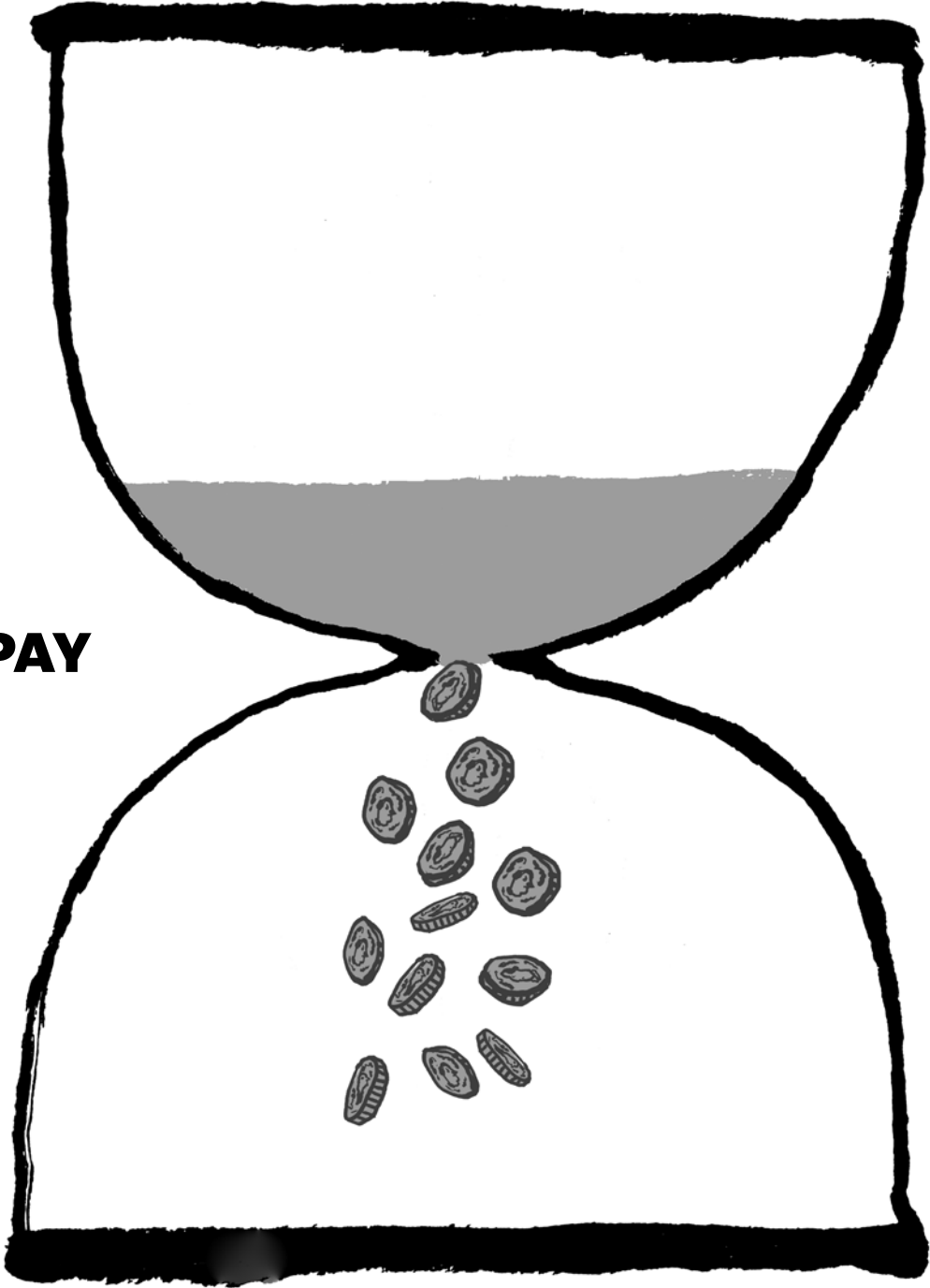


It's no secret that, on average, women – even those with equivalent education and experience – typically earn less than men. The ratio of the average (mean) earnings of female workers (full-time, full-year, 25 to 69 years old) to that of their male counterparts was 0.72 in 2010. The pay ratio of median earners (those at the 50th percentile) for the same groups was 0.78. But that is not the whole story.

## HOW TO ACHIEVE GENDER EQUALITY

First the good news: the gender gap has narrowed. The ratio of median earnings increased from 0.56 to 0.78 in the three decades prior to 2010. This narrowing of the gap in pay reflects the converging economic roles of men and women, a reality that is among the grandest social and economic advances in the last century. There are many aspects to the convergence, and each can be thought of as a chapter in a figurative book. The big question is whether the last chapter, in which the economy achieves full equality, can be written. And if so, how?

**BY CLAUDIA GOLDIN**



**IN PAY**

## **GENDER EQUALITY IN PAY**

Like many others, I think convergence is possible. However, I depart from the conventional view of what it would take to write this final chapter. The solution does not have to involve government intervention and it does not depend on the improvement of women's bargaining skills or heightened will to compete. Nor must men become more responsible in the home (although that would greatly help).

What is needed are changes in how jobs are structured and remunerated, enhancing the flexibility of work schedules. To succeed, the changes must decrease employers' costs in substituting the hours of one worker for another. Firms that have family-friendly policies – and there are many of them – are moving in the right direction. But if those policies are accompanied by decreases in women's average hourly pay and dimmer prospects for promotion because the cost of accommodating flexible hours remains high, they will only reinforce gender differences in the workplace.

The gender gap in hourly compensation would vanish if long, inflexible work days and weeks weren't profitable to employers – that is, if firms did not have a financial incentive to pay employees working 80 hours a week more than twice what they would receive for 40-hour weeks. A similar statement can be made with regard to working specific schedules tailored to episodic increases in demand or putting in enormous amounts of time at the start of one's career to demonstrate allegiance and commitment.

The costs of temporal flexibility have in fact begun to fall in some sectors – notably,

technology, science and health. And the change is reflected in the increased use of teams of substitute employees, as well as in the more routine handing-off of clients, patients and customers from one employee to another. It should be noted, however, that adaptation has been slower in other sectors, among them financial and legal services.

## **CONVERGING ECONOMIC ROLES**

The primary convergences of the past decades have concerned the “human capital” attributes – education, experience – of men and women. By the same token, differences in labor force participation rates between men and women have narrowed. In recent years the participation rate for 25-to-54-year-old females has risen to close to 75 percent, 14 percentage points below the rate for males. Contrast that with the 46 percentage point difference in 1970 and the 29 percentage point difference in 1980. Meanwhile, as participation rates of women have climbed, their time out of the labor force has decreased and their job continuity has increased.

Years of education of women have surpassed that of men among Americans born since the early 1950s. The distribution of college majors has become more equal between men and women, and women now represent the majority, or nearly the majority, of students in professional training in medicine, law, dentistry, veterinary medicine, pharmacy and optometry.

But there the progress ends. Gender differences in earnings are not much further reduced if one corrects for factors such as educational quantity and quality because there are now few such differences that disadvantage women. But gender earnings gaps remain. Why the persistent difference?

The answer turns on an understanding of where earnings differences between men and

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women are found. In what occupations, at what ages, and for what birth cohorts are the differences large or small? These provide clues that allow the formulation of a framework for explaining the basis of pay gaps by gender.

But while this analysis tells us what might level the playing field in the labor market, it doesn't follow that the solution can be achieved through regulation. Actually, it suggests the opposite.

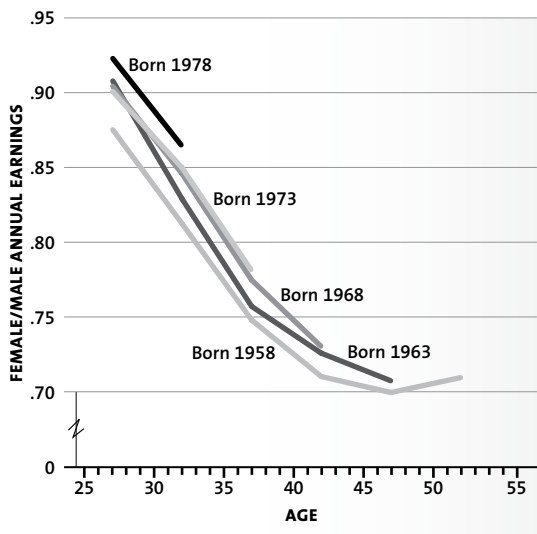
### EARNINGS GAPS BY AGE, COHORT AND OCCUPATION

The first evidence concerns gender earnings gaps by age for a range of birth cohorts. The calculation should hold hours per week and weeks per year constant, so the gap does not simply reflect the fact that working more hours and weeks yields greater income. The real issue here is what working more time or less flexible schedules means for hourly pay. Therefore, I only examine the experience of full-time, full-year workers, and I account for hours and weeks above the "full" amount in the statistical analysis. Consider earnings gaps among college graduates now aged 35 to 55, tracked from the time they were in their late 20s.

Two findings stand out. First, there is a decreasing pay gap across cohorts. The youngest (born around 1978) has the smallest gender gap and the oldest (born around 1958) has the largest gender gap at each age. More important to the story, the gaps within cohorts greatly increase over time. Whereas women in their late 20s are earning around 92 percent what comparable men receive, those in their early 50s receive just 71 cents on the average male's dollar.

A second group of clues comes from analyzing gender earnings gaps by occupation. By occupation I mean occupations defined by the U.S. Census at the "three-digit" level of speci-

### RELATIVE ANNUAL EARNINGS (FULL-TIME, FULL-YEAR) OF COLLEGE GRADUATES BY BIRTH COHORT 1958-1978



**NOTE:** Sample consists of full-time (35+ hours), full-year (40+ weeks) college-graduate (16+ years of schooling) men and women (white, native-born, non-military, 25 to 69 years old).  
**SOURCE:** U.S. Census Micro-data 1980, 1990, 2000, and American Community Survey 2004 to 2006 (for 2005), 2009 to 2011 (for 2010).

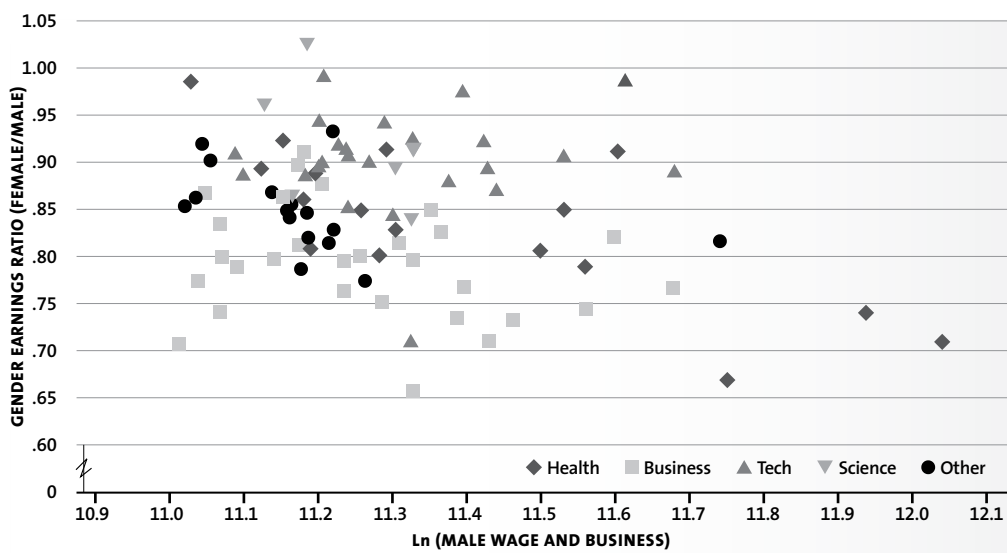
ficity, which total 469. It is worth noting that, while most are fairly narrowly defined (e.g., "actuary," "chemical engineer"), some are overly broad (e.g., "physicians and surgeons").

Here, it's worth emphasizing that the relationship between the gender earnings gap and occupations for all men and women is accounted for mainly (85 percent) by the gaps within occupations, not across occupations (the remaining 15 percent). Looking only at college graduates, 65 percent of the gender pay gap is due to that within occupations and 35 percent is due to the distribution of occupations by sex.

Putting this another way, the gender earnings gap would not be reduced much if women were distributed among occupations in exactly the same proportions as men. In fact, for the labor force as a whole, just 15 percent of the gap would be eliminated if women were

## GENDER EARNINGS GAPS BY OCCUPATION 2009–2011

FULL-TIME, FULL-YEAR WORKERS IN OCCUPATIONS WITH MALE EARNINGS >\$60,000 A YEAR



**NOTE:** Sample consists of individuals 25 to 64 years old, excluding those in the military

**SOURCE:** American Community Survey 2009 to 2011.

distributed exactly as were men by occupation, but the earnings gaps within occupations remained constant. For college graduates, just 35 percent of the total gap would be eliminated. Now that we know the importance of the within-occupation gender pay gap we can focus on it.

Although I construct the gender pay gaps for all 469 three-digit occupations, I will focus on individuals in occupations with average compensation exceeding about \$60,000 per year, often termed “professional service workers.” This group includes around 60 percent of all male college graduates and about 45 percent of all female college graduates. I classify the occupations in several categories: Business and Finance, Health, Science, Technology and a small “Other” category. This categorization can be done for the higher-income groups, but not for those with lower incomes.

As in the first figure, the gender gap is mea-

sured by the ratio of female to male earnings and is almost always less than one. The lower the marker, the larger the gender gap. The means of male annual earnings by occupation range from \$60,000 to \$170,000.

The Business and Finance occupations have relatively large gender earnings gaps, while Technology and Science have relatively small ones. Within the combined Tech-Science groups there is one big outlier – airline pilots – where women earn only about 70 percent as much as men. This is a somewhat anomalous occupation within the grouping because military experience has been an important entryway and seniority matters considerably. Gaps in Health occupations are scattered throughout the graph. The Health occupations with a high rate of self-ownership (e.g., dentist, podiatrist) generally have larger gender earnings gaps than those with low rates of self-ownership (e.g., pharmacist, various types of therapists).

# The gender gap in hourly compensation would vanish if firms did not have a financial incentive to pay employees working 80 hours a week more than twice what they would receive for 40-hour weeks.

Across the entire sample of full-time, full-year workers, the residual earnings ratio (female/male) for the Business and Finance occupations is 0.787 and the residual earnings ratio for the Technology and Science occupations combined is 0.892. For a sample limited to college graduates, the residual earnings ratios are 0.797 for individuals in Business and Finance and 0.903 for those in Science and Technology.

These very large differences between Business and Finance on the one hand and Technology and Science on the other demand explanation.

A really interesting hint concerns the role of average hours by occupation. In the analysis just discussed, the sample was limited to full-time workers (35 hours plus) and mean hours for each occupation was added as a control. When instead I allow hours to affect earnings differentially for each occupation, average time worked per week in the Business and Finance occupations (plus lawyers in the “Other” category) has a very large impact on hourly pay. But weekly time worked in the Technology and Science occupations has only a small impact.

That is, those in a Business or Finance occupation who work, say, 50 hours per week are, on average, paid disproportionately more than those who work 40 hours per week. But their counterparts in Technology or Science occupations who work 50 hours per week only increase their weekly or annual earnings proportionately more than those laboring 40 hours.



## UNDERSTANDING GENDER DIFFERENCES IN PAY

Here, I explore what happens when employees cannot “hand off” clients, patients and customers in a costless fashion. The framework fits into a model of compensating differentials and provides the foundations for the costs of providing a worker amenity such as flexible work hours.

Consider an employee (say someone with a law degree) in a position (say a lawyer in a relatively large law firm) whose work yields

## **GENDER EQUALITY IN PAY**

$\$X$  per hour during a normal  $Y$ -hour work week. But if the lawyer is on the job fewer than  $Y$  hours (or is not around during particularly vital business hours), his/her value is less than  $\$X$  per hour. Another lawyer's position (say, in-house counsel for a business) generates less value per hour than at a large firm. But it also comes with a lower penalty per hour for not being around for more than



some minimum number of hours per week. Now add a third lawyer to the mix – say, one working for a government agency. This lawyer generates the lowest value per hour, but his/her output is linear – that is, the value per hour remains the same, regardless of how many hours are worked per week.

Under these conditions, the value of a lawyer in the labor market depends on the costs to the firm of providing temporal flexibility. The big law firm won't be willing to pay as

much to lawyers unwilling to put in  $Y$  hours a week than it is to lawyers who are willing. The reason is that their clients do not view two lawyers working  $0.5Y$  hours each as good substitutes in the most productive positions for one lawyer working  $Y$  hours. The lawyers are better substitutes for each other as corporate counsels and perfect substitutes in government positions.

The framework suggests that “non-linearity” in labor value arises when it is costly to employers to allow workers to be off the job temporarily, when it is difficult to hand off clients to colleagues, and when interdependent teams must coordinate schedules – as in many finance and legal occupations. Note that non-linearity here means that a lawyer working 30 hours a week is worth less than half what a lawyer working 60 hours is worth.

Linearity, on the other hand, arises when employees can substitute for each other in a relatively costless fashion, when there are many independent team members, when information systems lower the cost of handing off clients and patients (as in health, pharmacy). Here, a lawyer who works 30 hours a week is worth precisely half that of a 60-hour-a-week lawyer.

Given the framework, what occupational characteristics should be related to residual gender gaps? I approach this question in two ways.

### **LESSONS FROM O\*NET**

The first involves identifying relevant characteristics for all three-digit occupations to see if the gender gap in earnings is related to whether the job is compatible with temporal flexibility without a significant loss in productivity. The source for the data is O\*NET, a database underwritten by the U.S. Department of Labor. O\*NET provides hundreds of characteristics for each occupation. Many of

them concern physical strength and cognitive abilities, which are not relevant to the issues here. But there are a variety of characteristics that are directly related to the job features highlighted by the framework. I selected characteristics indicating the degree to which employees:

- are subject to strict deadlines and time pressure;
- need direct contact with others;
- must develop cooperative working relationships with others;
- are tied to highly specific projects;
- cannot, as a practical matter, determine their pace, tasks, priorities and goals.

For the purposes of computation, I normalize each characteristic to have a mean of zero and a standard deviation of one. A negative score implies there is less-than-average need to be around, less time pressure, more work on specific projects, and more ability to regulate one's own pace and goals. A positive score has the opposite implication.

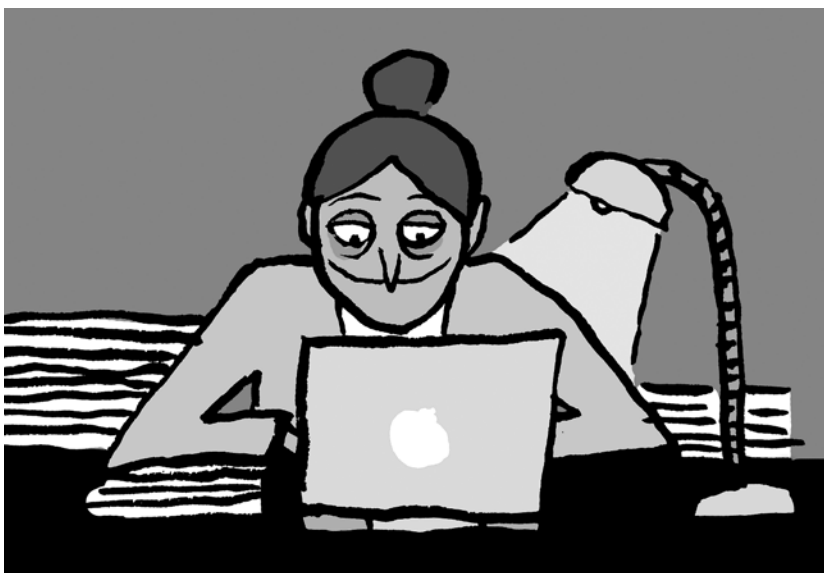
Technology and Science occupations score far lower – that is, are far more flexible in terms of time – by these criteria than do Business, Finance and Law occupations. In fact, they score about one standard deviation below on most of the characteristics.

Not surprisingly, there is a strong negative association between the average of the O\*NET scores for the five job categories and the (corrected) ratio of female to male earnings. The lower the average of the O\*NET scores the higher is the (corrected) ratio of female to male earnings in that occupation.

#### LESSONS FROM THE LARGE GENDER EARNINGS GAPS IN MBAs AND JDS

Another way to gain insight into differences in the gender earnings gap is to explore individual occupations that have substantial pay gaps. The data I use are longitudinal or retrospective, and contain enormously rich information on characteristics that are related to individual productivity.

The data for Business and Finance come from administrative records of University of Chicago Booth School MBAs (1990 to 2006)



and a survey, used in my research with Marianne Bertrand of the University of Chicago and Larry Katz of Harvard. We found that the gender earnings gap greatly increases with time since attainment of an MBA, so that 12 to 15 years after earning an MBA women earn just 57 percent as much as men. Even after correcting for MBA courses taken (some specialties pay more) and grades, the figure is still 64 percent, although it is about 95 percent at the start of their careers. But the largest factors explaining the gender earnings gap are weekly hours and time spent out of the



## **GENDER EQUALITY IN PAY**

labor force, even though differences in hours by gender are not large and time out for women is not extensive.

We found that, when they have children, MBA women shift into lower paying positions (or out of the labor force) to gain temporal flexibility. The finance and corporate sectors heavily penalize lower hours for both men and women, and flexible or low-hour positions are rare. Half of all MBA women who work part-time are self-employed.

For the data on law degrees (JDs) I used the University of Michigan Law School Alumni research data set, which contains rich information on hours and earnings. The relationship between the gender earnings gap and time since earning the JD degree is similar to that for the MBAs. Because the information on hours in the law school alumni data set is much better than that for the MBAs, I can better assess whether hourly earnings are non-linear with respect to hours worked.

I examined annual earnings (in constant dollars) by hours worked 15 years after the JD degree was earned for men and women who graduated from law school between 1982 and 1991. Earnings are clearly non-linear, with those working more hours per week earning more per hour. These findings stand up to controls for years off the job and years working part-time. In addition, the fraction of women in the lower-hour group is much higher, and the fraction of the women who have children is also much higher in the lower-hour group.

### **LESSONS FROM THE SMALL GENDER EARNINGS GAP IN PHARMACY**

Pharmacy is a very high-income occupation. Among (full-time, year-round) male workers, it was the eighth highest on an annual basis in 2010 and among women it was the third

highest. But unlike occupations in business, finance and law, it has a small gender pay gap and almost no penalty for low hours.

Pharmacy underwent major changes in the last several decades. Self-ownership and the fraction working in independent practice plummeted from 1970 to the present. Whereas almost 70 percent of all pharmacists in the United States worked in an independently owned pharmacy in 1970, just 14 percent do today. Meanwhile, the fraction of pharmacists who are female rose from around 10 percent in 1970 to almost 60 percent today, and the ratio of female to male annual earnings increased from 0.65 in 1970 to 0.92 today.

Most pharmacists are now employees of large firms or hospitals. The spread of vast information systems and the standardization of drugs have enhanced their ability to seamlessly hand off clients and be good substitutes for one another. The result is that short and irregular hours are not penalized. Pay is almost perfectly linear in hours. Those who work fewer hours – say, because of family responsibilities – are paid proportionately less. Part-time work is common, especially for women. But there is almost no part-time wage penalty.

### **WHERE WE STAND**

We now know what must be in the last metaphoric chapter for it to be truly the last. It must involve considerable economic change, not a Band-Aid with firms offering flexible hours and schedules to workers in return for lower compensation. And to get from here to there, temporal flexibility must become less expensive for firms, pushing competitive labor markets to generate more linearity of earnings with respect to the number of hours and the particular hours worked.

A restructuring of jobs has happened organically in many health care occupations, in-

## For pharmacists today, short and irregular hours are not penalized. Pay is almost perfectly linear in hours.

cluding pharmacists, physicians, optometrists and veterinarians. Some physician specialties have low hours, few on-call hours, and primarily planned procedures. Many of the Technology and Science occupations have built-in flexibility because work projects are often done independently and are highly specific requiring less oversight. And the spread of information systems has led to change in other sectors, enhancing substitutability across workers.

Am I advocating that workers become clones of one another? Wouldn't that degrade the work of professionals?

Many of the highest earning and most prestigious professionals have almost perfect substitutes, a reality acknowledged by the way their professions are organized. Obstetricians cannot deliver two babies at the same time – or deliver them when they are on vacation in Cambodia – and thus work in group practices. Likewise, anesthesiologists generally work in groups and surgeons will generally pick a group of anesthesiologists to work with, not individual anesthesiologists. Personal bankers are organized as teams so that clients can obtain help 24/7.

Am I suggesting that all jobs could be structured so that clients could be handed off seamlessly, driving labor markets toward linear pay? There will always be some jobs that require one person to be on call. We don't expect the occupant of the White House to have a perfect substitute. But we have long lives, and as the need to care for children declines so does the need for flexible- and/or part-time hours (although these needs may return with elderly parents or ill spouses).

The earlier chapters in the grand gender



convergence chronicled women's relative gains in education and work experience. But the last chapter concerns the utilization and remuneration of these productive attributes. It will be about how firms respond to changes in technology and to the evolving preferences of employees as family/work issues arise.

Don't fall into the trap, though, of assuming the last chapter is just about women. This isn't only a woman's problem, and it isn't a zero-sum game. The labor-market conditions that will generate convergence in pay between genders – the technological and institutional changes that reduce the cost of temporal flexibility – will make life better for almost everybody. 