



Scientific Background to the Sveriges Riksbank Prize in Economic Sciences in Memory of Alfred Nobel 2023

The Committee for the Prize in Economic Sciences in Memory of Alfred Nobel

To Claudia Goldin

For having advanced our understanding of women's labor market outcomes

1. Introduction

Women are severely underrepresented in the global labor market: around 50% of women work or actively seek work for income, compared to 80% for men. The gender differences in participation are fundamentally driven by variation in women's participation rates – men's participation rates are broadly constant across time and countries. The participation gaps between men and women are particularly large in South Asia, the Middle East, and North Africa, where they sometimes exceed 50 percentage points.¹

A century ago, similarly large differences in participation rates between women and men were observed in North America and Europe. But over the past century, women's labor force participation more than tripled in many high-income countries – arguably one of the most significant economic and social changes to have occurred in these countries in the past 100 years.

Equal participation does not, however, imply gender equality, as gender gaps exist in many other dimensions of the labor market. When women work, they earn less: across the OECD, for example, women earn on average 13% less than men.² Moreover, women tend to work in jobs with less room for promotion and are severely underrepresented on corporate boards or as CEOs. Gender gaps in earnings and the “glass ceiling” in promotions are worldwide phenomena.

Why are labor market gender gaps so pervasive around the world today? What explains the variation in the size of these gaps over time and across countries? Is the extent of gender equality primarily a reflection of economic development? Why do gender earnings gaps remain in high-income countries, despite, for example, women being more educated and the adoption of equal pay legislation?

Answering these questions is of fundamental importance for prosperity. If women are treated unequally in the labor market, this is not only an equity concern, but also a matter of economic efficiency. The allocation of labor is inefficient if workers are not assigned to the jobs best suited to their skills. Such inefficiencies lead to large economic costs to society. Reducing the gender gap in employment and improving the allocation of female talent could thus lead to significant increases in global GDP.

This year's Prize in Economic Sciences is awarded to **Claudia Goldin**, of Harvard University, for significantly advancing our understanding of women's labor market outcomes. Goldin's masterful account of the economic history of women has provided novel facts about the many dimensions of the gender differences in the labor market, and uncovered both the driving forces of these gaps over time and the gaps that remain today.

¹ See the World Bank Gender Data Portal for information on labor force participation rates by gender.

² OECD (2023).

The lens of history as a way to understand gender gaps today

In many parts of the world, women's work shifted dramatically from the home to the marketplace over the past century. The lens of history can identify the drivers of change and provide insights into how the economic paths of women may continue to evolve into the future. It helps us understand the extent to which the past influences the present and how social hurdles were both created and resolved historically.

Many of these insights are best obtained by carefully documenting the long-term evolution of labor market gender differences in a single country (in Goldin's case, the US) rather than by studying short-term changes within or across countries today. Such a long-term account highlights developments (e.g., technological change, educational advancements, and declines in fertility) that may easily elude a contemporary observer due to their slow-moving nature.

Moreover, to the extent that countries undergo similar transformation processes at different points in time, or at different levels of development, long-run analyses may also inform us about the sources of contemporary cross-country differences. There is as much variation in gender gaps in participation and earnings across countries today as in the US in the past 250 years; for example, the labor force participation rate of women in India today is comparable to that in the US in 1900.

But measuring (let alone explaining) long-run trends in labor market gender gaps is challenging due to a lack of historical employment records, especially for women. Moreover, even if data do exist, women may be systematically undercounted. For instance, historically women's occupation were often listed as "wife" in the US censuses. A crucial first step to fully appreciating and explaining the economic advancements of women is to reliably measure women's outcomes in the labor market.

Applying a unifying economic framework

Prior to Goldin's work, a coherent framework for studying the labor market outcomes of women was lacking. In many studies, the facts presented were not always correct – sometimes even contradictory – and the explanations put forward were arguably too simple. Historians focused on the stability of gender differences in the social and economic spheres (e.g., Harris, 1978, Tentler, 1979), while economic historians, with a few notable exceptions (e.g., Pinchbeck, 1930, Richards 1974), often presumed that meaningful estimates of women's work would be impossible to retrieve from historical records, and therefore paid little attention to the role of women in the economy. Economists (see, e.g., Durand, 1948, Mincer, 1962), on the other hand, pointed to a secular increase in 20th century US female labor force participation as a function of economic development, with increases in real wages and an elastic supply of female labor providing the underlying mechanisms.

Goldin pushed these strands of literature forward, and partly united them, in important ways. By pioneering a framework in which education, fertility, and productivity are connected to the evolution of women's aspirations and identity, as well as institutional change, she put women at the center of the analysis. The choices made by women under important constraints (largely

due to the need to balance work for the market with work for the family) are then embedded in the economy as a whole.

More specifically, underlying Goldin's explanations of the changing status of women in the economy over time is an economic framework where employment and wages of women at any given point in time are determined by supply as well as the demand for the skills provided by female labor. Demand evolves over time due to, for instance, structural and technological change. Labor supply decisions are embedded within a life-cycle framework, where expectations about future prospects in the labor market at the time of making educational decisions are key. Social norms, institutional barriers, and the need to balance work with the family, all constrain female labor supply choices. At any given point in time, aggregate supply of female labor is comprised of women at various points in their life-cycles. These women have made different educational choices in the past and their family responsibilities evolve with age. The ability of women to adjust to underlying changes in the demand for their skills thus varies across their lifetimes.

Goldin's application of this demand-and-supply framework thus provides a consistent lens through which changing female labor market outcomes can be understood. Labor market gender gaps can be explained by economic fundamentals, and the constraints facing women are central in this framework.

The long-run evolution of US gender gaps in employment and earnings

Goldin's research approach, which marries history and economics, has yielded results that have often challenged conventional wisdom. For example, Goldin (1990) overturned the previously widely accepted view that female labor participation is a positive function of development. Through careful detective work, using novel data sources, and correcting for biases in existing data, Goldin (1990) showed that the long-run evolution of US female labor market participation is in fact U-shaped. Moreover, the upward trend began later than indicated by preexisting data. Though such a U-shape had been hypothesized based on cross-country data, it had not been previously documented within the context of a single country's development.³

Goldin further demonstrated that these long-run trends were primarily driven by changes in the employment of married women due to a range of often intersecting factors affecting the demand for and supply of (married) female labor. Opportunities for paid female work expanded in the 20th century with (i) structural change attributable to the expansion of white-collar work, (ii) technological change affecting the nature of work at the office and home, and (iii) changes in access to education, such as the expansion of secondary schooling. Yet social stigma attached to the employment of married women and explicit institutional barriers (i.e., so-called marriage bars) severely limited the impact of improved opportunities.

Piecing together multiple sources of earnings data dating back to the early 19th century, Goldin (1990) also provided the first evidence of how gender earnings gaps evolve with development. Three novel facts stand out. First, fundamental shifts in the structure of the demand for labor did benefit women historically, even before social movements pressing for wage equality. The

³ Inspired by Goldin (1990), this U-shaped pattern has been replicated in other high-income countries (e.g., Mammen and Paxson, 2000, and Olivetti, 2014).

gender earnings gap narrowed substantially in the US during the Industrial Revolution (1820–1850) and with the rise of clerical work and secondary education (1890–1930). Second, and contrary to standard accounts, Goldin found that “wage discrimination” – that is, gender pay differences not accounted for by differences in observed productivity-related variables – increased contemporaneously with the narrowing of the earnings gap during the shift to white-collar employment. The share of the gap accounted for by discrimination more than doubled, which Goldin attributed to the introduction of modern era wage policies in which promotion is used to reward workers with few career interruptions. Third, after the 1930s, the gap remained essentially stable for a half century, despite both a tripling of the national GDP per capita and a doubling of the female participation rate.

Goldin’s work also helps answer the fundamental question of *why* change is slow. Specifically, an important insight in Goldin’s account of US history is that changes in participation rates and the composition of labor supply to a large extent worked through cohorts, i.e., through the choices and opportunities of women born around the same point in time. When we measure the overall share of women participating in the labor market, and their experience and composition (e.g., education and training) in a given year, we are averaging across cohorts. In other words, aggregate female labor market outcomes include both young labor market entrants as well as women from older cohorts, who grew up in very different circumstances and are past their child-bearing years. As employment opportunities over the life cycle are shaped by the human capital decisions made when workers are young (i.e., education and early career experience), change really occurs when new cohorts start to make different decisions at a young age. Aggregate outcomes thus change slowly, or possibly not at all at times, depending on which cohorts make up the bulk of the labor force at a given point in time.

Starting in the 1970s, the US (and other high-income countries) experienced dramatic increases in women’s college education rates and wages relative to men’s, along with a steady increase in women’s participation in the labor market. Goldin identified two fundamental and interlinked causes, the first relating to cohorts and the second to technological change.

On the first cause, Goldin (2006) demonstrated that, in times of rapid change, women’s expectations about future labor force participation can be severely off the mark, which can lead to underinvestment in education. Women’s expectations in the early 1900s of short working careers (due to marriage and family) were largely accurate. These expectations were incorrect, however, for the generation of women who came of age in the 1950s and 1960s, who formed their expectations as young girls with mothers at home. These mothers did in fact return to the labor market, but only after their daughters’ educational decisions were made. Ex post, the women of the 1950s and 1960s spent a significant amount of time in the labor force, and they would likely have invested more in their careers had they expected this outcome. Women coming of age in the 1970s and 1980s, on the other hand, expected to work most of their lives and, as a result, invested in higher education.

On the second cause, Goldin and Katz (2002) showed that increased investments in professional careers were also driven by an important technological innovation in the 1960s – the birth control pill. Despite the transformative role attributed to the first easy-to-use and female-controlled contraceptive by casual observers at the time, it was not until the work of Goldin and Katz (2002) that the impact of the pill on female labor market participation was

rigorously established.⁴ They showed that access to the pill caused college women to invest in professional careers and delay marriage. The availability of reliable contraceptives thus allowed women to control their fertility, which improved incentives to invest in costly career-educations.

The determinants of contemporary gender gaps

Today, in high-income countries, women have more education than men, enroll in professional programs to a similar extent, and participate in the labor market at increasingly similar rates. But gender earnings gaps persist and the convergence seems to have stalled. Why? In a set of papers, Goldin identified both a proximate cause – parenthood – and a contributing driver of that cause – workplace inflexibility.

As a starting point, Goldin (2014) demonstrated that differences in education and occupational choice – factors that traditionally explained a large part of the raw gender gaps in wages and earnings – have become less important over time, while within-occupation gender differences have risen in importance. By examining how gender gaps evolve across the lifecycle, Bertrand, Goldin, and Katz (2010) further showed that these within-occupation gaps largely emerge and expand upon childbirth. Time away from the labor market, and returning to the labor market at reduced hours, has long-term consequences on the female wage-earnings profile.⁵ Further, Goldin and Katz (2011) and Goldin (2014) provided empirical evidence suggesting that a lack of workplace flexibility contributes to this parenthood effect; in most labor markets, there is a wage penalty associated with jobs flexible enough to allow women to be the “on-call” parent.

Implications for policy?

Goldin’s work provides a clear example of the power of combining history and economics. By studying the past, we can learn a tremendous amount about contemporary determinants of gender gaps. And by applying a unified framework, Goldin could explain what happened – and why – to women in the labor market through the course of societal and economic transition. Although the body of Goldin’s work is “positive” in nature – i.e., she does not address normative issues regarding policy design – it contains many valuable insights for policymakers aiming to reduce labor market gender gaps. At the core: in order to design effective policy, we must understand the source of the problem being addressed.

Goldin’s studies of the US experience should help inform the design of policy today in countries that are still undergoing changes long since completed in the US. However, one central lesson from Goldin’s research is that there are many, often not mutually exclusive, explanations of labor market gender gaps (e.g., discrimination, human capital inequalities, social norms, childcare expectations, technological change, labor market structures), and these

⁴ As noted by Goldin and Katz (2002), *The Economist* in 1999 named the pill the greatest advance in science and technology in the 20th century.

⁵ This finding has stimulated a rapidly growing literature, which confirms the pattern documented by Bertrand, Goldin and Katz (2010). Kleven, Landais, Posch, Steinhauer, and Zweimüller (2019b), for example, found that the earnings of men and women evolve similarly before parenthood but diverge sharply after in all the six OECD countries that they examined.

explanations change as a society transitions from one stage of development to another. Her work also makes clear that because the many sources of the gender gap often interact with one another, policies targeting one channel may be insufficient to yield significant change. Moreover, policies that are effective in one context or country may be ineffective in others.

Another key lesson for policymakers is that the speed of change is likely to be slow for two reasons. First, social norms and expectations, regarding e.g., who cares for children, often evolve slowly. Second, human capital decisions, affecting entire careers, depend on expectations at the critical junctures when such choices are made. Change thus really takes place when new cohorts enter the labor market, and it will take some time until these changes are reflected in aggregate outcomes.

Document roadmap

The remainder of this document is organized as follows. Section 2 presents Goldin's seminal contributions to measuring female labor force participation and wage rates over the past 250 years. We highlight her novel data work and the new stylized facts that emerged regarding the evolution of gender inequality in the US labor market. Section 3 emphasizes Goldin's contributions to explaining the development of gender gaps and why they persist today – especially in earnings. Section 4 briefly discusses the relationship between the long-run time series evolution of gender gaps in the US and the gender gaps that exist across countries at different stages of economic development, as well as the core role played by education. Section 5 considers implications of Goldin's historical work for contemporary policy debates. Section 6 concludes.

2. Establishing key facts regarding gender gaps in labor markets

Claudia Goldin's work has significantly improved our understanding of core facts regarding female labor force participation and gender earnings gaps over time and phases of development. This section discusses the following four empirical findings:

The U-Shape in female labor supply over time and development. Before Goldin's work, US census data had been used to document a secular increase in female participation rates since 1890. Little was thus known about female labor market participation in the 19th century. Using a wealth of previously unexplored quantitative and qualitative information, Goldin extended this "time series" back to the late 1700s and corrected existing participation statistics for the years 1890 and 1900. She demonstrated that a 19th century decline in female labor force participation in fact preceded the more celebrated 20th century rise. The extended longitudinal data depicts a U-shape in women's labor market participation over time. See Section 2.1 for details.

The important role played by married women's return to the labor market and cohort effects. To understand core aggregate measures of the gender gap, it is crucial to understand how labor force participation evolved over time for both married and single women. In the 18th and 19th century, most women stopped working outside of the home upon marriage. Goldin showed that this pattern did not change in the US during much of the 20th century; the 20th century rise in female labor force participation thus originated in higher rates of female reentry to the labor market later in life (i.e., after child-rearing years). Each cohort returned to the labor market at higher rates than the cohorts before: this finding of strong cohort effects has important bearings on the composition of the female labor force in terms of education and work experience. See Section 2.2 for details.

The slow improvement in female relative earnings and the origins of "wage discrimination". The US began collecting comprehensive earnings data only midway through the 20th century. Goldin pieced together a nearly two-century history of the ratio of female-to-male earnings from different primary sources and presented surprising findings. Despite substantial economic growth, as well as structural and social change favoring women, the earnings gap was slow to change. Although the female-to-male earnings ratio in manufacturing rose throughout most of the 19th century, it came to a halt and remained at around 55% between 1880 and the 1960s. The overall earnings gap narrowed substantially with the rise of clerical work and increased education in the period 1890 to 1930, but remained stagnant until the 1980s. Goldin also showed that "wage discrimination" came along with the improvements in labor market opportunities for women of the mid-20th century. See Section 2.3 for details.

The increasing role played by within-occupation differences in explaining the gender earnings gap. Standard views suggest that differences in human capital or occupations primarily drive the gender earnings gap between men and women in the labor market. Historically, such differences were large. But Goldin showed that most of the current earnings gap comes from differences in earnings within – rather than between – occupations. The sources of current gender earnings differences must therefore be sought in the relative pay that men and women receive when they work in similar occupations. See Section 2.4 for details.

2.1 The U-Shape in female labor supply over time and development

Prior to Goldin's work, US census data from 1890 and onwards had been used to document a secular increase in the participation rates of women (see e.g., Durand, 1948, Mincer, 1962, Easterlin, 1968). Yet the accuracy and inclusiveness of the data, especially prior to the 1940 census, have been questioned ever since their collection.

Goldin (1990) highlighted several reasons why women's work is underestimated in historical censuses, including biases in historical accounting definitions, changing definitions in the meaning of labor force participation, and the undercounting of female workers in the census.⁶ By reporting corrected earnings estimates, and discussing the severity of changing definitions to labor force participation, Goldin constructed new evidence on women's work historically.⁷

One of her main contributions concerns the under-counting and omission of female workers, especially in the period before 1940. During this time, it was, for example, common to simply list "wife" in the census when referring to married women. In a modern context, this would imply nonparticipation in the labor market. Yet many married women who were recorded as wives actually engaged in what we would now consider labor market activity. The wife of a small farmer or farm laborer almost certainly worked together with her husband on the farm. The wives of boardinghouse keepers, and probably many other small business owners, worked in their husband's business.

Combining data from income reports, time budget surveys and census data, Goldin showed that adjusting for the undercounting of women in the agricultural sector raises the female labor force participation rate by almost 7 percentage points in 1890. Adjusting for undercounting in other sectors (mainly boardinghouse keepers and manufacturing workers) adds an additional 3 percentage points. Most of the adjustments apply to white married women: the corrected female participation rate of that group is five times the official census statistic (12.5% versus 2.5%). The labor force participation rate for married women in 1890, therefore, is similar to that observed in 1940. For all women, the correction resulted in a relative increase in the 1890 labor force participation rate by 37% (i.e., from 19 to 26 percentage points).

Goldin (1990) provided evidence that the undercounting problem is likely greater further back in time, since the occupations of women were not collected in most pre-1890 censuses. Changes in occupational composition – due to the shift from agriculture to manufacturing, the rise of factory production, and an associated decline of small proprietorships – imply that a fully corrected employment series for the entire 19th century would almost certainly show declining female labor force participation. The effects of industrialization are, however, likely to differ between unmarried and married women, since married women had to combine market work with work for the family, a factor that constrained their choices when the economy modernized. For young single women, however, industrialization initially provided jobs complementary to their skills. Goldin's work, discussed below, corroborated these hypotheses.

⁶ The current US labor force definitions was initiated in the 1940 census, and measures whether the individual works for pay during the survey. Prior to 1940, labor force participation was based on a measure denoted "gainful worker," which was derived using responses to a census question on whether the individual claimed to have an occupation during the year just prior to the census (see Goldin, 1990).

⁷ Carefully correcting prior measurements of participation and earnings is a recurrent theme in Goldin's work; see Goldin and Sokoloff (1982, 1984), Goldin (1986, 1990), for example.

Goldin and Sokoloff (1982) noted that the US Industrial Revolution marked a critical juncture in the evolution of female labor force participation and the relative earnings of men and women. They used previously underexploited archival sources and constructed new data to document women's work during the early phases of US industrialization. They found that a considerable portion of women, especially young and unmarried women, were employed in manufacturing and that the proportion rose wherever industrialization spread. In Massachusetts, for example, they documented that 27.1% of all girls and women aged 10 to 29 were employed in manufacturing (including home workshop production) in 1832, and that this figure increased to over 40% in 1837. As women were also employed in non-manufacturing sectors, these rates must be considered high in comparison with the overall participation rate of 40% for single women in 1900.

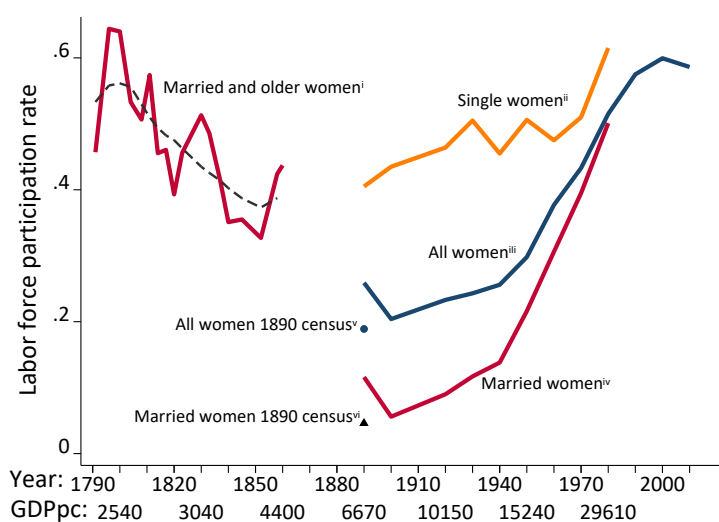
In the second half of the 19th century, the participation rates of young and single women in manufacturing started to decline. Goldin (1990) identified one reason for this development: the huge increase in female employment led many to question women's right to labor and call for protective legislation. This resulted in the creation of institutional barriers (to which we will return in Section 3) faced by subsequent cohorts of women.

Goldin (1986) documented a different pattern for older and married women. Combining business and city directories with population census manuscripts from Philadelphia, Goldin (1986) assembled a dataset of about 12,000 households headed by women, who were mostly unmarried adults or widowed, from 1791 to 1860.⁸ This pioneering work provided the first systematic data on the economic status of women during industrialization. By focusing on female-headed households, Goldin documented the work of women – something that could not be done for married women in the census. A key finding was that 44% of the women in the directories listed an occupation, notably with jobs that could be performed at home, e.g., hand sewers, retail dealers, inn or boardinghouse keepers, and washerwomen.

Anecdotal historical evidence also suggests that married women, and not just widows and spinsters, were engaged in “hidden market work”: wives are often mentioned working together with their husbands in family enterprises. Goldin employed an innovative approach to quantify the magnitude of this type of work. Specifically, she traced out the work trajectory of wives after their husbands died by matching female households in the 1796 Philadelphia directories to earlier directories. Goldin showed that widows in the 1790s had a high probability of assuming their deceased husbands' businesses and craft positions. Though the highest rates of transmission were found in shop keeping and boardinghouse keeping, many widows inherited more atypical positions, e.g., shoemaker, ironmonger, and tinsmith, from their husbands suggesting that widows at the turn of the 19th century had a fair amount of practical knowledge of their husbands' occupations. However, a reduction in the share of female heads-of-household employed in such male-dominated occupations over time suggests a fall over the 19th century in the share of married women involved in “hidden market work.”

⁸ This sample of female-headed households comprises about 15% of Philadelphia households. Note that the Philadelphia directories are among the most comprehensive, available from 1785 to the late 19th century.

Figure 1: U-shaped female labor market participation over time and development



Notes: Figure 1 plots labor force participation rates for women by marital status. “Married and older women” is labor market participation rates for female heads of households in Philadelphia. “All women”, “Married women”, and “Single women” include women in the respective category (all, married, or single) who are 15 years and older up to 1960 and 16 years and older from 1970 and forward. Dashed line shows a smoothed scatterplot.

Sources: (i) Goldin (1986); (ii) Goldin (1990); (iii) Goldin (1990), Olivetti (2014), ILO (2023); (iv) Goldin (1990); (v) 1890 US census (from Goldin, 1990) (vi) 1890 US census (from Goldin, 1990).

In sum, using mostly unexplored historical data from the US dating back to the 18th century, Goldin showed that the well-known 20th century increase in labor supply was in fact preceded by a decrease throughout the 19th century; see Figure 1. In other words, the US labor force participation rate of women over time (and development) is U-shaped.⁹ Goldin (1990) has inspired research in economic history aiming to document the extent of women's involvement in the labor market (e.g., Humphries and Sarasúa, 2012, reconstructs participation rates in historical Europe). Goldin’s research has also spurred a growing literature that integrates gender into the analysis of long-run economic development (see Merouani and Perrin, 2022, for a recent survey).

2.2 The important role played by married women and cohort effects

The increased involvement of women in the labor market over the 20th century is primarily driven by the behavior of married women (see Figure 1). White married women played an especially prominent role in accounting for this increase: over the period 1890–1970, 89% of the population was white; moreover, black women already worked to a much greater extent than white women in 1900 and the increase in participation was thus much lower among black women.¹⁰ In 1900, female labor force participation was 21%, while the participation rate for

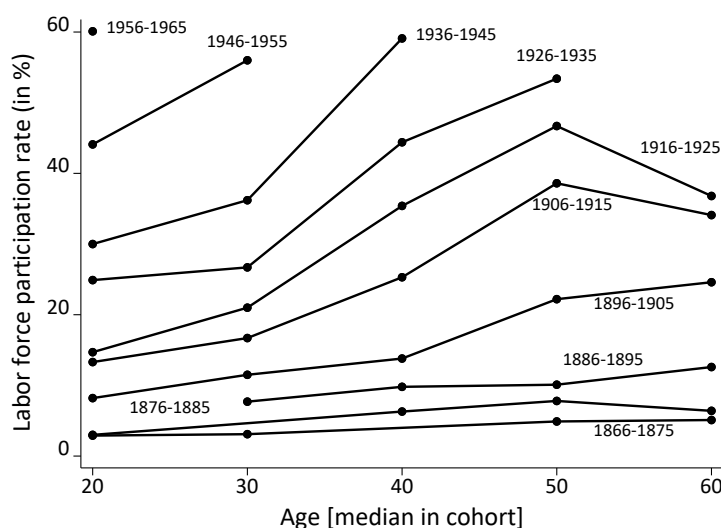
⁹ As shown in Olivetti (2014), men’s labor force participation has changed little over (most of the) 20th century.

¹⁰ Goldin (1990) analyzed the participation rates for both black (African-American) and white women. In 1900, the participation rate for black married women was more than 10 times that for white women. Goldin (1977) argued that slavery may have made work less socially stigmatized among black married women. Over time, the

married women was less than 6%. Eighty years later, the employment rate for all women and the subsample of married women were roughly the same (around 50%).

Although the increased involvement of women over the 20th century is driven by the behavior of married women, most women actually stopped working outside of the home upon marriage for most of the century. Goldin (1990) showed that these two patterns are compatible, as the increase in participation did not originate in a change in the historical pattern of leaving employment at the time of marriage, but rather in much higher rates of reentry years later in life.

Figure 2: Labor force participation by cohorts of white married women born 1866–1965



Notes: Participation rates for married white women. Cohorts defined by birth years (10-year periods), from 1866–1965. Figure 2 reproduces Figure 2.2 in Goldin (1990).

Source: Goldin (1990).

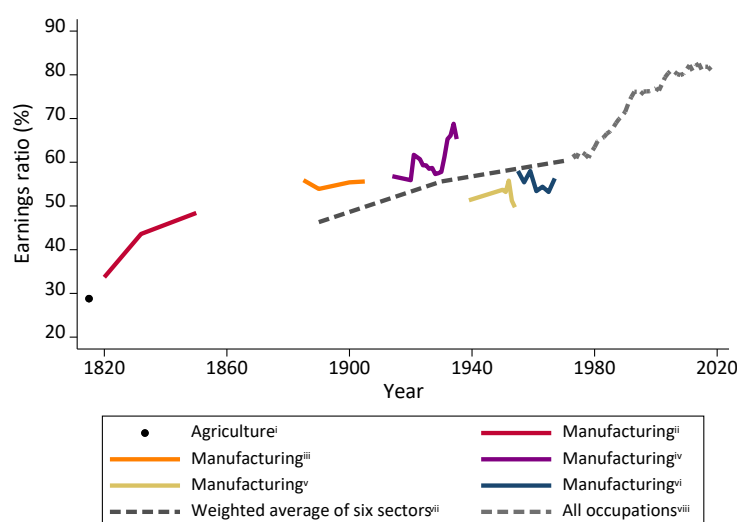
Figure 2 (after Figure 2.2 in Goldin, 1990) highlights the key role of white women’s life-cycle choices in driving female labor force participation, especially from the 1950s and onward. As an example, consider the consecutive cohorts of married (white) women born in 1886–1895, 1896–1905, and 1906–1915 (so with a median cohort age of 50 in 1940, 1950, and 1960, respectively). The labor force participation rate of these cohorts essentially doubled decade by decade between 1940, when 10% of the 50-year-old women were in the labor force, and 1960, when almost 40% participated. In Section 3, we return to a discussion of the reasons why certain cohorts experience increased rates of participation during particular periods and the consequences for the gender earnings gap.

rates converged. In 1970, the ratio was 1.3. Over the first half of the 20th century, black women held jobs almost exclusively in agriculture and the service sector.

2.3 The slow improvement in female relative earnings and the origins of “wage discrimination”

A serious complication in measuring the evolution of the gender earnings gap was the lack of comprehensive earnings data: The US began collecting such data midway through the 20th century. Goldin (1990) pioneered a long-run view by piecing together almost a two-century history of female-to-male earnings, primarily from manufacturing surveys. See Figure 3.

Figure 3: US gender earnings ratio (women relative to men) from 1820



Note: Reproduced from Goldin (1990) and extended up to 2020. Ratio of female-to-male earnings.

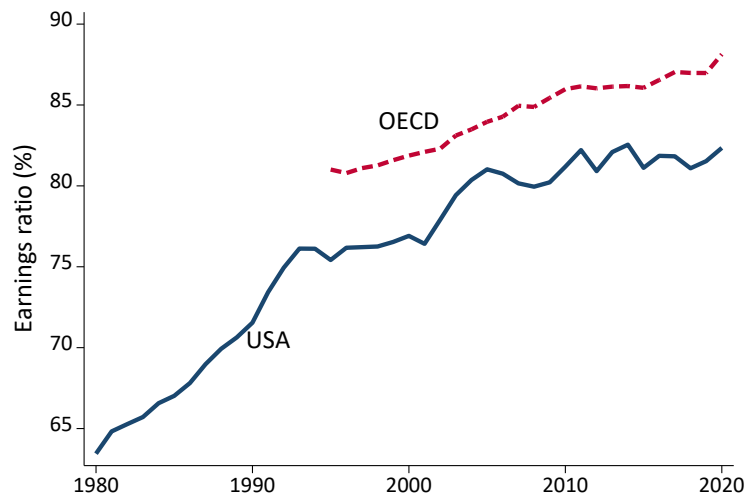
Sources: (i-vii) Goldin (1990); (viii) OECD (2023).

In her analysis of gender differences in earnings, Goldin established three core facts. First, the earnings gap narrowed significantly during both the US Industrial Revolution (1820–50) and the era of the rise of white-collar employment (1890–1930). Both periods of narrowing earnings differentials were associated with new work opportunities for women and occurred before much of the social movements for equal pay for equal work.

Second, the overall convergence in the gender earnings gap has been slow despite the major structural and social changes of the 20th century, including large increases in female participation and human capital. After an initial period of rising relative female earnings, the manufacturing earnings gap stagnated at around 55% from 1880 until the 1960s, i.e., for about 80 years. Looking at average earnings for all occupations from 1890 to 1980 suggests that the gender gap narrowed until 1930, but remained essentially stable (with some business cycle fluctuations) until 1980.¹¹

¹¹ Average earnings are constructed by weighting the earnings for each group by the occupational distribution.

Figure 4: Gender earnings ratio in US and OECD



Notes: The gender earnings gap is defined as the ratio of female-to-male median earnings. Data refer to full-time employees and self-employed individuals. OECD is the average across all OECD countries.

Source: OECD (2023).

Third, the nature (source and magnitude) of earnings differences changed over time. In the late 19th century, earnings differences were driven largely by gender segregation in US manufacturing. Women were confined to a handful of industries (textiles, apparel, boots and shoes, canning, and tobacco) and to jobs lacking qualifications for entry and opportunities for promotion. But Goldin (1990) noted that the observed “wage discrimination” – i.e., the pay gap adjusted for productivity differences across the genders – was relatively low because it was straightforward to monitor productivity in manufacturing jobs. In fact, pay by the piece was common – in particular in the industries where women worked – and piece rates automatically adjust wages to differential productivity. That is, when labor markets were organized as spot markets, workers were mainly paid according to their individual productivity. This left little room for discrimination based on group characteristics.

Paradoxically, it was the expansion of white-collar work that opened the door for substantial “wage discrimination”. By 1940, more than half of the difference in male and female earnings in office work could not be accounted for by observed indicators of individual productivity.¹² In other words, “wage discrimination” primarily arose as labor markets were transformed from spot markets into modern labor markets based on long-term contracts. The establishment of personnel departments in the mid-20th century came with occupational ladders and salary

¹² When payment is not by the piece, or when monitoring productivity is hard, it is more difficult to determine the true rate of wage discrimination. Typically, the measures of wage discrimination rely on either the so-called Blinder-Oaxaca decomposition or a pooled regression model. In the pooled regression model, the (logarithm of the) individual wage is regressed on variables hypothesized to capture individual-level differences in productivity (or preferences) and an indicator variable for women. The coefficient on the female indicator variable is interpreted as a measure of wage discrimination. It captures the residual earnings differences between groups, holding other observable differences constant. In the Blinder-Oaxaca decomposition, separate wage regressions are estimated for women and men, and the wage differentials between them is decomposed into “explained” and “unexplained” components.

schemes; individuals were promoted when they showed loyalty and abilities. Because women, on average, were expected to have lower job tenure than men, employers likely used gender as a signal in promotion decisions.¹³ The gender wage gap adjusted for observed indicators of individual productivity thus increased in the modern-day labor market, since men were more likely than women to be in the higher job ranks within occupations.

2.4 The increasing role played by differences in earnings within occupations for the remaining gender earnings gap

Figure 3 and Figure 4 document considerable convergence in the gender earnings gap over the past half century. Yet women still earn less than men. In 2020, the average gender gap in median full-time earnings across the OECD countries was 13%. There is substantial heterogeneity across countries, however: the earnings gap equals 7% in Sweden and 18% in the US, for instance.

What factors account for the evolution of the gender earnings gap? Differences in human capital or occupations between men and women in the labor market of course play a role. Historically, such differences were large. Over time, however, women's education and occupation choices have become more like the choices of men. And Goldin (2014) showed that most of the earnings gap that remains today stems from earnings differences within – rather than between – occupations.

Many studies use linear regression to measure the relative roles of human capital and other factors as sources of the gender gap over time (e.g., Blau and Kahn, 2000). Based on US data, Blau and Kahn (2006) showed that female earnings amounted to 54% of male earnings, for full-time employed workers in 1979; by 1998, this earnings ratio had increased to 77%. Human capital factors explained 25% of the raw gender pay gap in 1979 but only 8% of the gap in 1998.

Today, human capital differences, when measured in terms of educational attainment, account for even less of the gender wage gap in high-income countries. In fact, as illustrated in Figure 5, women have been educating themselves to a greater extent than men, and this difference has been increasing over time. This is true not only for the US today, but also for the OECD countries on average, both for younger (aged 25–34) and older cohorts (aged 55–64).

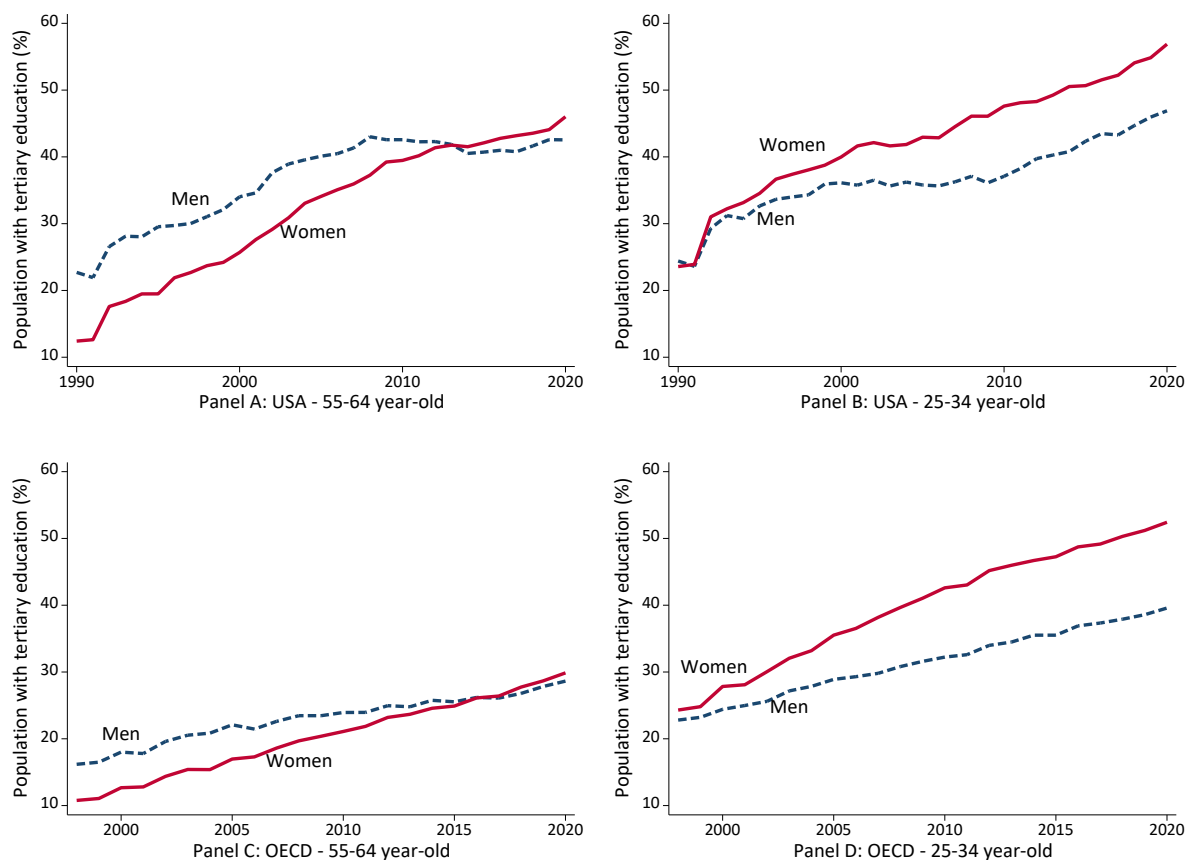
Standard measures of human capital, such as years of education, cannot explain much of the gender earnings gap that remains today. However, the type of education and subsequent occupations men and women select may play an important role.

Starting with Altonji (1993), it has been well-documented that differences in educational choices directly impact gender differences in earnings. For example, using US data, Black, Haviland, Sander, and Taylor (2008) found that the choice of college major could explain more than half of the raw gender gap in log earnings among women who had a labor force attachment similar to men. The gender difference may be starkest in the STEM fields: science, technology, engineering and mathematics. As noted by Bertrand (2020), while more than 50% of men complete a tertiary degree in a STEM field in some OECD countries, the share of women who

¹³ Promotion decisions are in part based on expected tenure with the firm, since longer tenure implies greater value to the firm.

do so never crosses the 20% mark. In contrast, across OECD countries, a larger share of women than men graduate with a tertiary degree in the humanities, while gender imbalances are less systematic when it comes to business and law degrees.

Figure 5: Proportion of population with tertiary education in the US and OECD, 1990–2020



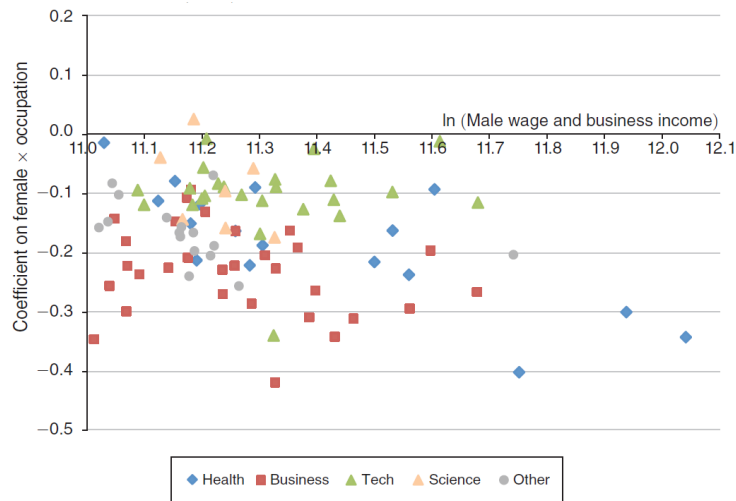
Notes: Proportion of population with tertiary education. OECD, panels C and D, is the average across OECD countries.

Source: OECD (2023).

Goldin (2014), however, noted that while these differences in education and occupational choices remain, the majority of the earnings gap among US college graduates comes from within-occupation differences in earnings rather than from between-occupation differences. That is, in explaining the gender gap in earnings, differential education and occupational tracks have become less important over time, while differences between men and women within occupations have become more important. Specifically, using data for 2010, Goldin (2014) calculated how the aggregate gender gap would change if earnings were equalized by gender within each occupation compared to equalizing the proportions of men and women in each occupation. Removing the within-occupation gender gap in earnings matters far more than equalizing the distribution of men and women between occupations: around two-thirds of the aggregate gap is due to the “within gap” and one-third to the “between gap”.

Figure 6, taken from Goldin (2014), shows the (standardized) within-occupation gender difference in log earnings across occupations using data from 2009 to 2011.¹⁴ The plotted coefficients give the raw gender pay gap adjusted for age, education, and time worked within each occupation. While women’s earnings relative to men’s are visibly lower within almost all occupations, there are large differences in this “within-component” across occupations and broad sectors of the economy. “Business” occupations have the largest gender pay differences.

Figure 6: Gender pay gaps by occupations in US, 2009–2011



Notes: See notes to Figure 2A in Goldin (2014). The graph gives the coefficients for approximately the top 95 occupations ranked by male (wage and business) income.

Source: Goldin (2014).

A core implication of Goldin’s finding is that, as gaps within occupations are becoming more important than the distribution of individuals by occupations, investigating what goes on within occupations can provide further evidence on the drivers behind the observed gap – a topic we return to in Section 3.

¹⁴ A concern with these types of empirical investigations is selection, in particular, in occupations where relatively few women work (like the technology sector). However, Goldin (2014) provided evidence suggesting that selection is not a dominant driver of these findings.

3. Explaining the evolution of the gender gaps in employment and earnings

Claudia Goldin has not only provided new facts about the evolution of the gender gaps in employment and earnings over time, she has also uncovered the factors driving this evolution, including those most relevant for the gaps remaining today. She achieved this by combining the micro-founded demand-and-supply framework and rigorous empirical analyses of modern-day labor economics with the careful narrative of an economic historian.

At the core of her research is the role played by the family (spouses and children) in shaping gender differences in labor supply and earnings. Women face many constraints when making labor supply decisions or investing in pre-market human capital. Of central importance is the responsibility to bear and rear children. Women may carry the burden of childbirth in a household. But many decisions are within the household's control: When should one have the first child? How many children should one have? Who should provide childcare?

The answers to these questions are in part guided by social norms on the acceptability of married women working in the labor market and, if they are mothers, having their children cared for by someone other than themselves. As these norms changed over the past century, and were even at times manifested in legal barriers (so-called marriage bars) that formally prevented women from working after marriage, so too did the answers to these questions.

The answers have also changed with changes in educational access and institutions, technology that impacted the amount of time required for housework, the nature of the work environment (e.g., clean office jobs), and the ability of women to "time" births via the contraceptive pill and postpone childbirth to older ages via in vitro fertilization (IVF).

All of these changes have led women in high-income countries to alter their expectations when young about their future participation in the labor market, the share of their (married) lives for which they will be employed, and their wage returns to labor market participation. As a result of changing expectations about the future, women started to make different human capital investment decisions. This substantially reduced the gender gap in educational attainment and skills, and even eliminated the gap in the rate of college graduation.

As highlighted in Section 2, another central feature of Goldin's work, which plays an essential role in explaining *why* gender gaps evolved as they did, is her identification of cohorts that are subject to the same social norms and institutional barriers or innovations. That is, participation primarily changes when new cohorts – with different education levels, attitudes, aspirations, and fertility decisions from those of previous generations – enter working age. Decisions also change as cohorts update their expectations about their future based on the successes and failures of previous generations. Goldin's cohort approach revealed important new insights regarding women's choices at different stages of their lives – life-cycle choices that help explain the gender earnings gap.

This section presents Goldin's contributions to explaining the evolution of labor market gender gaps.

3.1. Structural change and the evolution of the gender gaps in employment and earnings

Structural change – including the shift from agriculture to manufacturing, the rise of clerical work, and the expansion of the service sector more generally – are key factors that drive female employment during the different stages of economic development. In a standard economic model, the downward movement along the U-shape is often explained by a dominant income effect: as incomes rise (higher wages in the industrial sector relative to the agricultural sector), the pressure on women to work is weakened. The upward movement, along the U-shape, can be attributed to a dominant substitution effect (e.g., Mincer, 1962) due to higher wages, which in turn is driven by the expansion of the service sector, and the corresponding shift in female labor demand arising from an increased need for more analytical rather than physical skills.

Goldin showed that structural change in the US indeed fundamentally affected the economic role of women from the 19th century and onwards, and that its impact was heterogeneous (e.g., for married versus single women) and at times slow (due to cohort effects). This subsection is divided chronologically into three parts that describe the drivers identified by Goldin of the changes in female participation and the gender earnings gap from the early 19th century to the mid-1950s: (i) from agriculture to manufacturing; (ii) the first phase of the white-collar expansion; and (iii) the second phase of the white-collar expansion. Understanding these drivers provides important insights for countries at different stages of development.

From agriculture to manufacturing. Section 2 highlighted Goldin’s novel evidence of (i) relatively high female labor force participation levels (outside of subsistence agriculture) in the early 19th century, (ii) a falling gender earnings gap from the first half of that century, and (iii) falling female participation rates in the 1800s. Below, we outline the forces that Goldin identified that help explain these patterns.

The US Industrial Revolution got underway during the early decades of the 19th century.¹⁵ The organization of production in factories had a large impact on female labor force participation, at least for young unmarried women. By 1832, over 40% of the industrial work force in the Northeast was young and female. In the early-industrializing state of Massachusetts, one-third of all young women and girls were employed in the manufacturing sector by 1850. Given the very low earnings of women relative to men in the agricultural sector (especially in the Northeast), relative female earnings nearly doubled as the manufacturing sector expanded; by 1850, the gender earnings gap was 50%, not far from the gap in 1950 (Goldin and Sokoloff, 1982). Thus, the shift from agriculture into mainly light manufacturing in the 19th century helps explain the first narrowing of the earnings gap.

While industrial development significantly altered labor market outcomes for young single women, it left the outcomes of married and older women largely untouched. Substantial social stigma regarding married women working outside the home existed throughout the 19th

¹⁵ Industrialization in the US first took root in the Northeast. Goldin and Sokoloff (1984) studied the early industrial history of the US and show that relative productivity of women and children to that of men in the agricultural sector prior to industrialization is a core contributing factor to the evolution of the factory system and to the regional variation (North/Northeast versus South) in industrial development. In the North, relative wages of women versus men were relatively low, a result driven in part by an agricultural system relying on crops such as hay and wheat, for which men had a comparative (strength) advantage relative to women. Abundant and relatively cheap female and child labor helped fuel the early phases of the Industrial Revolution.

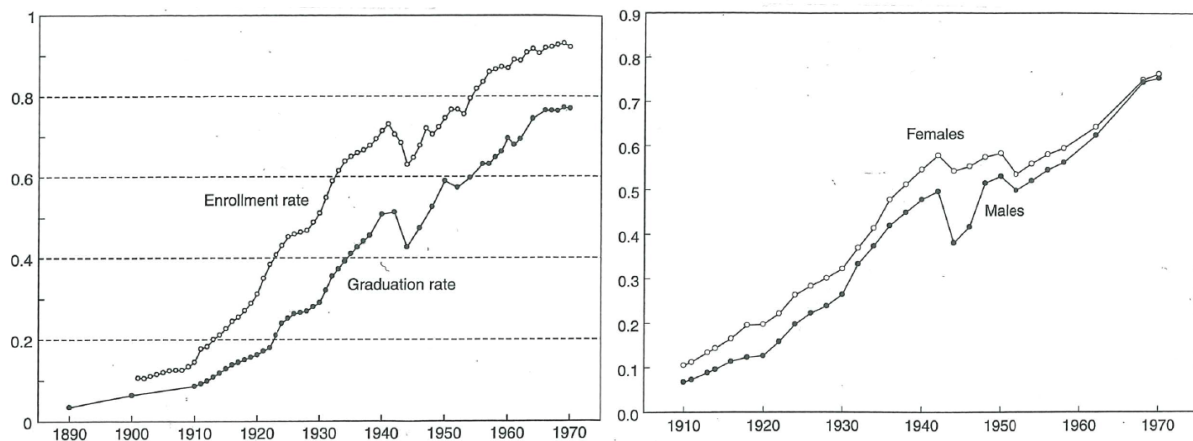
century. Thus, women who entered the workforce when they were single almost always exited upon marriage. In fact, industrialization – and the expansion of cities as well as the progressive separation of home and work that followed – coupled with existing social norms, decreased the possibilities of combining market work with responsibility for the household. Therefore, the Industrial Revolution also resulted in a secular decline in the labor force participation rate among married women in urban areas over most of the 19th century (Goldin, 1986).

The first phase of the white-collar expansion. The earnings gap between men and women narrowed substantially during the rise of white-collar employment (1890–1930), but participation rates changed only marginally. Why?

During the early decades of the 20th century, the bulk of the female labor force consisted of low-educated unmarried women. Women primarily worked in light manufacturing (e.g., shoe or clothing production or fruit and vegetable canning) or in domestic service jobs. These jobs had no entry qualifications or promotion opportunities and often paid by the piece. The lack of career prospects provided little incentive to invest in human capital.

Yet these same decades also saw the seeds of change being sown. First, technological innovation (e.g., the typewriter, cash register and stenotype) changed the nature of clerical work, such that it became routine and mechanized by the early 20th century (Rotella, 1981). Contemporaneously, firm size and demand for office workers to support management increased. Between 1870 and 1930, clerical employment grew from 1% to 10% of employment.

Figure 7: Secondary school rates



Notes: Left: public and private schools. Right: graduation rates from public high schools.

Source: Goldin and Katz (2008).

Second, the so-called high school movement started in 1910 and yielded rapid growth in secondary school attainment (Goldin, 1998, Goldin and Katz, 2008). Figure 7 shows that the share of 15- to 18-year-olds enrolled in high school rose from 19% in 1910 to 73% in 1940.¹⁶

¹⁶ The rise in educational attainment among US women preceded that of other advanced countries.

And young US women graduated from high school to a greater extent than men throughout the 20th century – a pattern partly explained by gender differences in the returns to schooling. Without a high school degree, women’s labor market prospects were bleak; men without high school degrees, however, could still get relatively well-paid (but physically demanding) manufacturing jobs.

These two forces combined to expand the clerical sector and shift it from being predominantly male (85% in 1890) to predominantly female (Goldin, 1984). More pleasant working conditions, and lower penalty on absence from the labor market compared to manufacturing jobs, attracted women to the clerical sector (Goldin, 1984).¹⁷ Moreover, because earnings in the clerical sector were higher than in most other sectors, the earnings gap between men and women fell.

The “feminization” of the office was thus achieved via an enormous shift from manufacturing and domestic service jobs into white-collar occupations, rather than a large increase in female participation rates. Section 2 shows fairly marginal changes in participation rates between 1890 and 1930, despite the growth of higher paying jobs in the clerical sectors. Why?

As in the 19th century, the answer can be found in the norms and regulations governing women’s work: women almost uniformly left the labor force upon marriage (and were married for the vast majority of their adult lives). The social stigma and norms driving this exit were formalized into explicit regulations in the late 19th and early 20th centuries. So-called marriage bars, which explicitly prohibited the hiring or employment of married women, were introduced.

Goldin (1988, 1990) documented two kinds of marriage bars. “Hire bars” banned hiring married women but permitted firms to retain women who got married while already employed. “Retain bars” were more restrictive and required the firing of women upon marriage. The use of the marriage bars peaked after the Great Depression and were particularly common for positions as teachers and clerical workers. In 1942, 87% of school districts had hire bars and 70% had retain bars. Marriage bars were also more prevalent in large firms. A 1930s survey of firms found that 35-40% of women worked in firms that would not hire a married woman. Thus, discriminatory regulations capped the extent to which women could benefit from the growth of the clerical sector.

The second phase of the white-collar expansion. Section 2 documented a secular rise in female employment rates, occurring mainly among married women. The gender earnings gap, however, remained fairly flat from 1930 to about 1980. Why?

Between 1930 and 1950, demand for clerical workers continued to grow. The marriage bars that constrained female employment at the beginning of this period were entirely abolished during the 1940s, as excluding significant portions of potential labor supply made little economic sense (Goldin, 1988, 1990). Specifically, due to a decline in the size of cohorts born in the 1920s and 1930s, there were fewer young high-school-educated women available for white-collar employment in the 1940s. At the same time, there was a sizable pool of older married women, with experience from clerical work, who had the desire to return to the labor

¹⁷ Because productivity rises with experience, and manufacturing jobs often paid by the piece (while clerical employment was salaried) absence from the labor market was penalized to a greater extent in manufacturing.

market after having raised their children. This desire was also facilitated by the widespread adoption of labor-saving technological innovations in home production (e.g., Greenwood, Seshadri, and Yorukoglu, 2005), which, to some extent, freed women from household responsibilities. Thus, market forces – high demand for female workers in combination with a potential supply of mostly married women – drove the abolition of the marriage bar.¹⁸

The demand for female workers was also driven by the mobilization of men during the Second World War. Goldin and Olivetti (2013) showed that this episode had a lasting impact on the labor force participation of women who had completed (at least) high school education – participation rates of women increased more in states where armed forces mobilization rates for men were high.¹⁹

With the rising employment of women came an increased social acceptance of work among married women. The labor market also adjusted. For example, firms started to create scheduled part-time work during the 1940s and especially the 1950s (Goldin, 1990): 18% of the female labor force worked part-time in 1940 versus 28% in 1960. Female part-time work especially increased in the retail trade, from 14% in 1940 to 40% in 1960. With greater flexibility in hours, married women could combine their household responsibilities with market work.

The life-cycle pattern of labor supply also sheds light on why the gender earnings gap changed little. The majority of labor market entrants were older women who had not worked for several years and had not expected to work later in life. Their educational investments were predicated on these expectations. Thus, the average skills of the cohort of women entering the labor market were relatively low, resulting in employment in routine clerical jobs with scant human capital accumulation on the job and little room for advancement.

3.2. The quiet revolution

From 1970 and onwards, women’s educational choices changed considerably: their college attendance and graduation rates surpassed those of men, and their enrollment in professional programs increased massively. This increase in human capital investments contributed to a substantial reduction in the (raw) gender wage gap, which started around 1980; see Figure 3. Labor force participation rates also continued to increase but at a slower rate than previously.

¹⁸ The elimination of the marriage bar and overt discrimination did not end more subtle discriminatory practices. Goldin and Rouse (2000) analyzed a particular setting, namely the auditioning of musicians to major American symphony orchestras. These orchestras changed their hiring practices, at different points in time, starting in the late 1970s. Prior to the change, there was face-to-face auditioning. After the change, candidates auditioned behind a screen. Goldin and Rouse asked whether the advent of “blind” auditions made the hiring process more gender neutral. Though females were not explicitly “banned,” the open hiring process left substantial room for discretionary biases. Goldin and Rouse found large effects of blind auditions for women, which suggest that females were discriminated against prior to the reforms. The effects are only significant at the 10% level, however, and somewhat difficult to interpret in the later rounds of auditions (which are conditional on outcomes of the earlier rounds). This work has had a lasting contribution on the research frontier, demonstrating the feasibility of testing for gender discrimination using quasi-experimental variation in real-world settings.

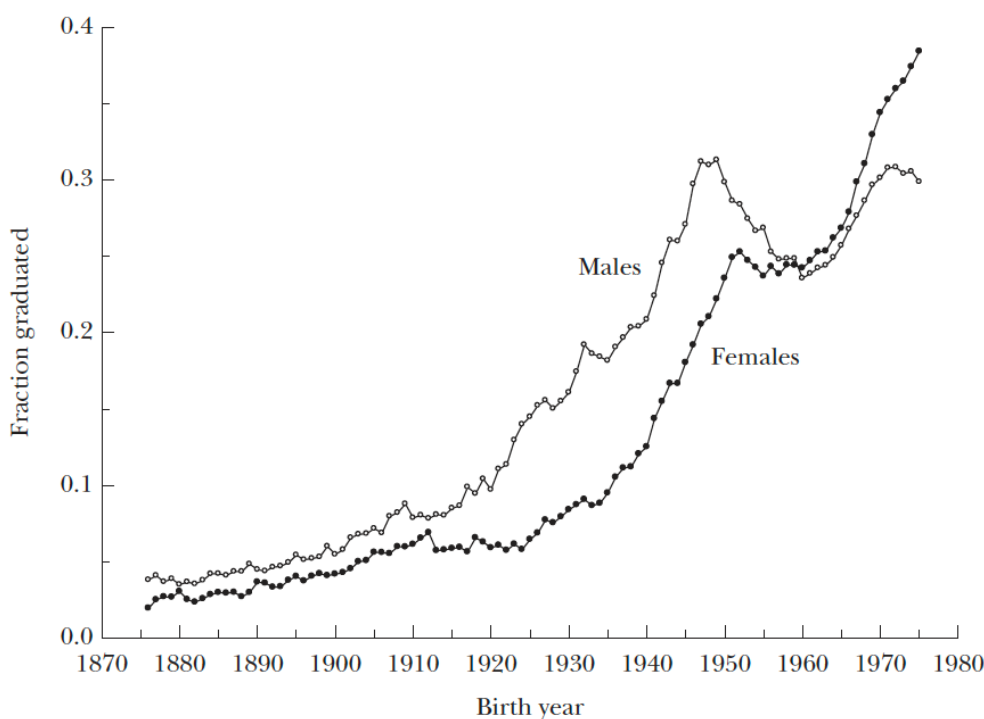
¹⁹ Mobilization of young men for the US armed forces had no impact on the employment of low-educated women, however. The reason is that they started to work in manufacturing during the war and were later replaced by men returning from military service.

What factors drove the massive increase in human capital investments and the associated reduction in the gender earnings gap? In a series of publications, Goldin identified two complementary factors: changing expectations and the introduction of oral contraceptives.

Changing expectations. Individuals form expectations when they are young about the future. These expectations may be about the likelihood and timing of marriage, fertility, and employment. Decisions on how much to invest in education – e.g., high school, university, field of study, post-graduate degrees – depend on how much one expects to work in the future. How are these expectations formed? They are in part a function of observing labor market outcomes for the preceding generation, as social norms and expectations are passed from one generation to the next. However, because educational investment happens when young, the younger generation does not observe all of the outcomes of previous generations. The expectations they form about the future can thus be inaccurate and lead to suboptimal educational choices.

Using data from the National Longitudinal Survey, Goldin (2005, 2006) showed that the share of women aged 20–21 who expected to be employed at age 35 increased from 35% in 1967 (the cohorts born 1947/1948) to 80% in 1979 (the cohorts born 1958/1959). The predictions of the cohort born 1947/1948 were close to the actual employment rates of their mothers (which were approximately 30%). Yet their future employment rates at age 35 would in fact be around 65%.²⁰ The predictions of the cohort born 1958/1959, on the other hand, were much closer to the employment rate experienced by the youth of the National Longitudinal Survey (75%).

Figure 8: College graduation rates (by age 35) by gender

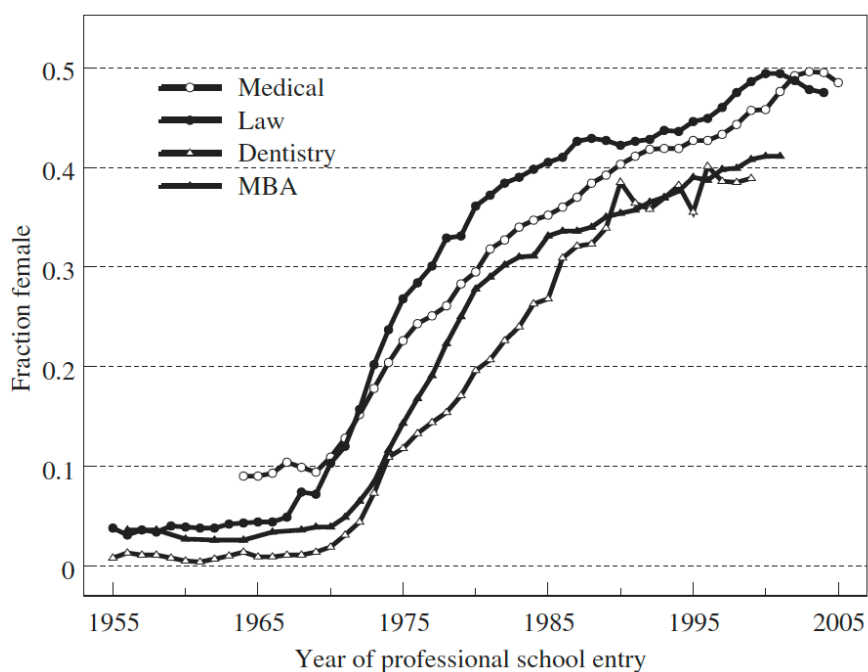


Source: Goldin, Katz, and Kuziemko (2006).

²⁰ More precisely, about 65% of ever-married women born 1951–1954 worked at age 35; see Goldin (2005).

As expectations about future career prospects were updated, high-school-aged girls invested more in college preparation as measured by, e.g., achievement test scores and enrollment in math and science courses (Goldin, Katz, and Kuziemko, 2006). As the returns to college education started to increase around 1980 (see Katz and Murphy, 1992, Goldin and Katz, 2008), women were particularly poised to take advantage of this increase, possibly due to smaller non-pecuniary costs for college preparation.²¹ Goldin (2006) characterized the period after the late 1970s as a “revolutionary phase” – the “quiet revolution”. One feature of this revolution is the dramatic increase in young women entering college: Figure 8 shows that women’s college graduation rates have exceeded those of men, starting with the cohort born in the early 1960s. Another feature is that women started making different career choices, with massive increases in female enrollment in professional programs (see Figure 9) and increased female labor market participation. More education, different career choices, and higher labor market participation, in turn, contributed to a reduction in the gender earnings gap (see Goldin, 1990, Olivetti, 2006, and Goldin and Mitchell, 2017).

Figure 9: Fraction of women among first-year students in professional programs.



Source: Goldin (2006).

The introduction and diffusion of contraceptives. The birth control pill enabled women to time fertility. Goldin and Katz (2002) showed that the pill’s availability had a transformative

²¹ The increase in the return to college, starting around 1980, was preceded by a long period of a declining college wage premium between 1915 and 1950 (see Goldin and Margo, 1992, Goldin and Katz, 2008). The college premium increased between 1950 and 1970 and then fell during the 1970s.

role for women and was an important catalyst of the quiet revolution. The pill increased incentives to invest in education and the supply of highly educated female labor.

Why did access to contraception have such a huge impact? Goldin and Katz (2000, 2002) presented a simple framework to explain how access to the pill lowers the cost of waiting to get married (e.g., abstinence) and incentivizes women to invest in careers. The introduction of the pill improved women's ability to control fertility, making the investment in costly "career" educations worthwhile for a larger portion of the population. Their framework implies that the introduction of the pill should increase the age at first birth, the age at marriage, and career investments.

In the US, the first oral contraceptive was approved in 1960 and made available to married women. But until the end of the 1960s, access was limited for young unmarried women. Single women below the (state-specific) age of majority needed parental consent to access the pill. In the early 1970s, many states reduced the age of majority from 21 to 18 and passed laws increasing access to family planning and contraception without parental consent. Thus, there is state-by-time variation in access to oral contraceptives for young single women. Importantly, the changes in the age of majority were not actually driven by family planning concerns but rather by a desire to reduce the age of conscription for the Vietnam War.

Before evaluating the effect of the pill, Goldin and Katz demonstrated that it was indeed taken up as a contraceptive tool by unmarried women.²² Goldin and Katz then showed how the pill impacted the fertility and educational choices of young women. First, they found breaks in the time series of premarital sex behavior, age of marriage, and career investment, which occur for women born in the early 1950s (i.e., the first cohorts of unmarried women to have access to the pill). Figure 10, for instance, shows that a surge in investment in professional programs started in the early 1970s when these women made their college education choices.

Second, Goldin and Katz (2002) presented a more formal analysis that relied on differential timing in the age of majority and family planning reforms across states, to identify whether access to the pill causally impacted age of marriage. This reliance on timing allowed them to hold aggregate trends constant, and thus addressed the concern that there might have been some other unmeasured factor – such as a shift in gender norms – that changed contemporaneously. Finally, they examined occupational and marital outcomes for different age groups in the 1970, 1980, and 1990 censuses. By observing successive cohorts at the same age, Goldin and Katz investigated whether variation in marriage and career choices across cohorts is related to variation in access to the pill and abortion across cohorts. These analyses compellingly showed that the pill had a transformative role: access to reliable contraceptives caused college women to invest in professional careers and delay marriage.

3.3. The parenthood effect: why a gender earnings gap remains

Despite higher female education, similar entry rates into professional program participation, and decreasing gender gaps in participation, a gender earnings gap remains today that seems

²² Goldin and Katz used two surveys that included retrospective questions about the age of first pill use or family planning and found that increases in pill use coincided with the age of majority and parental consent reforms.

difficult to close. In the US, the convergence in the gender earnings gap may in fact have stalled (see Figure 4). What explains this?

Claudia Goldin, along with Marianne Bertrand and Lawrence Katz, showed that parenthood is a key juncture where the earnings of men and women diverge. In fact, the negative earnings impact of parenthood falls on mothers, while the earnings of fathers may even increase.

The parenthood effect.²³ Section 2 highlighted Goldin’s (2014) finding that the majority of the current earnings gap comes from earnings differences within rather than between occupations. What happens within specific occupations may therefore provide important evidence on the underlying sources of the observed gap.

Bertrand, Goldin, and Katz (2010) examined how the gender earnings gap varies across the life cycle. They studied the career outcomes of graduates from a top US business school (MBAs) – the Booth School of Business at the University of Chicago; individuals with an MBA typically enter high-paying corporate and finance jobs.²⁴ Similar to other professional programs, the gender gap in MBA enrollment in the US has closed over time, from 4% female in 1970 to 43% in 2006. Goldin and co-authors matched retrospective surveys (about jobs, earnings, and family changes) of the classes that graduated in 1990 to 2006 to administrative school records on courses, performance, and pre-enrollment characteristics. Small gender differences in employment and wages are observed upon graduation, but the differences are large 10 years later. By year 10, the cumulative amount of time off for women is on average around one year (versus 0.12 years for males). These relatively small amounts of time off translate into large gaps in the share of women (41%) and men (10%) who have taken career breaks of 6 months or more. Holding cohort and year constant, the 11 log-point gender earnings gap at graduation expands to 31 and 60 log points at 5 and 10 years, respectively.

What explains the evolution of the gap? Regressions of log earnings on gender demonstrate that three factors – MBA courses and performance, post-MBA experience and time out of the labor market, and hours worked – can explain 84% of the overall gender gap (pooled across all years). The relative importance of each factor changes with time since graduation. There are large penalties of time away from work, which are nonlinear in nature. Though these penalties are not gender-specific, the propensity for men to take such career breaks is low.

Thus, the question that needs answering is why gender differences in labor supply and career interruptions emerge. The answer is children. Gender differences in employment (manifested in the probability of working, experience, and hours worked) are driven by women with children. This pattern is not due to negative selection of the type of women who gets married and have children.

To dig deeper into the role of having children, Bertrand et al. (2010) examined within-individual changes in employment and earnings in the years after the birth of a first child. They

²³ We use the term parenthood effect rather than other common labels (e.g., “child penalty” or “motherhood penalty”). Whether the effect can be interpreted as a penalty depends on the underlying mechanisms.

²⁴ Wood, Corcoran, and Courant (1993) and Noonan, Corcoran, and Courant (2005) have also analyzed the within-occupation dynamics of the earnings gap for University of Michigan law school graduates (JDs). Goldin (2014) showed, using more recent data from the University of Michigan Alumni Survey Research Dataset, that the parenthood effects documented in Bertrand et al. (2010) for MBAs are similar to those of JDs.

estimated this event-study-like design separately for men and women to assess the differential gender responses to the birth of a child – the parenthood effect. Female employment, earnings, and hours immediately decrease after childbirth, and continue to do so in the following years. But male labor market outcomes do not deteriorate – if anything, earnings increase.

Inspired by Goldin and co-authors, other researchers have contributed to a rapidly growing literature with the goal of understanding the sources of gender differences in the labor market. A number of recent studies of the parenthood effect have used within individual changes in labor market outcomes, as in Bertrand, Goldin, and Katz (2010).²⁵ These studies have been conducted in a large number of countries, for example in Sweden (Angelov, Johansson, and Lindahl, 2016), Denmark (Kleven, Landais, and Sogaard, 2019a), and Germany (Adda, Dustmann, and Stevens, 2017). Each study confirmed the general finding of Bertrand, Goldin and Katz (2010): the parenthood effect explains a large share of the remaining gender gap (or even all of it in Denmark). The gender earnings gap expands after children are born. Though the pattern is the same across countries, the magnitude of the effect does differ. As a share of mother’s pre-childbirth earnings, it equals 21–26% in Denmark and Sweden, 31–44% in the US and UK, and 51–61% in Germany and Austria (Kleven et al., 2019b).

Compensating differentials and workplace flexibility as an explanation for the parenthood effect. Why is there a negative effect on earnings as women become mothers? And why does the effect persist? The answers to these questions may be related to an empirical pattern observed everywhere: women take the lion’s share of child-rearing responsibilities.

Goldin and Katz (2011) and Goldin (2014) pointed to one important explanation for the parenthood effect: a lack of workplace flexibility. They present a framework of compensating differentials, in which women receive a wage penalty for demanding a job flexible enough to be the on-call parent. Men, on the other hand, receive a premium for being flexible enough to be the on-call employee, i.e., constantly available to meet the needs of an employer and/or client. In jobs where such “face time” is valued, one employee cannot easily substitute for another and part-time work is hard to implement. Nonlinearities in wages emerge as a result: workers willing to work many hours are rewarded with a higher wage.

Goldin (2014) illustrated the potential of this explanation by looking across industries and occupations with different job demands. The gender earnings gap is larger in occupations with more time pressure, contact with others, interpersonal relationships, and freedom to take decisions. The degree of worker substitutability is low in these occupations.

Goldin and Katz (2016) highlighted pharmacists as an occupation where substitutability is high. Though a limited gender gap in earnings exists for those with children, it can be completely explained by differences in hours per weeks of work. Earnings are linear: there is no extra penalty for working fewer hours. The substitutability of pharmacists is a modern

²⁵ See Waldfogel (1998) for a survey of the earlier studies of the parenthood effect. The literature on the gender gap in earnings due to parenthood is currently very active. Lundborg, Plug, and Rasmussen (2017) used an alternative instrumental variables strategy based on the random success of IVF treatments; they found that fertility implies persistently lower earnings for women. Bensnes, Huitfeldt, and Leuven (2023) also used variation from IVF treatments. In the longer run, the earnings gap between mothers and fathers increase following child birth. This increase in the gender gap stems partly from a reduction in the earnings of mothers, and partly from an increase in the earnings of fathers.

innovation, as the pharmaceutical industry shifted in structure – from one with many independent retailers, drugs mixed directly by the pharmacist, and pharmacists that intimately knew the personal details of their customers to one with a few large chains, pre-mixed drugs, and computerized prescription and insurance records. The unadjusted ratio of female-to-male earnings (for full-time, full-year) for pharmacists was 0.60 in 1960; with all of these institutional changes, it has risen to 0.85 today.

Recent follow-up work has examined the role of workplace flexibility. The evidence is somewhat mixed. Azmat and Ferrer (2017) found evidence in support of flexibility being a determinant of the gender earnings gap, while this was less so in Cook, Diamond, Hall, List, and Oyer (2021). Using Norwegian registry data, Bütikofer, Jensen, and Salvanes (2018) found larger child earnings penalties for mothers in professions with a nonlinear wage structure (MBAs and lawyers) than those with a linear structure (STEM and medical professions). Finally, using US data, Wasserman (2023) showed that a cap on weekly hours in certain medical specialties encouraged women to enter that specialty, but had no effect on men.

While the research of Goldin and her contemporaries has made clear that a substantial fraction of the remaining gender earnings gap is tied to parenthood, the exact mechanism is still debated. Goldin put forward workplace flexibility as one contributing factor, but other explanations cannot be ruled out. For instance, entrenched beliefs or gender stereotypes (see Bertrand, 2020) may lead women to make decisions about careers, career breaks, and caring for their children to avoid the reputational costs associated with deviating from a prescribed behavior.

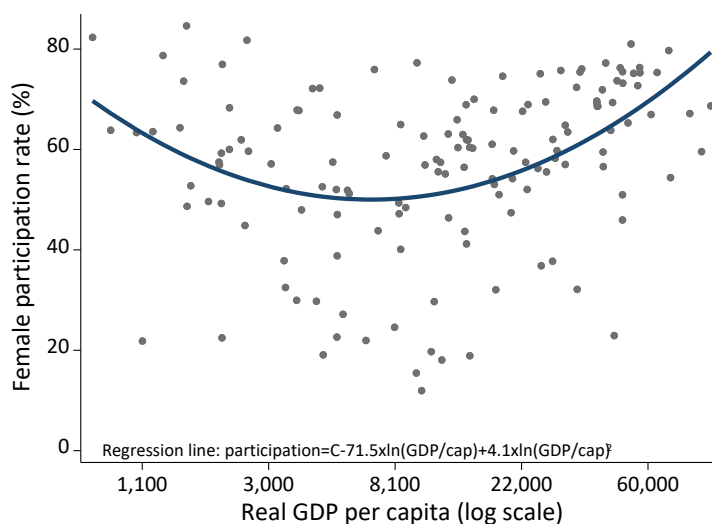
4. The international context

The labor market participation of women, and women's changing roles during the course of economic development, has been studied for more than half a century.²⁶ Much of the earlier work on female participation and development was hampered by a lack of data and especially longer time-series data for developing countries.

Goldin's US-based work provides a unique case study of how female labor market outcomes evolve, due to shifts in the supply of and demand for female labor, as a society undergoes: (i) structural transformation (industrialization and white-collar expansion), (ii) technological change that affects the nature of work (in and out of the home), (iii) changes in gender norms and expectations regarding childcare responsibilities, (iv) changes in educational opportunities, and (v) changes in institutional barriers permitting women to participate in education and the labor market. As these transformations are far from complete in many developing countries around the world today, Goldin's work made important contributions to understanding the sources of contemporary labor market gender gaps in developing countries and the challenges faced by policymakers in addressing them.

Goldin (1995) illustrated the external validity of the long-run development of the US experience to contemporary cross-country variation in development using data for around 130 countries. Figure 10 reproduces the cross-country correlation between economic development (as proxied by GDP per capita) and female labor force participation, using more recent data.

Figure 10: Female labor market participation and development, cross-country evidence



Notes: Figure 10 plots the labor force participation rate for women ages 15–64 in 2018 and log of GDP per capita in 2018 (constant 2017 USD).

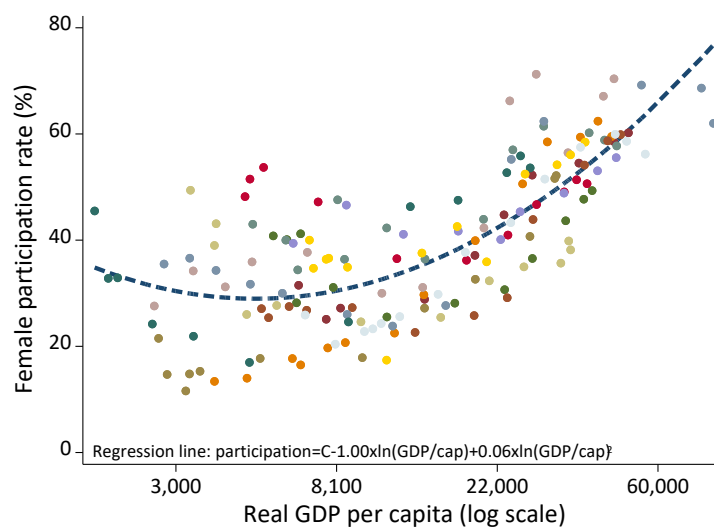
Source: World Bank Open Data (2023).

²⁶ See for example Boserup (1970) and Schultz (1990). For a review of earlier literature, see Psacharopoulos and Tzannatos (1989).

As in the US case, Goldin interpreted the downward portion of the U as driven by structural change, in which the locus of production shifts from family farms to factories, firms, and other places of wage labor. Following such structural change, women have the opportunity of wage labor outside the home, rather than working for the family. However, as her account of the US showed, whether and to what extent women can exploit these opportunities depend on the existence of social norms and stigma related to married women’s working outside of the home. There is considerable evidence that such social norms remain widely held (see Goldin, 1995) and as the earnings of husbands (and thus mechanically the household) increase, an income effect further serves to decrease women’s labor market participation.

As development proceeds, education, and especially secondary education, plays a key role – again in line with the upward movement observed in the US following the era of the rise of white-collar employment. Yet social norms, or gender discriminatory laws, continue to determine both the extent and the speed to which female employment rates increase.²⁷

Figure 11: Female labor force participation and development within-country over time, 14 industrialized countries 1890–2005



Notes: Figure 11 plots the labor force participation rate for women and log of real GDP per capita in 1990 USD.

Sources: Olivetti (2014) for participation rates and Bolt and van Zanden (2020) for real GDP per capita.

More recent research, using comparable data for high-income countries, have confirmed the existence of a U-shaped female labor supply function for industrialized countries. Using data for a number of developed economies with consistently available statistics for most of the 1890 to 2005 period, Olivetti (2014) identified a U-shaped female labor supply function coming from within-country variation. Figure 11 illustrates her main findings. Consistent with the timing demonstrated by Goldin (1990) of the upwards swing in US female labor market participation, the U in Figure 11 for these post-industrial countries and periods is dominated

²⁷ For example, norms that stigmatize husbands for having their wives work outside the home may be self-reinforcing, which helps explain their slow change as economies develop.

by the expansion of female participation (i.e., the upwards slope of the U). Ngai, Olivetti, and Petrongolo (2022) showed that this pattern not only holds for the extensive margin of labor market participation but also the intensive margin, i.e., hours worked.

The evidence presented here thus suggests that the lessons learned from the US experience over more than 200 years of economic development are also relevant for other countries.

5. Broad policy implications and further impact of Goldin's work

Goldin's groundbreaking contributions to measuring and explaining labor market gender gaps through the course of more than 200 years of US history have been almost completely positive in nature. That is, the vast majority of Goldin's work does not make normative policy prescriptions.²⁸ Rather, in most of her work, she has applied a unified supply-and-demand framework to explain what happened – and why – to women in the labor market.

This does not mean that Goldin's research has no policy implications, however; to the contrary, policy can only effectively achieve its goals if we have a firm grasp of the problem that is being addressed. Her research thus provides many insights regarding *what* kinds of policies may or may not work to reduce labor market gender gaps, *when* they may work, and *how long* it will take until a particular policy has an effect.

A first fundamental takeaway of Goldin's work is that the source of the gender gap is not constant as a society transitions from one period of development to another. Rather, her work highlights which factors are most relevant at various stages of economic development, and, importantly, how multiple sources of gender gaps often interact with each other. For instance, policies aimed at improving female educational attainment – an ambition of many lower-income countries today – will not be effective at closing labor market gender gaps if social norms or institutional barriers keep women out of the workplace.

A second fundamental insight is that it is key to identify the root causes of gender gaps. For example, the recent literature suggests that the main reason for earnings differences between women and men in high-income countries is related to childbirth. But what is the underlying reason for this parenthood effect? And can it be addressed by policy and, if so, by what policies? In general, Goldin's work has inspired a large body of research that evaluates specific policies.²⁹ Moreover, there is a recent literature that tries to account for the variation in the parenthood effect across countries.³⁰ It seems that the effect is larger in absolute value in more gender-conservative environments. This may suggest that for policy to make a difference, it must change entrenched norms on who is the “on-call parent” in the longer run.³¹

A third fundamental insight of Goldin's work relates to the speed of change. The impact of even effectively designed policies may only slowly be reflected in aggregate outcomes, as it is mainly younger cohorts that can alter their human capital investment decisions, as well as family and career choices.

Finally, Goldin's work demonstrates that women's expectations about the future play a key role, due to the intertemporal nature of labor supply decisions. This is important for two

²⁸ In some of her work, Goldin has evaluated concrete policies, however. See Goldin and Rouse (2000) and Goldin and Katz (2002), for example.

²⁹ Olivetti and Petrongolo (2017) reviewed the literature on the impact of family policies as well as early childhood spending on female employment and gender earnings gaps. They concluded that there is little compelling evidence that parental leave rights have a positive effect on women's labor market outcomes; increased spending on early education and childcare, tend to have reduced gender disparities.

³⁰ See Kleven et al (2019b) and Boelmann, Raute, and Schönberg (2019), for example.

³¹ When Kleven, Landais, Posch, Steinhauer, and Zweimüller (2022) evaluated the direct impact of family-friendly policies (parental leave and childcare) within a given country (Austria), they found a very limited impact. They concluded that policy must shift equilibrium social norms and preferences in order to be effective. In a similar exercise for Norway, Andersen and Nix (2022) concluded that paternity leave has no impact, but that childcare use reduces the absolute size of the parenthood effect by almost a quarter.

reasons. First, government policies that, for instance, impact the structure of work or labor market opportunities of employed women today may also have dynamic (yet to be seen) effects in the future – by impacting the expectations of the young women who still have the opportunities to take these policy reforms into account when making their human capital investment decisions. This is another reason that effective policies may only slowly result in change. Second, it is key to understand the formation of these expectations and how they can be affected by policy. There is now a growing literature aimed at understanding how such expectations are formed and the impact, for instance, female role models may have, especially in contexts where women have to contend with negative stereotypes.³²

³² See, for instance, Bertrand (2020) for a review of the state of the literature related to gender stereotypes.

6. Concluding remarks

Equal opportunity is crucial to a healthy and prosperous society. Thanks to a series of pioneering contributions by Claudia Goldin, spanning a period of over 40-years, we know much more about the underlying drivers of gender convergence as well as about important remaining hurdles. Her core set of contributions, which we have highlighted in this document, share a common feature: the fundamental role of family, children, and the organization of work in shaping gender differences in labor supply and wages.

Several strands of literature build on her original contributions. She has inspired researchers to: (i) collect historical records that allow for the study of long-run female labor market outcomes beyond the US, (ii) search for natural experiments that allow better understanding of the sources of gender gaps, including discrimination, (iii) study the impact of parenthood on female labor market outcomes, (iv) study the role of workplace structure and flexibility in explaining labor market gender gaps, and (v) consider alternative and or complementary explanations, such as gender stereotypes, of phenomena like the parenthood effect. Moreover, the fundamental understanding of how and why women's labor market outcomes have changed with economic development has also led to a growing body of research studying how a wide range of policy interventions impact these gender gaps.

Finally, Goldin's work has played a central role in establishing the economics of gender as a mainstream area of economic research. In so doing, she has played a crucial role in cross-fertilizing economic history with applied economics.

References

- Adda, Jerome, Christian Dustmann, and Katrien Stevens. 2017. "The Career Cost of Children." *Journal of Political Economy*, 125(2): 293–337.
- Altonji, Joseph G. 1993. "The Demand for and Return to Education When Education Outcomes Are Uncertain." *Journal of Labor Economics* 11(1): 48–83.
- Andersen, Martin E. and Emily Nix. 2022. "Can the Child Penalty Be Reduced? Evaluating Multiple Policy Interventions." Manuscript. University of Oslo.
- Angelov, Nikolay, Per Johansson, and Erica Lindahl. 2016. "Parenthood and the Gender Gap in Pay." *Journal of Labor Economics*, 34(3): 545–579
- Azmat, Ghazala and Rosa Ferrer. 2017. "Gender Gaps in Performance: Evidence from Young Lawyers." *Journal of Political Economy*, 125(5): 1306–1355.
- Bensnes, Simon, Inger Huitfeldt, and Edwin Leuven. 2023. "Reconciling Estimates of the Long-Term Earnings Effect of Fertility." IZA Discussion Paper 16174.
- Bertrand, Marianne. 2020. "Gender in the Twenty-First Century". *AEA Papers and Proceedings*, 110: 1–24.
- Bertrand, Marianne, Claudia Goldin, and Lawrence F. Katz. 2010. "Dynamics of the Gender Gap for Young Professionals in the Financial and Corporate Sectors." *American Economic Journal: Applied Economics*, 2(3): 228–255.
- Black, Dan A., Amelia M. Haviland, Seth G. Sanders, and Lowell J. Taylor. 2008. "Gender Wage Disparities among the Highly Educated." *Journal of Human Resources*, 43(3): 630–659.
- Blau, Francine D., and Lawrence M. Kahn. 2000. "Gender Differences in Pay." *Journal of Economic Perspectives*, 14(4): 75–99.
- Blau, Francine D., and Lawrence M. Kahn. 2006. "The U.S. Gender Pay Gap in the 1990s: Slowing Convergence." *Industrial and Labor Relations Review*, 60(1): 45–66.
- Bolt, Jutta and Jan Luiten van Zanden. 2020. "Maddison Style Estimates of the Evolution of the World Economy. A New 2020 Update.
- Boserup, Ester. 1970. *Woman's Role in Economic Development*. London: George Allen & Unwin.
- Boelmann, Barbara, Anna Raute, and Uta Schönberg. 2019. "Wind of Change? Cultural Determinants of Maternal Labor Supply." Working Papers 914, Queen Mary University.
- Bütikofer, Aline, Sissel Jensen, Kjell G. Salvanes. 2018. "The Role of Parenthood on the Gender Gap Among Top Earners." *European Economic Review*, 109: 103–123.
- Cook, Cody, Rebecca Diamond, Jonathan Hall, John A. List, and Paul Oyer. 2021. "Gender Earnings Gap in the Gig Economy: Evidence from Over a Million Rideshare Drivers." *The Review of Economic Studies*, 88(5): 2210–2238.
- Durand, John D. 1948. *The Labor Force in the U.S.* New York: Social Science Research Council.

- Easterlin, Richard A. 1968. *Population, Labor Force, and Long Swings in Economic Growth: The American Experience*. Cambridge: National Bureau of Economic Research.
- Goldin, Claudia. 1977. "Female Labor Force Participation: The Origin of Black and White Differences, 1870 and 1880." *Journal of Economic History*, 37(1): 87–108.
- Goldin, Claudia. 1984. "The Historical Evolution of Female Earnings Functions and Occupations." *Explorations in Economic History*, 21(1): 1–27.
- Goldin, Claudia. 1986. "The Economic Status of Women in the Early Republic: Quantitative Evidence". *The Journal of Interdisciplinary History*, 16(3): 375–404
- Goldin, Claudia. 1990. *Understanding the Gender Gap: An Economic History of American Women*. Oxford: Oxford University Press.
- Goldin, Claudia. 1988. "Marriage Bars: Discrimination against Married Women Workers from the 1920s to the 1950s." NBER Working Paper No. w2747.
- Goldin, Claudia. 1995. "The U-shaped Female Labor Force Function in Economic Development and Economic History. In: T.P. Schultz (ed), *Investment in Women's Human Capital and Economic Development*. Chicago: University of Chicago Press.
- Goldin, Claudia. 1998. "America's Graduation from High School: The Evolution and Spread of Secondary Schooling in the Twentieth Century." *Journal of Economic History*, 58(2): 345–374.
- Goldin, Claudia. 2005. "From the Valley to the Summit. A Brief History of the Quiet Revolution that Transformed Women's Work." *Regional Review*, 14(3): 5–12.
- Goldin, Claudia. 2006. "The Quiet Revolution That Transformed Women's Employment, Education, and Family." *American Economic Review*, 96(2): 1–21.
- Goldin, Claudia. 2014. "A Grand Gender Convergence: Its Last Chapter." *American Economic Review*, 104(4): 1091–1119.
- Goldin, Claudia, and Lawrence F. Katz. 2000. "Career and Marriage in the Age of the Pill." *American Economic Review*, 90(2): 461–465.
- Goldin Claudia, Lawrence F. Katz. 2002. "The Power of the Pill: Oral Contraceptives and Women's Career and Marriage Decisions." *Journal of Political Economy*, 110(4): 730–770.
- Goldin, Claudia and Lawrence F Katz. 2008. *The Race between Education and Technology*. Cambridge, MA: Harvard University Press.
- Goldin, Claudia, and Lawrence F. Katz. 2011. "The Cost of Workplace Flexibility for High-Powered Professionals." *Annals of the American Academy of Political and Social Science* 638: 45–67.
- Goldin, Claudia, and Lawrence F. Katz. 2016. "The Most Egalitarian of All Professions: Pharmacy and the Evolution of a Family-Friendly Occupation." *Journal of Labor Economics*, 34(3): 705–746.
- Goldin, Claudia, Lawrence F. Katz, and Ilyana Kuziemko. 2006. "The Homecoming of American College Women: The Reversal of the College Gender Gap." *The Journal of Economic Perspectives*, 20(4): 133–156.

- Goldin, Claudia and Robert A. Margo. 1992. "The Great Compression: The Wage Structure in the United States at Mid-century." *Quarterly Journal of Economics*, 107(1): 1–34.
- Goldin, Claudia and Joshua Mitchell. 2017. "The New Life Cycle of Women's Employment: Disappearing Humps, Sagging Middles, Expanding Tops." *Journal of Economic Perspectives*, 31(1): 161–182.
- Goldin, Claudia and Claudia Olivetti. 2013. "Shocking Labor Supply: A Reassessment of the Role of World War II on Women's Labor Supply." *American Economic Review*, 103(3): 257–262.
- Goldin, Claudia and Cecilia E. Rouse. 2000. "Orchestrating Impartiality: The Impact of "Blind" Auditions on Female Musicians." *American Economic Review*, 90(4): 715–741.
- Goldin, Claudia and Kenneth Sokoloff. 1982. "Women, Children, and Industrialization in the Early Republic: Evidence from the Manufacturing Censuses." *Journal of Economic History*, 42: 741–774.
- Goldin, Claudia and Kenneth Sokoloff. 1984. "The Relative Productivity Hypothesis of Industrialization: The American Case, 1820 to 1850." *The Quarterly Journal of Economics*, 99(3): 461–487.
- Greenwood, Jeremy, Ananth Seshadri, and Mehmet Yorukoglu. 2005. "Engines of Liberation." *The Review of Economic Studies*, 72(1): 109–133.
- Harris, Barbara. 1978. *Beyond Her Sphere: Women and the Professions in American History*. Westport, CT: Greenwood Press.
- Humphries, Jane and Carmen Sarasúa. 2012. "Off the Record: Reconstructing Women's Labor Force Participation in the European Past." *Feminist Economics*, 18(4): 39–67.
- International Labour Organization. 2023. Data retrieved from World Bank Gender Data Portal, <<https://genderdata.worldbank.org/data-stories/flfp-data-story/>>
- Katz, Lawrence F. and Kevin M. Murphy. 1992. "Changes in Relative Wages, 1963–1987: Supply and Demand Factors." *Quarterly Journal of Economics*, 107(1): 35–78.
- Kleven, Henrik, Camille Landais, and Jakob Egholt Sogaard. 2019a. "Children and Gender Inequality: Evidence from Denmark." *American Economic Journal: Applied Economics*, 11(4): 181–209.
- Kleven, Henrik, Camille Landais, Johanna Posch, Andreas Steinhauer, and Josef Zweimüller. 2019b. "Child Penalties across Countries: Evidence and Explanations." *AEA Papers and Proceedings*, 109: 122–126.
- Kleven, Henrik, Camille Landais, Johanna Posch, Andreas Steinhauer, and Josef Zweimüller. 2022. "Do Family Policies Reduce Gender Inequality? Evidence from 60 Years of Policy Experimentation." Forthcoming *American Economic Journal: Economic Policy*.
- Lundborg, Petter, Erik Plug, and Astrid Würtz Rasmussen. 2017. "Can Women Have Children and a Career? IV Evidence from IVF Treatments." *American Economic Review*, 107(6): 1611–1637.

- Mammen, Kristin and Charistina Paxson (2000). "Women's Work and Economic Development." *Journal of Economic Perspectives*, 14(4): 141–164.
- Merouani, Youssouf and Faustine Perrin. 2022. Gender and the Long-run Development Process. A Survey of the Literature. *European Review of Economic History*, 26(4): 612–641.
- Mincer, Jacob. 1962. "Labor Force Participation of Married Women: A Study of Labor Supply." In H. G. Lewis (ed.) *Aspects of Labor Economics*. Princeton, New Jersey: Princeton University Press.
- Ngai, Rachel, Claudia Olivetti, and Barbara Petrongolo (2022). "Structural Transformation over 150 years of Women's and Men's Work," Working Paper.
- Noonan, Mary C., Mary E. Corcoran, and Paul N. Courant. 2005. "Pay Differences among the Highly Trained: Cohort Differences in the Sex Gap in Lawyers' Earnings." *Social Forces* 84(2): 853–872.
- OECD (2023), Gender wage gap (indicator). doi: 10.1787/7cee77aa-en (Accessed 2023).
- Olivetti, Claudia. 2006. "Changes in Women's Aggregate Hours of Work: The Role of Returns to Experience." *Review of Economic Dynamics*, 9(4): 557–587.
- Olivetti, Claudia. 2014. "The Female Labor Force and Long-Run Development: The American Experience in Comparative Perspective." In L.P. Boustan, C. Frydman, and R.A. Margo (eds.) *Human Capital in History: The American Record*. Chicago: University of Chicago Press.
- Olivetti, Claudia and Barbara Petrongolo (2017) "The Economic Consequences of Family Policies: Lessons from a Century of Legislation in High-Income Countries." *Journal of Economic Perspectives*, 31(1): 205–230.
- Pinchbeck, Ivy (1930). *Women Workers and the Industrial Revolution, 1750–1850*. London: George Routledge.
- Psacharopoulos, George and Zafiris Tzannatos (1989). "Female Labor Force Participation: An International Perspective." *The World Bank Research Observer*, 3(2): 187–201.
- Richards, Eric. (1974). Women in the British Economy since about 1700: An Interpretation. *History*, 59(197), 337–357.
- Rotella, Elyce (1981). *From Home to Office: US Women at Work, 1870-1930*. Ann Arbor: UMI Research Press.
- Schultz, T. Paul (1990) "Women's Changing Participation in the Labor Force: A World Perspective," *Economic Development and Cultural Change*, 38(3): 457–488.
- Tentler, Leslie Woodcock. 1979. *Wage-earning Women: Industrial Work and Family Life in the United States, 1900–1930*. New York: Oxford University Press.
- Waldfoegel, Jane. 1998. "Understanding the 'Family Gap' in Pay for Women with Children." *Journal of Economic Perspectives*, 12(1): 137–156.
- Wasserman, Melanie. 2023. "Hours Constraints, Occupational Choice, and Gender: Evidence from Medical Residents." Forthcoming, *Review of Economic Studies*.

Wood, Robert G., Mary E. Corcoran, and Paul N. Courant. 1993. "Pay Differences among the Highly Paid: The Male-Female Earnings Gap in Lawyers' Salaries." *Journal of Labor Economics*, 11(3): 417–441.

World Bank. 2023. Data retrieved from World Bank Open Data Portal.