaped curve. When grouping low income regions, the average FLFP rate is 41% across years 1985 to 1990. Middle income countries have an average FLFP rate of 36% across years 1985 to 1990 and high-income countries have an average FLFP rate of 45% across years 1985 to 1990. When grouping the same 1985 low income countries, the average 2017 FLFP rate is 45%. Middle income countries have an average FLFP rate of 46% and high-income countries have an average FLFP rate of about 54%. These preliminary results do suggest that

there is the presence of the U-shaped FLFP function from years 1985 to 1990. However, the FLFP rates using the same region groupings with 2017 data may not support the U.

4.2 Real Per Capita GDP

Real per capita GDP is another crucial variable in this research. The range of real per capita GDP in 1960 spans from 158.8 to 27,838.4. The country with the lowest per capita GDP was Myanmar, which is located in Southeast Asia. The country, or territory in this case, with the highest was Bermuda, which is a British Island territory located in the North Atlantic Ocean. The range of real per capita GDP in 2017 spans from 213.4 to 107,865.3. The country with the lowest per capita GDP was Burundi, which is located in East Africa. The country with the highest was Luxembourg, which is located in Western Europe. These findings are interesting because they suggest that the disparity between real per capita GDP has increased tremendously throughout the years that the Gender Statistics report has been around.

5 Economic Logic

5.1 Preferences and the U-Shaped Function [15]

The theory behind the U-shaped curve begins with the framework shown in **Figure 7**. The model includes the good that the firm produces (G), time the women spends working to produce goods (G), time the women spends on childcare (C), and the total amount of time in the given period (T). In this figure, production of G is guided by a production possibilities frontier

[15] See Goldin, Claudia, 1994.

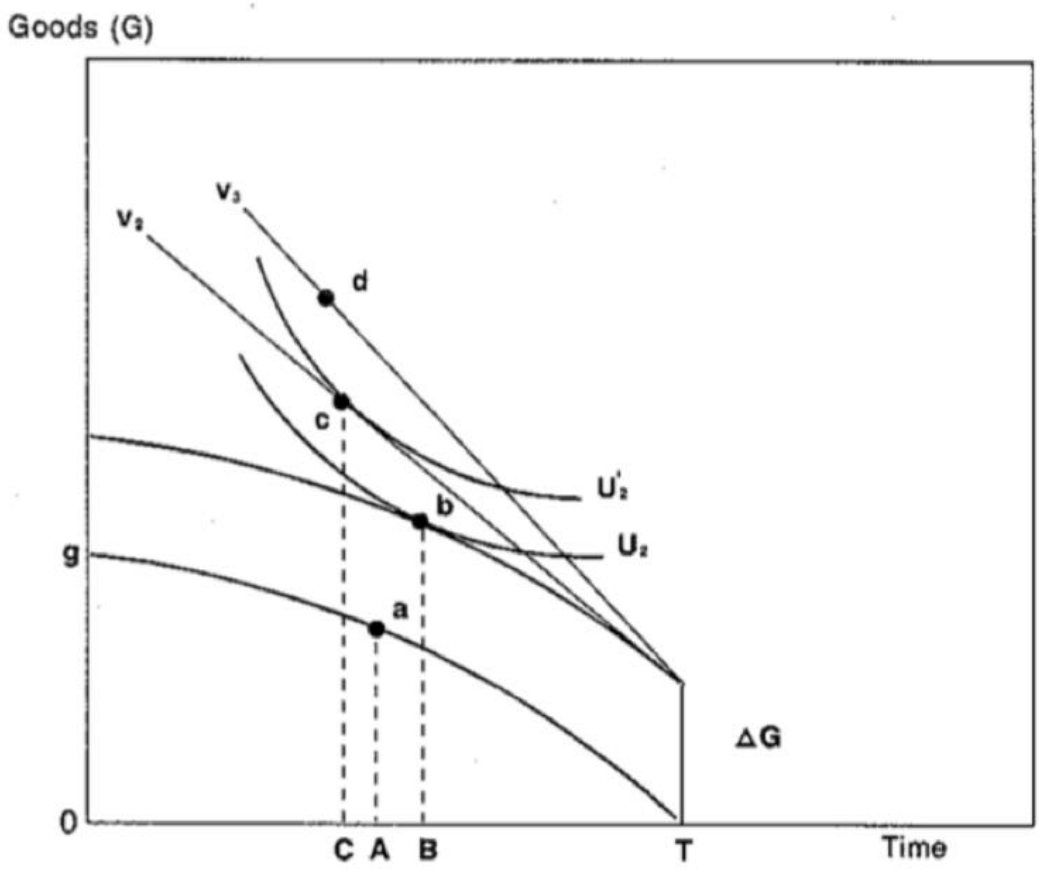
(PPF), which shifts up by ΔG as the income of family members increases. The woman's utility is shown as an indifference curve tangent to the PPF. In this model, the woman's utility function is as shown below:

$$U = U(G,C)$$

In **Figure 7**, a woman initially chooses point a. In this stage, the woman is working in her home towards production of goods at A hours. However, imagine a new firm appears causing a family member's income to increase. Due to this, the income effect drives the woman to point b. Her home production time decreases to B. However, with the addition of the firm, the woman now has the option to work outside of the home. The line V_2 represents the increase in wages that the women could obtain if she were to work at the firm rather than through home-production. Given the entrance of the firm and the increased wage opportunity, the model suggests that the woman will now choose to work for the firm rather than for home-production. Lastly, line V_3 shows how a woman's preferences may change if she were able to get a job in the white-collar sector. While this model shows a possibility for the U-shaped function, it may not hold while economic development increases family income and women's wages simultaneously.

This initial figure does not incorporate a binary variable for the stigma (S) that the family faces from society when the wife works in the blue-collar sector. To account for the entirety of the U-shaped function, stigma must be brought into the model.

Figure 7: *Women's Preferences Towards Work*



Source: The U-Shaped Female Labor Force Function in Economic Development

5.2 Introducing Stigma

In reality there is often a stigma attached to women working in the blue-collar sector. Stigma detracts from a woman's utility function.[16] Once taking this stigma into account the women's utility function will be as shown as follows:

[16] See Goldin, Claudia, 1994.

$$U = U(G,C) - dS$$

This added variable has powerful adverse effects on women's employment outcomes. The amount that a family is affected by stigma differs, as shown through the value of d. When the value of d increases, the family is more strongly affected by the stigma. When the value of d decreases, the family is less affected. The effect may deter women from moving from equilibrium a to b or equilibrium b to c. Whether the stigma has a significant effect on the employment outcomes of women depends on whether her increase in utility from the increase in income is greater than or less than the value of the stigma.

$$(U'_2 - U_2) > S \quad \text{or} \quad (U'_2 - U_2) < S$$

The value of the stigma tends to be larger at lower levels of household income and when women's wages are lower.

In the stigma model, when women have lower levels of education and thus only have employment options in home-production or blue-collar positions, more women will leave the workforce. As women gain education and have employment options in white-collar firms, the FLFP increases. Once stigma is accounted for in the model, all portions of the U-shaped function are supported.

6 Empirical Results

The final results show that the U-shaped female labor force function remains robust to present day data. As of 2014, each portion of the U is present and strong. The presence of the full

U demonstrates that countries that had low levels of development in 1985 have not developed as we may have expected throughout the past 30 years. If all countries had seen substantial development over the past 30 years, we would expect to see the upper left portion of the U disappear when using present day data. This lack of development suggests that on average, geographic regions that faced lower levels of development in 1985, will not have traveled much along the U over the past couple of decades.

When breaking up regions to test the second half of my hypothesis, I broke the countries into six geographic regions (see **Appendix 9.3**). The regions were split into groupings as defined in Goldin's original paper (see Literature Review). The most underdeveloped region showed a significant decline in the FLFP as it faced development. Although the decline in FLFP was significant, the slope was not as negative as initially predicted and in recent years these regions have faced a slight increase in FLFP. The second most underdeveloped region along with the middle-income regions, did not follow along the U-shaped function and produced insignificant results. The only region that followed along the U as initially predicted, was the region that had the highest level of development in 1985. This may imply a number of things; first, geographic location is not the best indicator of economic development or second, countries that are not already in the most developed bracket are facing relatively slow rates of development or third, both.

6.1 Modern Day U-Shaped Function

To begin to recreate the U, following Goldin, I generate a log variable for GDP per capita. The natural log of GDP better graphically conveys changes in real GDP. Graphing using this method will standardize the scale of the y-axis to clearly show changes in the percent of real

per capita GDP. Next, I chose sample years 2010 and 2014. I chose these years because they had the highest sample sizes of all recent years. I work with both 2010 and 2014 to ensure that the U is present for more than a single moment in time. To account for the changing slope in the U, I next generate a quadratic for the log of per capita GDP. The final regression (**Figure 8**) can be modeled using the equation below:

$$FLFP^d = \beta_0 + \beta_1 \ln(GDP^d) + \beta_2 (\ln(GDP^d))^2 + E^d$$

Figure 8: *U-Shaped Curve (2014)*

Source	SS	df	MS	Number of obs	=	131
				F(2, 128)	=	12.65
Model	4445.09669	2	2222.54834	Prob > F	=	0.0000
Residual	22496.8423	128	175.75658	R-squared	=	0.1650
				Adj R-squared	=	0.1519
Total	26941.939	130	207.245685	Root MSE	=	13.257

flfp2014	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnpcgdp2014	-85.75312	17.31317	-4.95	0.000	-120.0102	-51.49607
lnpcgdp2014sq	4.554769	.9105851	5.00	0.000	2.753021	6.356517
_cons	449.3911	81.8732	5.49	0.000	287.391	611.3912

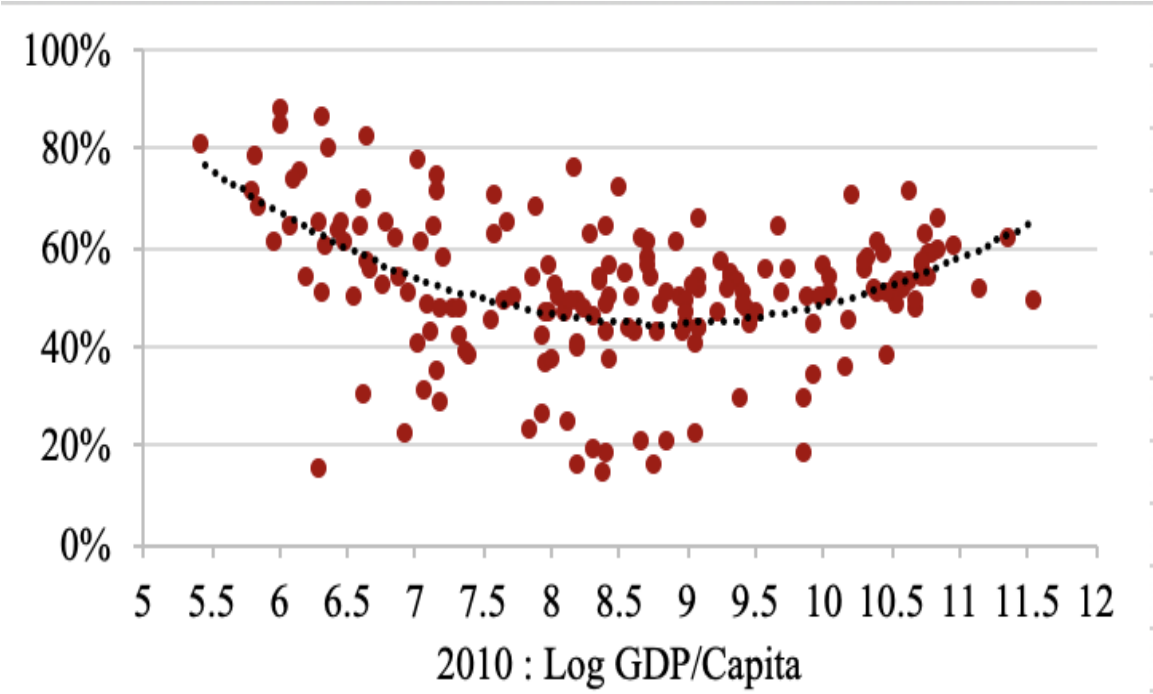
Source: Author's Figure

Note: When using cross sectional data, the R-squared value is often low

I create two scatter plot graphs using the FLFP rate on the y-axis and the log of real per capita GDP on the x-axis, both from the corresponding years. I plotted the predicted lines in red over the scatter plot graph to visualize the overall trend. As shown below in **Figure 9 and**

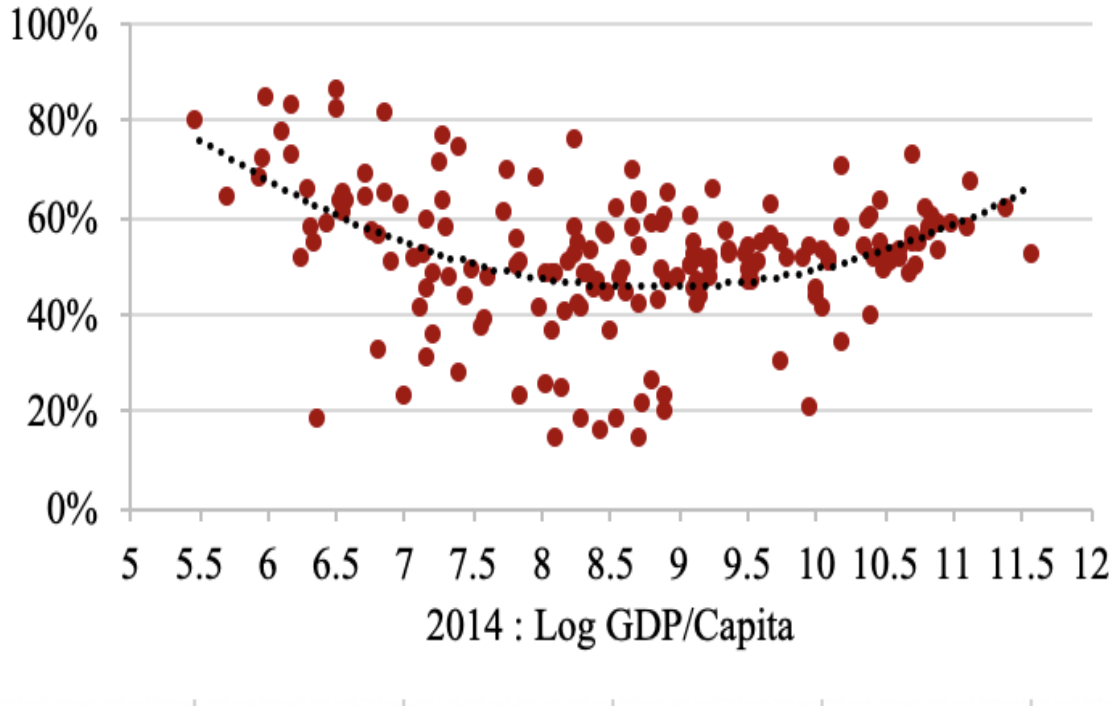
Figure 10, there remains a very strong U-shaped curve in both 2010 and 2014. As shown in the regression output in **Figure 8,** the results are significant to the 1st percentile. This shows that Goldin's curve remains robust to the present.

Figure 9: *U-Shaped Female Labor Force Function (2010)*



Source: Author's Figure

Figure 10: *U-Shaped Female Labor Force Function (2014)*



Source: Author's Figure

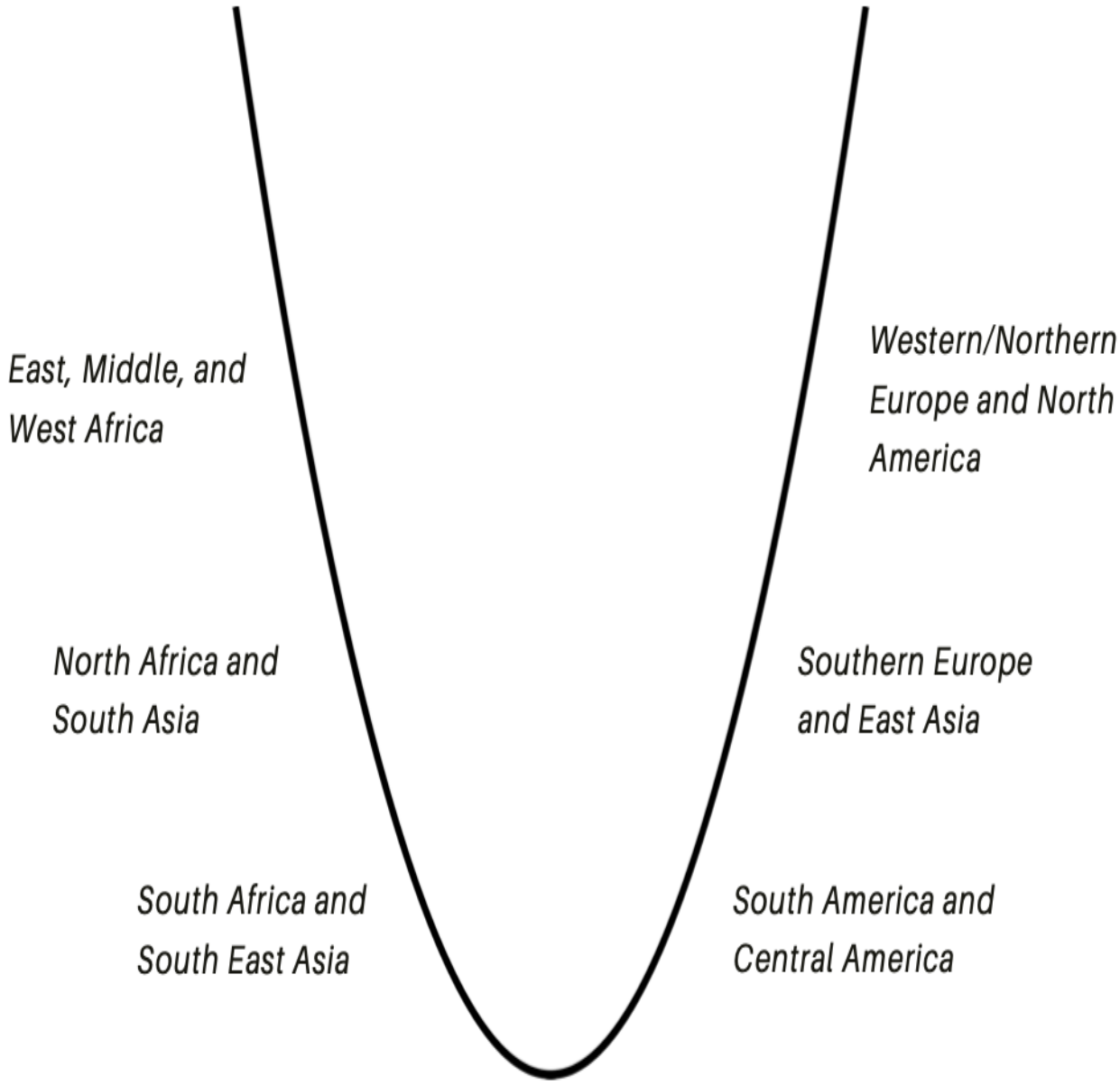
Although, Goldin's U-shaped FLFP prediction proves correct, there are a few unexpected results within the figures. As explained above, as countries have become more developed, they should move along the U. If a full U was present in Goldin's initial work, we should expect that over the past 30 years, as development occurred, the top left portion of the U would fade. However, as of 2014, the entire U is visible. This finding suggests that many countries have not seen much development since 1985.

6.2 Geographic Regions Along the U-Shaped Function

In Goldin's original work, geographic regions seemed to vary little in placement along the U. However, whether or not they continued to follow similar patterns of development has yet to be tested. The original regions, as defined in Goldin's paper are shown below, in **Figure 11**. On the upper left portion of the curve are East Africa, Middle Africa, and West Africa. Below these regions and still on the downward sloping portion of the U are North Africa and South Asia. At the bottom left corner of the curve is South Africa and Southeast Asia. The bottom left corner of the curve contains South America and Central America. Starting on the upward sloping side of the curve is Southern Europe and East Asia. Finally, in the upper right portion of the curve is Western Europe, Northern Europe and North America.

In testing each region separately, I start with the regions that were the least developed in 1985. I generate the natural log of the real GDP for each country across years 1960 to 2018. To once more allow for the curve of the U, I generate a quadratic for the log of real per capita GDP. I also include predicted values in red to help visualize the overall trend. Finally, I create a scatter plot graph using the FLFP rate on the y-axis and the log of real per capita GDP on the x-axis. I follow these steps for each of the regions outlined above.

Figure 11: *Regions Along the U-Shaped FLFP Function*



Source: Author's Figure

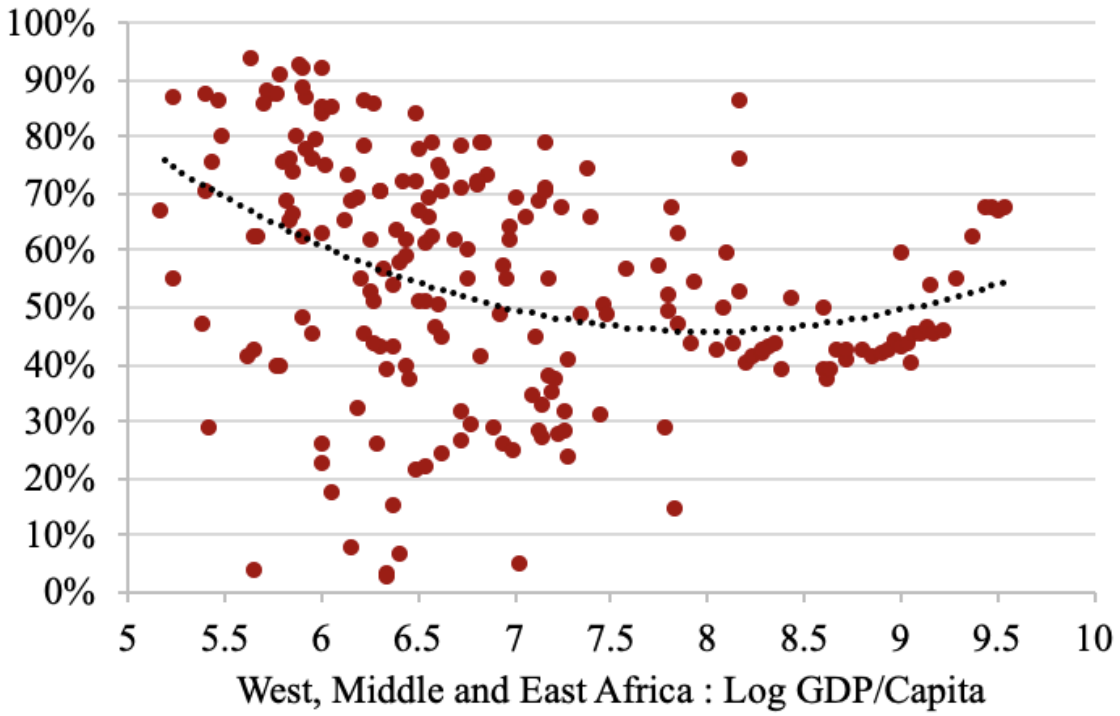
6.3 East Africa, Middle Africa and West Africa Along the U

As shown in **Figure 12**, East Africa, Middle Africa and West Africa have seen a decline in the FLFP rate. As the most underdeveloped regions, the initial prediction as posed by the U-shaped function is a very steep decline in FLFP. Although there is an initial decline, these regions have recently experienced an increase in FLFP. The regression output shows that the results are significant to the 1st percentile. Because of the unexpected recent increase in FLFP, these findings do not fully support the prediction posed by the U-shaped curve. The regression equation can be shown below:

$$FLFP^d = 261.27 - 52.82\ln(GDP^d) + 3.25(\ln(GDP^d))^2 + E^d$$

Note: Please refer to **Appendix 9.1** for regression output by region

Figure 12: *U-Shaped Curve: East Africa, Middle Africa and West Africa*



Source: Author's Figure

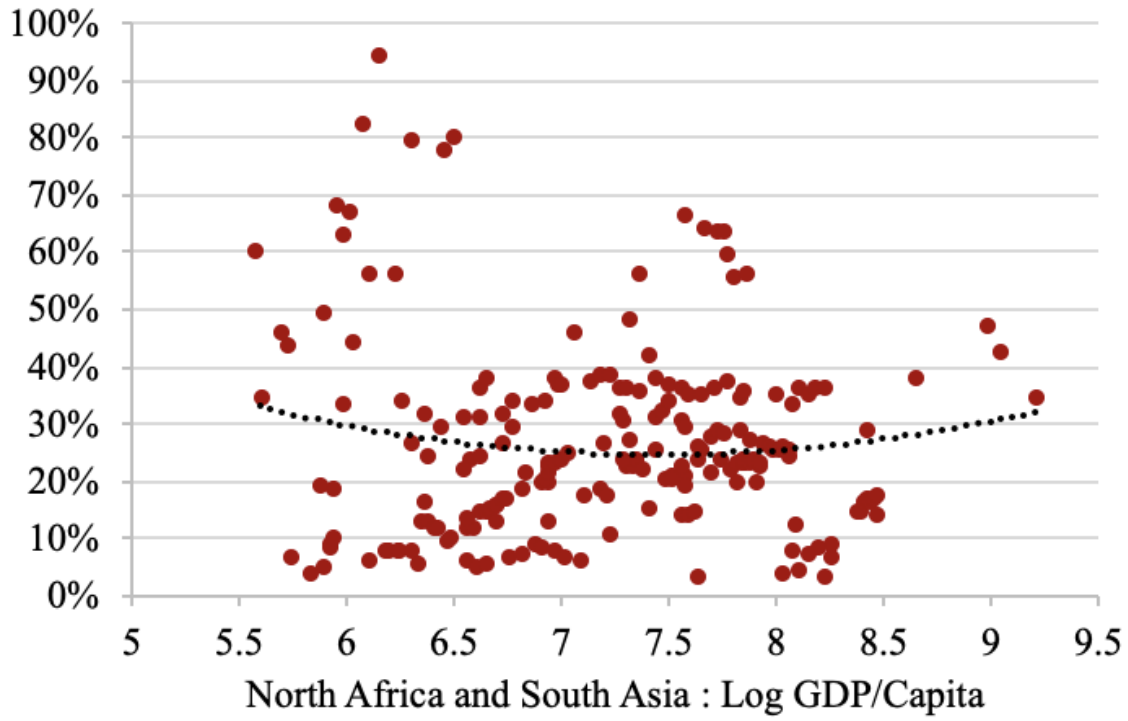
6.4 North Africa, South Asia Along the U

Next, I analyze North Africa and South Asia. Both of these regions were initially on the downward sloping portion of the U-shaped curve. If they were to follow along the U, the expectation would be an initial relatively steep decline in FLFP as the regions face development. **Figure 13** shows that these regions do not follow the prediction. These findings were not significant. The results for North Africa and South Asia show that

there has not been much change in FLFP over the past decades. The regression used is modeled below:

$$FLFP^d = 165.47-37.81\ln(GDP^d)+2.53(\ln(GDP^d))^2+E^d$$

Figure 13: *U-Shaped Curve: North Africa and South Asia*



Source: Author's Figure

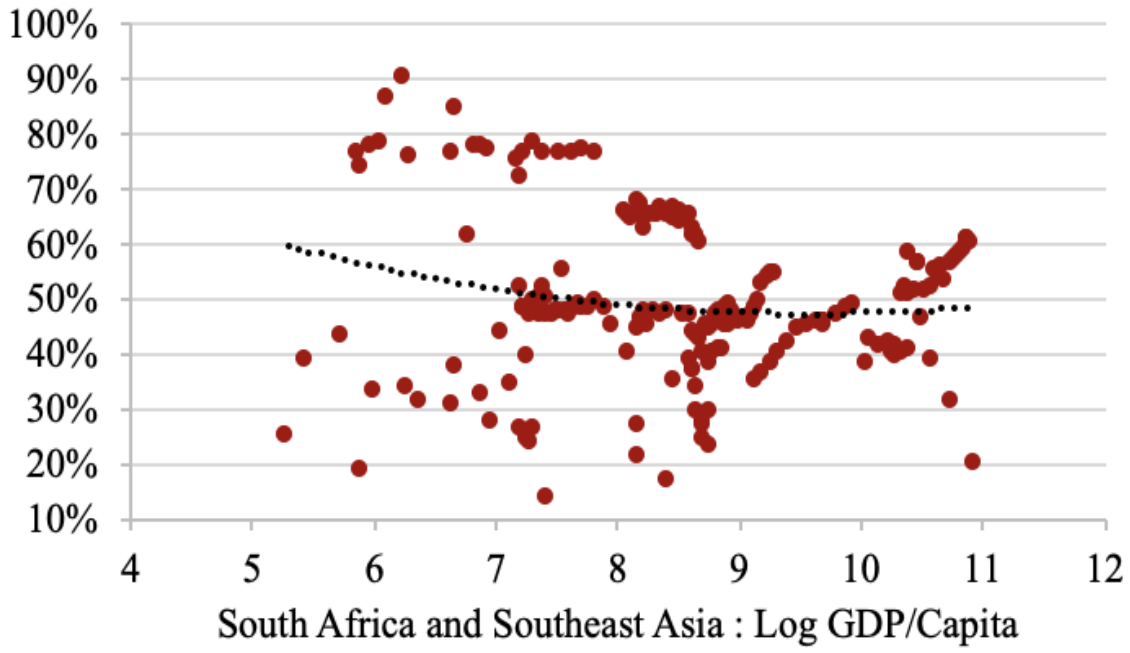
6.5 South Africa, Southeast Asia Along the U

The next set of regions were nearing the bottom portion of the U in 1985. South Africa and Southeast Asia are predicted to have an initial slight decline in their FLFP. **Figure 14** shows that these regions follow the prediction from Goldin's FLFP function precisely. As they have

continued through development, South Africa and Southeast Asia have faced a steady decline in the FLFP rate. As shown in the regression output, these results are significant. The regression used is modeled below:

$$FLFP^d = 137.18 - 18.05\ln(GDP^d) + 0.91(\ln(GDP^d))^2 + E^d$$

Figure 14: *U-Shaped Curve: South Africa and Southeast Asia*



Source: Author's Figure

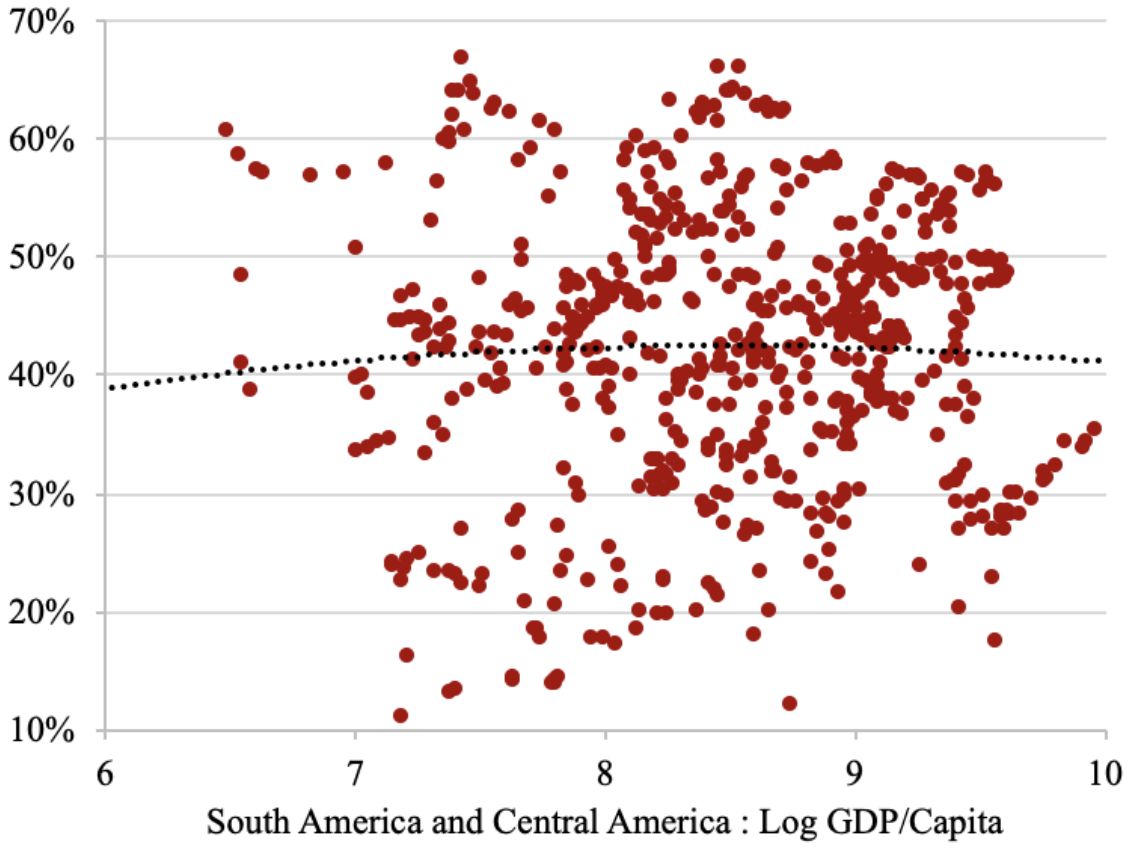
6.6 South America, Central America Along the U

South America and Central America are predicted to have a significant incline in the FLFP. In 1985 these regions laid on the bottom right of the U-shaped function. These regions in

the early 80's had large increases in female education. The increased opportunity cost that women face from not working should spark a large increase in the FLFP rate. However, these predictions prove to be incorrect. **Figure 15** shows that there has been very little change in the FLFP rate over the past few decades. The regression output shows that these findings are not significant. The regression used is modeled below:

$$FLFP^{d} = -46.84 + 21.14\ln(GDP^{d}) - 1.24(\ln(GDP^{d}))^{2} + E^{d}$$

Figure 15: *U-Shaped Curve: South America and Central America*



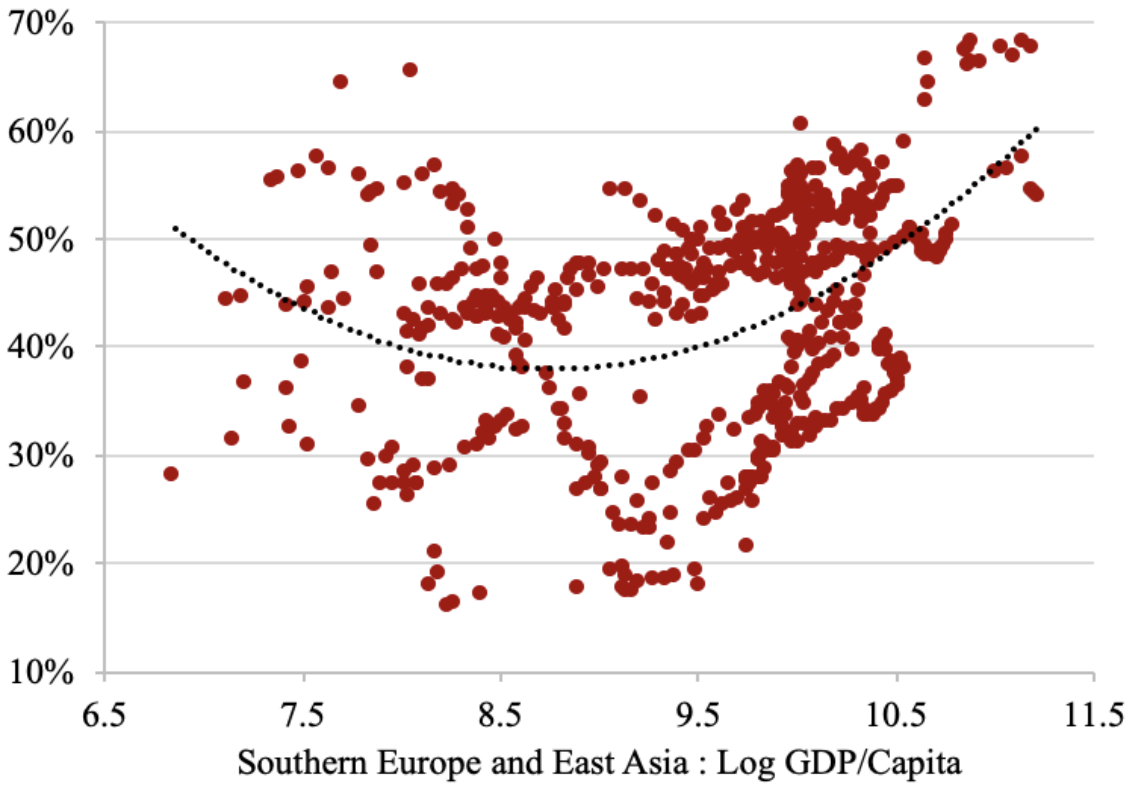
Source: Author's Figure

6.7 Southern Europe and East Asia Along the U

The last two region groupings were on the upper portion of the U-shaped curve in 1985. Southern Europe and East Asia are predicted to have an increased FLFP. As shown in **Figure 16**, these predictions were not proven correct. The FLFP rate went from a little below 60% to a little above 60% throughout the years captured. The regression output shows that the results are significant to the 1st percentile. The regression can be modeling below:

$$FLFP^d = 318.09 - 64.09\ln(GDP^d) + 3.67(\ln(GDP^d))^2 + E^d$$

Figure 16: *U-Shaped Curve: Southern Europe and East Asia*



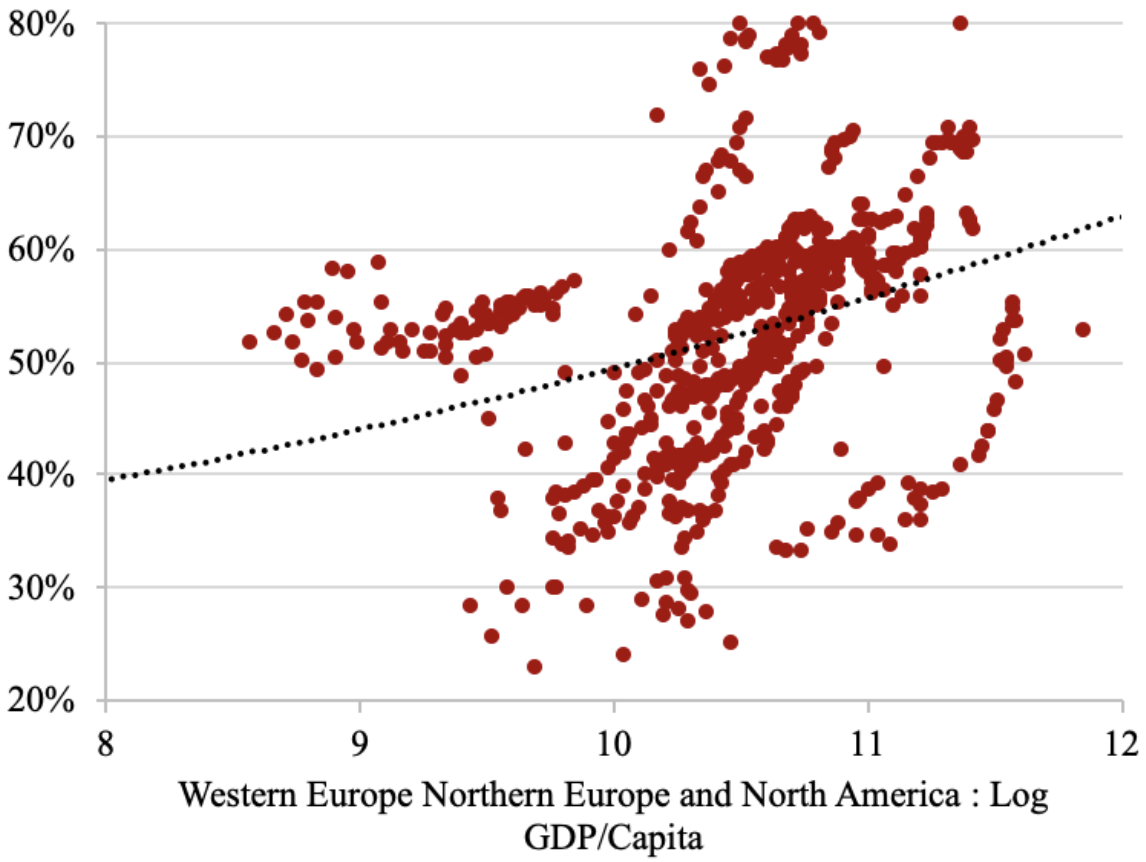
Source: Author's Figure

6.8 Western Europe, Northern Europe and North America Along the U

As the most developed set of regions, Western Europe, Northern Europe and North America are predicted to have the largest increase in their FLFP rate over the past 30 years. **Figure 17** shows that these regions follow the prediction precisely. On average there has been a tremendous increase in FLFP throughout these regions. The regression output shows that these regions are significant at the 1st percentile. The regression used is modeled below:

$$FLFP^{d} = 270.71 - 48.73\ln(GDP^{d}) + 2.66(\ln(GDP^{d}))^{2} + E^{d}$$

Figure 17: *U-Shaped Curve: Western Europe, Northern Europe and North America*



Source: Author's Figure

7 Conclusion

Overall, three of the six preconstructed regions followed along the U-Shaped curve as predicted in Goldin's original work. There are a couple reasons as to why some of the regions may have not moved along the U as expected. First, as shown in *U-Shaped Female Labor Force Function (2010) and U-Shaped Female Labor Force Function (2014),* there are still many countries that have not undergone much development throughout the last 30 years. Countries that

are stuck and are unable to increase their level of development by the function's definition, should not have traveled along the U. However, in graphing countries that have not developed, we are unable to tell whether or not they are cooperating with the theories of the curve. We are able to see that the most developed regions have followed the U exactly as expected. Much of this success may be due to their fast rate of development. Additionally, countries, such as China, have recently undergone enormous rates of development. China has become a developed country at a much faster rate than any of its neighboring countries. Because not all countries follow the same levels of development as their geographical neighbors, geography may no longer be a good measure or prediction for development trends.

7.1 Future Direction of Research

As mentioned above, some regions have not followed along the U as initially predicted. This may be because countries within similar geographical regions may face very different circumstances. To better understand whether or not countries, on average, move along the U as development increases, it may be beneficial to redefine the regions. Testing countries that are grouped not only by initial level of development, but also by similar levels of economic growth, would potentially produce more clear results. This approach would enable us to work backwards and to visualize the trends that countries with similar levels of developmental growth have faced over the past 60 years.

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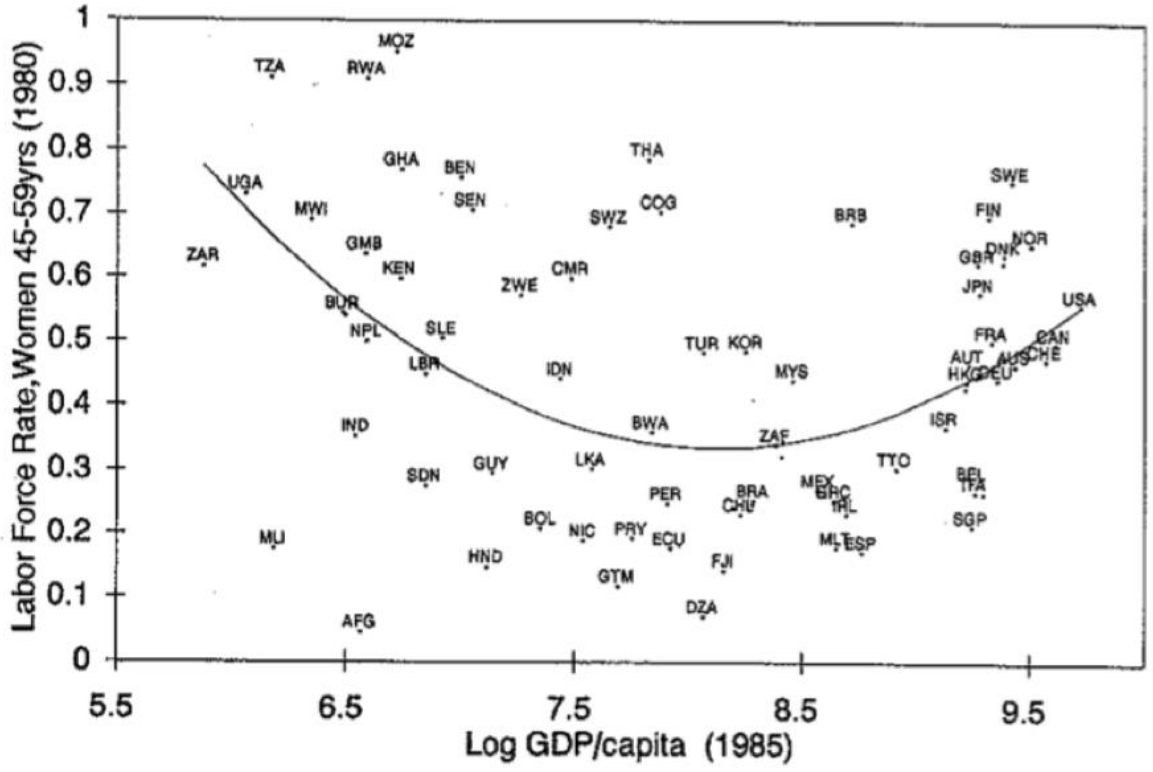
9 Appendix

9.1 U-Shaped Curve

The Original U-Shaped Function



Source: The U-Shaped Female Labor Force Function in Economic Development

9.2 Appendix Regression Output

Figure 18: *East Africa, Middle Africa and West Africa*

Source	SS	df	MS	Number of obs	=	237
				F(2, 234)	=	13.21
Model	9949.85227	2	4974.92613	Prob > F	=	0.0000
Residual	88143.8892	234	376.683287	R-squared	=	0.1014
				Adj R-squared	=	0.0938
Total	98093.7415	236	415.651447	Root MSE	=	19.408

FLFP_Rates	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnGDP	-52.82467	15.70427	-3.36	0.001	-83.76448	-21.88485
lnGDPsqrd	3.253034	1.065104	3.05	0.003	1.154615	5.351453
_cons	261.2722	56.84893	4.60	0.000	149.2711	373.2733

Source: Author's Figure

Figure 19: *North Africa and South Asia*

Source	SS	df	MS	Number of obs	=	228
				F(2, 225)	=	1.62
Model	847.598668	2	423.799334	Prob > F	=	0.2005
Residual	58917.0079	225	261.853369	R-squared	=	0.0142
				Adj R-squared	=	0.0054
Total	59764.6066	227	263.280205	Root MSE	=	16.182

FLFPR_NEst	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnGDP	-37.81079	23.55526	-1.61	0.110	-84.22793	8.606346
lnGDPsqrd	2.531253	1.628362	1.55	0.121	-.6775371	5.740042
_cons	165.4676	84.52839	1.96	0.052	-1.100959	332.0361

Source: Author's Figure

Figure 20: *South Africa and Southeast Asia*

Source	SS	df	MS	Number of obs	=	233
				F(2, 230)	=	9.51
Model	3855.49093	2	1927.74546	Prob > F	=	0.0001
Residual	46627.9521	230	202.730227	R-squared	=	0.0764
				Adj R-squared	=	0.0683
Total	50483.443	232	217.601048	Root MSE	=	14.238

FLFPR_NEst	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnGDP	-18.05235	7.922878	-2.28	0.024	-33.66305	-2.441651
lnGDPsqrd	.9051657	.4677774	1.94	0.054	-.016511	1.826842
_cons	137.1788	33.01687	4.15	0.000	72.12459	202.233

Source: Author's Figure

Figure 21: *South America and Central America*

Source	SS	df	MS	Number of obs	=	626
				F(2, 623)	=	1.80
Model	487.112038	2	243.556019	Prob > F	=	0.1664
Residual	84362.7731	623	135.413761	R-squared	=	0.0057
				Adj R-squared	=	0.0025
Total	84849.8852	625	135.759816	Root MSE	=	11.637

FLFPR_NEst	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnGDP	21.13752	11.14876	1.90	0.058	-.7561799	43.03122
lnGDPsqrd	-1.244926	.6586111	-1.89	0.059	-2.538292	.048441
_cons	-46.83813	46.95704	-1.00	0.319	-139.0514	45.37511

Source: Author's Figure

Figure 22: *Southern Europe and East Asia*

Source	SS	df	MS	Number of obs	=	606
				F(2, 603)	=	68.40
Model	12223.6974	2	6111.84871	Prob > F	=	0.0000
Residual	53877.4807	603	89.3490558	R-squared	=	0.1849
				Adj R-squared	=	0.1822
Total	66101.1781	605	109.258146	Root MSE	=	9.4525

FLFPR_NEst	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnGDP	-64.0865	8.394568	-7.63	0.000	-80.57264	-47.60036
lnGDPsqrd	3.665465	.4533666	8.08	0.000	2.775096	4.555835
_cons	318.0925	38.58671	8.24	0.000	242.3118	393.8732

Source: Author's Figure

Figure 23: *North America, Western Europe and Northern Europe*

Source	SS	df	MS	Number of obs	=	713
				F(2, 710)	=	44.31
Model	8581.81482	2	4290.90741	Prob > F	=	0.0000
Residual	68750.0167	710	96.8310094	R-squared	=	0.1110
				Adj R-squared	=	0.1085
Total	77331.8315	712	108.612123	Root MSE	=	9.8403

FLFPR_NEst	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
lnGDP	-48.7326	15.89633	-3.07	0.002	-79.94204	-17.52316
lnGDPsqrd	2.655694	.7713567	3.44	0.001	1.141281	4.170107
_cons	270.7098	81.79892	3.31	0.001	110.1131	431.3065

Source: Author's Figure

9.3 Appendix Country Region

Region Name	Country Name
West, Middle, East Africa	Angola
West, Middle, East Africa	Benin
West, Middle, East Africa	Burkina Faso
West, Middle, East Africa	Cabo Verde
West, Middle, East Africa	Cameroon
West, Middle, East Africa	Central African Republic
West, Middle, East Africa	Chad
West, Middle, East Africa	Comoros
West, Middle, East Africa	Congo, Rep.
West, Middle, East Africa	Equatorial Guinea
West, Middle, East Africa	Ethiopia
West, Middle, East Africa	Gabon
West, Middle, East Africa	Gambia, The
West, Middle, East Africa	Ghana
West, Middle, East Africa	Guinea
West, Middle, East Africa	Guinea-Bissau
West, Middle, East Africa	Kenya
West, Middle, East Africa	Liberia
West, Middle, East Africa	Madagascar
West, Middle, East Africa	Malawi
West, Middle, East Africa	Mali
West, Middle, East Africa	Mauritania
West, Middle, East Africa	Mauritius
West, Middle, East Africa	Mozambique
West, Middle, East Africa	Niger
West, Middle, East Africa	Nigeria
West, Middle, East Africa	Rwanda
West, Middle, East Africa	Senegal
West, Middle, East Africa	Seychelles
West, Middle, East Africa	Sierra Leone
West, Middle, East Africa	Somalia
West, Middle, East Africa	Sudan
West, Middle, East Africa	Togo
West, Middle, East Africa	Uganda

West, Middle, East Africa	Zambia
West, Middle, East Africa	Zimbabwe
North Africa, South Asia	Afghanistan
North Africa, South Asia	Algeria
North Africa, South Asia	Bangladesh
North Africa, South Asia	Bhutan
North Africa, South Asia	Egypt, Arab Republic
North Africa, South Asia	India
North Africa, South Asia	Libya
North Africa, South Asia	Maldives
North Africa, South Asia	Morocco
North Africa, South Asia	Nepal
North Africa, South Asia	Pakistan
North Africa, South Asia	Sri Lanka
North Africa, South Asia	Sudan
North Africa, South Asia	Tunisia
South Africa, Southeast Asia	Brunei Darussalam
South Africa, Southeast Asia	Cambodia
South Africa, Southeast Asia	Malaysia
South Africa, Southeast Asia	Myanmar
South Africa, Southeast Asia	Philippines
South Africa, Southeast Asia	Singapore
South Africa, Southeast Asia	South Africa
South Africa, Southeast Asia	Thailand
South Africa, Southeast Asia	Timor-Leste
South Africa, Southeast Asia	Vietnam
South, Central America	Argentina
South, Central America	Bolivia
South, Central America	Brazil
South, Central America	Chile
South, Central America	Colombia
South, Central America	Costa Rica
South, Central America	Cuba
South, Central America	Dominican Republic
South, Central America	Ecuador
South, Central America	El Salvador
South, Central America	Guatemala
South, Central America	Haiti
South, Central America	Honduras

South, Central America	Mexico
South, Central America	Nicaragua
South, Central America	Panama
South, Central America	Paraguay
South, Central America	Peru
South, Central America	Puerto Rico
South, Central America	Uruguay
South, Central America	Venezuela
Southern Europe, East Asia	Albania
Southern Europe, East Asia	Andorra
Southern Europe, East Asia	Bosnia and Herzegovina
Southern Europe, East Asia	Croatia
Southern Europe, East Asia	Cyprus
Southern Europe, East Asia	Greece
Southern Europe, East Asia	China
Southern Europe, East Asia	Macedonia
Southern Europe, East Asia	Malta
Southern Europe, East Asia	Mongolia
Southern Europe, East Asia	Montenegro
Southern Europe, East Asia	Portugal
Southern Europe, East Asia	San Marino
Southern Europe, East Asia	Serbia
Southern Europe, East Asia	Slovenia
Southern Europe, East Asia	Spain
Southern Europe, East Asia	Turkey
Northern, Western Europe, North America	Austria
Northern, Western Europe, North America	Belgium
Northern, Western Europe, North America	Canada
Northern, Western Europe, North America	Denmark
Northern, Western Europe, North America	Estonia
Northern, Western Europe, North America	Finland
Northern, Western Europe, North America	France
Northern, Western Europe, North America	Germany
Northern, Western Europe, North America	Iceland
Northern, Western Europe, North America	Ireland
Northern, Western Europe, North America	Isle of Man
Northern, Western Europe, North America	Latvia
Northern, Western Europe, North America	Liechtenstein
Northern, Western Europe, North America	Lithuania

Northern, Western Europe, North America	Luxembourg
Northern, Western Europe, North America	Monaco
Northern, Western Europe, North America	Netherlands
Northern, Western Europe, North America	Norway
Northern, Western Europe, North America	Sweden
Northern, Western Europe, North America	Switzerland
Northern, Western Europe, North America	United Kingdom
Northern, Western Europe, North America	United States