The Female Labor Force and Long-run Development: The American Experience in Comparative Perspective*

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1 Introduction

What is the relationship between gender equality and economic development? In her influential body of work, Claudia Goldin sheds light on the process of transformation of women's status in the history of the United States and through a cross-section of the world's economies.

The nature and extent of segmentation of economic activity across genders and their changing roles during the course of economic development has been considered since Ester Boserup's pioneering work on *Woman's Role in Economic Development*. This is of course a complex phenomenon whose systematic analysis is complicated by measurement issues. Goldin's work greatly contributed to our understanding of this process and inspired much of the subsequent work on the topic. In a series of seminal papers she establishes the existence of a U-shaped labor supply of women across the process of economic development and the important roles played by education and the emergence of a white-collar sector in fostering the paid employment of married women.

The absence of a clear distinction between market production and work for the family affects the measurement of labor force participation in early phases of economic development. Goldin (1986, 1990) argues that until the late nineteenth century, women in the United States, whether married or single, worked almost exclusively in the home or as unpaid labor in family enterprises. This work involved not only the care of children and the upkeep of the house, but also goods production activities such as the cultivation and preparation of food and the manufacture of many of the goods used in the home or sold in the marketplace (clothing, canned food etc.). Women, both on farms and in cities, were active participants to the labor force when the home and work activities could be performed in the same place. Their participation, however, declined as the nature of the production process changed and the production moved from the household to factories and offices. Official statistics, however, might not capture the full extent of female participation to the labor market going back in time. Goldin (1990) estimates that adding paid and unpaid labor of farm wives and boardinghouse keepers to the census figure would imply a female labor force participation rate in 1890 similar to that observed in 1940. In this case most of the adjustment would come from married women. Moreover, Goldin (1986) shows that in the early phases of industrialization (late 18th and early 19th century), women's market oriented work in cities was more extensive than in the early twentieth century (most of the adjustment coming from adult widows and unmarried women). Based on these more comprehensive measures of female labor force participation, she argues, it is likely that female labor force participation was U-shaped over the course of US history. That is, it declined over the course of the 19th century before starting to increase again in the early decades of the 20th century. Goldin (1995) finds further evidence of a U-shaped female labor supply function with economic development (as measured by GDP per capita) using a large cross-section of countries observed in the first half

of the 1980s. Furthermore, she shows that increasing women's education and the emergence of the white-collar sector are important determinants of this pattern both historically and across countries. Subsequent work by Mammen and Paxson (2000) and Luci (2009) finds additional evidence of a U-shaped labor supply based on larger panel of economies observed in the 1970s and 1980s and for the years 1965 to 2005, respectively.[1]

This paper builds upon this work by providing additional evidence on the relationship between the process of economic development and women's labor force participation. Specifically, it investigates whether the US experience was exceptional historically and whether the timing of a country's transition to a modern path of economic development affects the shape of women's labor supply.

I first study the experience of the US in a comparative perspective relative to a sample of current economically advanced economies. I combine pre-WWII data on labor force participation rates and sectoral employment by gender from the International Historical Statistics (IHS, Mitchell, 1998) and comparable post-WWII data from the International Labour Organization (ILO) to construct a data set of sixteen "developed" economies for which data are available for most of 1890 to 2005 period. The sample includes the following countries: Australia, Belgium, Canada, Denmark, France, Finland, Germany, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, United Kingdom and the United States. This analysis, of course, is complicated by measurement problems but, far from being perfect, the data it relies upon are probably as close as possible to being harmonized in terms of the definition of the employment construct.[2] The analysis confirms the existence of a U-shaped female labor supply function, coming from both cross-country and within country variation.

Next, I use ILO data for the years 1950 to 2005 and confirm the findings of Goldin (1990), Mammen and Paxson (2000) and Luci (2009) for a longer panel of countries. Interestingly, the U-shape appears to be more muted when early OECD economies are dropped. One possible explanation is that the stigma towards married women's participation to labor market, or women dislike for factory production, might be lower when manufacturing production is cleaner or less brawn intensive than it was in the 19th century. For example, if, as it is the case with electronics in Asia, industrialization is associated with an increased demand for fine motor skills (in which women have a comparative advantage), then industrialization can generate an increase in women's relative wages and thus could potentially not be associated with a very large drop in female labor supply.

Finally, I link the evolution of women's employment to the process of *structural transformation*. This process is defined in the growth literature as the reallocation of labor across

[1] See Blau, Ferber and Winkler (2010, Chapter 12) for a comparative discussion of a recent cross-section of world economies. This work includes a discussion of the experience of the former Soviet countries as well as differences among African economies.

[2] Section 3.1 and the Data Appendix offer a detailed discussion of the data collection process.

the three main sectors of production: agriculture, manufacturing and services.[3] The typical process of sectoral reallocation over the course of economic development involves a systematic fall in the share of labor allocated to agriculture, a hump-shaped change in the share of labor in manufacturing, increasing in the early stages of the reallocation process and then declining, and a steady increase in the share of labor in services. In this paper, I study whether there are gender differentials in the process of sectoral re-allocation. I find that the share of women employed in the agricultural sector drops more rapidly than that of men, while the share of women employed in services increases much more rapidly than that of men. The share of men and women working in manufacturing exhibits a distinct hump-shaped profile although women's profile is much flatter.

The rest of the chapter is organized as follows. Section 2 provides a brief review of the literature. Section 3 discusses data collection and presents the analysis of my sample of developed economies. Section 4 analyzes the broader cross-section of world's economies. Section 5 documents gender differentials associated to the process of structural transformation. Finally, section 6 concludes.

2 Background

What are the most important factors that can explain the U-shaped female labor supply function? A rich literature exists that analyzes this phenomenon with reference to supply and demand factors that played an important role in the evolution of female labor force participation, and can explain the observed cross-country variation (cfr. Goldin (1990, 2006), Blau (1998) and Blau and Kahn (2007) for a comprehensive discussion of the factors affecting the trends in the US at different points in time; Blau et. al. (2010) for international comparisons and Lundberg (2010) for a discussion of the changing sexual division of labor with economic development.) In what follows I organize the discussion of the mechanisms underlying the U-shape based on the link between female labor force participation and structural transformation.

Women's presumably distinct influence on production across phases of economic development, ranging from agricultural to industrial and postindustrial, depends on the degree of substitution between their own labor in agricultural production and other activities, on the degree of substitution between labor and capital, and between male and female labor inputs under different production, organizational, and social conditions.

For example, the declining portion of the U-shape can be explained by the change in

[3]This process has been extensively documented starting with the work by Kuznets (1966) and Maddison (1980). Recent work by Herrendorf, Rogerson and Valentinyi (2012) provides systematic evidence about the 'facts' of structural transformation for a large cross-section of countries and going back in time as far as possible.

the nature of agricultural work as an economy moves away from subsistence agriculture. This change typically involves a shift from very labor-intensive technologies,where women are heavily involved as family workers, to capital-intensive agricultural technologies where men tend to have a comparative advantage because of the physical strength they require.[4]

The next phase of economic development is characterized by conflicting forces affecting women's work on the labor market. For instance, in the United States, the expansion of the manufacturing sector was accompanied by a process of de-skilling as the factory system began to displace the artisanal shop in the 1820s (Goldin and Sokoloff 1982). De-skilling became rapidly more marked as production increasingly mechanized with the adoption of steam power after 1850 (Atack, Bateman, and Margo 2008). Goldin and Sokoloff (1984) argue that the US agricultural areas, where the marginal products of females and children are low relative to those of adult men (which is, in and of itself a function of the agricultural technology used), were the first to industrialize. Thus with the increasing industrialization happening during the 19th century, there was a greater demand for labor, and single women gradually began to leave the house to work in factories. Why then do we reach the trough of the U-shaped function during industrialization? First, there was some kind of redistribution of employment across groups, as single women displaced widows handling the artisanal shop of their deceased husbands (Goldin, 1986). Second and more importantly, as emphasized in Goldin (1990), production processes in the early phases of industrialization were characterized by dirty, noisy and often physically demanding jobs. While it might be acceptable for a single woman to work in such conditions, the expectation was that she would work only until her marriage. Stated differently, there was a stigma against married women working as manual laborers in factory-type work.[5] Because of the changing nature of agricultural production, as well as the stigma attached to women's employment in manufacturing, the 'income effect' dominates during this phase of development, female labor force participation declines.

The increasing portion of the U during the transition from the industrial to the post-industrial phase of economic development is unambiguously associated with increasing female labor force participation and changing gender roles. The expansion of the service sector with its attendant white-collar jobs and/or the pervasive skilled-biased technological change in the economy (see Goldin and Katz, 2008, and Katz and Margo, 2012) greatly facilitates this transformation (Goldin, 1990, 2006). As intellectual skills grew in importance in market production relatively to physical power, increasing relative wages lowered fertility and increased

[4]For example, as noted by Boserup (1970), plough cultivation is much more capital intensive than shifting cultivation, and it requires significant strength to be operated. Because of these requirements, she argues, when plough agriculture is practiced, men have an advantage in farming, and this might originate traditional gender role attitudes. In recent work Alesina, Giuliano and Nunn (2012) prove this hypothesis correct.

[5]The stigma towards a working married woman was strong. In August 1936, a Gallup Poll asked: "Should a married woman earn money if she has a husband capable of supporting her?". A resounding 82% answered yes.

labor force participation (Galor and Weil, 1996).[6] Other types of technological progress reinforced this process by affecting women's investment in human capital and fertility choices.[7]

This discussion provides an incomplete representation of the vast literature on this topic. I will return to the link between structural transformation and female labor supply in Section 6.

3 The American Experience in Comparative Perspective: Developed Economies.

In this section I use data from sixteen "rich countries over the period 1890 to 2005 to trace out the relationship between economic development and women's labor force participation. The data set is constructed using information reported from the International Historical Statistics (Mitchell, 1998) and, for the post-1950 period, the International Labour Organization (ILO). Why is it interesting to look at the past experience of rich countries relative to the US? One reason is that although today economically advanced countries are similar to the US in many ways, they transitioned across stages of economic development at different points in time over the course of the 19th and 20th Century. Table 1 summarizes statistics on log GDP per capita expressed in 1990 international dollars (column 2), sectoral employment shares (column 3 to 5) and value added shares (column 6 to 8), for a subset of developed economies at three points in time: 1890, 1950, 2000. The first panel in the table reports statistics for the US. Going down the table I report statistics for Belgium, the Netherlands, France, Spain, Sweden and the UK.[8].

What I want to show with this table is that the range of experiences spanned by these countries is quite heterogeneous. Consequently, by looking at the past experience of currently developed economies we can learn more about the U-shape relationship between economic development and female labor force participation.

Entries in Table 1 show that the UK had the highest (log) GDP per capita in 1890, around 8.3, only 16% of its workers were employed in agriculture and the agricultural value added share was below 10%, a relatively postindustrial value. The UK is well ahead in its process of

[6]Most models in this vein predict a monotonic relationship between growth and female labor force participation. Galor and Weill (1996, pg. 384-385) is an exception. They propose extensions of their model that can generate the U-shaped labor supply. For example, by adding a technology for producing market goods that is not fully rival with raising children at home and does not require capital.

[7]For example, progress in medical technologies related to motherhood (Albanesi and Olivetti, 2011), progress in contraceptive technology (Goldin and Katz, 2002, Bailey, 2006) and progress in household technologies in new domestic appliances (Greenwood, Seshadri and Yorukoglu, 2005). Changing cultural norms and attitudes towards gender roles might also have played a role (see for example, Fernandez, Fogli and Olivetti, 2004, Fogli and Veldkamp, 2011, and Fernandez, 2012.)

[8]Data on GDP per capita are from Maddison, 2010. Sectoral data are constructed and discussed in Herrendorf, Rogerson and Valentinyis (2012). The choice of this specific subset of my sample of 16 economies is driven by the availability of value added shares from Herrendorf et al. (2012).

industrialization. The Manufacturing sector employs 44% of its workers (valued added share of 41%). The broad service sector employs 40% of its workers and has the highest valued added share, 50%. The other countries are still lagging behind in the process of structural transformation at this point in time. In the US, the country with the third highest log GDP per capita (8.1) in 1890, the employment share in agriculture is still quite high (42%) although the size of the sector as measured by its value added share is already down to less than 20%. The rest of the economically active population is roughly equally employed in the Manufacturing sector (27%) and in Services (30%). The service sector has the largest valued added share (46%). At the other end of the spectrum we observe economies that are still prevalently agricultural. At least half of the economically active population in France, Spain and Sweden is employed in agriculture that is, the three countries with the lowest log GDP per capita. By 1950 the employment share in agriculture is less than 30% and the value added share is around or below 10% in all countries in the table except Spain. The US has the largest GDP per capita, 9.165 in logs and in all the countries in the table, except for Spain, the log of GDP per capita is around 9.[9] By year 2000 all the countries in the table are fully developed. In all countries the agricultural share is 5% or lower, the manufacturing share is about 20% and the service sector share is 70% or higher.[10] Thus table 1 emphasizes the fact that, although these early OECD members are comparable in terms of standards of living starting in the 1970s, there is a substantial cross-country variation, both in terms of economic development, as measured by GDP per capita, and in terms of industrialization, during the reference period, especially in the earlier part of the sample. Thus they are an interesting sample to study long-run trends in labor market participation during the course of the 20th Century.

3.1 Data and Measurement Issues

The history of women's participation to market work is complicated by issues of measurement. The concept of being in the labor force is often ambiguous and its definition can vary substantially across countries and time periods as well as over time within a country. In this section I describe the data collection effort and measurement issues related to data comparability across countries and within a country over time. The end product of this data collection effort is a balanced panel of sixteen rich economies for which data are available for most of the period. That is, for these countries, information by gender on both labor force participation and the distribution of workers across sectors of production spanning the

[9] Herrendorf et al. (2012) show that a log GDP per capita equal to 9 represents an important milestone in the process of structural transformation of rich economies. It is associated with the onset of the decrease in the nominal value added share of the manufacturing sector and acceleration in service sector and economic growth.

[10] This holds both for employment shares and value added shares. The convergence of the two measures during economic development is yet another interesting regularity documented in Herrendorf et al. (2012).

entire 1890-2005 periods is consistently available. I will refer to this group of countries as to the sample of "developed economies". This sample includes: Australia, Belgium, Canada, Denmark, France, Finland, Germany, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, United Kingdom and the United States. The year 1890 is the first for which we have a starting data point for all the countries (except Australia and Denmark, for which the first available year is 1900). The end date is the latest year for which International Labour Organization (ILO) statistics are available. The data are available at 10- or 5-year intervals for most of the countries in the sample. Starting with 1990 data at 5-year intervals are available for all the countries in my sample.[11]

The United States

Prior to 1940 only workers who reported an occupation were classified as 'gainfully employed' and thus included in the labor force in the United States. Only starting in 1940 the definition of labor force participation changed to include all individuals working for pay, unpaid family workers and also the unemployed seeking work during the survey week, that is, a definition consistent with the ILO construct of 'economically active' population. It is not surprising then that the International Historical Statistics (IHS) do not report data for the United States prior to 1940. Our data on labor force participation of women aged 15 and above for 1890 to 1930 are from Goldin (1990, Table 2.1, first row). For 1940 to 2005 we use data from IHS and ILO, same as for the other countries in the sample. However, when they overlap (1940 to 1980) the rates from IHS and ILO are almost identical to those from Table 2.1 in Goldin (1990). The perfect overlap of the statistics is noted in Goldin (1990, pg. 43). She argues that the 1940 change in the definition of employment has no effect on the participation rate of women. "Applying the labor force concept to the pre-1940 data produces approximately the same numbers as obtained by the gainful worker definition". Goldin (1990, pg. 44) also shows that the most important source of bias for female labor force participation comes from the undercounting of people working as boardinghouse keepers, unpaid family farm workers and manufacturing workers in homes and in factories. This is because women were disproportionately engaged in these activities. Ill return to this in Section 2.2.[12]

Other Countries

Goldin's discussion centers on US statistics, however, similar concerns about undercounting women working in family enterprises or working for very few hours, also apply to other coun-

[11] I experiment by excluding the statistics at 5-year intervals or changing the end point of the sample. The results of the analysis are very similar to those reported in this section.

[12] Labor force participation rates for men aged 15 and above for years prior to 1940 were gathered from Pencavel (1986, Tables 1.1). Sector information for the US come from author's calculations using IPUMS data and Table Ba670-687 and Table Ba688-705 in Carter et al., 2006. See data appendix for full details.

tries. For example, Costa (2000) discusses the existence of similar measurement issues related to historical data on female participation from France and Great Britain. Thus it is difficult to construct somewhat comparable female labor force statistics going back to the second half of the 19th Century for a relative large cross section of countries. In this paper I combine pre-WWII data on the economically active population by gender and by industrial group as well as population counts by gender from the IHS (Mitchell, 1998) with similar post-WWII data from the ILO. Based on this data we construct a fairly long time series of labor force participation rates for women and men aged 15 and above.[13] Far from being perfect, these data probably are as close as possible to being harmonized in terms of the definition of the employment construct. This is the ILO definition that classifies an individual as economically active if he/she is working for pay or profit at any time during the specific reference period, *whether she receives wages or not.* According to Mitchell (1998, pg. 161) the statistics prior to 1968 were unified across different countries and different time periods to adhere to this definition to as great an extent as possible. Post-1968 IHS data were pulled directly from the ILO tables and thus should be harmonized using sophisticated estimation and imputation procedures.[14] For the developed economies in my sample recent versions of the ILO labor statistics now reports data starting with the 1940s. I also exploited the overlap between the ILO and the IHS statistics as a further tool for detecting inconsistencies in the data. (See Data Appendix for details). This further check further reduced the sample size because some of the 19th Century data or countries for which early data were available had to be dropped as a consequence. The resulting balanced panel of 16 countries is analyzed below.[15] Comparisons between countries, however, must still be made with some caution owing to potential differences in classification, including differences in the definition of "economically active", still remaining.

3.2 Long-run trends in female labor force participation

Figure 1 displays the evolution of female labor force participation rates for the US and a subset of developed economies in my sample, the same analyzed in Table 1. That is, the US, Belgium, France, the Netherlands, Spain, Sweden and the United Kingdom. This is for ease of graphical comparison but the trends observed for these countries are representative

[13] See Data Appendix for additional details. Unfortunately, because of data limitation, I cannot produce historical labor force statistics by age.

[14] See ILO report (2011) for a discussion of the difficulties collecting high quality data for women's labor force participation.

[15] For a few of these countries, namely Belgium, the Netherlands and the UK, it is possible to construct meaningful labor force participation rates by gender going as far back as 1840-1850. The trade-off is that the statistics for the earlier decades of the 19th Century, especially pre-1870, are only available for a very small subset of countries. Using 1890 as a start date delivers the most balanced panel of countries going as far back in time as possible. The results of the analysis are basically unchanged if I use 1870 or 1880 as the first year in the sample.

of those observed in the full sample. The analysis identifies two groups of countries. Female labor force participation grew monotonically in the first group of countries, at least prima facie, while it was U-shaped in the second group of countries.

As shown in Figure 1, in the United States but also, in the Netherlands and Sweden (and Canada, though this is not included in the graph) the female labor force participation grew monotonically over the period. In the United States only 18 percent of women worked for pay in 1890 and the figure had risen to around 26 percent in 1940, the year the definition of the employment construct changes. By year 2000 womens participation rate in the United States was around 60 percent. However, as argued by Goldin (1990) the 1890 figure is artificially low because it undercounts the paid and unpaid work of married women within the home and on the farm. Goldin estimates a 7 percentage points adjustment in female labor force participation for 1890 mostly stemming from widespread boarding in late 19th Century cities and from unpaid employment of family members in agriculture (see, Table 2.9 in Goldin, 1990, p. 44). The adjustment implies that female labor force participation in 1890 was as high as 26 percent, that is, as high as in 1940.[16] It follows that, as argued by Goldin (1990, pg. 45), the "obvious implication is that the labor force activity of adult and married women must have reached a minimum point sometime just after the turn of the century, falling before that time and rising after. Thus the participation of married women in the labor force may well be somewhat U-shaped over the course of economic development.[17] Although, the monotonicity of female labor supply might be genuine for the other countries, it is reasonable to think that undercounting of womens paid or unpaid work at home and on the farm might be also plaguing these estimates.

In most of the remaining countries the trends in female labor force participation are U-shaped, although in some cases the U is more muted than in others. Women's participation rates in Great Britain were the same in the early 1960s than they were in the past two decades of the Nineteen Century. This is consistent with the analysis in Costa (2000). Belgium also exhibits a U-shaped trend; female labor force participation hovers around 41 percent from 1890 to 1910, and then drops substantially and starts increasing again in the 1950s, reaching back to 41 percent only by the mid-1990s. Irelands trend (not displayed in the graph) is very similar to that observed for Belgium. Spain, Portugal and Italy (not displayed in the graph) also exhibit a U-shaped female labor supply although at lower levels of female labor force participation than Belgium. The female participation rate in Spain is the same, around

[16]Most of the adjustment comes from white married women. Goldin (1990) estimates a rate of omission of 10 percent for this group. This would bring the adjusted figure of 12.5 percent, up from the 2.5 census figures, for white married women in 1890.

[17]In other work Goldin (1986) shows that female labor force participation might have been even higher at the turn of the 19th century, thus implying an even stronger U-shape for the US. Using data from 26 city and business directories for Philadelphia, she estimates that in 1800 the labor force participation rate or female head of households (mostly widows) was around 65 percent, dropping to approximately 45 percent by 1860.

23 percent, in 1890 and in 1970. In Italy womens labor force participation in year 2000 is still 13 percentage points lower than it was in 1900. Female labor supply is also U-shaped in Australia (not displayed in the graph) although the U is more muted. Finally, France displays a slightly N-shaped pattern of female labor supply (also observed in Figure 2 in Costa, 2000). Female labor force participation is around 44 percent at the turn of the 20th Century, it peaks to 53 percent in 1920 and then drops and raises again during the course of the 20th century. By year 2000, however, the female labor force participation rate is still lower than it were in 1920. Next we turn to the discussion of the relationship between female labor force participation and GDP per capita for this historical sample of currently economically advanced economies.

3.3 Female labor force participation and economic development

Figure 2 plots the relationship between female labor force participation and log GDP per capita for my panel of developed economies. The distinct U-shape relationship between the two series is apparent. Female participation rates tend to be high both at low levels of income and at high levels of incomes. In Table 2 we report the results of quadratic regressions with female labor force participation regressed on log GDP per capita and its square term. Column 1 reports the coefficients for the fitted U-shaped line shown in Figure 1. Both coefficients are statistically significant. The graph and corresponding regression results, however, are based on comparing women's labor force participation in a set of countries observed over multiple time periods. Hence, the U-shape could be driven by some other aggregate factor that is changing over time. In order to take this into account column 2 adds year effects, that is equivalent to comparing the set of countries in the same time period. The estimates of the coefficients are still significant though the U becomes slightly more muted. Column 3 reports the regression results when we add both year and country effects. In this case we can study what happens to female labor force participation rates in individual countries as they grow. With country fixed effects the shape of the U is identified from variation in income within countries over time, rather than by cross-country variation. At the same time I am accounting for differences across years that are common to all countries because I include year fixed effects. As shown in column 3 I find evidence of a statistically significant U-shape of female labor supply with economic development even in this case, although the U-shape is more muted. Finally, Column 4 reports the estimates for males for the regression with both year and country effects. Males can be seen as a placebo group since almost all men aged 15 or above work at all levels of economic development spanned by this cross-section of countries (although, of course, there is declining trend in male labor supply driven by increasing years of education and early retirement for the most recent year). Consistent with this hypothesis I find that estimated coefficients for log GDP per capita and its square are very small and

not statistically significant. Earlier in the session I expressed a concern that differences in employment classification across countries might be biasing cross-country comparisons. In order to address this problem I have re-run the regressions using the ratio of womens to mens participation as the dependent variable. The regression results show a statistically significant U-shaped pattern between the female-to-male participation ratio and economic development. This finding should mitigate concerns that miss-measurement drives our main findings.

4 Female Labor Force Participation and Economic Development: Full Sample

Next I turn to the analysis of the panel of developed and developing economies observed over the 1950 to 2005 period.[18]. The purpose of repeating the analysis for this larger sample is twofold. First, we can check that the findings in the previous section apply more generally. Second, for this sample there is a richer set of data available to further investigate the relationship between female labor force participation and economic development. For example, I can compute labor force participation rates for older women who are past the childbearing and child-rearing stage (as in Goldin, 1995, and Mammen and Paxson, 2000). This is important in light of the observation that fertility and income are negatively correlated and so are female labor supply and the presence of children. Both forces would work against finding a U-shaped female labor supply that is, its declining part. Following Goldin (1995) I can also study the impact of increased education and increased white-collar employment on the labor force participation of women.

The results of this analysis are presented in Figure 3 and Table 3 and 4. Figure 3 pools together all country/year observations to show that women's labor force participation for the full sample has the distinct "U-shape" relative to GDP per capita. Table 3 reports the results of quadratic regressions in the log of GDP per capita. As with the earlier tables, column (1) reports the coefficients of the regression line plotted in Figure 3, columns (2) and (3) control for year effects and columns (4) to (6) control for both year and country effects. In the first panel the concept of labor force participation is the fraction of economically active women aged 15 to 64. The second panel reports the results for women aged 45 to 59. In column (3) and (5) we also add the log gender differential (male-female) in years of schooling. Finally, column (6) reports the results for males.[19] The estimates in Table 3 confirm the results for the

[18]Data were pulled directly from the ILO web page, see Data Appendix for details. Note that since Wistat reports ILO data on labor statistics this data set is comparable to the one used by Goldin (1995), and by Mammen and Paxson (2000).

[19]We also run a series of non-parametric regressions by estimating the relationships decade by decade. In all decades we find the U-shape relationship between female LFP and log GDP per capita. For the earlier decades, pre-1980, the estimates are not statistically significant, due this is due to the fact that we have relatively fewer observations and they are skewed toward relatively richer economies.

sample of developed economies. That is, there is a significant U-shape relationship between female labor force participation and log GDP per capita in every specification (column 1 to 5), though the U is more muted once we control for country-effects. This is true for both measures of female labor force participation although, as predicted by the theory, the U-shape is less marked for women aged 15-64, and also controlling for the gender gap in years of schooling (column 3 and 5). At any level of development female labor force participation is lower when women have fewer years of schooling relative to men (column 3) although the coefficient is not significant once we control for country effects. We find no evidence U-shape for men (column 6). For the sample of men aged 45 to 59 labor force participation declines at higher levels of economic development. This could be consistent with the trends in early retirement.

Table 4 has the same structure as Table 3 but I now exclude from the sample early OECD economies (that is, the founding countries as well as countries that joined the OECD before 1973, see footnote to the table for the list of countries). The results in column (1) to (3) and (6) are broadly similar to those observed in Table 3 except that the U-shape is now more muted, especially when we use labor force participation of women aged 15 to 64. However, unlike in the previous two cases, it disappears once we control for country effect. This means that in this case the U-shape is identified entirely by the cross-country variation. In other words, for these non-OECD economies, female labor force participation does not drop as much when the economy industrializes. The nature of manufacturing production when these countries industrialized might be 'cleaner than for countries that industrialized in the 19th century or could be associated with a larger expansion of the service sector so it could be the case that women do not drop out of the market to as greater an extent during the phase of transition from mostly agricultural to industrial economies. Interestingly, for this set of countries the labor supply of older men does not decline as GDP increases. This lends support to the notion that early retirement might explain the correlation for the full sample since early retirement is typical of economically advanced economies.

Goldin (1995) suggests that one reason for the existence of the U-shaped female labor force participation rate function is the relationship between female education and economic development. At low levels of economic development education increases for males far more than for females, and women are under-represented in the clerical sector. However, she argues that womens absence as clerical workers might be driven by the fact that their education levels are low, not just relative to mens, when the difference in education is highest. This conjecture is finds support in the data (Table 1, Goldin, 1995, pg. 77). Table 5 reproduces this analysis for the sub-sample of countries for which ILO data on occupation are available (see data appendix for details). The results confirm Goldins findings. The ratio of female-to-male clerical workers is positively correlated with the percentage of women with secondary education and negatively correlated with the ratio of male to female total years of education.

As pointed out by Goldin (1995, pg. 74) this is consistent with Boserup's observation that competition from men serves to force women out of clerical employment. The coefficient on female education looses significance once we control for country effects, indicating that the level of female education is an important determinant of cross-country differences in womens work outcomes.

5 Gender and structural transformation

The relationship between the process of structural transformation and women's involvement in the labor market has been noted by several authors. The idea is that production of goods is relatively intensive in the use of 'brawn' while the production of services is relatively intensive in the use of 'brain', since men and women may have different endowments of these factors, the historical growth in the service sector may impact female participation to the labor market. Goldin (1995, 2006), notes that service jobs tend to be physically less demanding and cleaner, thus more "respectable" for women entering the labor force, than typical jobs in factories. As discussed in the previous sections this might generate the rising portion of the U-shaped function. Insofar the decline in manufacturing and the parallel rise in services are staggered across countries, these ideas can explain the international variation in women's labor market outcomes.[20] Although this has not been as widely investigated, the declining portion of the U-shape can be explained by the change in the nature of agricultural work as an economy moves away from subsistence agriculture. This change typically involves a shift from very labor-intensive technologies, where women are heavily involved as family workers, to capital-intensive agricultural technologies (such as the plough) where men tend to have a comparative advantage because they require physical strength. However, production in manufacturing is relatively intensive in the use of 'brawn', especially in the early phases of the industrialization process in the 19th century, and thus women, especially married women, are more likely to drop out of the market. An interesting avenue of research is to investigate the U-shaped female labor supply, based on a three-sector model of structural transformation (Rogerson, 2008) with both male and female inputs of production. This model would have implication in terms of sectoral composition of female (and male) employment as well as on gender differentials within sector of production. This is, however, outside the scope of this paper. In this chapter I simply document gender differentials in the relationship between the

[20] There are only few papers in the recent literature that try to make this connection explicitly. Notable exception are papers by Rendall (2010), Akbulut (2011), Olivetti and Petrongolo (2011) and Ngai and Petrongolo (2012). All these papers, are concerned with recent trends in female labor force participation in economically advanced economies and suggests that industry structure affect women's work. But, of course, supply-side factors might be driving the change, although work by Lee and Wolpin (2006) suggests that demand-side factors associated with technical change are likely to be the prevailing force underlying these changes.

process of structural transformation and economic development.[21]

5.1 Developed Economies

As discussed in Herrendorf et al. (2012) increases in GDP per capita have been associated with decreases in employment share in agriculture, and increases in the employment share in services. Manufacturing behaves somewhat differently from the other two sectors: its employment share follows an inverted-U shape, that is, it is increasing for lower levels of development and decreasing for higher level of development.[22]. The first column in Figure 4 confirms these finding based on my sample of developed economies. The vertical axis in each of the horizontal panels reports the share of economically active population working in Agriculture (panel A), Manufacturing (panel B), and Services (panel C), respectively.[23] The next two columns show how this relationship varies by gender. Specifically, in column 2 the vertical axis represents the share of economically active women employed in each of the three sectors, similarly in column 3. The trends are the same as in the aggregate. That is, for both genders the correlation between GDP per capita and sectoral employment shares is negative in the agricultural sector, positive in the Service sector and has an inverted-U shape in the manufacturing sector. However, the graph reveals some interesting differences by gender. The female employment share in agriculture seems to drop somewhat less rapidly with log GDP per capita, the inverted-U shape in manufacturing is more muted for women than for men, and the employment share in services seems to grow more rapidly for women than for men. To investigate whether these gender differentials are statistically significant we pool the data and run a regression where the employment shares by industry are regressed against log GDP per capita (entering both linearly and as a quadratic polynomial), a female dummy and an interaction term between the two. The results are reported in Table 6. Columns 1 to 3 report the results for the linear specification, and columns 4 and 5 present the results for the quadratic specification. As in the previous table, we progressively add controls for year fixed effects (column 2 and 4) as well as country fixed effects (column 3 and 5) to the regression. For the agricultural sector (panel A), we find that the employment shares drop for both men and women but the rate of decline is slightly smaller, but statistically significant, for women. This finding might be surprising in light of the discussion in section 2 but it comes from the fact that both shares are converging to 0 as GDP per capita increases. Since men initially start from a higher share, the curve for men is steeper than for women. The result of the quadratic regressions in column 4 and 5 show a similar pattern, although gender differentials

[21] Using sectoral shares to study the evolution of women's work mitigates some data collection issues because it does not require the measure of economically active population to be compatible with the population counts.

[22] The same patterns are observed when using nominal value added shares.

[23] Following the definition of the three sectors in Herrendorf et al. (2012), I include mining as well as the utilities sector in the manufacturing sector.

are not statistically significant in this specification. Consistent with expectations, Panel B reveals strong gender differentials in the manufacturing sector. Male employment shares in manufacturing substantially (and linearly) increase with log GDP per capita, even when we control for both year and country effects, but the increase is much smaller, by about 8 log points, and statistically significant for females.

However, the change in the size of the manufacturing sector follows this inverted-U shape, so in column 4 and 5 we consider a quadratic specification. Interestingly, and consistent with the conjectures in Goldin (1995), this pattern differs greatly by gender. The inverted-U shape is really strong for males but very muted for women, even when controlling for country and year effects. The last panel in Table 3 reports the results for the service sector. In column 1 to 3 we observe that share of women employed in the Service sector increases at a higher rate for women relative to men, but the difference is not statistically significant (at least at standard levels of significance). The results of the quadratic regressions (column 4 to 5) reveal the existence of important gender differentials. The increase in the female share working in services is steeper than mens at low levels of log GDP per capita but it increases at a decreasing rate as GDP per capita grows, this is not surprising since the share is bounded by 1 and, in all the countries in our sample, 90% of all working women are in services. On the other end, the share of workingmen employed in the service sector increases somewhat linearly or with a slightly convex profile with economic development (being slow at first and then accelerating when the manufacturing sector starts shrinking).

Finally, I have also run regressions where I regress the female share of total sector employment, in agriculture, manufacturing and services, respectively, on log GDP per capita. This share measures the intensity with which female input of production is used in the production process. I find that, the share of female employed in agriculture is negatively correlated with GDP per capita, although the correlation is not significant at standard levels of significance. For the manufacturing sector, we also observe that the female intensity in the production process significantly declines with log GDP per capita, tracing the declining part of a U-shape. That is, this is the mirror image of the overall sectoral share in manufacturing. Finally, we find that the female-intensity in the service sector increases during the course of economic development, although again the coefficients are not significant at standard levels of significance.

5.2 Full Sample

Finally, Figure 5 and Table 7 reports the result of the sectoral analysis for the full sample (excluding early OECD economies from the sample does not alter the results). The results are fairly similar to those observed for the sample of developed economies with only a few exceptions. I find that, the share of working women employed in agriculture drops signifi-

cantly more abruptly than that of men (at least for the quadratic specification). For what concerns the service sector, the share of women employed in the sector increases significantly more rapidly than that of men. This was not the case for the sample of developed economies. However, the main difference has to do with how the share of females working in the manufacturing sector evolves over the course of economic development. Both male and female shares increase in the developed economies sample (although the increase is not as marked for women). However, in the full sample the share of female working in manufacturing has a distinct hump-shaped profile indicating that more women might be moving directly to the service sector in the sample of economies that experience the transition to a mainly industrial economy during the second half of the 20th century. The male share increases with GDP per capita as it did in the sample of developed economies.

6 Conclusions

This chapter shows that there is a consistent U-shaped relationship between women's role in the labor market and the process of economic development, both historically and looking at a large cross-section of countries over the post-WWII period. Interestingly, the U-shape is more muted when early OECD economies are dropped from this sample. One possible explanation is that the stigma towards married women's participation to labor market, or women dislike for factory production, might be lower when manufacturing production is cleaner or less brawn intensive than it was in the 19th century. For example, if, as it is the case with electronics in Asia, industrialization is associated with an increased demand for fine motor skills (in which women have a comparative advantage), then industrialization can generate an increase in women's relative wages and thus it could potentially not be associate with a very large drop in female labor supply. The chapter is purely descriptive and, among the other things, does not discuss the potential determinants for the observed differences in female labor supply across countries and over time. However, differences in taxation, childcare availability, maternity leave policies, institutions and culture are obviously important.

One interesting avenue for future research is to use the cross-state variation within the United States to gain a deeper understanding of the determinants of the U-shaped female labor supply. This is because there was (and still is) a substantial amount of regional variation in economic structure that can be exploited for identification (see Kim, 1998,1999, and Margo and Kim, 2004), as well as a substantial variation in married women labor force participation and earning (Olivetti and Petrongolo, 2011). This could be a promising identification strategy in light of the fact that, historically, for married women the geographic location of the household was arguably determined by the husband and thus, at least to a first approximation, can be thought of as exogenous.

7 Data Appendix

All datasets were merged with historical data on GDP per capita from Maddison (2010) .

7.1 Developed Country Sample

There are reasonable concerns about data comparability, especially for the early period in our sample. Fortunately, for developed economies, there is an overlap between the labor force statistics from IHS and those from ILO.[24] I have dropped from the sample countries for which the IHS statistics are inconsistent with the ones from the ILO. In all cases the inconsistency was due to compatibility issues between the numerator (economically active population) and the denominator (population counts). For example, for some of the countries geographical boundaries during our period were re-designed after wars. The IHS statistics usually refer to a countrys boundaries for the year the information was reported, however there are instances in which the geographical unit at the numerator is not consistent with that at the denominator (for example, Lombardia and Veneto and Austria pre-1890). In other cases the numerator and denominator represented a different age universe or referred to different populations.[25] The next subsection provides more details about this process. For the years of overlap between IHS and ILO statistics, the data source selection rule was to switch to the (updated in most cases) ILO statistics for the first year they became available, 1950 in most cases (see Appendix table A1). We have also experimented with alternative data source selection rules. For instance using IHS as the main data source and ILO data to 'fill the blanks. The overall results of the analysis were unchanged.

7.1.1 Developed Country Sample: Assumptions and Corrections

Economically active data and sectoral data was combined within the International Historical Statistics (IHS) as one table Mitchell, 1998 a,b,c). The following set of notes are thus relevant for both the analyses on overall LFP and sectoral shares. The below list provides all the assumptions and corrections made to the data that was compiled from the IHS.

Economically Active Population - Europe

- France: For the male population, the year 1866 was listed twice. It was assumed that the second 1866 was meant to be 1886 based on the corresponding year listed for women.
- Germany: East and West Germany were combined in the IHS for consistency with the other data sources.

[24] See Appendix Table A1 for a list of years and data sources for this sample.
[25] See Mitchell (2008), notes to "B1 Economically Active Population by Major Industrial Groups.

  - Observation for the period 1882 to 1939 Germany includes statistics for the area considered part of Germany from 1882-1939.
  - East Germany includes statistics for the respective territory from 1946-1971. Only years 1960 and 1971 include statistics for East Berlin.
  - West Germany includes statistics for the respective territory from 1946-1980. Only years 1961,1970, and 1980 include statistics for West Berlin.
  - Germany includes statistics for the respective territory from 1992.

- Ireland: Northern Ireland was included in the United Kingdom and Southern Ireland is listed as Ireland following 1926 to be consistent with how the ILO reports data for Ireland.

Total Population - Europe

- Denmark: From the second line for the year 1921 and below, Schleswig, which was acquired in that year, is included. In Stata, everything above the second line of 1921 is under the country "Denmark-S"

- Germany:
  - Germany: Areas ceded to Germany by Austria, Denmark, and France in 1860-1871 are excluded until 1864.
  - Germany: From 1910 the territories ceded after World War I are excluded.
  - East Germany: Statistics include East Berlin
  - West Germany: Statistics include West Berlin The last year following 1970 for West Germany was 1950. This year was changed to 1987 as that was the next census conducted after 1970.[26])

- Italy:
  - The year 1921 was listed twice, the second observation includes territories acquired after World War I.
  - The year 1951 was listed twice, the second observation and all subsequent observations are for the resident population.

- Portugal: Years prior to 1841 do not include Azores and Maderia.

[26] Wall Street Journal: $http://online.wsj.com/article/SB10001424052702303982504576423814268469244.html$ $http://www.faqs.org/faqs/genealogy/german-faq/part2/section-4.html\#b$

- Sweden: The year 1890 was included twice, consecutively. Based on the Department of National Archives, it was assumed the first observation was in fact 1880 and was adjusted accordingly.[27]

United States Labor force participation rate for men and women aged 15 and above in the US for periods prior to 1940 were gathered from Pencavel (1986, Tables 1.1) and Goldin (1990, Table 2.1).

Sector information for the US prior to 1940 comes from author's calculations using IPUMS data for the years 1900 and 1910 and 1920 comes from Table Ba670-687 and Table Ba688-705 contributed by Matthew Sobek in Carter et. al. (2006).

The above data was combined with the Full Sample data set for years that did not exist for the EAPEP and ILO data (see below for a full description).

7.2 Full Sample

7.2.1 Labor Force Participation Data

Data for 1990 - 2005 came from the the 6th edition of Economically Active Population, Estimates and Projections (EAPEP) published by the International Labour Organization (ILO). The data provide labor force participation by age group for a harmonized panel of 196 countries.[28] Labor force data for the full sample prior to 1990 were pulled directly from the Economically Active Population 1A Tables from the ILO website.[29]

7.2.2 Sector Data

Sector shares were calculated using data from the ILO Economically Active Population 1C Tables. This data source has employment information by industry which can be broadly categorized into agriculture, manufacturing and services. Data was generally available over the period 1945-2005 but was not consistently gathered for all countries.

7.3 Clerical Analysis

The analyses on clerical work utilized the Full Sample ILO data discussed above but limited the sample to women aged 45 to 59. The LFP data was then merged with the ILO Economically Active Population 1E Tables, which contains information on occupation by industry and gender. This data was in turn merged with the country panel dataset on education measures by gender from Barro and Lee (2010).

[27] $http://www.svar.ra.se/winder.asp?uidObjectGUID = 6587EEF0 - 3E98 - 4BE3 - A404 - E1938D3AEA68\&uidRedirectGUID = 9BCE8D60 - 1DC2 - 43AD - A33C - B758BAE5ACEE\&strType =$

[28] For a complete write up of the methodology used see: $http://laborsta.ilo.org/applv8/data/EAPEP/v6/ILO_EAPEP_methodology_2011.pdf$

[29] See $http://laborsta.ilo.org/STP/guest$

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Table 1: GDP per capita and sectoral shares, selected Developed countries, 1890-2000

		Employment Shares			Valued Added Shares		
Year	Log GDP per capita	Agriculture	Manufacturing	Services	Agriculture	Manufacturing	Services
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
				United States			
1890	8.129	0.427	0.272	0.301	0.190	0.350	0.460
1950	9.165	0.109	0.340	0.551	0.068	0.357	0.575
2000	10.257	0.024	0.204	0.772	0.010	0.218	0.773
				Belgium			
1890	8.140	0.321	0.415	0.264	0.110	0.440	0.451
1947	8.476	0.140	0.517	0.343	0.082	0.415	0.503
2000	9.936	0.023	0.220	0.757	0.013	0.244	0.743
				France			
1886	7.713	0.470	0.257	0.273	0.273	0.390	0.337
1954	8.685	0.263	0.355	0.382	0.130	0.480	0.390
2000	9.924	0.039	0.212	0.749	0.028	0.229	0.743
				Netherlands			
1889	8.161	0.365	0.316	0.319	0.208	0.321	0.471
1947	8.527	0.187	0.356	0.458	0.130	0.370	0.500
2000	10.006	0.034	0.194	0.771	0.026	0.249	0.724
				Spain			
1887	7.369	0.694	0.160	0.147	0.336	0.280	0.384
1950	7.691	0.496	0.255	0.249	0.287	0.270	0.443
2000	9.656	0.063	0.294	0.642	0.044	0.292	0.664
				Sweden			
1890	7.478	0.581	0.234	0.184	0.304	0.271	0.424
1950	8.820	0.208	0.420	0.372	0.112	0.425	0.463
2000	9.938	0.032	0.285	0.683	0.012	0.306	0.681
				United Kingdom			
1891	8.288	0.157	0.436	0.407	0.090	0.410	0.500
1950	8.845	0.053	0.454	0.493	0.050	0.470	0.480
2000	9.921	0.017	0.221	0.762	0.010	0.275	0.715

[1] GDP per capita in 1990 dollars (PPP adjusted) from Maddison (2008). Employment and value added shares from Herrendorf, Rogerson and Valentinyi (2012).

Table 2: Female Labor Force Participation and Economic Development
Developed Country Sub-Sample, 1890-2005

	Female			Male
	(1)	(2)	(3)	(4)
Log GDP per capita	-1.178***	-1.030**	-0.846*	-0.192
	(0.251)	(0.388)	(0.460)	(0.478)
Log GDP per capita squared	0.072***	0.064**	0.053*	0.013
	(0.014)	(0.023)	(0.026)	(0.027)
Constant	5.159***	4.431**	3.699*	1.661
	(1.107)	(1.637)	(1.971)	(2.074)
N	240	240	240	230
R^2	0.449	0.518	0.725	0.784
Country Effects	No	No	Yes	Yes
Year Effects	No	Yes	Yes	Yes

* p<.1, ** p<.05, *** p<.01

[1] Robust standard errors in parenthesis are clustered at the country level.

[2] For a full description of the developed countries sample see Appendix Table A1.

[3] Years are actually 5 year intervals. If multiple data points exist for a five year interval the values are averaged over the five year period.

Table 3: Female Labor Force Participation, Gender Education Gap and GDP per capita
Full Sample, 1950-2005

	Females					Males
	(1)	(2)	(3)	(4)	(5)	(6)
	15-64 years old					
Log GDP per capita	-1.025***	-0.797***	-1.126***	-0.336*	-0.351**	-0.034
	(0.224)	(0.216)	(0.195)	(0.178)	(0.167)	(0.057)
Log GDP per capita squared	0.063***	0.049***	0.066***	0.020*	0.021**	0.004
	(0.013)	(0.013)	(0.012)	(0.010)	(0.010)	(0.003)
Log of Male to Female Yrs School			-0.171***		-0.010	
			(0.036)		(0.032)	
Constant	4.596***	3.592***	5.146***	1.264*	1.340**	1.027***
	(0.935)	(0.907)	(0.827)	(0.719)	(0.673)	(0.229)
N	871	871	871	871	871	871
R^2	0.116	0.290	0.375	0.863	0.863	0.744
	45-59 years old					
Log GDP per capita	-1.328***	-1.072***	-1.437***	-0.436**	-0.354*	0.110**
	(0.257)	(0.250)	(0.232)	(0.184)	(0.181)	(0.051)
Log GDP per capita squared	0.080***	0.064***	0.083***	0.025**	0.020*	-0.006*
	(0.015)	(0.015)	(0.014)	(0.011)	(0.011)	(0.003)
Log of Male to Female Yrs School			-0.197***		0.051	
			(0.045)		(0.054)	
Constant	5.930***	4.763***	6.488***	1.620**	1.208	0.523**
	(1.070)	(1.047)	(0.983)	(0.752)	(0.753)	(0.204)
N	824	824	824	824	824	824
R^2	0.137	0.298	0.367	0.893	0.894	0.744
Country Effects	No	No	No	Yes	Yes	Yes
Year Effects	No	Yes	Yes	Yes	Yes	Yes

* p<.1, ** p<.05, *** p<.01

[1] Robust standard errors in parenthesis are clustered at the country level.

[2] For a full description of the full sample see Appendix Table A2.

[3] Years are actually 5 year intervals. If multiple data points exist for a five year interval the values are averaged over the five year period.

[4] Education data from Barro-Lee.

[5] OECD countries not included are: Australia, Austria, Belgium, Canada, Denmark, France, Finland, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxemborg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States.

Table 4: Female Labor Force Participation, Gender Education Gap and GDP per capita
Excludes Early OECD Countries, 1950-2005

	Females					Males
	(1)	(2)	(3)	(4)	(5)	(6)
	15-64 years old					
Log GDP per capita	-0.755**	-0.539*	-0.901***	-0.039	-0.057	0.023
	(0.321)	(0.288)	(0.263)	(0.231)	(0.217)	(0.068)
Log GDP per capita squared	0.045**	0.032*	0.051***	0.002	0.003	0.000
	(0.020)	(0.018)	(0.016)	(0.014)	(0.013)	(0.004)
Log of Male to Female Yrs School			-0.172***		-0.015	
			(0.038)		(0.032)	
Constant	3.544***	2.648**	4.320***	0.135	0.233	0.789***
	(1.287)	(1.175)	(1.081)	(0.910)	(0.850)	(0.270)
N	669	669	669	669	669	669
R^2	0.052	0.260	0.355	0.879	0.879	0.770
	45-59 years old					
Log GDP per capita	-1.026***	-0.754**	-1.150***	-0.150	-0.092	0.043
	(0.375)	(0.334)	(0.312)	(0.241)	(0.243)	(0.065)
Log GDP per capita squared	0.061**	0.043**	0.064***	0.008	0.004	-0.002
	(0.023)	(0.021)	(0.019)	(0.014)	(0.015)	(0.004)
Log of Male to Female Yrs School			-0.195***		0.050	
			(0.047)		(0.056)	
Constant	4.753***	3.585***	5.398***	0.550	0.240	0.796***
	(1.496)	(1.358)	(1.285)	(0.954)	(0.963)	(0.252)
N	627	627	627	627	627	627
R^2	0.093	0.298	0.372	0.910	0.911	0.756
Country Effects	No	No	No	Yes	Yes	Yes
Year Effects	No	Yes	Yes	Yes	Yes	Yes

* p<.1, ** p<.05, *** p<.01

[1] Robust standard errors in parenthesis are clustered at the country level.

[2] For a full description of the full sample see Appendix Table A2.

[3] Years are actually 5 year intervals. If multiple data points exist for a five year interval the values are averaged over the five year period.

[4] Education data from Barro-Lee.

[5] OECD countries not included are: Australia, Austria, Belgium, Canada, Denmark, France, Finland, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxemborg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, United Kingdom, United States.

Table 5: The Relationship Between Female Clerical Workers and Education, Population Aged 45-59

	F/M Clerical Workers		
	(1)	(2)	(3)
Log of Male to Female Yrs School	-0.700***	-0.683***	-0.837***
	(0.188)	(0.206)	(0.301)
Percent Women with Secondary Edu	0.020***	0.025***	0.005
	(0.005)	(0.005)	(0.006)
Constant	0.759***	0.368*	0.686***
	(0.170)	(0.201)	(0.242)
N	354	354	354
R^2	0.111	0.190	0.925
Country Effects	No	No	Yes
Year Effects	No	Yes	Yes

* p<.1, ** p<.05, *** p<.01

[1] Robust standard errors in parenthesis are clustered at the country level.

[2] For a full description of the samples see Appendix Table A1.

[3] Years are actually 5 year intervals. If multiple data points exist for a five year interval the values are averaged over the five year period.

Table 6: Sectoral Employment Shares by Gender and GDP per capita
Developed Countries Sub-sample, 1890-2005

	(1)	(2)	(3)	(4)	(5)
	Agriculture				
Log GDP per capita	-0.213***	-0.311***	-0.329***	-1.039**	-0.795**
	(0.010)	(0.040)	(0.060)	(0.384)	(0.335)
Female x Log GDP	0.046**	0.046**	0.046**	-0.109	-0.109
	(0.018)	(0.019)	(0.019)	(0.278)	(0.283)
Log GDP per capita squared				0.043*	0.029
				(0.021)	(0.021)
Female x Log GDP squared				0.009	0.009
				(0.016)	(0.016)
Female	-0.486**	-0.486**	-0.486**	0.195	0.195
	(0.183)	(0.187)	(0.190)	(1.196)	(1.215)
Constant	2.138***	2.881***	3.101***	5.945***	4.911***
	(0.100)	(0.299)	(0.487)	(1.719)	(1.353)
N	510	510	510	510	510
R^2	0.735	0.777	0.844	0.788	0.847
	Manufacturing				
Log GDP per capita	0.041***	0.125***	0.268***	1.301***	0.768***
	(0.014)	(0.039)	(0.045)	(0.302)	(0.215)
Female x Log GDP	-0.083***	-0.083***	-0.083***	-0.609***	-0.609***
	(0.009)	(0.010)	(0.010)	(0.131)	(0.133)
Log GDP per capita squared				-0.068***	-0.030**
				(0.016)	(0.014)
Female x Log GDP squared				0.030***	0.030***
				(0.008)	(0.008)
Female	0.593***	0.593***	0.593***	2.900***	2.900***
	(0.091)	(0.093)	(0.095)	(0.565)	(0.574)
Constant	-0.004	-0.662**	-1.888***	-5.678***	-3.983***
	(0.132)	(0.293)	(0.371)	(1.377)	(0.866)
N	510	510	510	510	510
R^2	0.521	0.673	0.839	0.710	0.846
	Services				
Log GDP per capita	0.152***	0.224***	0.124**	-0.596***	-0.292
	(0.008)	(0.034)	(0.042)	(0.199)	(0.221)
Female x Log GDP	0.026	0.026	0.026	0.782***	0.782**
	(0.016)	(0.017)	(0.017)	(0.262)	(0.266)
Log GDP per capita squared				0.047***	0.024*
				(0.012)	(0.013)
Female x Log GDP squared				-0.043**	-0.043**
				(0.015)	(0.015)
Female	-0.023	-0.023	-0.023	-3.340**	-3.340**
	(0.161)	(0.165)	(0.167)	(1.156)	(1.175)
Constant	-1.000***	-1.556***	-0.744**	1.970**	1.067
	(0.069)	(0.259)	(0.347)	(0.831)	(0.912)
N	510	510	510	510	510
R^2	0.771	0.794	0.873	0.801	0.877
Country Effects	No	No	Yes	No	Yes
Year Effects	No	Yes	Yes	Yes	Yes

* p<.1, ** p<.05, *** p<.01

[1] Robust standard errors in parenthesis are clustered at the country level.

[2] For a full description of the developed countries sample see Appendix Table A3.

[3] Years are actually 5 year intervals. If multiple data points exist for a five year interval the values are averaged over the five year period.

Table 7: Sectoral Employment Shares by Gender and GDP per capita
Full Sample, 1950-2005

	(1)	(2)	(3)	(4)	(5)
	Agriculture				
Log GDP per capita	-0.205***	-0.198***	-0.093***	-0.631***	-0.442**
	(0.007)	(0.008)	(0.025)	(0.122)	(0.189)
Female x Log GDP	0.011	0.011	0.011	-0.480***	-0.480***
	(0.011)	(0.012)	(0.012)	(0.171)	(0.178)
Log GDP per capita squared				0.026***	0.020*
				(0.007)	(0.011)
Female x Log GDP squared				0.029***	0.029***
				(0.010)	(0.011)
Female	-0.153	-0.153	-0.153	1.877***	1.877**
	(0.108)	(0.109)	(0.113)	(0.699)	(0.728)
Constant	2.045***	2.022***	1.154***	3.811***	2.664***
	(0.068)	(0.070)	(0.174)	(0.522)	(0.827)
N	1360	1360	1360	1360	1360
R^2	0.623	0.633	0.822	0.665	0.832
	Manufacturing				
Log GDP per capita	0.095***	0.106***	0.091***	0.391***	0.658***
	(0.005)	(0.005)	(0.015)	(0.077)	(0.092)
Female x Log GDP	-0.069***	-0.069***	-0.069***	0.150**	0.150**
	(0.005)	(0.005)	(0.006)	(0.070)	(0.073)
Log GDP per capita squared				-0.017***	-0.033***
				(0.005)	(0.005)
Female x Log GDP squared				-0.013***	-0.013***
				(0.004)	(0.004)
Female	0.473***	0.473***	0.473***	-0.430	-0.430
	(0.047)	(0.047)	(0.049)	(0.284)	(0.296)
Constant	-0.532***	-0.574***	-0.480***	-1.753***	-2.899***
	(0.039)	(0.042)	(0.104)	(0.321)	(0.403)
N	1360	1360	1360	1360	1360
R^2	0.515	0.579	0.755	0.620	0.790
	Services				
Log GDP per capita	0.112***	0.109***	0.034**	0.057	-0.227*
	(0.005)	(0.006)	(0.017)	(0.079)	(0.117)
Female x Log GDP	0.059***	0.059***	0.059***	0.262*	0.262*
	(0.010)	(0.010)	(0.011)	(0.148)	(0.155)
Log GDP per capita squared				0.003	0.015**
				(0.005)	(0.007)
Female x Log GDP squared				-0.012	-0.012
				(0.009)	(0.009)
Female	-0.363***	-0.363***	-0.363***	-1.200*	-1.200*
	(0.093)	(0.093)	(0.097)	(0.606)	(0.631)
Constant	-0.596***	-0.605***	-0.052	-0.386	1.044**
	(0.043)	(0.048)	(0.123)	(0.329)	(0.495)
N	1360	1360	1360	1360	1360
R^2	0.599	0.606	0.796	0.607	0.797
Country Effects	No	No	Yes	No	Yes
Year Effects	No	Yes	Yes	Yes	Yes

* p<.1, ** p<.05, *** p<.01

[1] Robust standard errors in parenthesis are clustered at the country level.

[2] For a full description of the full sample see Appendix Table A4.

[3] Years are actually 5 year intervals. If multiple data points exist for a five year interval the values are averaged over the five year period.

Figure 1: Trends in Female Labor Force Participation, 1890-2000

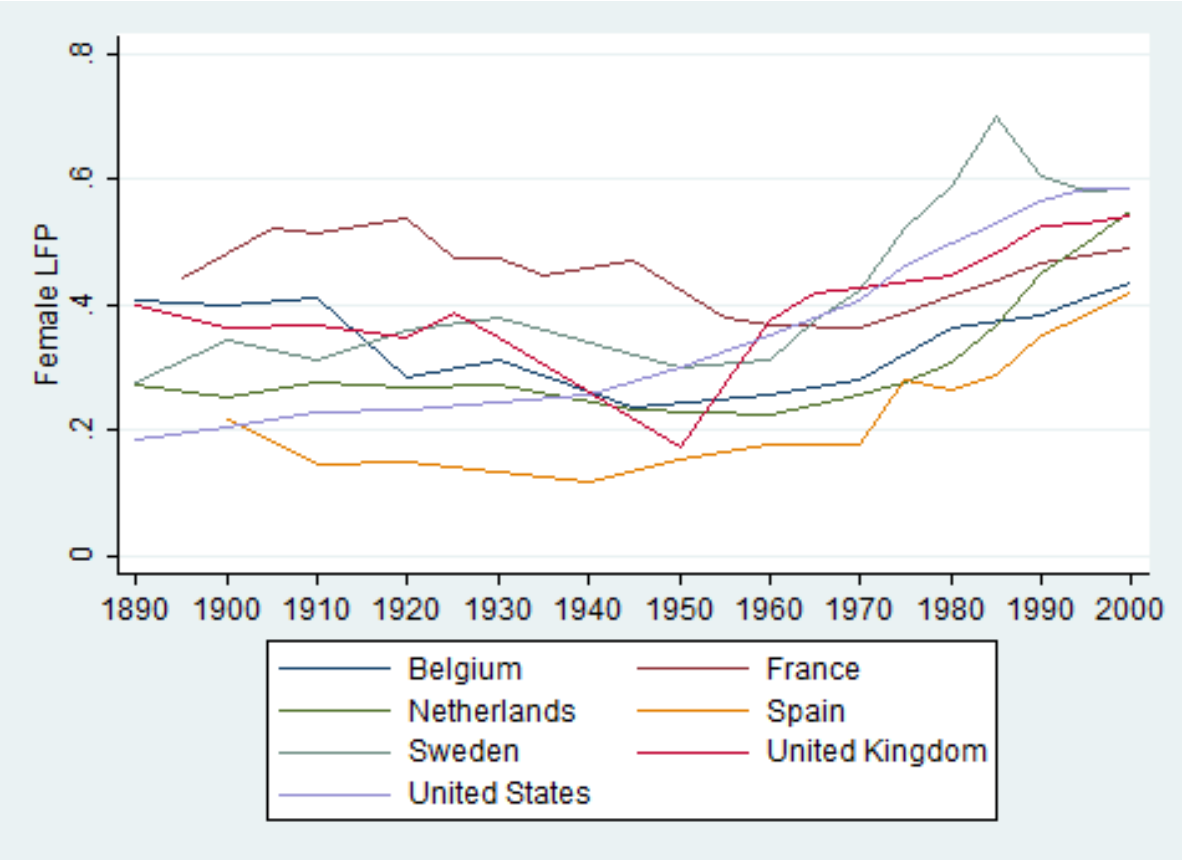


Figure 2: Female Labor Force Participation and Economic Development: Developed Country Sub-Sample 1890-2005

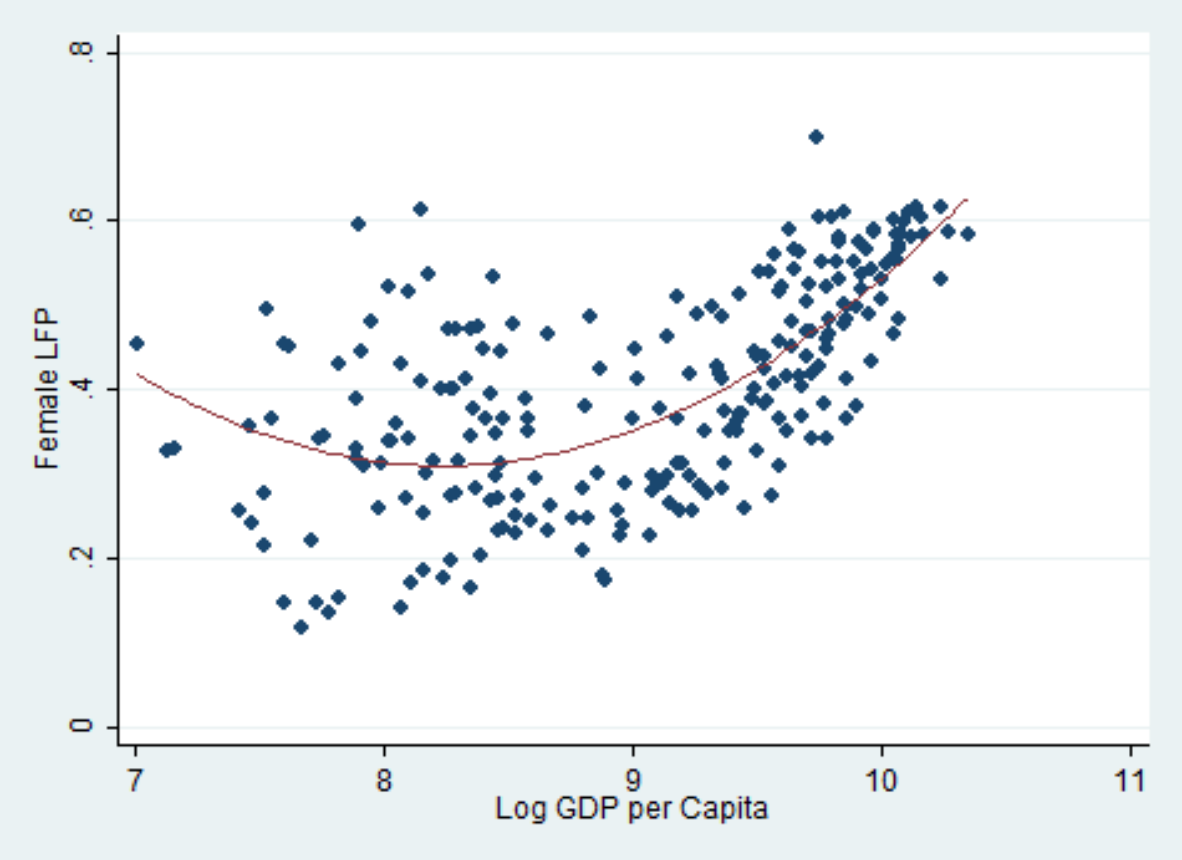


Figure 3: Female Labor Force Participation and Economic Development: Full Sample, 1950-2005

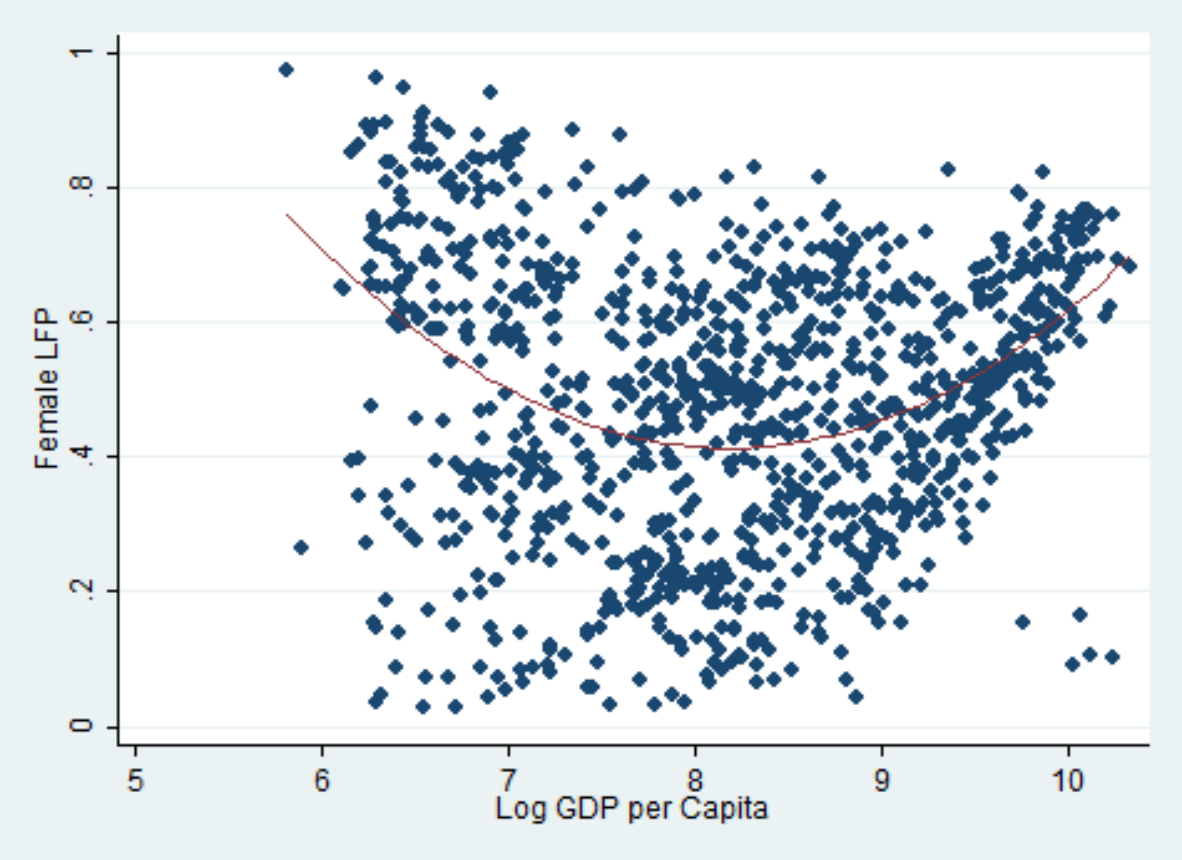
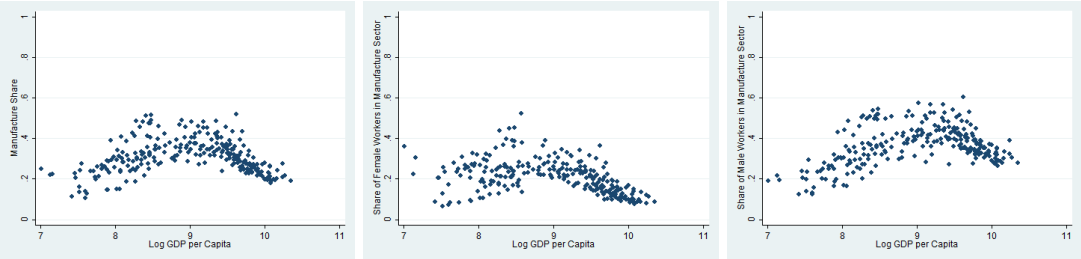


Figure 4: Sectoral Employment Shares by Gender:
Developed Country Sub-Sample, 1890-2005

All Females Males

Panel A: Agricultural Sector

Panel B: Manufacturing Sector



Panel C: Service Sector

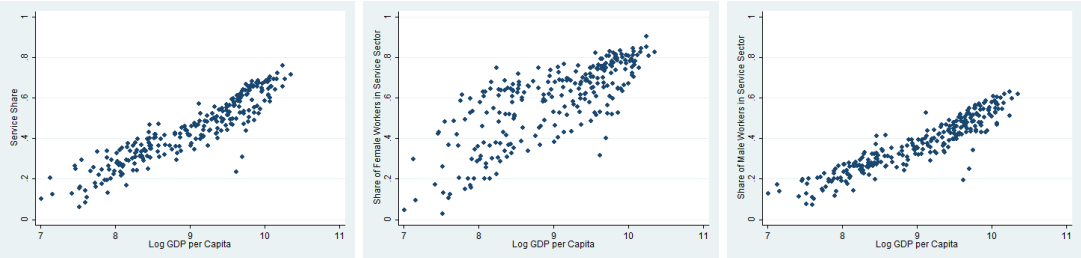
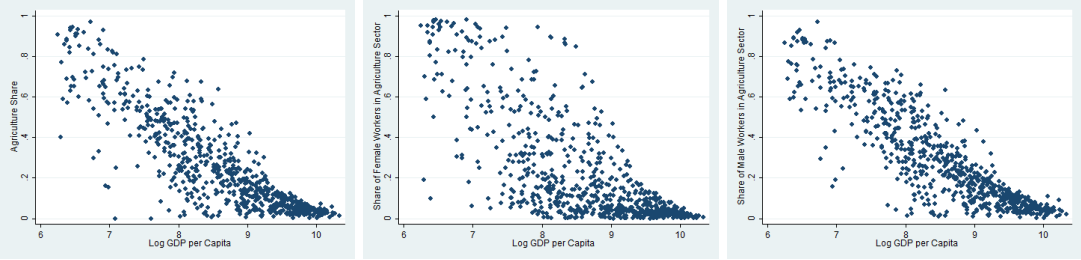


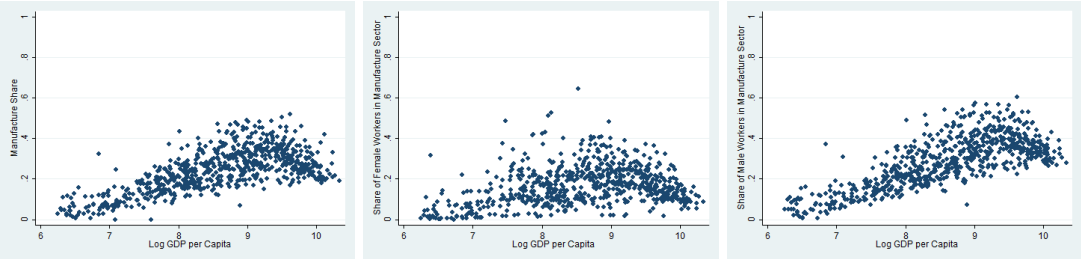
Figure 5: Sectoral Employment Shares by Gender:
Full Sample, 1950-2005

All Females Males

Panel A: Agricultural Sector



Panel B: Manufacturing Sector



Panel C: Service Sector

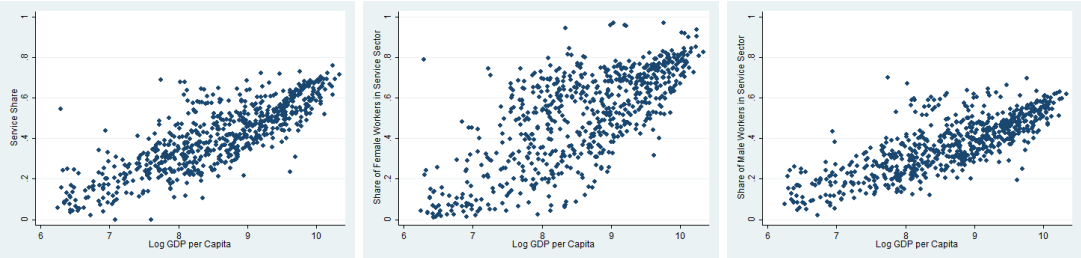


Table A.1: Developed Countries Sample for LFP Analysis

Country	Date Range
Australia	1900-1920 [IHS], 1960-2005 [ILO]
Belgium	1890-1930 [IHS], 1945, 1960-2005 [ILO]
Canada	1890-1940 [IHS], 1950-2005 [ILO]
Denmark	1890-1940 [IHS], 1950-2005 [ILO]
Finland	1900-1950 [IHS], 1960-2005 [ILO]
France	1895-1955 [IHS], 1960-2005 [ILO]
Germany	1925-1945 [IHS], 1950-2005 [ILO]
Ireland	1910-1935, 1950 [IHS], 1960-2005 [ILO]
Italy	1900-1935 [IHS], 1950-2005 [ILO]
Netherlands	1890-1930 [IHS], 1945, 1960-2005 [ILO]
Norway	1890-1930 [IHS], 1945-2005 [ILO]
Portugal	1890-1910, 1940 [IHS], 1950-2005 [ILO]
Spain	1900-1920, 1940 [IHS], 1950-2005 [ILO]
Sweden	1890-1930, 1950 [IHS], 1960-2005 [ILO]
United Kingdom	1890-1930, 1950 [IHS], 1960-2005 [ILO]
United States	1890-1930 [Goldin & Handbook], 1940 [IHS], 1950-2005 [ILO]

[1] The data for LFP on this project comes from the following sources: International Historical Statistics [IHS], International Labor Organization [ILO], Goldin and Handbook of Labor Economics.

Table A.2: Full Sample for LFP Analysis

Country	Date Range
Afghanistan	1975, 1990-2005
Albania	1990-2005
Algeria	1950-2005
Angola	1960, 1990-2005
Argentina	1960-2005
Armenia	1990-2005
Australia	1960-2005
Austria	1950-2005
Azerbaijan	1990-2005
Bahrain	1970-2005

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Table A.2 – continued from previous page

Country	Date Range
Bangladesh	1960-2005
Belarus	1990-2005
Belgium	1960-2005
Benin	1975-2005
Bolivia	1950, 1975-2005
Bosnia	1990-2005
Botswana	1980-2005
Brazil	1960-2005
Bulgaria	1955-2005
Burkina Faso	1975-2005
Burundi	1975-2005
Cambodia	1960, 1990-2005
Cameroon	1975-2005
Canada	1950-2005
Cape Verde	1960, 1980-2005
Central African Republic	1975-2005
Chad	1980-2005
Chile	1950-2005
China	1980-2005
Colombia	1950-2005
Comoros	1980-2005
Congo, Republic of	1970-2005
Costa Rica	1960-2005
Croatia	1990-2005
Cuba	1950, 1970, 1985-2005
Czech Republic	1990-2005
Czechoslovakia	1950-1990
Denmark	1950-2005
Djibouti	1990-2005
Dominican Republic	1960-2005
Ecuador	1960-2005
Egypt	1960-2005
El Salvador	1960-2005
Equatorial Guinea	1980-2005

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Table A.2 – continued from previous page

Country	Date Range
Estonia	1990-2005
Ethiopia	1975-2005
Finland	1960-2005
France	1960-2005
Gabon	1960, 1990-2005
Gambia	1980-2005
Georgia	1990-2005
Germany	1950-2005
Ghana	1960, 1970, 1990-2005
Greece	1950-2005
Guatemala	1960-2005
Guinea	1980-2005
Guinea-Bissau	1950, 1975, 1990-2005
Haiti	1950, 1970-2005
Honduras	1970-2005
Hungary	1960-2005
India	1960-2005
Indonesia	1960-2005
Iran	1955-2005
Iraq	1955, 1975-2005
Ireland	1960-2005
Israel	1970-2005
Italy	1950-2005
Jamaica	1960-2005
Japan	1950-2005
Jordan	1960, 1975, 1990-2005
Kazakhstan	1990-2005
Kenya	1985-2005
Korea, Rep.	1960-2005
Kuwait	1965-2005
Kyrgyzstan	1990-2005
Laos	1995
Latvia	1990-2005
Lebanon	1975, 1990-2005

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Table A.2 – continued from previous page

Country	Date Range
Lesotho	1975, 1990-2005
Liberia	1960-2005
Libya	1960, 1970, 1990-2005
Lithuania	1990-2005
Macedonia	1990-2005
Madagascar	1975, 1990-2005
Malawi	1975-2005
Malaysia	1955-2005
Mali	1975, 1990-2005
Mauritania	1975, 1990-2005
Mauritius	1950-2005
Mexico	1960-2005
Mongolia	1990-2005
Morocco	1960-2005
Mozambique	1950-2005
Namibia	1990-2005
Nepal	1960-2005
Netherlands	1960-2005
New Zealand	1950-2005
Nicaragua	1960-2005
Niger	1975-2005
Nigeria	1960, 1980-2005
Norway	1950-2005
Oman	1990-2005
Pakistan	1970-2005
Panama	1950-2005
Paraguay	1960-2005
Peru	1960-2005
Philippines	1960-2005
Poland	1950-2005
Portugal	1950-2005
Puerto Rico	1960-2005
Qatar	1985-2005
Romania	1955-1975, 1990-2005

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Table A.2 – continued from previous page

Country	Date Range
Russia	1990-2005
Rwanda	1975, 1990-2005
Sao Tome and Principe	1980-2005
Saudi Arabia	1990-2005
Senegal	1970-2005
Serbia/Montenegro/Kosovo	1990-2005
Seychelles	1960-1990
Sierra Leone	1960, 1990-2005
Singapore	1955, 1970-2005
Slovak Republic	1990-2005
Slovenia	1990-2005
Somalia	1975, 1990-2005
South Africa	1960-2005
Spain	1950-2005
Sri Lanka	1950-2005
Sudan	1955, 1970-2005
Swaziland	1965-2005
Sweden	1960-2005
Switzerland	1950-2005
Syria	1960-2005
Tajikistan	1990-2005
Tanzania	1965, 1975, 1990-2005
Thailand	1960-2005
Togo	1980-2005
Total Former USSR	1955, 1970-1985
Trinidad and Tobago	1960-2005
Tunisia	1955-2005
Turkey	1955-2005
Turkmenistan	1990-2005
Uganda	1990-2005
Ukraine	1990-2005
United Arab Emirates	1975-2005
United Kingdom	1960-2005
United States	1950-2005

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Table A.2 – continued from previous page

Country	Date Range
Uruguay	1960-2005
Uzbekistan	1990-2005
Venezuela	1960-2005
Vietnam	1985-2005
Yemen	1990-2005
Yugoslavia	1960-1980
Zambia	1965-2005
Zimbabwe	1980-2005

[1] All LFP data came from the Economically Active Population, Estimates and Projections 6th edition (EAPEP) or the International Labour Organization (ILO).

Table A.3: Developed Countries Sample for Sector Analysis

Country	Date Range
Australia	1900-1950 [IHS]; 1955-2005 [ILO]
Belgium	1890-1930 [IHS]; 1945, 1960-2005 [ILO]
Canada	1890-1940 [IHS], 1950-2005 [ILO]
Denmark	1890-1940 [IHS], 1950-2005 [ILO]
Finland	1900-1950 [IHS], 1960-2005 [ILO]
France	1895-1945, 1970 [IHS]; 1955-2005 [ILO]
Germany	1895-1950 [IHS]; 1960-2005, [ILO]
Ireland	1910-1945 [IHS], 1950-2005 [ILO]
Italy	1900-1935 [IHS], 1950-2005 [ILO]
Netherlands	1890-1930 [IHS]; 1945, 1960-2005 [ILO]
Norway	1890-1930 [IHS], 1945-2005 [ILO]
Portugal	1890-1910, 1940 [IHS], 1950-2005 [ILO]
Spain	1900-1920, 1940 [IHS], 1950-2005 [ILO]
Sweden	1890-1945 [IHS], 1950-2005 [ILO]
United Kingdom	1890-1930, 1950 [IHS], 1960-2005 [ILO]
United States	1900-1920 [IPUMS and HSUS], 1940 [IHS], 1950-2005 [ILO]

[1] Additional sectoral data for the US was gathered using IPUMS and Historical Statistics of the United States (HSUS), Earliest Times to the Present.

Table A.4: Full Sample for Sector Analysis

Country	Date Range
Algeria	1955-1985 2005
Argentina	1960-2005
Australia	1955-2005
Austria	1950-2005
Bahrain	1965-1990
Bangladesh	1960-2005
Belgium	1960-2005
Bolivia	1950, 1975, 1990-2005
Botswana	1965, 1980-2000
Brazil	1960-2005
Bulgaria	1965-2005
Burundi	1980, 1990
Cameroon	1975-1985
Canada	1950-2005
Cape Verde	1960, 1980, 1990
Central African Republic	1975, 1990
Chile	1950-2005
Colombia	1950-2000
Costa Rica	1965-2005
Croatia	1990-2005
Cuba	1955, 1970, 1980
Czech Republic	1990-2005
Czechoslovakia	1960-1990
Denmark	1950-2000
Dominican Republic	1960-1995
Ecuador	1950-2005
Egypt	1960-2005
El Salvador	1960-2005
Estonia	2000, 2005
Ethiopia	1985-2005
Finland	1960-2005
France	1955-2005
Germany	1960-2005

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Table A.4 – continued from previous page

Country	Date Range
Ghana	1960-1985, 2000
Greece	1950-2005
Guatemala	1965-1995
Haiti	1950-1990
Honduras	1960, 1975 1990-2005
Hungary	1960-2005
India	1950-1990
Indonesia	1960-2005
Iran	1955-2005
Iraq	1955, 1975-1995
Ireland	1950-2005
Israel	1960-2005
Italy	1950-2005
Jamaica	1955-2005
Japan	1950-2005
Jordan	1960, 1980
Kazakhstan	1990, 2005
Korea, Rep.	1960-2005
Kuwait	1965-1990
Latvia	2000, 2005
Liberia	1960-1985
Libya	1965, 1975
Lithuania	1990-2005
Malawi	1975, 1985, 2000
Malaysia	1955-2005
Mauritius	1950-2005
Mexico	1960-2005
Moldova	2000, 2005
Morocco	1960-2005
Mozambique	1950, 1970, 1980
Namibia	1960, 1990
Nepal	1960-1990
Netherlands	1960-2005
New Zealand	1950-2005

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Table A.4 – continued from previous page

Country	Date Range
Nicaragua	1965-2005
Niger	1960, 1975
Norway	1950-2005
Oman	1995-2005
Pakistan	1950-2005
Panama	1950-2005
Paraguay	1960-2005
Peru	1960-2005
Philippines	1960-2005
Poland	1950-2005
Portugal	1950-2005
Puerto Rico	1960-2005
Qatar	1985-2005
Romania	1965, 1975, 1990-2005
Russia	2000, 2005
Rwanda	1980-1995
Seychelles	1970-1980
Sierra Leone	1965, 2005
Singapore	1955-2005
Slovak Republic	1990-2005
Slovenia	1990-2005
South Africa	1960-2005
Spain	1950-2005
Sri Lanka	1965-2005
Sudan	1955, 1975, 1985
Sweden	1950-2005
Switzerland	1960-2005
Syria	1960-2005
Thailand	1955-2005
Trinidad and Tobago	1960-2005
Tunisia	1955-1995
Turkey	1965-2005
Ukraine	1995, 2000
United Arab Emirates	1975-2005

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Table A.4 – continued from previous page

Country	Date Range
United Kingdom	1960-2005
United States	1950-2005
Uruguay	1965-2005
Venezuela	1960-2005
Yemen	1975, 1995
Yugoslavia	1960-1980
Zambia	1970, 1980

[1] All sector data for this sample came from the International Labour Organization (ILO).