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The Athena Factor: Reversing the Brain Drain in Science, Engineering, and Technology

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By Sylvia Ann Hewlett, Carolyn Buck Luce, Lisa J. Servon, Laura Sherbin, Peggy Shiller, Eytan Sosnovich, and Karen Sumberg
Center for Work-Life Policy

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EXECUTIVE SUMMARY

In the spring of 2006 the Hidden Brain Drain—a private sector task force comprising 43 global companies—launched a research project targeting women with degrees in science, engineering, and technology (SET) who have embarked on careers in corporations. Sponsored by Alcoa, Cisco, Johnson & Johnson, Microsoft, and Pfizer—and named the Athena Factor to honor the Greek goddess of wisdom—this project set out to examine the career trajectories of women with SET credentials in the private sector. While considerable research has been done on women in the academic sector, women in SET in the private sector have been largely ignored and are poorly understood.[1] Over an 18-month period (March 2006–October 2007) the task force, under the aegis of the Center for Work-Life Policy and in collaboration with Harris Interactive, fielded four major surveys of both men and women and conducted 28 focus groups in Boston, Chicago, Geneva, Hong Kong, London, Moscow, New Jersey, New York, Palo Alto, Pittsburgh, Seattle, Shanghai, and Sydney.[2] The resulting rich data sets shed a great deal of light on the scope and shape of female talent in SET companies. This study also creates a road map for companies by showcasing a number of new initiatives that realign corporate cultures and redesign career paths to better fit the needs of SET women.

The DNA of Opportunity

In the private sector, the female talent pipeline in SET is surprisingly deep and rich. Athena Factor survey data show that 41% of highly qualified scientists, engineers, and technologists on the lower rungs of corporate career ladders are female. Despite the challenges they face at school and in our culture, a significant number of girls begin careers in science. Their dedication is impressive: Two-thirds of female scientists choose their fields to contribute to the well-being of society.

These women are newly important to employers. Labor shortages in SET fields are worsening. A recent newspaper headline tells the story: "Scramble for Scientists: Shortages Threatens to Slow Growth of Booming Biotech Industry."[3] Not so long ago, employers could turn to foreign-born engineers and scientists to fill their talent needs. This is no longer possible. Post-9/11 security concerns have reduced the number of H-1B visas (which allow foreign nationals to work in the United States). And rapid growth in Asia has created a reverse brain drain of highly qualified Indian and Chinese scientists and engineers who are returning home after completing their education in the United States.

To fill the skills gap, companies need to turn to the female talent in their own backyard. But there are some serious challenges. The female drop-out rate is huge. Over time, fully 52% of highly qualified females working for SET companies quit their jobs, driven out by hostile work environments and extreme job pressures. Powerful "antigens" in SET corporate cultures contribute to the exodus of female talent.

Antigens in SET Cultures

- **Hostile macho cultures.** Women in SET are marginalized by lab coat, hard hat, and geek workplace cultures that are often exclusionary and predatory (fully 63% experienced sexual harassment).

- **Isolation.** A woman in SET can be the lone woman on a team or at a site. This makes it difficult to find support or sponsorship (45% lack mentors; 83% lack sponsors).

- **Mysterious career paths.** As a result of macho cultures and isolation, women in SET find it hard to gain an understanding of the way forward—fully 40% feel "stalled" or "stuck" in their careers.

- **Systems of risk and reward.** The "diving catch" culture of SET companies disadvantages women, who tend to be risk averse (35% have difficulty with risk). Without buddies to support them they feel they can go from "hero to zero" in a heartbeat.

- **Extreme work pressures.** SET jobs are unusually time intensive and, because of their global scope, often involve working in multiple time zones (54% work across time zones).

The Fight-or-Flight Moment

Athena Factor research allows companies to gauge when to intervene. The data show that, for many SET women, attrition rates spike 10 years into a career. Across the climates of science, engineering, and technology, women experience a perfect storm in their mid- to late 30s. They hit serious career hurdles at the same time that family pressures ratchet up. Stepping in with targeted support before this fight-or-flight moment has the potential of lowering the female attrition rate significantly.

Antibodies: What Companies Can Do

This study features 14 new company initiatives—some still in an early experimental stage. They range from Cisco's "Executive Talent Insertion Program" (ETIP), which breaks down female isolation, to Johnson & Johnson's "Crossing the Finish Line," which helps young, female, multicultural employees make it into senior management. These initiatives are likely to be "game changers": They will allow many more women to stay on track in SET careers.

Reducing female attrition by one-quarter would add 220,000 people to the highly qualified SET labor pool. Given the tight labor market in SET fields, this is good news indeed.

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TERMS AND CONDITIONS

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PART I: ANTIGENS AND OTHER BARRIERS

CHAPTER 1: THE DNA OF OPPORTUNITY

Shortages and Shortfalls

Companies are facing serious shortfalls in the supply of high-caliber talent across science, engineering, and technology (SET). The headlines say it all: "Gates Sees Engineer Shortage Looming" warns the *Seattle Times*. "Scramble for Scientists: Shortage Threatens to Slow Growth of Booming Biotech Industry" laments the *National Post*. "As Jobs Sit Empty, Europe Debates Its Future" bemoans the *International Herald Tribune* in a piece detailing how labor shortages in engineering and computer science are limiting growth in Europe. And in "China's Looming Talent Shortage," the *McKinsey Quarterly* warns of the dangers posed by China's burgeoning talent shortfall, particularly in scientific and engineering fields. According to the *Economist*, "The Battle for Brain Power" is at its most intense in SET.[4]

The Bureau of Labor Statistics predicts that over the 2006–2016 period, job opportunities in SET will grow five times faster than other sectors (jobs in network systems, for example, are expected to grow by 53%).[5] The supply of talent is not expected to keep up with the need. Demand for IT professionals aged 35–45 is projected to grow by 25% over the next three decades, while the supply is projected to actually shrink.[6] Shortages are worldwide: NASSCOM forecasts a shortage of 500,000 professional employees in the technology sector in India by 2010.[7] The EU is projecting a shortfall of some 20 million skilled workers by 2030—most of them in technical fields.[8] In Germany alone, 22,000 engineering positions will not be filled owing to a shortage of qualified applicants, which equates to a loss of $4.8 billion to the German economy.[9]

In the United States, private sector leaders are swinging into action, attempting to hire more foreign-born or foreign-trained talent. To this end they are lobbying to relax immigration rules, which since the attacks of 9/11 have become more restrictive. (The number of H-1B visas granted by Congress has shrunk from 195,000 to 65,000 over the last six years.) In June 2007 Bill Gates of Microsoft, Craig Barrett of Intel, and Edward Sweeney of National Semiconductor led a parade of high-tech executives to Capitol Hill. They urged lawmakers to provide more visas for highly qualified foreign workers needed to fill critical jobs in software engineering, computer science, and basic research.

These "high-tech titans" failed to change Congress's mind on the Immigration Bill.[10] Anti-immigration groups are well-organized and politically connected. U.S. computer programmers, for example, have come together in a powerful lobbying group to make the case that H-1B workers undercut the wages of American workers.

So what can companies do?

Gates, Barrett, and Sweeney would be well advised to focus on the female talent in their own backyard—highly credentialed women with degrees in SET who make it through the educational system and onto the lower rungs of the corporate career ladder only to quit in their mid- to late 30s, overwhelmed by hostile workplace cultures and extreme work pressures. There's a great deal of upside here. The female talent pipeline in SET is surprisingly rich and deep and can be leveraged to fill the labor gaps noted above. A small number of targeted interventions by employers could make a great deal of difference in allowing this important stream of talent to stay on track in private sector SET careers.

A Rich Pool of Female Talent

Athena Factor survey data developed for this study show that 41% of highly qualified scientists, engineers, and technologists on the lower rungs of corporate career ladders are women. Despite the challenges and barriers girls face in the educational system and in our culture, a significant

number conjure up the commitment to begin careers in science, engineering, and technology. Figure 1.1 illustrates the depth of female talent at the early stages of careers in the private sector.

Young women are gaining ground and excelling in SET fields. For example, in 2007, girls claimed first and second prize in the prestigious Siemens science contest.[11] And in 2008 the winner of the Intel Science Talent Search was a 17-year-old girl from Durham, North Carolina.[12] Three other girls made it into the top 10.

In higher education, women are also making steady progress. With the exception of computer science (where trend lines are down), women are forging ahead in SET fields. In the United States,

FIGURE 1.1
Female Talent Ages 25–29 in Private Sector SET Careers
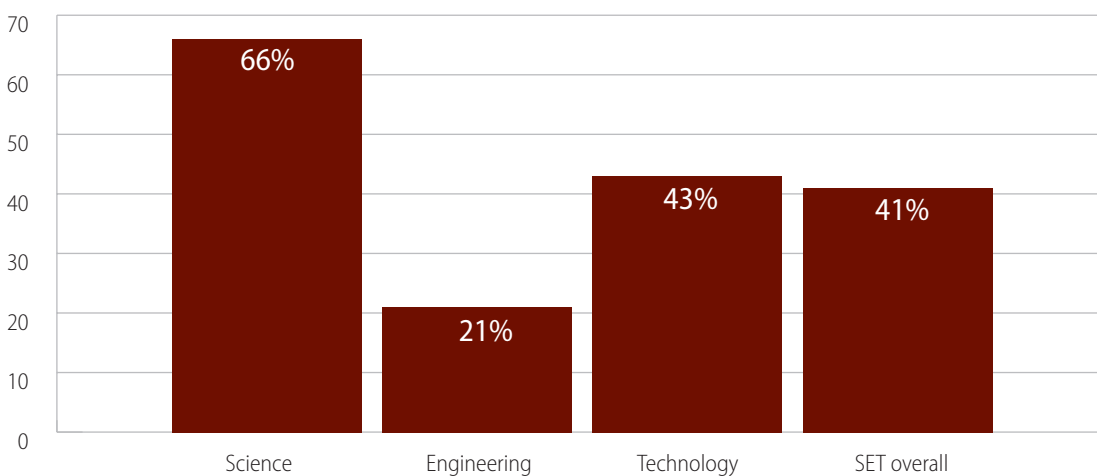
FIGURE 1.2
Female Talent Ages 25–29 in SET Careers, by Company Size
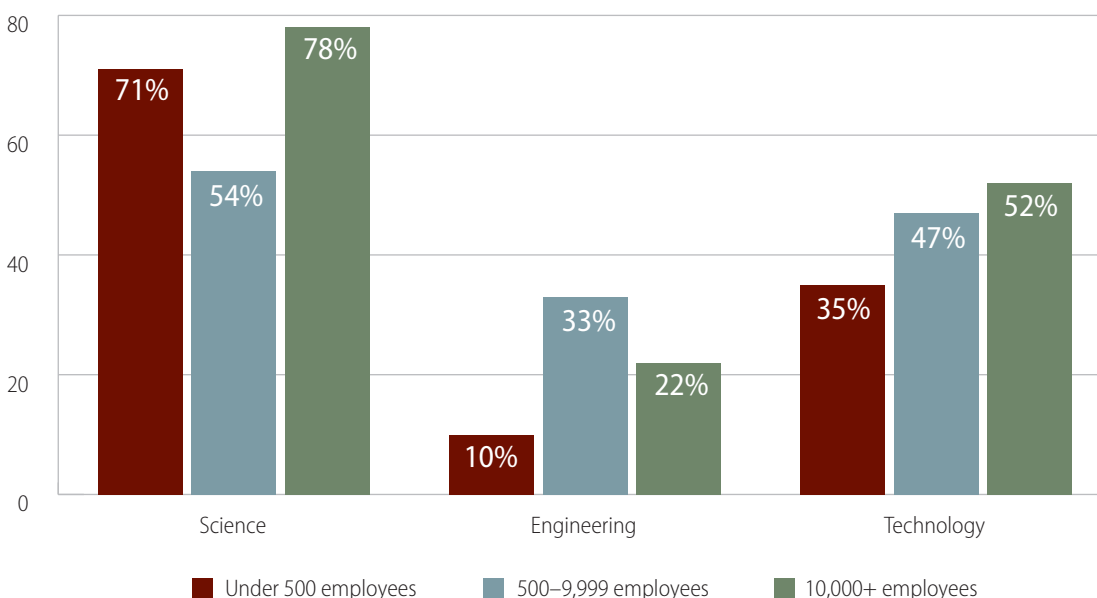
fully 46% of PhDs in the biological sciences are now awarded to women, as are 31% of PhDs in chemistry, compared with 31% and 18%, respectively, just 20 years ago (see figure 1.3).[13]

In Russia and China, the figures are even more impressive. In these countries women make up a significant share of degree holders in scientific fields (for a fuller discussion, see Chapter 11). Even in Spain and Turkey, nations that are rarely on the cutting edge of female progress, there are pockets within SET where women are newly dominant. Women are clearly interested in and engaged with SET. The key is for private companies to connect this interest to opportunity and sustain it over time.

Athena Traits

With an MD and a PhD in hand from one of the leading medical programs in the country, Beth had her pick of places to work. Even with her array of attractive options, Genzyme stood out from the rest. Although not a traditional employment choice for someone with her specialty—pathology—she saw a unique and rewarding opportunity at Genzyme. She was offered the chance to participate in very early stage drug research, which gave her the potential to help children. In 2000 Beth joined a division at Genzyme that specializes in lysosomal storage diseases—genetic diseases caused by a deficiency or malfunction of a particular enzyme. One of these diseases, Pompe disease, is particularly life threatening: Children with this disorder often do not live past the first year of life. Over the last several years, Beth has worked on three drugs and seen two of them through the research and development process and administered to patients. Her work has enabled her to attend medical conferences, speak with physicians who administer the drugs, and meet patients who benefited from them. She finds it extremely rewarding to see a child get better. One particularly memorable moment for Beth was viewing the progress videos of a five-year-old patient who was newly able to run around kicking a ball after having received treatment with a drug she had helped develop. Without that drug, he simply would not have survived to this age.[14]

Jody, a highly qualified technologist who works for Intel, is another case in point. When she talks about the contribution of technology to human progress, you can feel her passion: "First, there are

FIGURE 1.3
Percentage of Doctorate Degrees Earned by Women

Legend: Biological sciences · Chemistry · Physics · Engineering · Computer science · All doctorate degrees
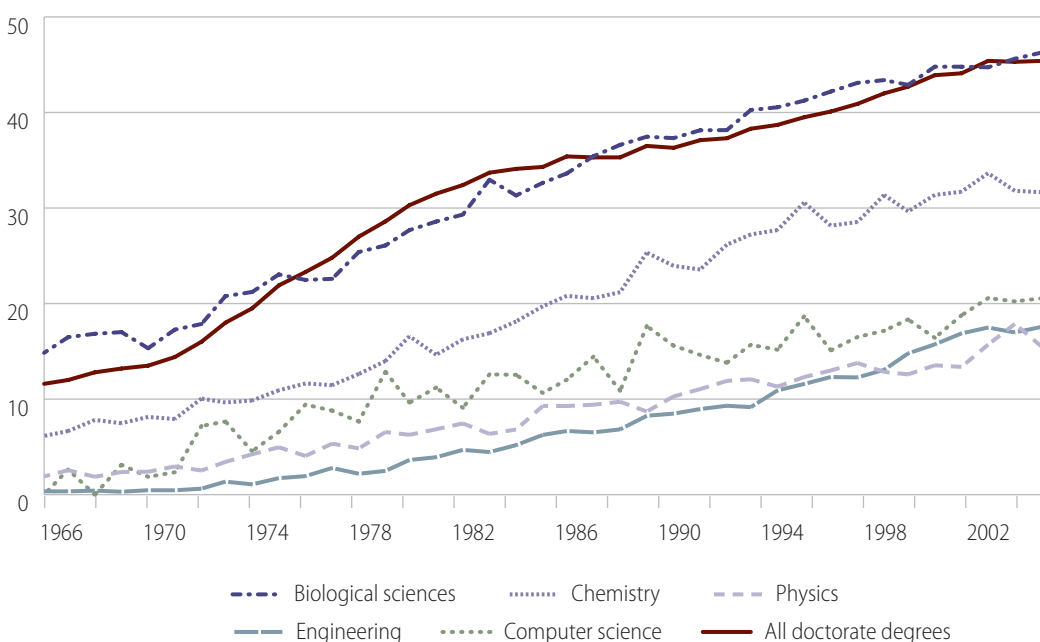
quality-of-life things that come from technology—MP3 devices that enable people to listen to music or books, GPS devices that keep them from getting lost…The list goes on and on, but we don't even think about it when we use technology. That's the beauty of it. It's just there…and it helps us minute to minute." Jody worked on the first software DVD player that enabled people to play movies on their computers: "Just think what that did for transatlantic flights. It might not seem like much, but if you're a person who has to travel a lot, it's huge."

Even more powerful from Jody's vantage point is new technology that affects life itself. Jody's sister—a nurse at a small, very poor school on the Texas-Mexico border—runs a program called Telemedicine. When a student is sick, Jody's sister puts the child in front of a video camera connected to a computer, and a doctor in Houston looks at him or her through various scopes—such as the one for the throat—and makes a diagnosis. Jody has been with her company for more than 25 years. "It's not about money or title but about coming home at the end of every day and feeling I've had an opportunity to make a difference."

Beth and Jody exhibit what we call Athena traits. They want to use their skills for altruistic purposes—to improve people's lives and give back to society. Indeed, this is the main reason why they elected to do what they do in the first place. They are not alone. A full 55% of female scientists, compared with 45% of male scientists, in the Athena Factor survey said they entered their field primarily "to make a difference and help humankind."

Thus, when describing the enormous potential of women in SET, we're not just talking about quantity, we're also talking about quality. The dedication and commitment of these women is deeply impressive. Women in science, engineering, and technology adore their jobs. Athena Factor survey data show that nearly 90% of women in science love their work. The figures in engineering (75%) and technology (74%), while not as outstanding, are still remarkable.

Figure 1.4 lays out the reasons why women love these fields. SET women find their work intellectually stimulating and exciting: They enjoy grappling with new ideas, being on the cutting edge, and driving innovation. But they also greatly appreciate being able to use their skills and

FIGURE 1.4
Women in SET Exhibit High Levels of Commitment

	Science	Engineering	Technology
Love their work	88%	75%	71%
Find the work intellectually challenging and stimulating	75%	77%	65%
Like being able to contribute to the well-being of society	63%	49%	45%
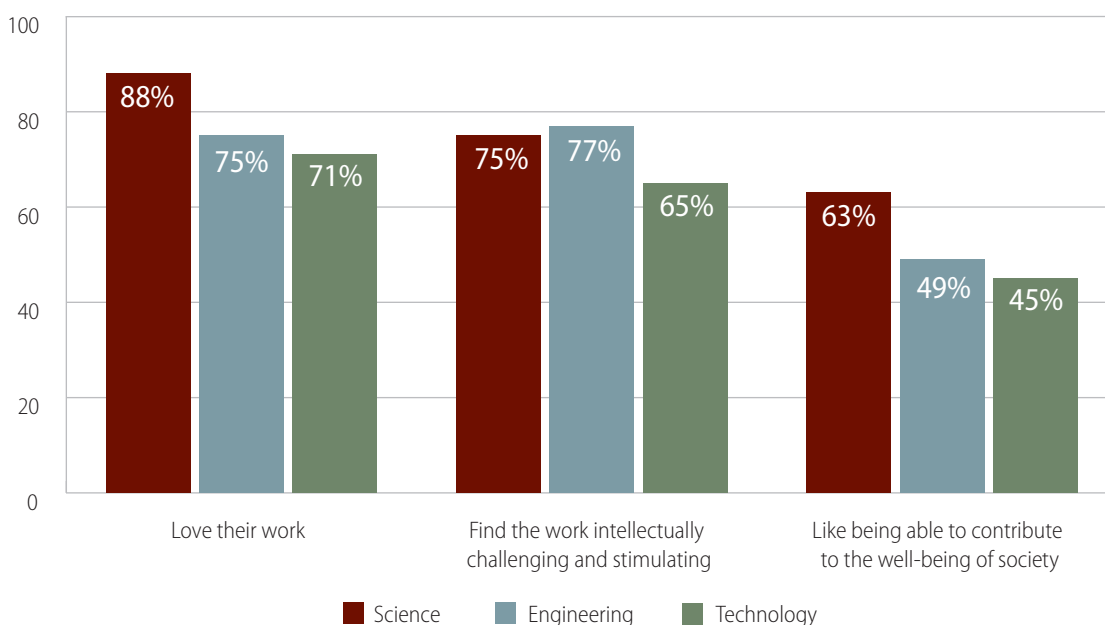
knowledge—which in many cases have taken years to acquire—to improve the lot of humankind. For instance, fully 63% of female scientists working in the private sector have chosen to do what they do because of a desire to contribute to society's health and well-being; this compares with 51% of their male colleagues. For women in SET, this desire to give back or to do good is a more powerful motivator than money. As shown in figure 1.5, when it comes to what motivates SET women to go to work every day, altruism trumps compensation.

The research literature supports these findings. Jane Jorgenson finds that women scientists are drawn to their fields because they want to save lives or make a difference to society (or both). These female scientists assert that "work is integral to who I am."[15] Jorgenson concluded that women in these fields are "singularly called to their profession."[16]

Athena traits can be particularly powerful when they are leveraged to solve some of the world's most critical problems.[17] Ruth Spellman, president and chief executive of the London-based Institution of Mechanical Engineers, is particularly mindful of how much women bring to the table in the areas of climate change and green technology. In her words, "With their altruistic bent and enthusiasm for global environmental issues, women engineers have much to offer in an area that is hungry for innovative solutions."

Similarly, Dr. Sadaf Farooqi's story illustrates how a woman's unique skills and knowledge can contribute to important discoveries that save lives. When Farooqi was still a medical student, a professor asked her to participate in a research project investigating the causes of Sudden Infant Death Syndrome (SIDS). One thing they already knew, he told her, was that crib death mortality rates were much lower in the South Asian communities in the UK than in the country in general. Farooqi's immediate reaction—based on child-rearing practices in Pakistani families—was that the answer had something to do with the fact that South Asian mothers put their babies to sleep on their backs, not on their stomachs. Research shored up her hypothesis, and the results were published in the eminent British medical journal, *The Lancet*. Before long the government began a national campaign to educate mothers to put their babies to sleep on their backs. In the first year,

FIGURE 1.5
Prime Motivators for SET Talent

	Men	Women
Ability to contribute to the well-being of society	40%	51%
Being highly compensated	54%	45%
Receiving recognition from my company	38%	40%
Having a powerful position	17%	10%
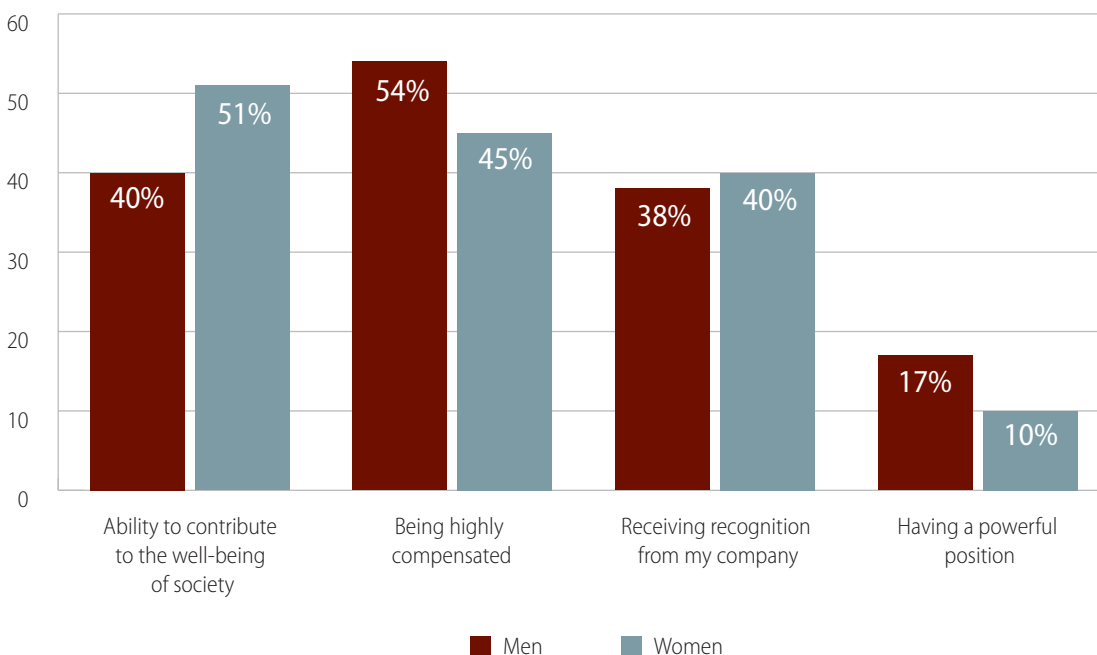
FIGURE 1.6
Young SET Talent and Performance Reviews

Men   Women
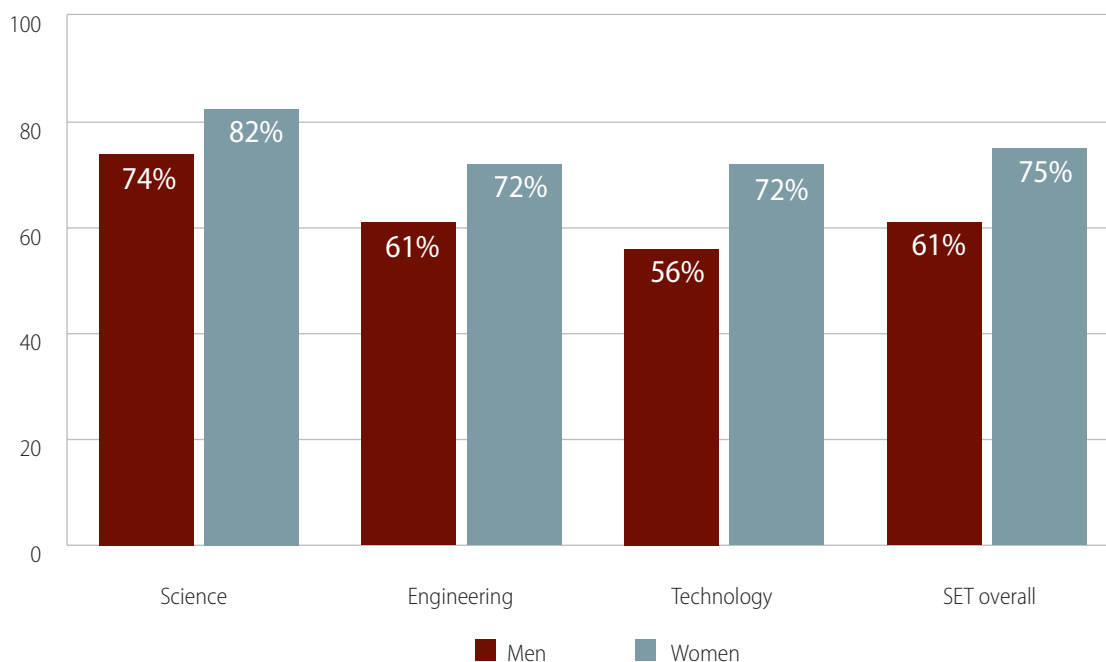
the number of crib deaths was cut in half. "It was a simple little project based on something I had observed," Farooqi says. "But it was enormously gratifying. It's not very often that you can see how research actually saves lives."

Over the last decade the Corporate Leadership Council has conducted research on employee engagement that found "a positive emotional connection to one's work" can enhance employee performance by 20%.[18] The Athena traits identified in our research underscore these links between commitment, engagement, and performance. The meaning and purpose SET women derive from their work result in high rates of engagement and impressive performance ratings, especially at young ages, before macho SET cultures have had a chance to undermine commitment and engagement. Fully 75% of young (age 25–29) SET women regularly receive performance reviews that include appraisals like "superb," "excellent," or "outstanding." In comparison, only 61% of their male peers receive such accolades in annual performance reviews. Figure 1.6 illustrates this phenomenon across SET.

It's hard to avoid coming to the conclusion that SET women are special in all kinds of ways. These are women who—at least in the United States—have overcome many hurdles in an educational system that sidelines women. They have faced down a culture that not only fails to honor but actively ridicules female "science nerds." No wonder their commitment is so finely honed—they've needed steely determination to succeed in these fields. All the more reason for companies to figure out how not to waste this talent.

CHAPTER 2: HOSTILE MACHO CULTURES

The focus group in Silicon Valley was high voltage. Among other luminaries it included Josephine, a "hot shot" woman who had successfully navigated the wilds of the early tech industry to become a major player in several start-ups. During the session she offered advice to the younger women in the room. Her most outrageous steer: "If you want to be in the loop, get yourself a male alias."

Ten years ago, at a start-up in the Northeast, Josephine had a boss who was big on nicknames. She hated every name he tried to call her—Josie, Joey, Jo—until they finally settled on Finn. Finn stuck, but the gendered nature of the name really came into play when e-mail took off. "It turned out to be really useful to allow some of my colleagues to imagine I was a man." The e-mails Finn got were completely different from those received by Josephine. Some of them contained brutal locker room stuff that was hard to take. But some contained essential information for those who wanted to get promoted at the firm: inside dope (who was on the in, who was on the outs with the CEO) and information on cutting-edge business issues (where the new investments would be, what markets were being tagged for expansion). In sharp contrast, Josephine got the pap—polite enquiries about the family and boilerplate stuff on company strategy.

So, said Josephine, "Get yourself a Finn. He's as necessary today as he was in 1997. Back then I thought that Finn would outgrow his usefulness—that there would come a day when Josephine was in the know. It's sad, but that day hasn't happened."

Macho Behaviors in Lab Coat, Geek, and Hard Hat Cultures

The Athena Factor survey data describe a workplace culture that is at best unsupportive and at worst downright hostile to women. The macho culture excludes women from the spaces in which the real business happens—after hours at the lab or smelter, after work at the bar or golf course—and, as a result, women are not privy to vital information. Not only are they physically excluded, women told us, but they are often pushed away by demeaning or degrading behavior. Locker-room language and sexually explicit taunts are standard and hard to take. A surprising number of SET women described their male colleagues as acting in rude, predatory, and vulgar ways. These behaviors significantly exacerbate the isolation that comes with being the only woman on a team or at a work site. Sarah, a young technologist who has stellar performance ratings and is being groomed by her company for a top job, told us: "I'm used to being the only woman in the room, but I can't get used to vulgarities. I have a son, and I would never want him to behave like this—constantly using foul language and sexual innuendos. This behavior makes me not want to participate on team projects. When I talked to the VP of HR about this, I was told: 'You can't succeed and maintain your way of doing things; you have to try harder to become one of the boys'…He simply has no clue as to how difficult that is."

The women who participated in this focus group believed that predatory behavior flourishes because it is condoned by senior leadership and the "tone at the top." According to Lindsay, a systems engineer and a colleague of Sarah, "There's a feedback loop that encourages macho behavior, and it exists at the most senior executive level. The guys at the top set the tone for everyone else. As a woman, you have to develop armor plate."

In the fall of 2006, just before the Athena Factor surveys were fielded, the CWLP research team conducted a series of focus groups to explore how SET women working in the private sector experienced their workplace cultures. These women described their workplace culture variously as "lab coat," "hard hat" or "geek," depending on which climate or microclimate they worked in. Figure 2.1 illustrates the heft of these macho characteristics across science, engineering and technology. Women scientists, for instance, are particularly affected by an onerous lab coat culture. Sixty-four percent spend relentlessly long hours in the lab. Women engineers find that they are up against both a geek and a hard hat culture. Forty-three percent say they deal with geeks—who avoid women and tend to take the arrogant position that women don't have the smarts to succeed in technical fields. And 33% of women engineers struggle with a hard hat culture, (sometimes

described as "firefighter" or "cowboy") where male colleagues regularly use locker room language and revel in sexual innuendo. Women technologists experience a double whammy. Forty-seven percent feel the pressures of an onerous lab coat culture, while 37% feel sidelined by an exclusionary geek culture.

The Athena Factor survey research allows us to measure the incidence of key macho behaviors in SET companies (see figures 2.1 and 2.2). The most shocking data point to the prevalence of sexual harassment. The figures are higher in engineering fields and lower in scientific fields, but overall, fully 63% of women in SET have been the victim of sexual harassment on the job.

More than one woman spoke about the predatory male culture at their companies. Jillian, a young high potential at one of the world's leading technology firms, described it this way: "It reminds

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A GLOSSARY OF TERMS IN MACHO SET CULTURES

Lab Coat Culture. This term conjures up the esoteric world of scientists bent on splicing genes in a strange new world of synthetic biology—or discovering the next miracle drug. Picture a scientist wearing protective goggles, shrouded in a white lab coat, tethered to an electron microscope 10 to 12 hours a day, six days a week. Lab environments are hostile to women not so much because of attitudes (women scientists are generally treated with respect) but because of working conditions: the extreme hours, the sheer relentlessness of the face time involved. Focus group participants talked about regularly working around the clock to meet the "unforgiving demands" of experimental protocols.

The tyranny of the lab coat culture is grounded in two phenomena. There are the constraints of the work itself. As Nancy Lane explains (see the sidebar "The Lab Coat Culture"), a scientist can't just put an experiment on hold while she drops by her house to fix dinner for the kids. The demands can be overwhelming, and women also often fall victim to their own altruism. As one focus group participant explained, "I feel enormous pressure. Every hour I'm not in the lab is one more hour someone has to wait for the drug that could save their lives."

Hard Hat Culture. This term evokes the macho culture that dominates many engineering fields—a hard hat being the mandatory headgear for engineers working in mines, oil refineries, smelting plants, machine shops, and construction sites. Women often feel conspicuous and targeted in hard hat cultures, the victims of various kinds of predatory behavior. Vulgarities and sexual "humor" permeate these places. One woman said she "stood out like a sore thumb." Another reported needing to do a "whistle-check" on the clothes she wore to work—she wanted to make sure that she didn't provoke a barrage of whistles and catcalls.

In some industries, this hard hat culture is known as a "firefighter" culture, where the most admired individual at the plant is the larger-than-life male who runs around dealing with various emergencies—putting out actual and proverbial fires.

Geek Culture. Picture that incredibly bright, gawky, A-V guy from high school who preferred hunkering down with a computer manual than going out on a date and you've got the stereotypical geek. Alpha male techies have minimal social skills and can be awkward around women, but this awkwardness coexists with enormous arrogance. Engineering schools seem to breed a type of male superiority: Women, it is assumed, just don't have what it takes to succeed in highly technical fields. One focus group participant described a recent uncomfortable experience: A male colleague walked up to a group where she was the only female. The man shook the hand of every man but avoided contact with her. "I could feel his anxiety in assessing how to handle greeting me," she noted. "But he also didn't think I was important. So in the end he just chose not to deal with me."

Tech women talked about the "diving catch" behavior that is center stage at technology companies. Alpha male techies come to the rescue—zooming in at the eleventh hour like Superman or the Lone Ranger to save a system that is threatening to crash. Women find it extremely difficult to take the kinds of risks involved in making these saves—their buddy system just isn't strong enough to save them if they were to fail. They resent the fact that making a diving catch is often the only way to get promoted at a tech company.

FIGURE 2.1
Macho Cultures Across SET

Science   Engineering   Technology
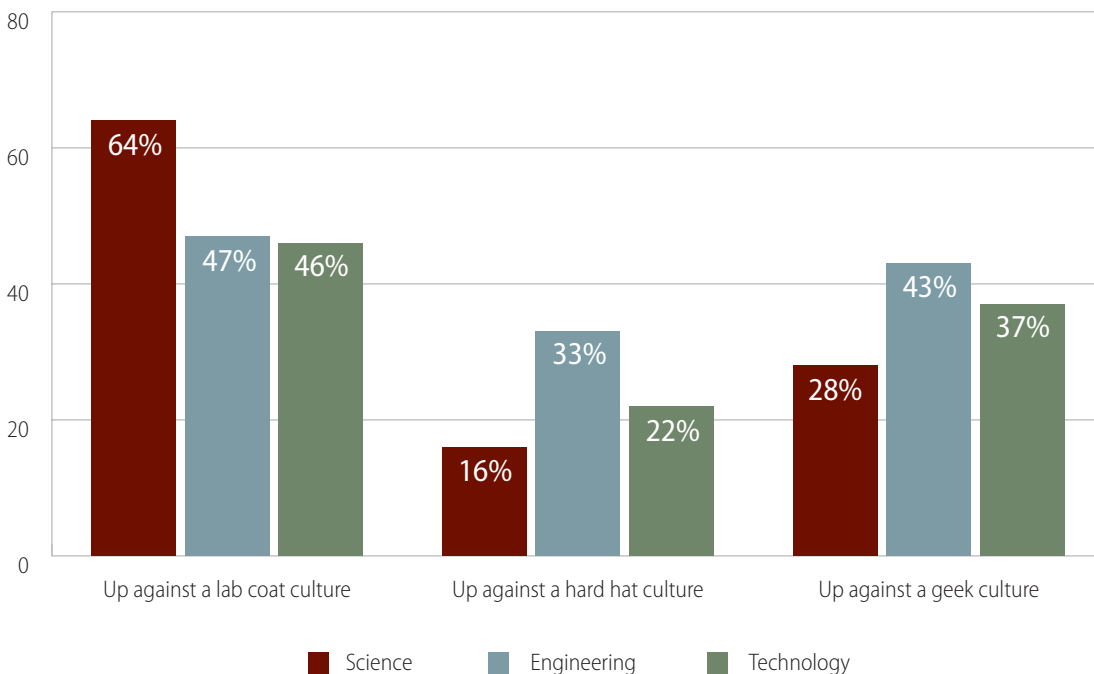
FIGURE 2.2
Predatory Behaviors Across SET

Science   Engineering   Technology
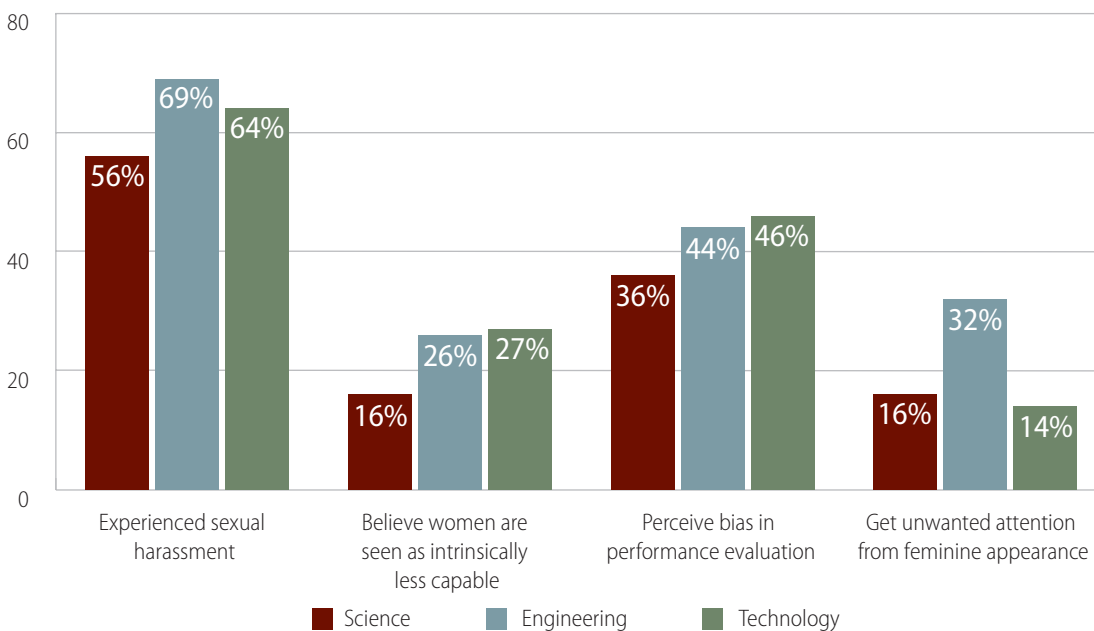
me of the antelope and lion footage you see in nature films. The culture is extremely predatory, and the women are the prey." You can play out the scene in your head: the lone woman at the watering hole (read, luxurious off-site in Vegas), exposed and vulnerable as she pitches a great

idea, surrounded by hungry colleagues looking to take her down. You see the males circling, approaching in a pack, ready to swoop in for the kill (read, put their names on her breakthrough strategy).

The stress has taken its toll; Jillian admitted that she's now on medication and in therapy to help her function in her job: "One night I had to go to the ER because I was shaking uncontrollably." The combination of several project deadlines, pressure to outperform just so she can be considered an equal by her male colleagues, and an upcoming performance review had pushed her over the edge. The ER doctor said to her "Oh, you're from [X firm]. We see one or two of you women engineers a week." Sensing that Jillian was not alone, we asked the women: "How many of you are seriously thinking about leaving in, say, a year?" Of the nine women present, five raised their hands. This is deeply disturbing, given the high level of commitment we uncovered in Chapter 1.

Another sobering finding is the degree to which women at SET companies believe that their male colleagues consider females to be intrinsically less capable. In engineering and technology, more than a quarter of female respondents feel they are seen as genetically disadvantaged in SET fields. When Larry Summers, then-president of Harvard University, talked about how women have a "different availability of aptitude" in his infamous speech of January 2005, he was perhaps merely giving voice to a standard view![19]

Some researchers are convinced that "the societal assumption that women are innately less able than men" is the foremost factor contributing to women's slow advance in SET careers."[20] Upon meeting a woman at work, for instance, a male colleague will assume she is an administrative assistant. When he learns that she is in fact an electrical or systems engineer, the male colleague will evince surprise and exclaim, "Why, you don't look technical." The unspoken assumption is, of course, that women—especially attractive women—are not meant to be in technical roles and are

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THE LAB COAT CULTURE

Nancy Lane is a distinguished cell biologist at Cambridge University. In midlife she looks back at the "crunch" she experienced as a young scientist and wonders how she survived, as she was surrounded by talented women who did not make it.

"In a way I was lucky. I was single when I did my postdoc and therefore able to dedicate full attention to my research. This enabled me to get 'liftoff' in my career." But in a short space of time, she accepted a job at Cambridge University with heavy teaching and research responsibilities, got married, and started a family. That, she says, is when the juggling started in earnest.

In those days she was working on "tight junctions" in invertebrates, and each research project required a series of delicate laboratory experiments that could last for a week or two. Embryonic tissues had to be prepared and put in a fixing solution and then samples had to be taken at set intervals over a series of days. When the tissues were ready, very thin sections had to be cut and painstakingly examined through an electron microscope. Each step involved a great deal of precision and needed to follow a strict timetable—you couldn't put a sampling on hold for a family meal or a school run.

She remembers feeling forced to make agonizing trade-offs, asking herself: Do you abandon an experiment or abandon a needy child? At one critical moment she found herself "backward mapping"—deliberately choosing research questions that allowed her to run experiments that could be fitted into a five-day week. She felt hugely envious of male colleagues who seemed to be able to work deep into the night and through the weekend—all that was needed was a quick call to the wife.

Moreover, the situation was exacerbated by the disapproval of colleagues, faculty wives, and even friends: They were cluck clucking about "How can you do it?" How could she work as a serious scientist and pretend she was doing right by two young children? The guilt-inducing talk was seriously debilitating.

no good at them. Moreover, at team meetings, male colleagues will assume that the woman is the most junior person in the room, though she may be the most senior.

One focus group participant described an experience that resonated with many of the women we talked to. "It's always surprising to the men to see me; it's like 'What are you doing here?' When I do contribute, my opinions and reasoning are always questioned, 'Are you sure about that?' whereas what the men say is taken as gospel." This kind of questioning erodes self-confidence; over time women begin to believe that perhaps their male colleagues are right—maybe they do not have what it takes to excel.

Finally, there's the seemingly inconsequential stuff. Catcalls and whistles might not sound too serious, but they can be wearing. Over time, they can undercut loyalty to a firm and commitment to a field. Overall, 17% of women in SET report receiving unwanted attention just from looking feminine (when wearing a skirt or using lipstick).

Learning to Act Like a Man

The view from the soaring glass windows in the conference room at this high-tech company was picture perfect: a beautiful Western sky, flat-topped mountains glowing pink in the late afternoon sunlight. Around the table sat nine female engineers—who, incidentally, did not know one another. You could say their sartorial style was rugged: worn jeans or wrinkled chinos paired with crewneck sweaters well past their prime; scuffed hiking boots, sneakers down at the heel. Most of the women had short, unstyled hair, and only two wore makeup or jewelry. The attire was definitely gender-neutral, if not masculine. These were women inhabiting a world of men.

During a meandering three-hour discussion, it became clear that it was no coincidence these women didn't know one another. For years they had avoided women's networking events because they were "packed with lawyers and HR types," not people in the "business of the business." If one of these female engineers walked into a room filled with women, she promptly walked back out. As one explained, "By definition nothing important is going on in this room: In this company men hold the power." These women seemed to have learned to avoid and look down on other women.

Because of hostile macho cultures, many SET women recognize relatively early in their careers that "professional success is contingent on [their] ability to withstand aggressive male behavior."[21] Hence, as a coping and advancement strategy, women in SET fields tend to adopt traditionally masculine attitudes and attributes. In short, women tend to behave like men.[22] One woman we spoke with said she learned to stop wearing skirts and makeup early on in order to increase her credibility at work. She reflected that increasingly she had developed a "discomfort with being a woman." The Athena Factor survey data show that fully 53% of SET women believe that behaving like a man improves their prospects for advancement.

For Marianne, a tech professional, the lightbulb went on when she took a Myers-Briggs diagnostic at her firm and came out with a completely different profile than when she had taken it several years earlier. According to Marianne, "It made me realize that I had learned to function in a way that is different from what I truly am. A few years earlier, I answered the questions one way, but when the test was administered to me recently, I answered them another way"—more as a man might.

Behaving like a man might be a useful coping mechanism, but it can backfire. Some women who employ this survival strategy end up more isolated than ever.[23] They find it well-nigh impossible to join the "old boys' club," and at the same time they learn to distrust and distance themselves from women (for a fuller discussion, see Chapter 3). This insight is confirmed by other research in the field. A recent study of women engineers demonstrates how women who attempt to behave like men end up attacking other women, invoking "traditional feminine stereotypes to underscore their shortcomings."[24]

Attitudes of suspicion and condescension toward other women have the unfortunate effect of seriously undermining support policies companies put in place. For example, at a focus group conducted by the CWLP research team at a Seattle-based technology firm, several senior female computer engineers were dismissive of women's networks and other women-focused programs. They not only refused to participate, but they also heaped scorn on the utility of these programs, which tended to undermine corporate commitment. It's hard to increase the budget for a women's network that is openly criticized by those it is meant to serve! These women engineers had chosen to behave like the powerful men around them and saw their weak "sisters" as a threat to upward mobility. They simply didn't see any women in the chain of command immediately above them. Many voiced negative opinions about women in their field, describing them as "emotional" and "petty." These adjectives were used by both women and men talking about female colleagues. These adjectives are not random; they play directly into the theory of gender schemas.

Gender Schemas and Women's Progress

In her powerful work on the glass ceiling, psychologist Virginia Valian shows how "gender schemas" affect expectations of men and women, evaluations of their work, and progress in their careers.[25] As Valian describes them, schemas are "hypotheses about what it means to be male or female."[26] We heard an example of this at an engineering company: "We have an awards dinner for teams who make a difference—usually it's all men. When a woman was pictured on a team, there were numerous questions as to why the team leader would have included his wife in the picture. It didn't even occur to anyone that the woman was on the team and was being rewarded for her role."

In white middle-class society, the gender schema for men includes being assertive, instrumental, task oriented, and capable of independent autonomous action. Above all, men are proactive. Men act. The gender schema for women is different; it includes being nurturant, expressive, communal, and concerned about others. Women are reactive.

Schemas are not wholly inaccurate (men do tend to be more assertive, women more expressive). But in workplace settings, these schemas can block women's progress. Take leadership. Leaders

FIGURE 2.3
Behaving Like a Man
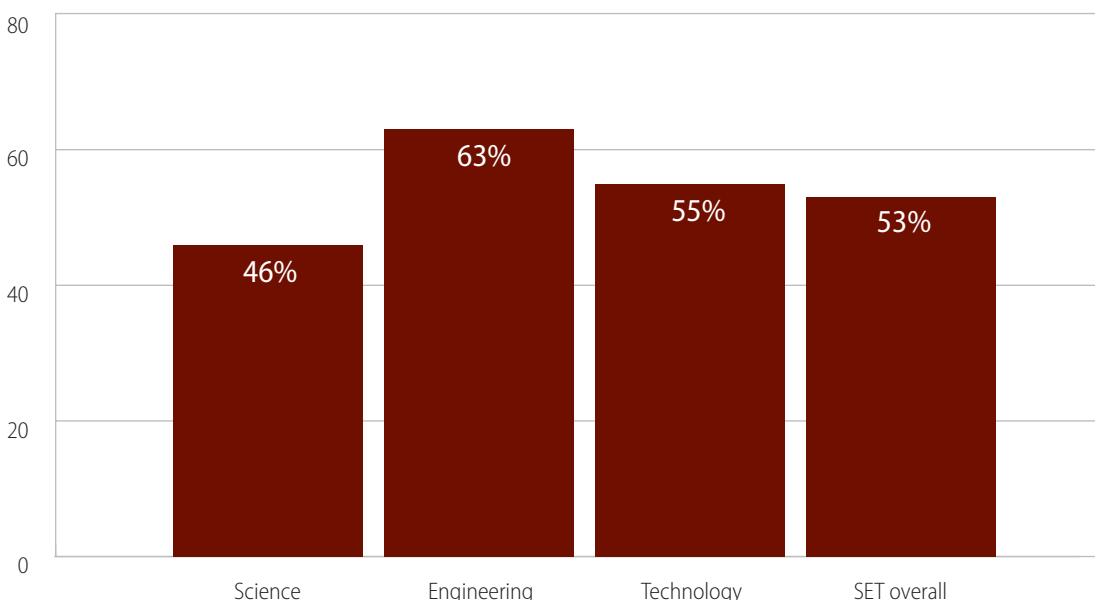
need to be assertive. Yet when women act assertively, they provoke a negative response. They are perceived as too masculine, and their "likeability quotient" plummets.[27] This obviously undercuts their ability to lead. One woman at a tech company described her experience being the leader of an all-male team: "It didn't take long for the men to label me either as too aggressive or as a meddlesome micromanager. In most cases I was simply giving needed direction on the project—as any team leader should, regardless of gender. All too often my male subordinates saw my leadership as an unwarranted attack."

Researchers have pointed out that gender schemas are particularly debilitating for women in fields where jobs are seen as inherently masculine.[28] SET jobs are prime candidates here: Rolling out ingots or developing the next generation of microchips are seen as "guy jobs," and, as discussed earlier, workplace cultures in these fields can be decidedly macho. The macho culture permeates product development in many SET fields. In one focus group held at a medical device company, a female surgeon who specialized in OB/GYN talked about the surgical tools she used in laparoscopic surgery being designed for male hands. They were too big for her, and often she had to use two hands to operate an instrument designed for one. This seriously disadvantaged her. She found it ironic that tools meant to be used on women could not be used by them—an oversight, to say the least.

Hiring decisions in SET fields are another example of gender schemas. A study by Frances Trix and Carol Psenka of letters of recommendation for similarly qualified men and women being considered for medical faculty jobs found that letters for men (written by both men and women) were longer and contained more "standout" language (excellent, superb) than letters for women.[29] In contrast, letters for women included "doubt-raisers" ("she had a somewhat challenging personality") and "grindstone" adjectives that made a woman seem like a conscientious secretary (meticulous, reliable). This kind of evaluation bias puts women at a disadvantage in hiring and promotion decisions.[30]

In summary, SET companies foster macho cultures that are often hostile to women. The lab coat, geek, and hard hat cultures all work to exclude women. The ambitious women who stick it out and push ahead within SET learn to behave like men, adopting traits and attitudes that belittle other women. This strategy can, of course, exacerbate female isolation—already a pervasive problem in SET fields. It is to this issue that we now turn.

CHAPTER 3: ISOLATION

Our interview with the CIO took place at the Silicon Valley headquarters of his high-tech firm. The setting could not have been more idyllic. His office overlooked a leafy green campus complete with scooter trails and ping-pong tables. This did not seem to be the kind of place where a person might need a posse for protection. But the story he told us was sobering.

Last fall this company had recruited Andrea to head up the marketing department. The CIO was thrilled; he had been on the lookout for a woman (there had been none in senior positions) and Andrea had a reputation as a top performer. A few weeks after she joined, in an effort to showcase her, the CIO arranged a high-level meeting where Andrea and Tom, the head of sales, would give talks on new product development. Andrea went first. When she sat down her new colleagues laid into her, not only demolishing her ideas but also attacking her presentation methods. Then Tom made his presentation. In the CIO's view, he laid out some rather standard stuff and didn't even bother with a PowerPoint, but when he sat down everyone applauded. In fact, two male colleagues—both members of the executive committee—got up to congratulate Tom on his strategic vision.

The CIO was both appalled and puzzled. He thought that Andrea had been fabulous. Her ideas were innovative, her materials focused and powerful. Tom, on the other hand, had been totally uninspired. How come the "lackluster" presentation got all the kudos while the "great pitch" was run out of town? The CIO shared his reactions with a male colleague, who, to his surprise, blew off his concerns, saying there had been no difference in treatment.

The CIO told us that some time later he figured out the underlying dynamic: "Tom had his posse in the room to root for him—to make sure he got an A. Andrea had to fend for herself—she had no one in her corner. I still kick myself that I didn't get up and tell those guys how good she was. But I guess it's hard to defend 'the woman.' The room practically reeked of testosterone—it didn't seem to be the time to play the martyr role."

Before we left, the CIO told us that Andrea had just accepted a position at a larger company back East. Such a move is hardly surprising: Despite its trendy image and progressive politics, Silicon Valley is only 28% female.[31]

Severe Isolation

Tales of isolation by women are standard fare. By the time SET women get anywhere near the top, they are a tiny minority in most companies. They are often the only woman at the meeting, on the team, on the floor. One professional at a large engineering firm reported that she had to go down three floors to find a women's bathroom. The Athena Factor survey data show that fully one-third of women in private sector SET jobs feel extremely isolated at work (see figure 3.1). This figure is higher in engineering companies (44%) and lower in science-based companies (27%). Collectively, however, the prevalence of feelings of isolation is troubling.

Consider the story of Talia, a midlevel star performer we talked with at a focus group in Geneva. After she had been with her engineering company for three years, Talia was asked at short notice to move to a plant in Poland to oversee logistics. She was given one week of intensive Polish instruction and expected to learn the language on the job. At her smelter facility, there were just three women in a workforce of 120. "To be fair, there's no harassment; but I've had to work my tail off to gain their respect. I'm always referred to as 'the woman at the smelter' or 'the woman in the cast house.' I don't have the luxury of messing up—I'm too conspicuous…This creates quite a lot of strain and stress."

We're talking about a feedback loop here. The isolation of women in SET is both a cause and a consequence of the lack of female role models, mentors, and sponsors in SET companies.[32] Precisely because there are few women at executive levels, it's hard for women climbing the corporate ladder to find enough role models, mentors, and sponsors to support them. But without

FIGURE 3.1
Female Isolation Across SET
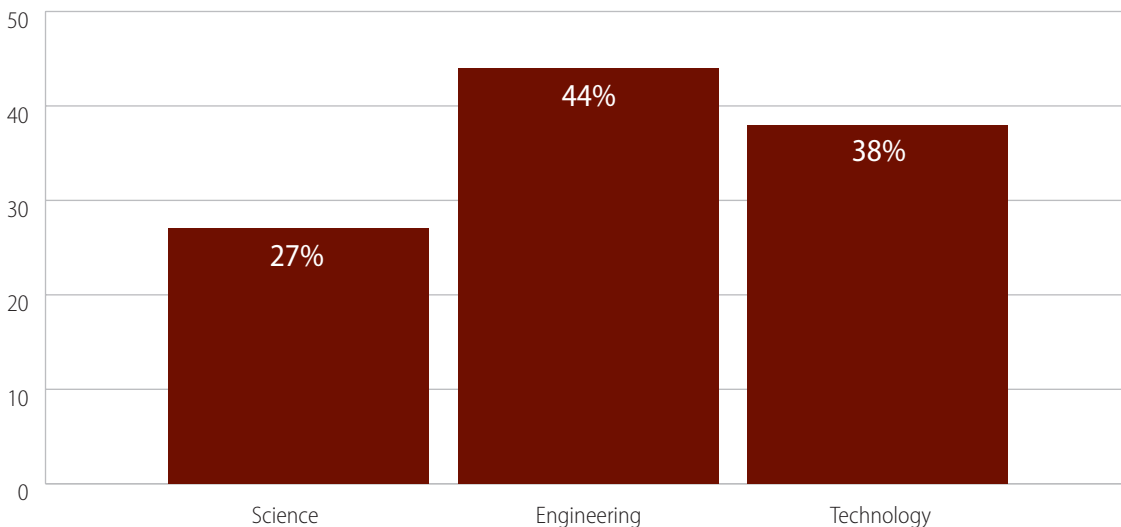
that support, it is impossible for them to reach the upper levels, which leaves the next generation of women professionals similarly adrift. They are caught in a vicious cycle.

In our focus groups, the yearning for female role models was palpable. Young female engineers in particular wanted to look up and see senior women in their fields coping with work-family issues and dealing with the scrutiny that comes with being a woman engineer. As one young woman puts it, "Seeing is believing—right now there is no one out there."

Quite aside from the visuals (just seeing a woman in a top job), young female engineers expressed a strong desire for a mentor—a senior woman who would offer advice and guidance. But meeting

FIGURE 3.2
Lack of Role Models, Mentors, and Sponsors Across SET
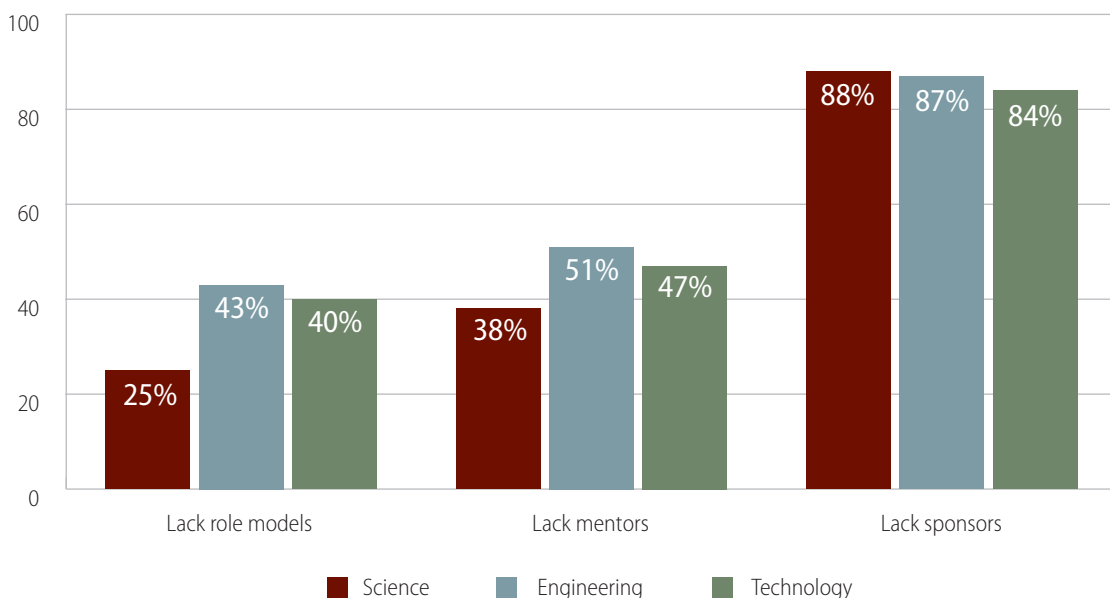
this need is a difficult challenge. How does a company create a mentoring program when there are so few women in leadership positions?

The Impact of Isolation

Isolation is a serious problem because it takes a toll on job satisfaction and engagement. Women who are isolated are 13% more likely to report being unsatisfied with their job. Moreover, women who are not satisfied with their job are 22 times more likely to leave. As one female executive at a tech firm explains, "When you are isolated, it takes a huge amount of energy just to maintain your footing." In other words, isolation creates flight risk.

Isolation also takes a toll on career progression, which ultimately leads to women leaving SET fields. Women who feel isolated are 25% more likely to be stalled in their career than counterparts who are not isolated. A full 14% of women who feel stalled have one foot out the door, compared with only 5.6% of their colleagues who are maintaining a lockstep progression with male colleagues.

Some of this isolation comes simply from being the only woman in the room, while other stories we heard imply less benign dynamics at work. Deena, a high-ranking scientist, has an idiosyncratic definition of isolation: "Isolation is everyone agreeing on the direction of the project except the girl. Pressure to raise the bar/up the ante is particularly hard to hear from a woman."

Feelings of isolation can sometimes be heightened unintentionally. At one engineering firm where we held a focus group, for instance, a small group of high-potential employees had recently taken part in a leadership seminar that included a diagnostic survey (the Hermann Brain Dominance Instrument). This tool coded participants' thinking styles into one of four colors: red (emotional), yellow (strategic), green (structural), and blue (analytical). These styles are thought to influence communication, decision-making, and problem-solving approaches. Michelle, the only woman invited to attend the workshop, describes her experience:

"The facilitator asked all of the 'red' people to stand up…I was the only red. They told us that the point of the leadership training was to show people about different styles, and how it's important to go halfway and meet others in the middle. But it seems that I am always meeting them [the men] more than halfway. What about them? Why can't they meet me halfway?"

Old Boys' Network

Women's feelings of isolation are exacerbated by the persistence of an exclusionary old boys' network. Time and again we heard stories about the strength of old boys' networks at SET firms—and women's failure to gain access.[33] As one female engineer describes it, "The guys would get together every month and never invite the women. So I started a networking group with my female colleagues. Unfortunately it broke up—the working moms had a hard time arranging babysitting, and people drifted away." One woman we spoke to at a tech company told us, "I walk up to group of guys and conversation stops. They could be on projects I'm involved with, but conversation still stops and they ask, 'Susan, how's your son?' I don't want to talk about my son; I want to talk about work!"

Tanya, a female engineer working in Texas, relays a similar exclusionary experience. As a team co-chair, she had spent a weekend preparing for an important meeting designed to update subordinates on the direction of the project and assign tasks. Come Monday morning, however, she found herself completely undermined. Tanya's three male colleagues had gotten together over the weekend to watch a football game. Over beers, pretzels, and pizza they had discussed what they thought was a problem with the project and changed the entire plan of action. Tanya spent the meeting mute with anger: She looked like an incompetent leader who was not deemed important enough to include in decision making about her own project.

Even when women are recognized for their work, subtle slights often serve to set them apart. Robin, a technologist working in Europe, describes "an isolation culture" where the men called one another by their last names, told off-color jokes, and generally treated the conference room as an extension of the locker room. Women, by contrast, were called by their first names—leaving them out of the informal fraternity—and were the butt of the smutty jokes. In an effort to break down the old boys' club, Robin started to call the men by their first names. But the minute Robin walked out of the room, the last name/first name dichotomy was resumed.

FIGURE 3.3
A Snapshot of Women's Isolation
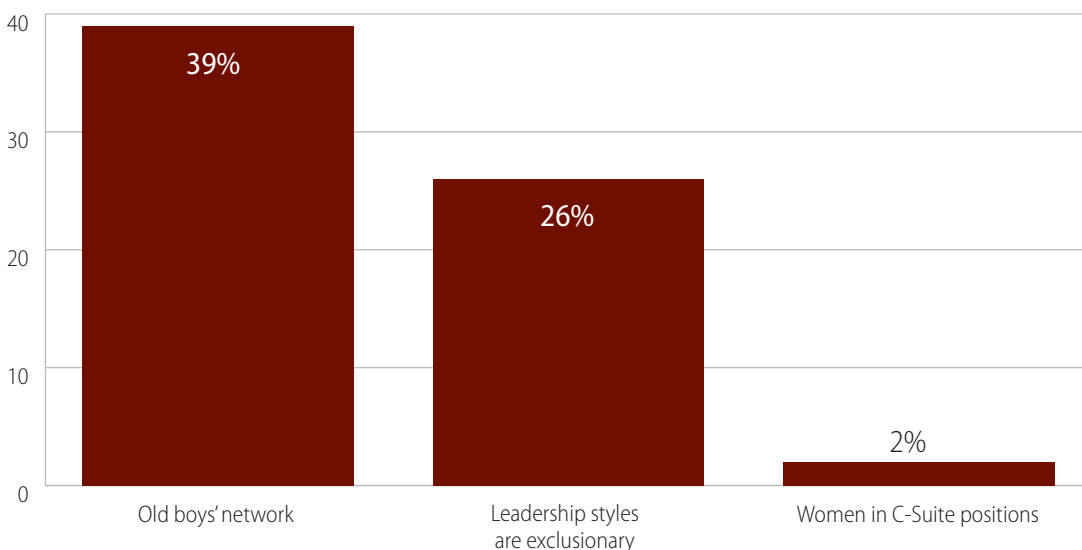
FIGURE 3.4
Old Boys' Network Across SET
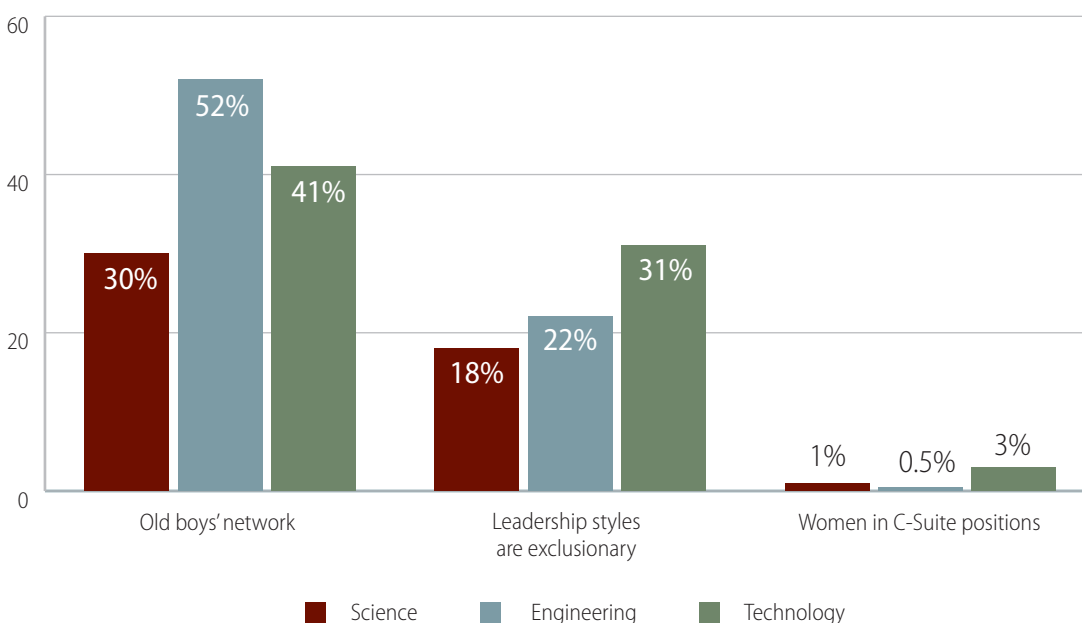
As figure 3.3 illustrates, nearly 39% of the women surveyed believe that an exclusionary old boys' network operates in their field, and 26% believe that the leadership circles at their companies exclude women. It's not surprising then that very few women reach the upper echelons of management—only 2% of C-Suite positions in SET companies are held by women.

Figure 3.4 shows that the effects of the old boys' network manifest differently across the various climates of SET. The particularly striking figures here are the percentages of women at the C-Suite level. Technology is ahead of the game with 3%, more than twice the amount in engineering.

Women Managers Make a Difference

Fortunately, not every focus group was filled with grim stories of women treading water, feeling isolated, and contemplating leaving. In fact, in the rare SET context where there are significant numbers of women in management, a different story unfolds. A senior manager named Felice, for example, shared an inspiring story. Two years ago, Kathy, a bright and talented scientist in her group, had trudged into Felice's office with a letter of resignation. When Felice asked why, Kathy explained that things had started to spiral out of control at home. She had a number of pressing family issues, including the new responsibility of caring for her sister's son. She just couldn't

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HOW GENZYME BUCKS THE TREND

Genzyme—a Boston-based company with more than 10,000 employees worldwide specializing in therapies for rare inherited disorders and other diseases—is an example of a biotech company that has achieved considerable success recruiting and retaining women scientists (51% of its scientists are female). Focus groups conducted in Genzyme in October 2007 allowed us to identify elements that distinguish this company from other SET firms and help to explain how the company has become an employer of choice for women.

- **Tapping into a mother lode of female talent.** Biology appears to be more attractive to women than the other sciences—53% of graduate degrees in the biological sciences now go to women. Although biotech firms as a whole are adept at tapping into this female-rich pipeline, Genzyme outperforms its competitors in recruiting. In 2006, 56% of new hires were women. The firm also does a relatively good job developing and promoting talented women. In 2006, 42% of senior managers at Genzyme were women.[34]

- **Creating a caring culture.** The corporate culture at Genzyme centers on care. The language of family and community is used to describe workplace relationships, and women find this authentic—it resonates with their experience. In focus groups, women talked about feeling cared for as people, not just as profit makers. (Biotech company cultures in general tend to be less macho than SET as a whole. Athena Factor survey data show that only 5% of female scientists in biotech report working in a macho environment, compared with 22% overall.)

  A main feature of the caring culture at Genzyme is how managers help women deal with the inevitable clash between work commitments and family responsibility. One woman described how she was told the night before she started a new job at Genzyme that she would be spending the first six months at a different site than she had expected in order to take advantage of a critical training opportunity. She had two small children and had already made arrangements for daycare and organized a drop-off and pick-up schedule. The change in location required a whole new set of arrangements to be made. When she explained that to her manager, he told her not to worry; the company would "make it work." She was indeed required to work six months at the new location, but she was encouraged to leave at 4 PM to get home early. In addition, a senior manager called her weekly to check in and make sure that the arrangement was working for her family.

  Women who participated in our focus groups talked about enjoying a supportive culture that helps sustain their family responsibilities along with their careers. The results are measurable. Athena Factor survey data shows that women scientists across the biotech industry are much more likely to have children than in SET overall (48% versus 33%).

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manage it all and had thought the option of taking a company-sponsored parenting leave wasn't open to her because a nephew wasn't a biological child. But Felice went to bat for her, telling the head of HR, "Losing Kathy permanently would be detrimental to my team." In the end a plan was developed to allow Kathy to take the time she needed—a six-month leave of absence—and return without penalty.

The Athena Factor survey data show that women managers have a tremendously positively effect on other women. "Having more senior women helps a lot," asserts a junior tech woman in one of our focus groups.

Although other researchers have shown that the tipping point is 20%, our research finds that SET fields are so male dominated that a mere 10% of women in management makes a critical difference.[35] As figure 3.5 shows, once the proportion of managers who are female crosses the 10% line, all the key variables change dramatically. All of a sudden women feel significantly less isolated, have an easier time accessing role models, and feel that they can talk about work-life issues more readily. Of course, we're not suggesting 10% should be some kind of corporate goal.

- **Offering flex within flex.** At Genzyme individual managers have a great deal of discretion in how they use flexibility. They're able to customize schedules for their direct reports. Given the demographic realities of the Genzyme talent pool, this flex within flex is deeply needed—and appreciated. In one focus group consisting of less-senior women, all either had two children or were pregnant with a second child. Struggling with work-life balance issues, they all credited their ability to stay at the company to managers who understood their situation and were prepared to devise imaginative forms of flexibility—provided, of course, they came through on the performance front. Staggered hours and telecommuting were particularly valued. Unlike women in similar situations at other firms we visited, none here were considering leaving the company.

- **Matching talent to a menu of job options.** Women at Genzyme told us that one reason the company retains female talent is that managers recognize when a skilled person is not being used to her full potential. As one senior woman puts it, "If we see someone who is not performing well because she is a square peg in a round hole—but is very talented—we find a square hole." Even less-senior women recognize that they have some control and autonomy over where they might best fit. This business of recognizing potential and being willing to work with it is particularly important to women, who often have more constraints than men and therefore more difficulty in finding a job that is a good fit. Athena Factor research show that lack of recognition of female potential is somewhat mitigated in biotech. Thirty-five percent of women in SET overall report lack of recognition, compared with 11% of women in biotech.

- **Harnessing altruism.** Genzyme is populated by women scientists eager to give back and improve the lot of humankind. As can be seen from Beth's story, the patient is at the heart of the Genzyme culture and is allowed to shape the mission of the researchers who work for the company. In the oncology division, for example, the Genzyme motto is "Our patients are waiting." Athena Factor research points to the importance of altruism to women. The survey data show that 55% of female scientists entered their field to help humankind, and fully 63% consider contributing to the well-being of society a motivating factor in their choice of career (considerably more important than compensation).

- **Emphasizing green awareness.** Genzyme's strong commitment to the environment is apparent in all company locations. Corporate headquarters, Genzyme Center, has received numerous awards for its green design, including a Platinum certification from the U.S. Green Building Council. Genzyme's green awareness makes it an innovative place to work. And for women working at this firm, green awareness is vitally important because it echoes and confirms their strong altruistic values.

Gains are cumulative, and when 50% or more of the managers are women, "workplaces are much more comfortable for women.

During our research we interviewed several senior women in SET companies who have sought to pave the way for other women. JoAnn Heffernan Heisen, who championed the Women's Leadership Initiative at Johnson & Johnson, is one example. As treasurer and one of only a handful of women in senior positions, she realized from the get-go that she had a responsibility to accelerate women's progress across J&J. Understanding "how important it was for women to have a strong and caring network that provided support and encouragement to counter the isolation they often faced in the workplace," she began reaching out to senior women at J&J. The networking that she did with this small group evolved into what is now an extremely successful Women's Leadership Initiative that spans the world.[36]

FIGURE 3.5
Women Managers Combat Isolation

	10% or less female managers	11%–49% female managers	50% or more female managers
Feel isolated in the organization	40%	34%	28%
Lack role models	45%	33%	25%
Can't talk about work-life issues	33%	22%	15%
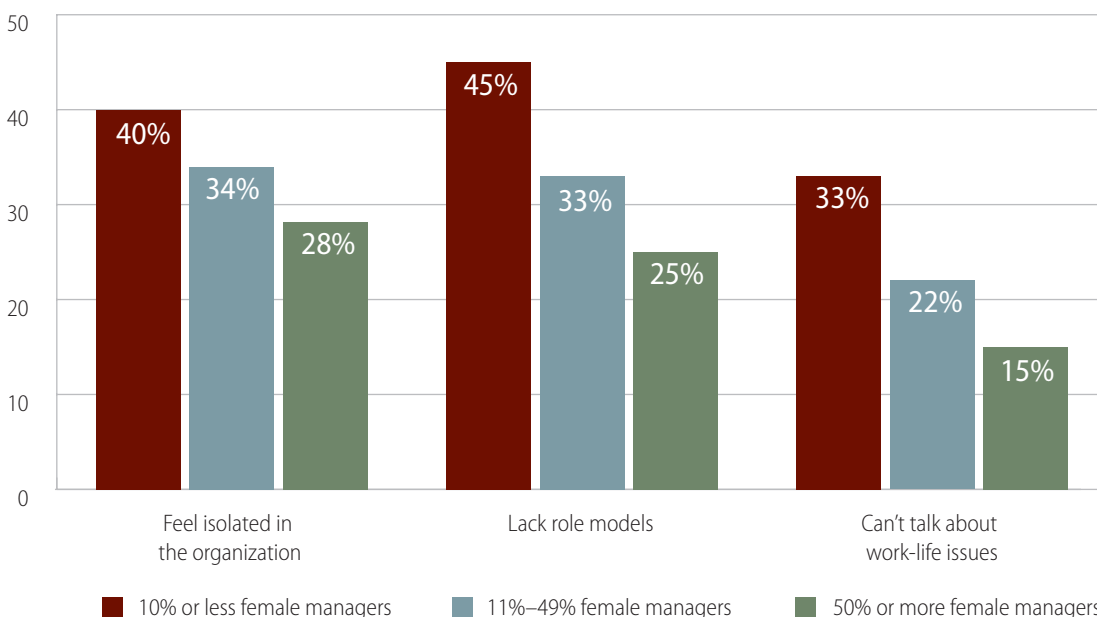
CHAPTER 4: MYSTERIOUS CAREER PATHS

The women gathered in the room for the focus group were strangers. Despite the fact they all worked in Australia for the same employer—a U.S.-based company—they worked at seven different facilities, some of which were thousands of miles apart. Australia is, after all, a big place.

Dressed in charcoal grey and black pantsuits, their hair in utilitarian bobs, these female engineers looked somewhat alike. But they didn't feel much solidarity. The half hour spent chatting before the focus group started was filled with awkward silences.

The first part of the discussion centered on general themes: the challenges and rewards of being a woman engineer in the oil industry. At this point the women were reasonably relaxed, for it was well-trodden ground. They had answered these questions before. When the conversation turned to career paths, however, the tension mounted.

Annie, a chemical engineer who worked at a facility in western Australia and one of the more vocal participants, pitched in with some thoughts: "Grade levels are confusing at this company. There's some kind of alphabet soup out there—D-3s, F-7s, and F-2s—but I've had trouble figuring out how these levels line up in terms of pecking order, and I've no clue as to what they mean in terms of compensation." Joyce, a systems engineer in Queensland, took these thoughts further: "I would particularly like to know where the big jumps are. I mean, what level is the big reach, and what kind of track record do you need to get there?" Joyce turned to the older woman on her left who, at the beginning of the session, had introduced herself as heading up the quality control function across the company. "Lisa," she said, "You seem to be the most senior woman around this table, can you help us out? First off, what grade level are you? Knowing that would be really useful." Lisa looked annoyed and replied curtly, "I can't tell you that." She went on to explain—rather awkwardly—that sharing this information would leave her too exposed.

There was a sharp intake of breath as the women absorbed this rebuff. It was downhill from there—the focus group tailed off. Later, Joyce sought out the facilitator and said that she hadn't realized how threatening these issues were. In her words, "It seems that asking a colleague's grade level is akin to asking a person's age in a job interview—strictly taboo." The problem is this secrecy makes it hard to map the journey to the top. If no one is willing to show them the way, women definitely won't make it there. Men are lucky enough to have comrades to post the road signs for them.

Women's Problematic Career Paths

Across science, engineering, and technology fields, we found a surprising lack of clarity around career paths and widespread confusion about exactly what it takes to get ahead. Women who participated in the Athena Factor surveys clearly felt "stuck"—their career progress had stalled. Moreover, they felt ignored and abandoned by employers who largely failed to lay out clear career paths or provide professional development plans. In focus groups, women frequently talked about needing a map to see where to go. "If there was a blueprint," one female engineer told us, "I could figure this out."[37]

Figure 4.1 illustrates that women in technology feel the lack of clarity in career paths most strongly; those in engineering come in a close second. Career paths seem to be clearer in science. These differences are mirrored in the figures showing how stalled women feel. Again, technology fields are worst, followed by engineering and science.

A Fight-or-Flight Moment

The going starts to get really tough for women in their mid- to late 30s. Figure 4.2 shows a spike in the number of women feeling stalled in their careers. This seems to be a fight-or-flight moment, when large numbers of women in SET feel stuck and therefore begin to fall away. Halfway through the decade of the 30s, several factors combine to make career progression incredibly difficult for women. Mounting isolation and the growing impact of their failure to find sponsors—who are crucial to gain access to highly competitive senior positions—are two examples. As a result, many

FIGURE 4.1
Roadblocks to Women's Career Paths

Science   Engineering   Technology
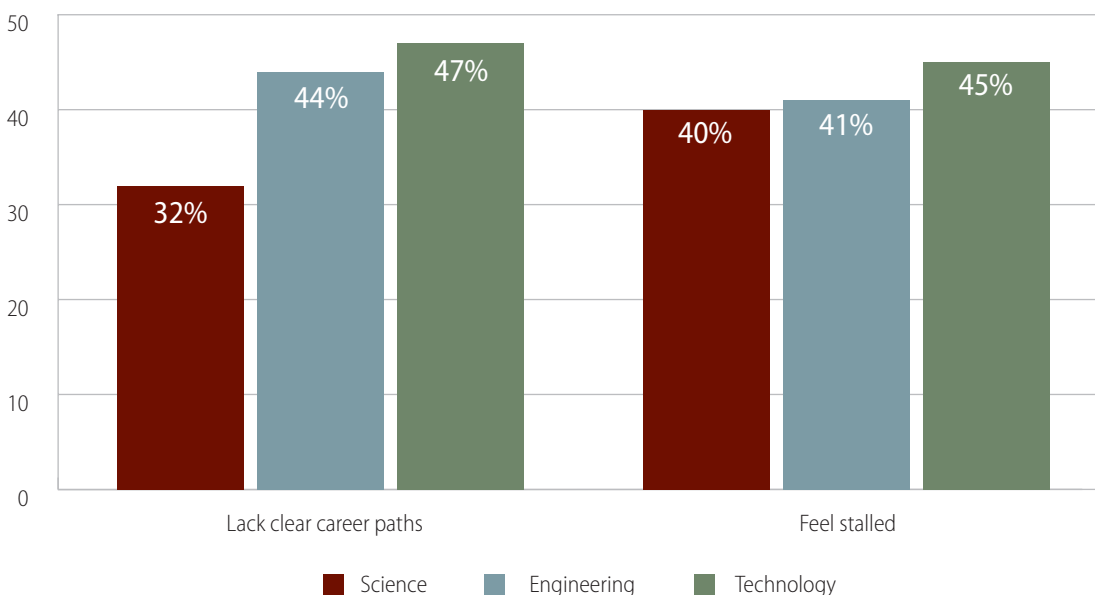
women choose to leave their work altogether. In their mid- to late 40s, the feeling of being stalled is much less prevalent among SET women. It seems that women who choose to fight rather than flee in their late 30s can count on a less rocky road. These progressions are discussed in greater detail in Chapter 7.

The dissatisfactions around stalling connect clearly to quit rates and attrition. More than 14% of women who are only somewhat or not at all satisfied with their rate of progression report that they are likely to leave the field. Compare that with less than 6% of women who are satisfied with their rate of advancement.

FIGURE 4.2
When Careers Stall
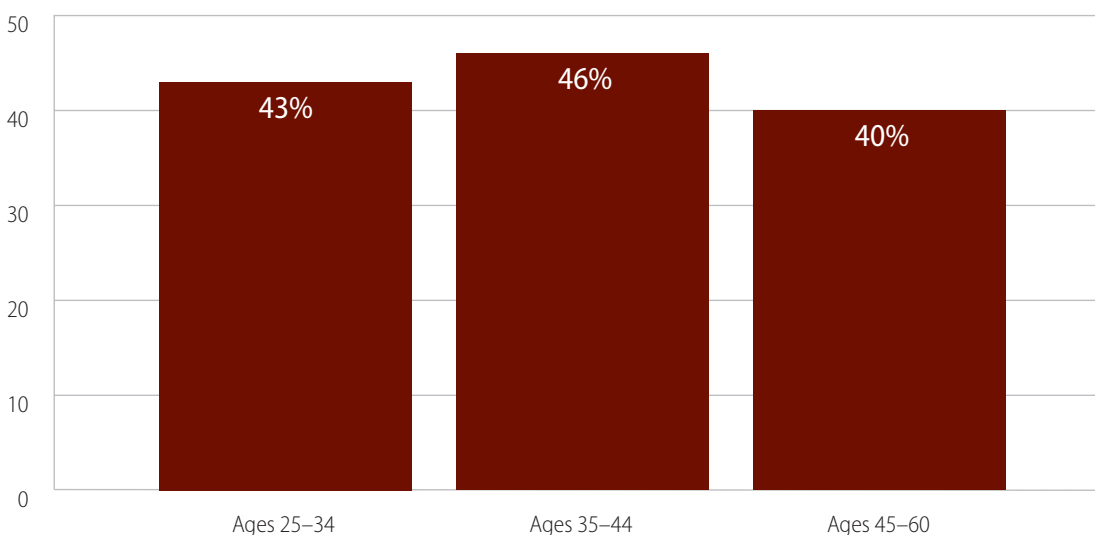
Where to Turn for Help?

Women not only have a hard time finding road maps and blueprints but they also have no one to turn to for help. Indeed, most of the women we spoke with had had no assistance in planning their careers. Says one focus group participant, "On my own initiative I put together a one-page development plan. I tried to discuss it with my boss, who told me he didn't have a career development plan, either. I then asked his boss, a senior VP. He said, 'Don't ask me. It's up to you to develop your own path.'"

We've already shown that the lack of women in upper management leads to too few women mentors and sponsors. Women's chances of finding a male sponsor, however, seem to be equally limited. One focus group participant explains: "In my experience, standout senior guys (the kind you want to be your sponsor) avoid getting too close to junior women. They're fearful of a Monica [Lewinsky] problem. Palling around with a younger female—grabbing a coffee or a beer after hours, getting to know her—has risks. They think it's better to keep women at arm's length." The Athena Factor survey found that fully 83% of SET women are without sponsors.

The Importance of Finding a Sponsor

Judith, a 37-year-old electrical engineer who is seen by her Seattle-based company as high potential, is fiercely ambitious and extremely committed to her career. Yet in a focus group discussion she was despondent about her chances of making it to VP. "I no longer have a sponsor. I don't have a senior person willing to reach out and help me get to the next level."

For 10 years she had made good progress, helped in large measure by a previous sponsor who had taken her under his wing. Judith explained the process by which he had taken her on: "We crossed paths at MIT and then six years ago I helped him handle a particularly difficult project. I gave it my all—pulled all-nighters, worked through weekends. He was impressed and grateful and ever since he's been on my side. Whenever he's seen an opportunity out there he's put my name forward, made sure I was on the slate. But this last winter my main man got fired. His division was streamlined and Larry didn't make the cut (it didn't help that he'd had a falling out with the COO). So now I feel stranded. It isn't as though there are other sponsors waiting in the wings—men seem to have all kinds of buddies in senior management, but not us women. I count myself lucky that

FIGURE 4.3
Lack of Sponsors Across SET
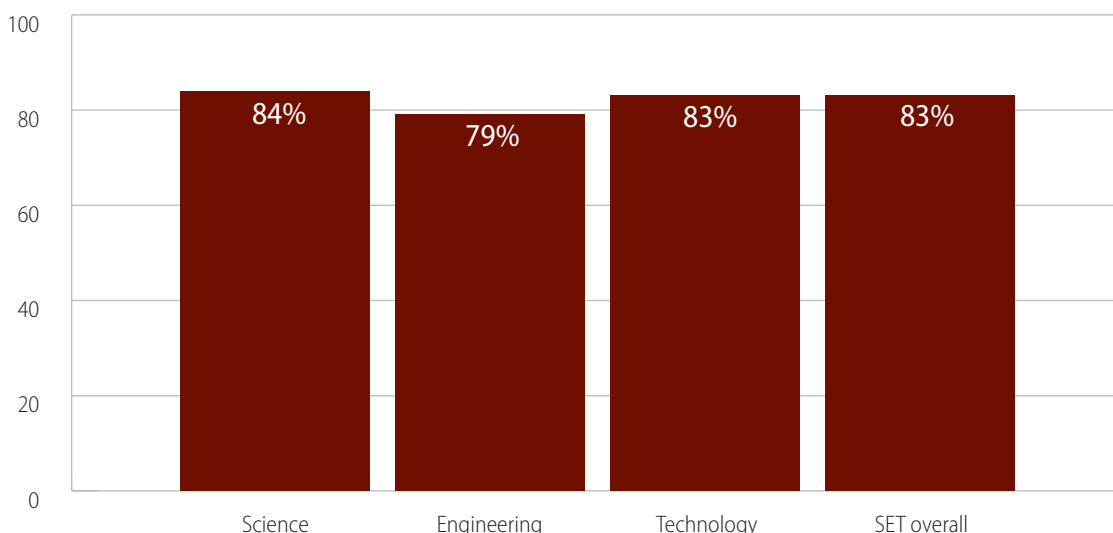
I've had even one sponsor. It could be years before I find another Larry, and I'm not sure I can wait it out…" At this point Judith's voice trailed off.

It's not that women don't recognize the value of sponsors. Indeed, they yearn for one. Yet time and again in focus groups we found that most women had never had one. They blame their predicament on the paucity of women at the top—there just aren't enough senior women to go around—and the disinterest of senior men, whom they see as focused on deepening their connections to the old boys' club.

Women variously describe a sponsor as "someone who is willing to use up chips on my behalf," "someone who has great faith in my potential," or "someone who recognizes the greatness in me." In focus groups, SET women pinpointed the critical importance of a sponsor in helping navigate the promotional hurdles five to 10 years into a career, when the going gets tougher. One woman describing the yawning chasm that faced her at age 35 said, "I need someone who can reach over, pick me up, and carry me over."

One woman at a large tech firm told us, "You never see a woman being tapped for leadership. You see men being tapped all the time—they're plucked out of the ranks by a senior guy and the rumor is that they are being groomed for a leadership position. There's a group of them here that's known for grooming the next generation of leaders; they're all white men. It's like a secret society." Another participant in the focus group agreed: "Only men get fast-tracked. I've never seen that happen to a woman. It's a question of getting anointed for one's potential by male leaders. They don't take that kind of bet on a woman."

The dearth of sponsors has a clear effect on retaining women. According to the Athena Factor survey data, women without sponsors are three times more likely than women with sponsors to be on the verge of quitting—in other words, to have "one foot out the door" (see figure 4.4).

FIGURE 4.4
Women with Sponsors Are Less Likely to Have One Foot out the Door

Legend: ■ Have sponsor and leaving   ■ Lack sponsor and leaving
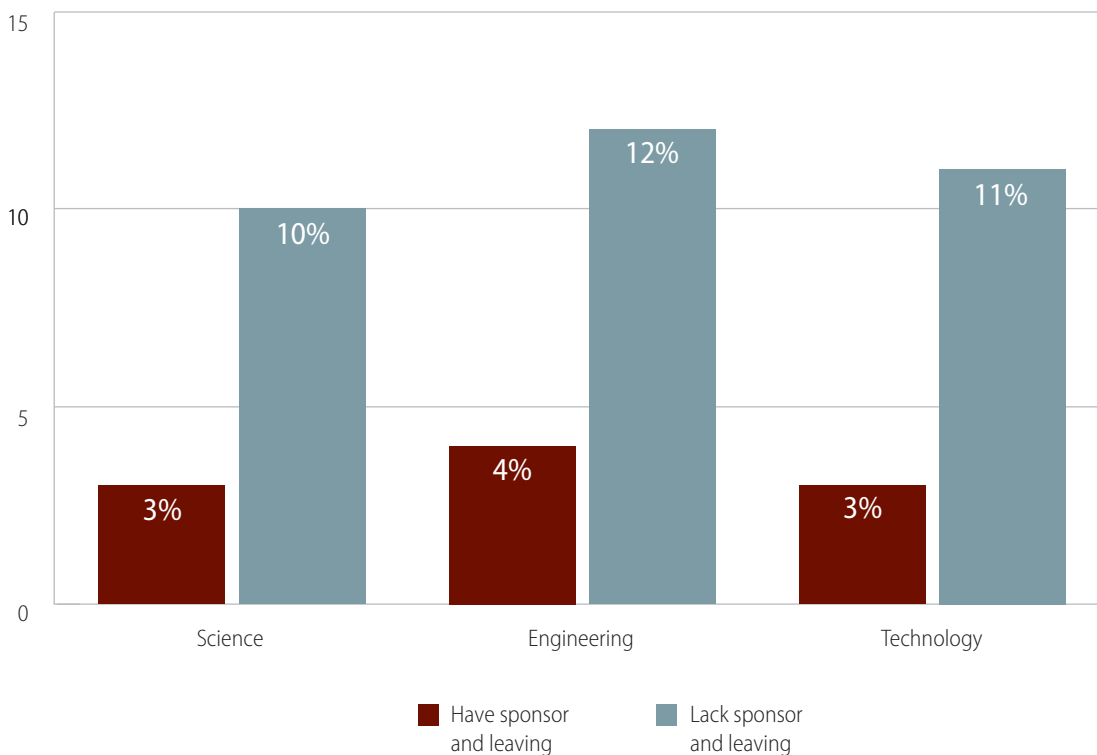
Lateral Moves

Left to themselves, one strategy employed by many women we spoke was to make a lateral move—accepting a different role at a similar level either within SET or outside. Women do this for many reasons—to show movement on their résumés, for example, or to gain experience that will enable them to advance or to find a "pocket of sanity." In this latter case, women deliberately seek a work environment that is less macho—perhaps choosing one that has significant numbers of female managers—that will allow them to flourish.

These lateral moves can provide important momentum if the employee is strategic about her choice. Some savvy female managers use lateral moves as a way to help their more junior sisters. As one senior tech manager told us, "I recently moved two women to give them lateral mobility, so they don't look stuck. Lateral moves make it look like they're going someplace." However, as we will see in Chapter 5, lateral moves are more likely to marginalize SET women by propelling them out of line positions, or out of the "business of the business."

MULTICULTURALISM IN SET

Our research reveals some striking differences in the career experiences of Caucasian, Asian, African-American, and Hispanic women in SET fields. Asian women are by far the largest minority group, making up almost 20% of SET degree holders.[38] Perhaps it is because they have reached critical mass that their career experiences tend to be similar to their Caucasian counterparts. African-Americans and Hispanics, by contrast, face greater challenges, possibly because their low numbers reinforce a sense of isolation.

Figure 4.5 illustrates how Caucasian, Asian, African-American, and Hispanic women perceive the macho and geek cultures so typical in SET firms. Caucasian and Asian women have much the same assessment of the culture, whereas African-American and Hispanic women have a much more negative reaction. Asian women are the least affected by macho behaviors—only 35% of Asian women report biases or double standards in performance

FIGURE 4.5
Perceptions of the Macho Culture

Legend: Caucasian, Asian, African-American, Hispanic

"Up against a hard hat culture": Caucasian 19%, Asian 22%, African-American 44%, Hispanic 37%

"Up against a geek culture": Caucasian 32%, Asian 32%, African-American 46%, Hispanic 57%
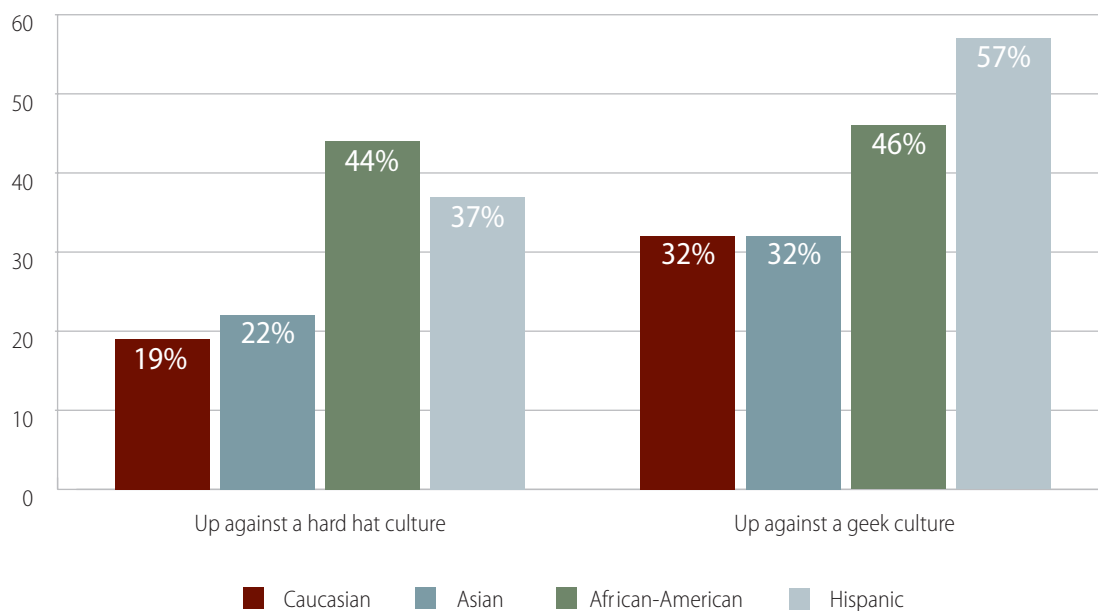
Staying put can also be bad news for a career. Eliza, a scientist who had been labeled high potential by her company, had been stuck at the senior director level for eight years. Wanting to stay on track in her career, she had avoided lateral moves. But she was aware that office grapevine said she wasn't getting promoted because she didn't have enough drive or smarts. Whatever her performance ratings, the fact she had stalled was limiting her; she was increasingly seen as not having "what it takes." She found her situation intensely frustrating, especially since a male counterpart in another division had been treated differently. Steven had also been stuck at the senior director level—in his case for 10 years—yet he was lauded as the company's Yoda, or resident expert. People came to him for advice, and he was given important assignments.

Clearly, SET women can easily find themselves in an untenable position. Unable to move up, they can be marginalized by either moving laterally or by not moving at all, and few companies provide them with clear career paths.

evaluations, for instance, compared with 40% of Caucasian women, 41% of Hispanic women, and 59% African-American women).

We know that isolation can lead to stalled careers and is a contributing factor to the mystery around career paths that so many SET women experience. Figure 4.6 shows how this plays out across minority groups. African-Americans, by far, find navigating their career paths to be more difficult than do Caucasians or Asians. It's not surprising therefore that more than half of African-American respondents feel stalled in their careers. It is unclear, however, why Hispanic women, who report considerable mystery, feel less stalled than their counterparts.

FIGURE 4.6
Multicultural Women's Career Paths

Bar chart. Y-axis from 0 to 70.

Lack clear career paths: Caucasian 40%, Asian 33%, African-American 60%, Hispanic 47%.
Feel stalled: Caucasian 42%, Asian 32%, African-American 52%, Hispanic 29%.

Legend: Caucasian, Asian, African-American, Hispanic
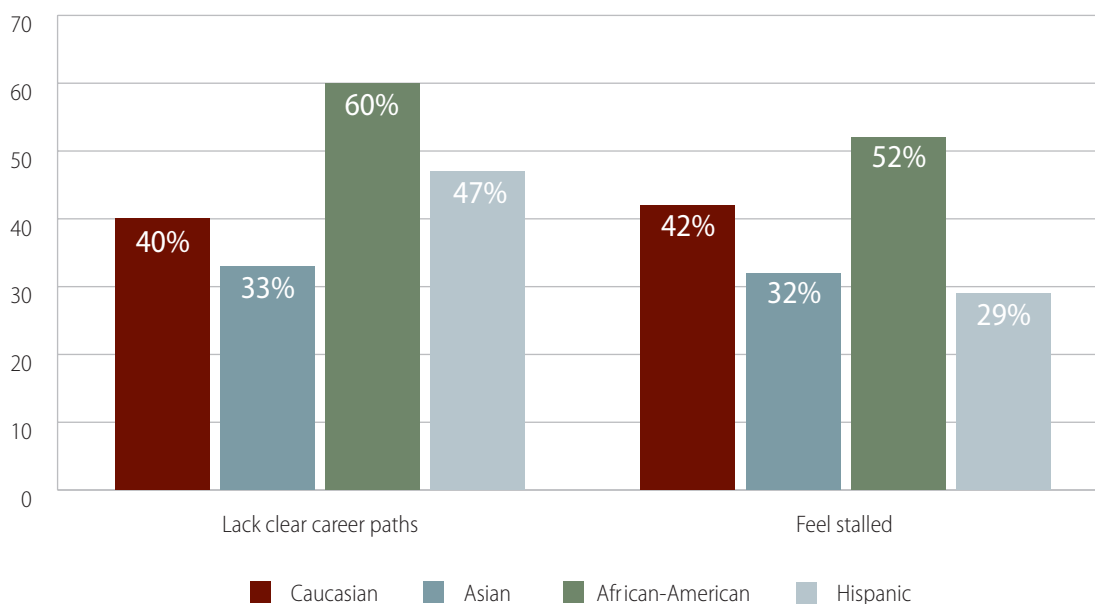
CHAPTER 5: RISK, RECOGNITION, AND REWARD

The subject matter was "risk and rewards," and focus group participants (eight senior engineers—six men, two women—at a California-based technology company) were engaged in a conversation that centered on how you move up the career ladder. "How do you get promoted around here?" asked David, a distinguished engineer and the most senior person in the group. "It's simple. Like Superman you make a 'diving catch'—you just swoop down out of the sky and fix some potentially catastrophic problem.

"I'll give you an example: This time last year one of our systems was crashing in Russia. An important customer is panicked—and outraged. I'm in Austin. I get a phone call 2 AM Sunday. By 5 AM I'm at the airport, having assembled a team. Three flights later we're at the site, wrestling with a system that's near total collapse. We figure things out—stabilizing the situation, getting the platform up and running. I'm a hero. Two months later I got a double promotion—actually leapfrogged a whole job grade."

David's story did not go down well with the women engineers in the room. Kaitlyn's words were pointed: "Typical male macho behavior…I find it infuriating that it's this crack-of-dawn, emergency-surgery stuff that gets you promoted. Women are just not cut out for this. For starters you might have a few childcare issues at 2 AM Sunday, but more importantly, it's much too risky. If you dive and fail to catch, which happens all the time, a woman can go from hero to zero in a heartbeat. As a female, you're isolated and don't have buddies to pick up the pieces. If you get whacked, there's no one to cover for you. You're out there on a limb—on your own.

"So you don't take the risks, you don't get the visibility, and you're passed over when it comes time to hand out bonuses and promotions."

Susan, another female engineer in the room, had a thought: "There's another problem with this 'diving catch' thing. Why don't we just build the system right in the first place? Women are much better at preventive medicine. A Superman mentality is not necessarily productive; it's just an easy fit for the men in the sector." Because it is generally men who are making the promotion decisions, they recognize this behavior and reward it.

Risk and Rewards: A Gendered Reality

In many focus group discussions, SET women described work cultures that encourage a state of crisis and celebrate diving catch behavior that "saves the day." These diving catches can provide visibility—and rewards—to an employee who is willing to travel thousands of miles and work around the clock to fix a potentially disastrous situation. As we dug deeper into this phenomenon, we discovered that women and men are rewarded very differently for taking risks. A full 35% of women perceive that risks don't translate into success.

Diving catches can be very risky. You can, after all, dive and fail to catch. As one male engineer told us, "This is risky business, there are no guarantees in these situations…a person can crash and burn." He then went on to explain that when he attempted a diving catch he made sure to put in place some "cover"—a senior colleague who would support him should he fail.

Because they often lack mentors and sponsors, many SET women find it much more difficult to find "cover." As a result they tend to be risk averse.[39] Athena Factor survey data showed that 17% of SET women believe they don't get second chances. For them, the downside to taking risks is just too great. In focus groups, women were vocal about the gendered nature of risk-taking in SET companies. Says one female engineer, "Men play differently…Men will make decisions to move forward and do things that are high risk. That's because men are able to walk away unscathed from a mistake—women aren't."

The research also shows that, even when women do make a diving catch, they aren't always recognized for their efforts. Miriam, an engineer we interviewed, told of sacrificing her Easter Sunday to deal with an emergency. One of the systems at her plant was down, and the resulting stoppages were costing the company. Understanding the urgency of the situation, she decided to

FIGURE 5.1
Taking Risks and Losing Out
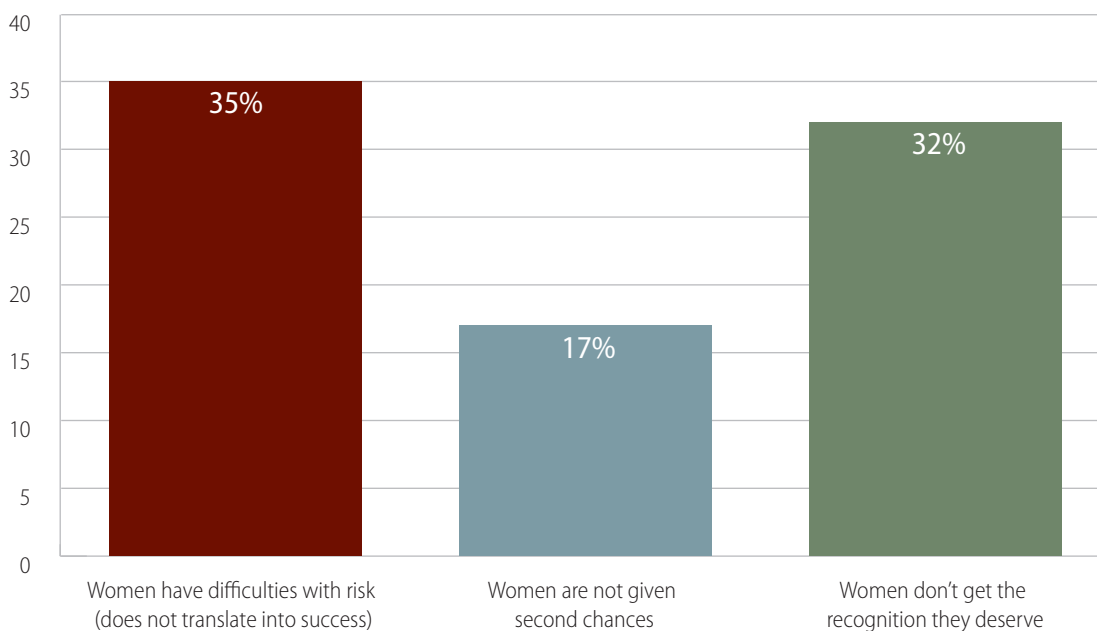
abandon her family and went into work. She spent the whole of Easter at the plant, getting the failed system up and running again. She felt good about her sacrifice until she went into work Monday morning and found that her heroics had gone virtually unrecognized. Partly because she wasn't well connected in senior management, she had no one to toot her horn. She barely got a pat on the back.

For many women in SET, these challenges around risk and reward intensify over time. As women climb the ladder, there's a significant increase in the number who have difficulty with risk—and an appreciable increase in the number who understand that they don't get second chances (see figure 5.2). It seems that as women gain experience—and suffer the knocks and bruises of trying but failing to catch—they become more risk averse, which undoubtedly affects their ability to move to the next level.

In addition to opting not to make diving catches because of escalated risk, women also do less to advertise their successes. In focus groups, SET women talked about the need to do a better job selling themselves and the desirability of learning how to "advertise" their contributions— something their males peers did on a regular basis. Alison, who worked for a high-tech company in Boston, made the following point: "If you want to get recognized, you need to be constantly telling your manager how much you are doing—women just don't do this. When talking about a recently completed project, a woman will say I did this much." Alison demonstrated by holding her hands a few inches apart. "While a man will say I did this much," now holding her hands two feet apart.

Creator/Producer Versus Executor Roles

Lack of recognition extends beyond the extraordinary effort of diving catch cultures to more routine aspects of work. In focus groups, SET women repeatedly told us that men occupy the "creative" and "producer" spaces while women are pushed into execution.[40] The former roles carry the lion's share of status and rewards in SET companies; the latter are seen as subordinate and are

FIGURE 5.2
Taking Risks and Losing Out, by Age

Legend: Ages 25–34 | Ages 35–44 | Ages 45–60

Women have difficulties with risk (does not translate into success): 28%, 35%, 40%
Women are not given second chances: 14%, 15%, 20%
Women don't get the recognition they deserve: 28%, 31%, 36%
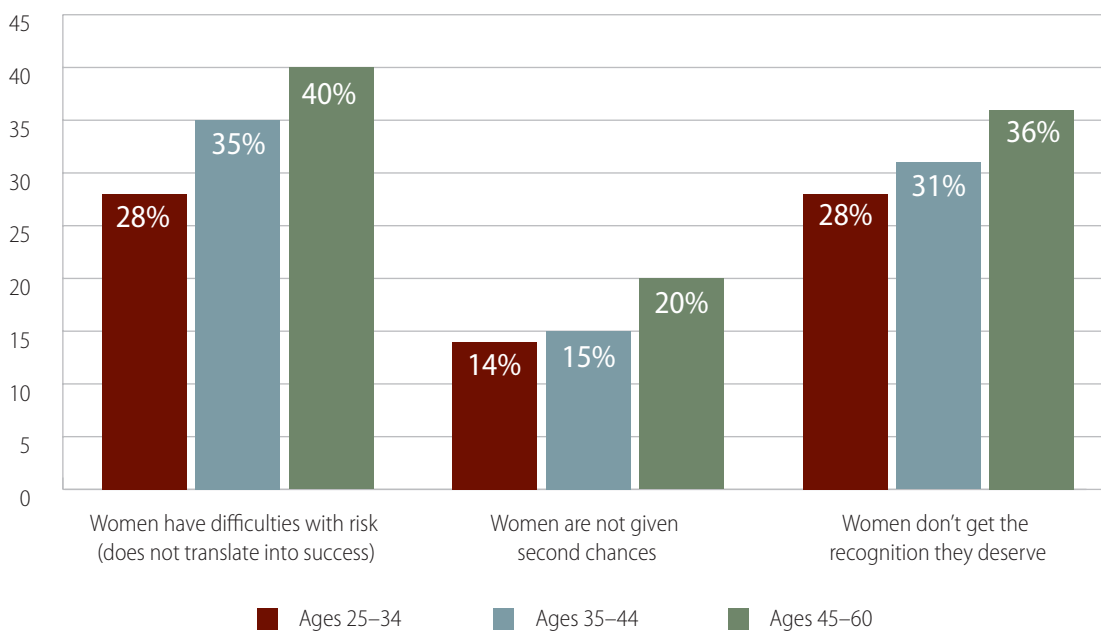
FIGURE 5.3
Creator versus Executor Roles

Legend: Science | Engineering | Technology

Women are pushed into execution roles: 35%, 36%, 45%
Women do not have equal access to the creator role: 41%, 39%, 42%
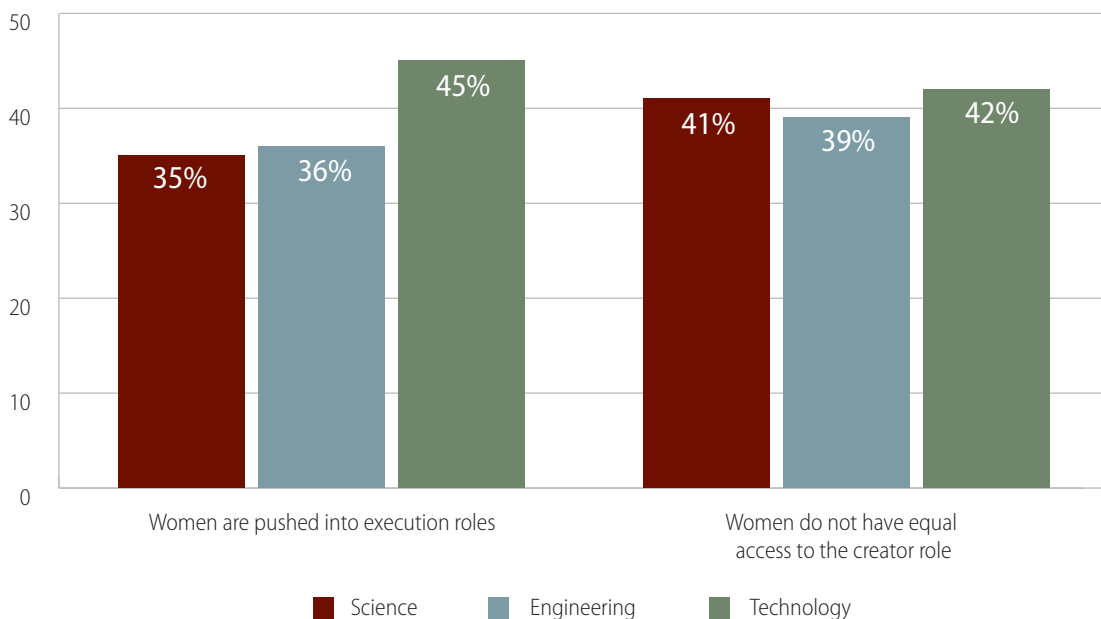
often poorly rewarded. Figure 5.3 shows that almost half of women in SET believe that females are pushed into execution roles and do not have the same access as men to the "creator roles."

Naomi, an endocrinologist working at a pharmaceutical company in New Jersey, described how she had joined her company "with a thirst for discovery, but slowly, over time, I was nudged into 'helper' roles—executing the strategies, making sure things actually got done." Some of the more senior women we interviewed told us that sometimes they deliberately cultivated incompetence in these areas—pretending to be disorganized or inefficient—to avoid being pigeonholed into stereotypical female roles. Being "great at follow through" just doesn't get you promoted. Indeed, these traits can backfire. Despite the intrinsic value of execution, a woman exhibiting strength in this area runs the risk of being seen as a Girl Friday rather than a creative genius.

Research in the field confirms this dichotomy between creation and execution roles. According to Rob Goffee and Gareth Jones, SET corporate cultures "celebrate clever ideas."[41] The very fact that SET companies reward a very narrow band of behaviors means that there are few opportunities to recognize contributions that more typically come from women.

Erica, a technologist at a Silicon Valley company, says she is often accused of being "process driven" as if it were some kind of liability: "It shouldn't be a problem that I actually get projects completed." The execution skills that women bring to the table are essential—team management, ability to deliver on time, accuracy, and attention to detail—but they're routinely discounted in SET workplaces.

In summary, many SET work cultures place a high value on risky behaviors: They celebrate heroic diving catches made at the eleventh hour to rescue a failing project. However, men and women are rewarded differently for taking risks, and women—who lack strong "buddies" and a cheerleading group—cannot bounce back if they dive and miss. In fact, even when they dive and catch, their lack of support means their effort often goes unnoticed. Finally, women are often pushed into the less flashy and less valued executor-type roles.

CHAPTER 6: EXTREME JOBS

Jennifer, who has a PhD in microbiology, began her career at a pharmaceuticals company in the Midwest, first doing research then moving to the clinical side, where she found a good niche for herself—one where she could both do intellectually challenging work and feel as though she was contributing to society. A few years later Jennifer married, and she and her husband (a colleague at work) had their first child. At about the same time the company restructured, and Jennifer was offered a job at another location—which would have meant living apart from her family. With some regret she turned that opportunity down, taking a job at another company. Her new position required international travel, but Jennifer managed to cope because her business trips "while long, were relatively infrequent."

Then a second child was born. According to Jennifer, that's when "the mommy syndrome really kicked in. It was hard for me to travel at all—partly because I now had two small children and partly because of a move to a new community (my husband took a job at an East Coast pharmaceuticals firm) where I had no support network." Jennifer realized she and her husband could not both have ambitious careers and reluctantly scaled down her own career expectations. In her words, "I decided to have a job instead of a career." So she got a nontraveling job at the same firm where her husband worked and moved out of research into technical writing. After two years in her new job, the company decided to move the technical-writing division to India to cut costs, and Jennifer and her colleagues were forced to spend 18 months training their replacements. Disillusioned, Jennifer has decided she is better off staying home with her children. "I'll come back in three or four years when they're teenagers," she says, "and then I just want one of those jobs where I can put in some hours, punch the clock, and go home." Her talent completely underutilized, Jennifer's experiences have wrung the ambition out of her.

According to CWLP research on the high-echelon labor market, work pressures have become more extreme in recent years: A growing proportion of managerial workers travel extensively, put in long hours, and deal with 24/7 client demands.[42] Extreme work pressures are now present across industrial sectors and across stages of a worker's life.

The Athena Factor survey data show that high-echelon SET jobs are more extreme than the norm. As illustrated in figure 6.1, women in science, engineering and technology are more likely than women in other sectors to be coping with 100-hour workweeks (8% versus 3%), dealing with 24/7 customer demands (36% versus 26%), and working across multiple time zones (54% versus 14%).[43]

Some of the findings are eye-catching. More than one-third need to be responsive to clients, customers, or colleagues around the clock, and more than two-thirds feel enormous pressure to put in a great deal of face time. Being tethered to the lab is a particular complaint of women in science-based companies, where 79% report onerous face-time pressure. Jobs in technology and engineering come with heavy-duty global demands: Engineers and technologists are twice as likely as scientists to work across multiple time zones.

Athena Factor survey research, which focuses on women in global science, engineering, and technology companies, found that women in large engineering and technology companies log even more onerous hours than SET women overall (see figure 6.3).[44] However, women in the global pharmaceutical company we surveyed fared slightly better than their counterparts in global manufacturing and high tech.

Extreme Work Pressures Disproportionately Affect Women

Women are more affected than men by the extreme pressures of SET jobs. Long workweeks, global responsibilities, and 24/7 client demands make it difficult for both parents in a family to hold on to ambitious careers. Participants in several focus groups identified with the "two-body problem"—the issues that arise when spouses have similar credentials.[45] Spouses can be competing for seniority at work (more pay, a better title) or seniority at home (more support, fewer chores). Either way, male needs are often prioritized, at least in part because at the same time women

FIGURE 6.1
Extreme Job Pressures: Women in SET Compared with All Sectors
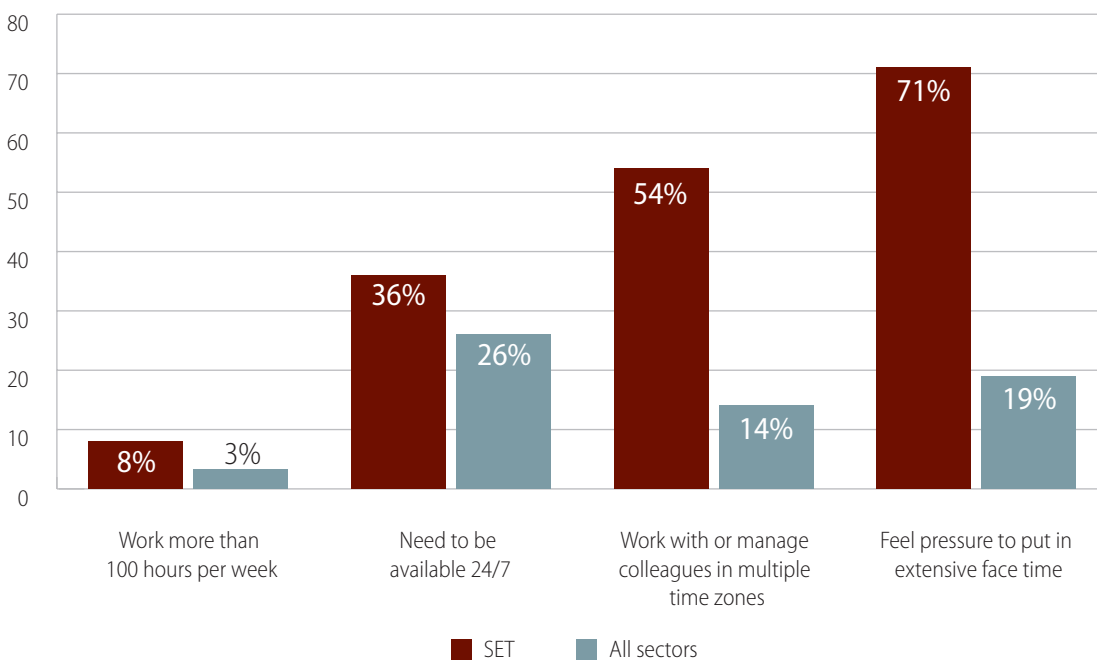
FIGURE 6.2
Extreme Job Pressures: Women Across SET
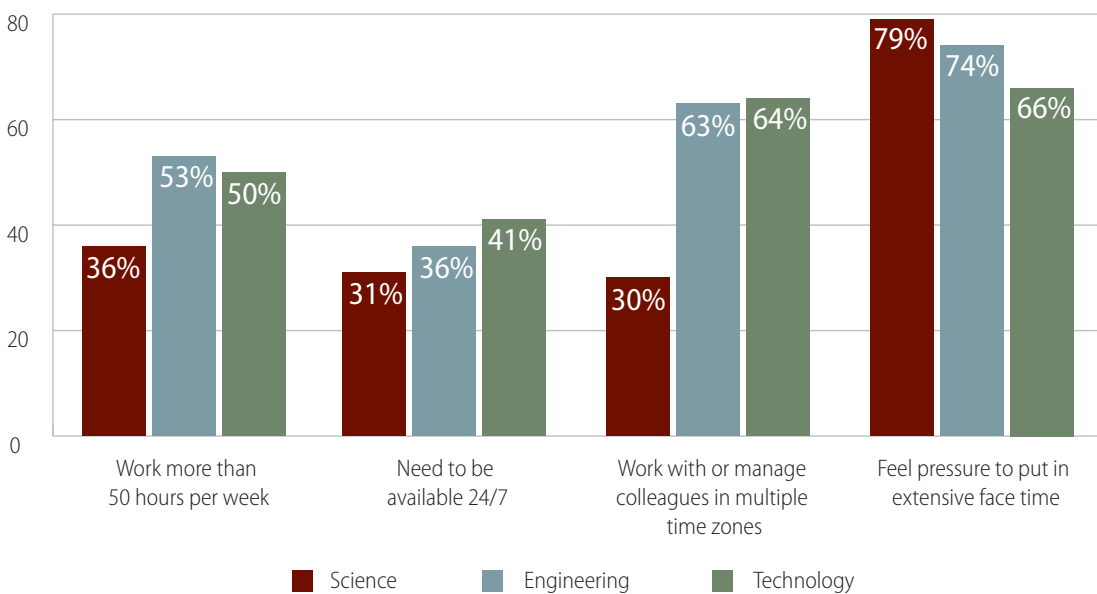
FIGURE 6.3
Long Workweeks (50+ Hours) for SET Women
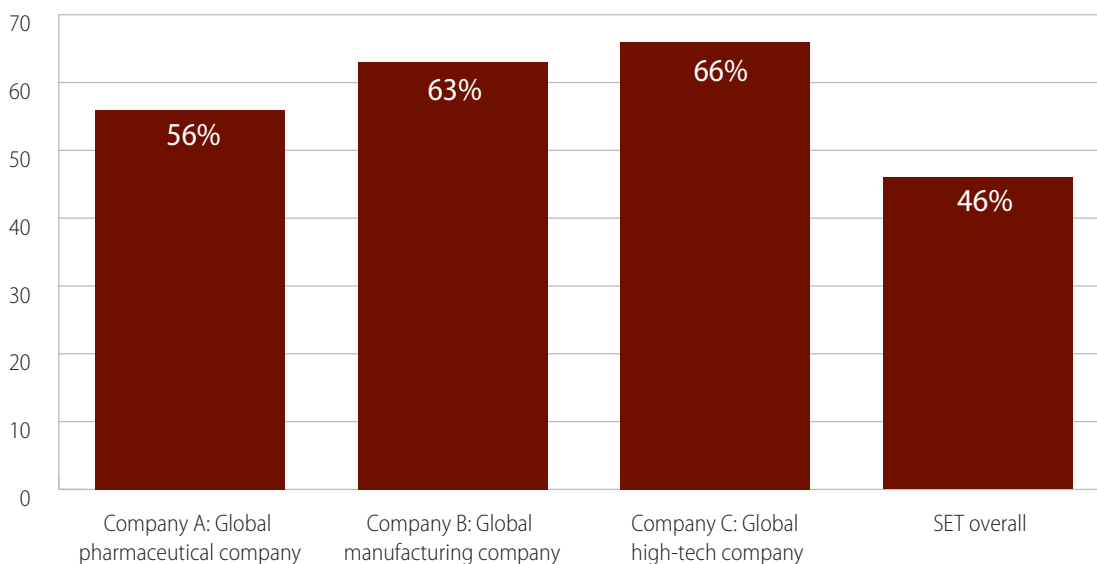
get sidetracked by raising children, men begin earning more. Then it becomes an economically rational decision for a family to give priority to the husband's career. Among respondents in the Athena Factor survey, 49% of women surveyed said they had a spouse who earned more than they did, compared with 17% of men.

Family/work dynamics are complicated. Culture, socialization, and economics all play important roles. But the bottom line is clear: Care-giving responsibility, for both children and elders, still falls disproportionately on women.

Our survey data show that between the ages of 25 and 34, 36% of women have childcare responsibilities. That figure jumps to 47% in the 35- to 44-year-old age group. The combination of delayed childbearing with the advent of a second child in the 35- to 44-year-old age bracket translates into a significant increase in childcare pressures in the mid- to late 30s (see figure 6.4). In addition, at this point eldercare responsibilities kick in: 11% of 35- to 44-year-old women are involved with eldercare, and that figure increases sharply over the next decade. This mid- to late 30s time period seems to be some kind of watershed for women in SET.

In focus groups in Shanghai and Moscow, we found eldercare responsibilities to be particularly onerous for SET women. In China we talked with young women engineers who were part of the first generation produced by the "one-child policy." Because they have no siblings and because husbands were "off the case," these women were solely responsible for parents who, although not very elderly (many were in their 50s and 60s), were in poor health and unable to work. Cultural expectations require the daughter-in-law to provide care. Similarly, many young Russian female engineers found themselves disproportionately responsible for needy elders (parents and parents-in-law) who had lost their homes and their livelihoods in perestroika. Here, too, men seemed to be "off the case."

The difficulties of balancing extreme jobs with ongoing family responsibilities lead to a great deal of female attrition from SET fields. As we shall see in Chapter 8, some women leave the workforce entirely; some opt for a flexible work arrangement; others stay where they are (avoiding promotions) or downshift to a job with less pressure. Many believe the best option is to keep one

FIGURE 6.4
Burden of Care, by Age
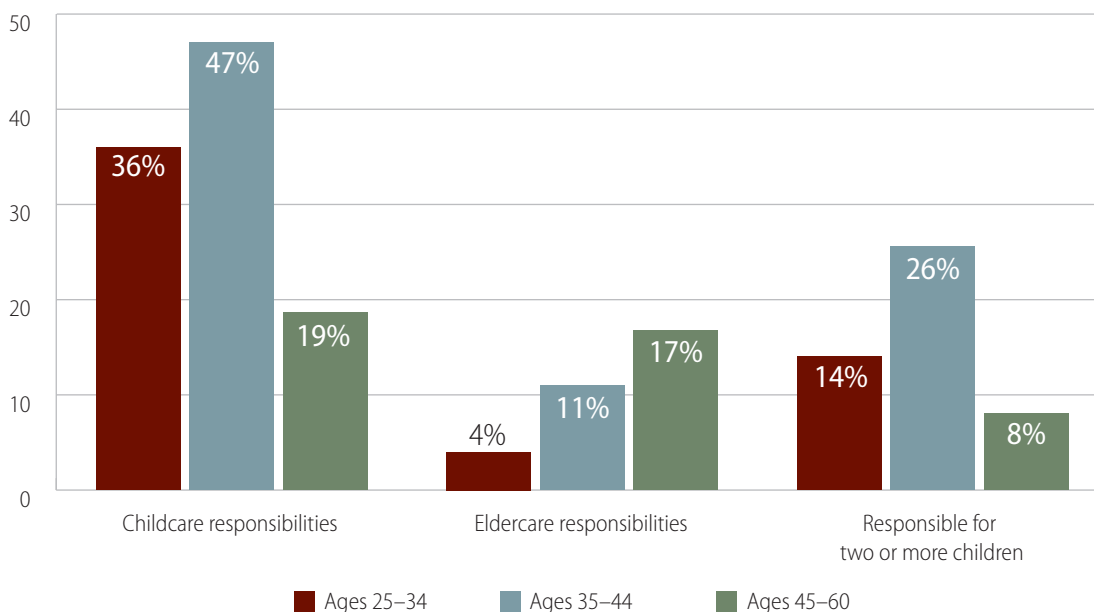
foot in the field they love while trying to devote sufficient time to their family responsibilities. But that approach can be dangerous.

Downsizings and Reorganizations

As discussed in Chapter 5, women often fail to realize the risk involved in staying put or downshifting. These strategies take them off the leadership track at a critical juncture. They also make them more vulnerable when downsizings and reorganizations come down the pike.

Downsizings and reorganizations are a reality in the corporate world, and SET firms are no different. These restructurings leave employees vulnerable to layoffs; our research indicates that restructurings can be particularly treacherous for women. Twenty percent of the women who participated in the Athena Factor survey believe that women are more negatively impacted than men during reorganizations. Women's vulnerability stems from two factors.

First, because women are less likely to be in the "business of the business"—often by choice because they have deliberately sought a pocket of sanity—they are more likely to be in roles that can be eliminated or outsourced. Many women make a series of seemingly rational choices (often in response to family concerns) at key points in their careers that move them to increasingly peripheral roles. They fail to appreciate, as they make these choices, that they are becoming more and more exposed—and expendable. Second, because women are not part of the old boys' club and tend not to have sponsors, they have less protection during a reorganization or downsizing. In other words, there is no one to deflect or cushion the blow.

The fact is, fewer women than men (49% versus 60%) are in the "business of the business"— defined in the survey as line positions in the core business. Only 23% of women in SET report having rainmaking responsibilities (compared with 32% of men), and only 24% say they have profit and loss responsibilities (compared with 35% of men). Take Jennifer, the scientist we met at the beginning of this chapter. Her move from research and development to technical writing— away from the business of the business—ultimately led to her losing her job.

FIGURE 6.5
Women Tend Not to Be in the Business of the Business
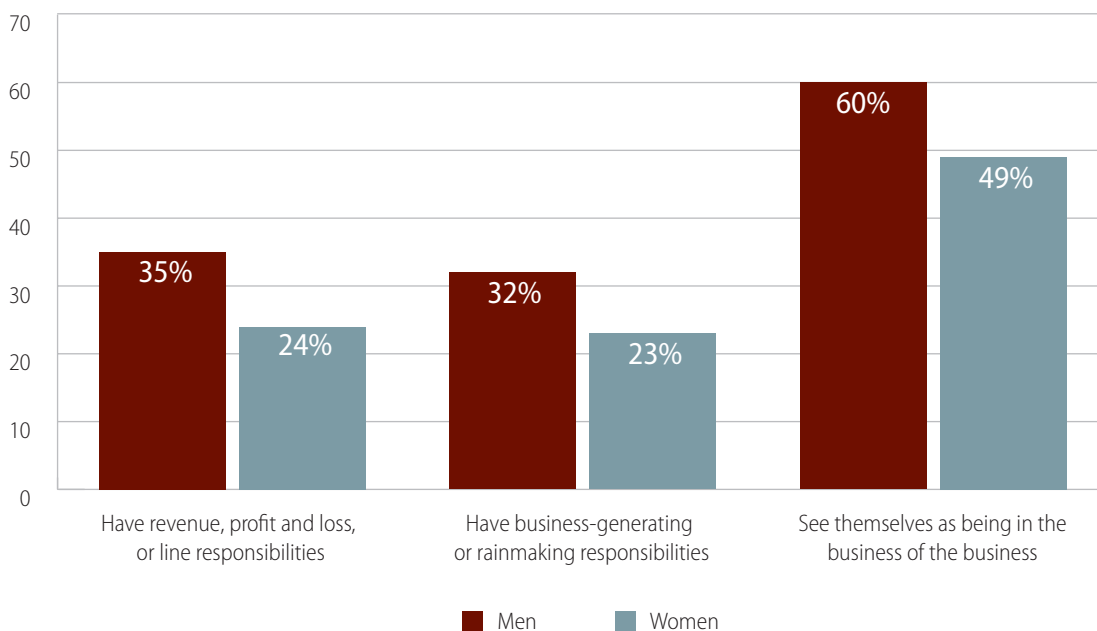
Men   Women

FIGURE 6.6
Women Tend Not to Be in the Business of the Business Across SET
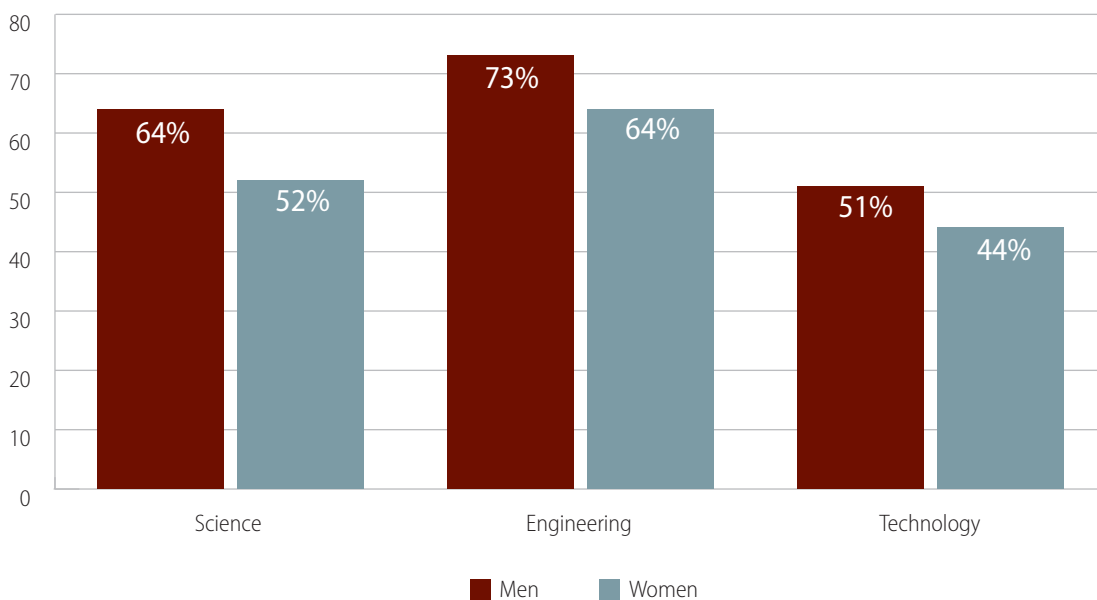
Men   Women

The problem is that in SET careers advancement often means taking a much more extreme job. Several women we interviewed had the opportunity to take such jobs but could not imagine how they could perform well in them *and* meet their current or prospective family responsibilities.

Lengthening the Runway

In focus group discussions, many women told us that, given their family responsibilities, they would like to remain on the same career rung for a while, but they did not see that as an option. Take Shannon, a young African-American engineer who was eager to advance in her career and had significant senior support at her company, including a mentor. Pregnant with her first child, Shannon was concerned about the choices she would soon need to make. Ideally she would like to tread water "just do a great job where I am until I get my family started…then down the road I would like to really ramp up." Unfortunately, this plan seems to be a nonstarter. Her mentor has told Shannon that "if I pass up an opportunity for promotion, I won't last."

Lengthening the runway would help keep Shannon—and many other women—satisfied and productive. Athena Factor survey data show that 44% of SET women believe that allowing women to stay at one level for a longer period of time without being written off would increase retention. This desire was voiced most often by female technologists, 47% of whom want longer runways.

FIGURE 6.7
Women Want a Longer Runway Across SET
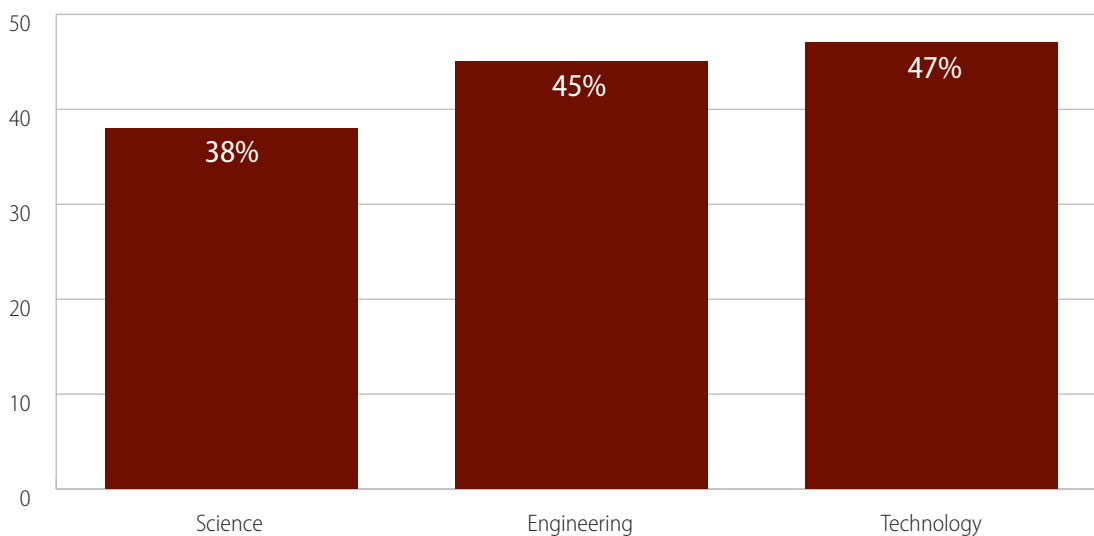
CHAPTER 7: ACROSS THE MICROCLIMATES

Thus far, we've been talking in broad terms about women across the SET fields. Before assessing the full impact of these antigens—before counting the losses in terms of female brain drain—it is helpful to take a closer look. This chapter puts individual businesses under the microscope to examine exactly how the opportunities and barriers described in the previous chapters manifest themselves in specific corporate settings. As part of the Athena Factor research, we fielded surveys inside three large global companies: one pharmaceutical (Company A), one manufacturing (Company B), and one high tech (Company C). These surveys allowed us not only to dig deeper into the microclimates but also to play out some of the antigens in the global context. While this chapter does not attempt to be comprehensive, it will illuminate key differences across these sectors and firms.

COMPANY A

Gina, who has been working at the same scientific company for 10 years, told us that she entered her field full of ambition and purpose. With her PhD in microbiology, she felt ready to change the world. Initially, she found the company to be a great place to work. The demands of the job were reasonable, and her coworkers were supportive. Over time, however, she noticed that the experiences of men and women at her company were very different. Men were "plugged in"—they knew a ton of people and seemed to know exactly how to "slide right by." And women, by contrast, unwittingly picked up the slack.

She demonstrated her point by telling us about a male colleague who was leading a project. One of his subordinates had taken ill and missed a few days of work, thus putting the project behind schedule. Unfazed, the team leader simply told his boss that the project wouldn't be finished on time, and his boss accepted the excuse. Gina was amazed; when she'd been in a similar situation a few months earlier, she had finished the project herself—staying late, coming in on the weekend, and canceling a family trip. The thing that really annoyed her was

FIGURE 7.1
Company A: Prime Motivators for Women

Motivator	U.S.	UK
Love their work	85%	80%
Ability to contribute to the well-being of society	74%	50%
Being highly compensated	35%	33%
Having a powerful position	8%	6%
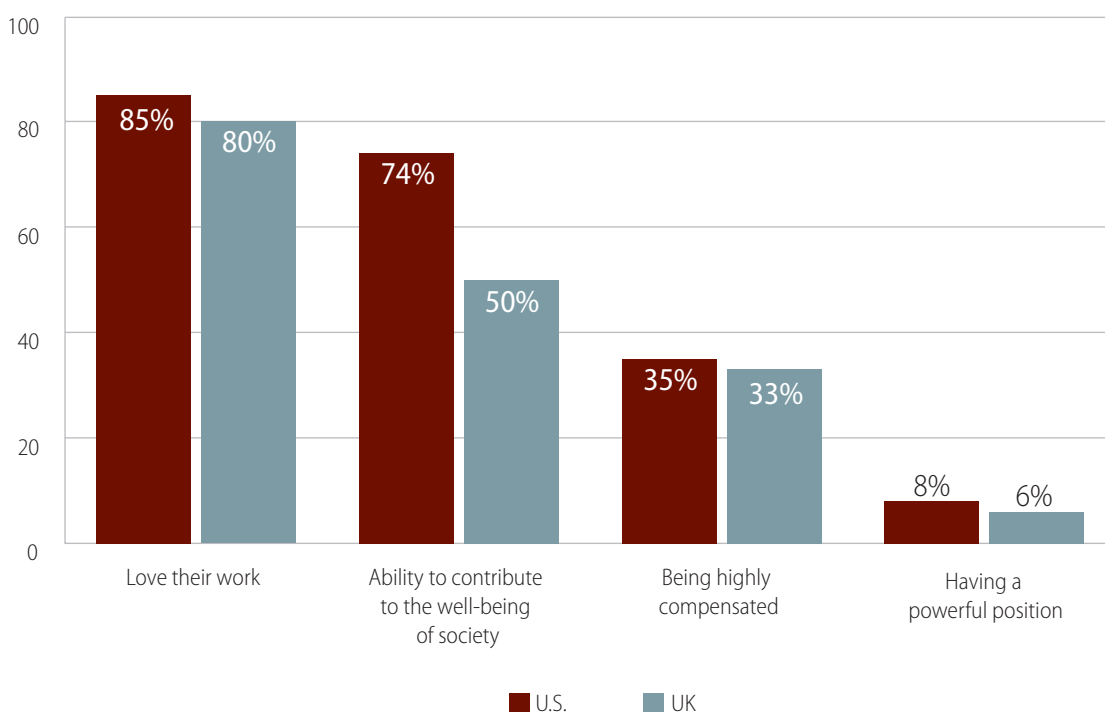
when she brought the project in on time, no one noticed—she didn't even get a pat on the back for the extra effort. She continues to love her work but is sometimes discouraged by the lack of recognition.

Gina's story illustrates exactly how dangerous unsupportive work environments can be—even when the other culture factors are in check. When women see men effortlessly climbing the ladder they can become disillusioned and turned off.

Women Scientists Love Their Jobs

The women at Company A (the global pharmaceutical company) are extremely vested in their careers: An amazing 85% of female respondents working in the United States say they love their jobs (see figure 7.1). The majority of women scientists at this company chose their jobs because of opportunities to better the lot of humankind. Fully 68% of female respondents ranked "ability to contribute to the well-being of society" as their primary motivation. For women at Company A, altruism trumps both pay/compensation and a powerful position as motivating factors.

Workplaces Are Less Macho

Relatively few women scientists here see the corporate culture as macho (13%, compared with 22% across SET). For example, a mere 8% of female survey respondents report that dressing in feminine attire brought them unwanted attention, as opposed to 17% in the larger SET universe.

Mysterious Career Paths

Women scientists at Company A do, however, see mysterious career paths as a problem. They also find it difficult to find support in senior ranks. Similar to the female experience across SET, almost half (43%) of the women here feel that they do not know how to climb the ladder at their organization. Indeed, more than half report feeling stalled in their careers. Part of the explanation lies in the fact that fully 46% lack role models; in pharmaceutical companies women tend to populate the lower ranks. Women are hungry for success stories and role models to emulate. They feel that men have much richer networks of support in senior ranks, which is an advantage when it comes to promotion and advancement. This last finding is mitigated in Company A's operations in the United Kingdom, where fewer women feel that men progress more quickly (see figure 7.3).

FIGURE 7.2
Company A: Macho Culture and Key Macho Behaviors

Legend: U.S. / SET overall

Up against a macho culture: U.S. 13%, SET overall 22%
Can't talk about work-life issues: U.S. 18%, SET overall 25%
Believe feminine dress would get unwanted attention: U.S. 8%, SET overall 17%
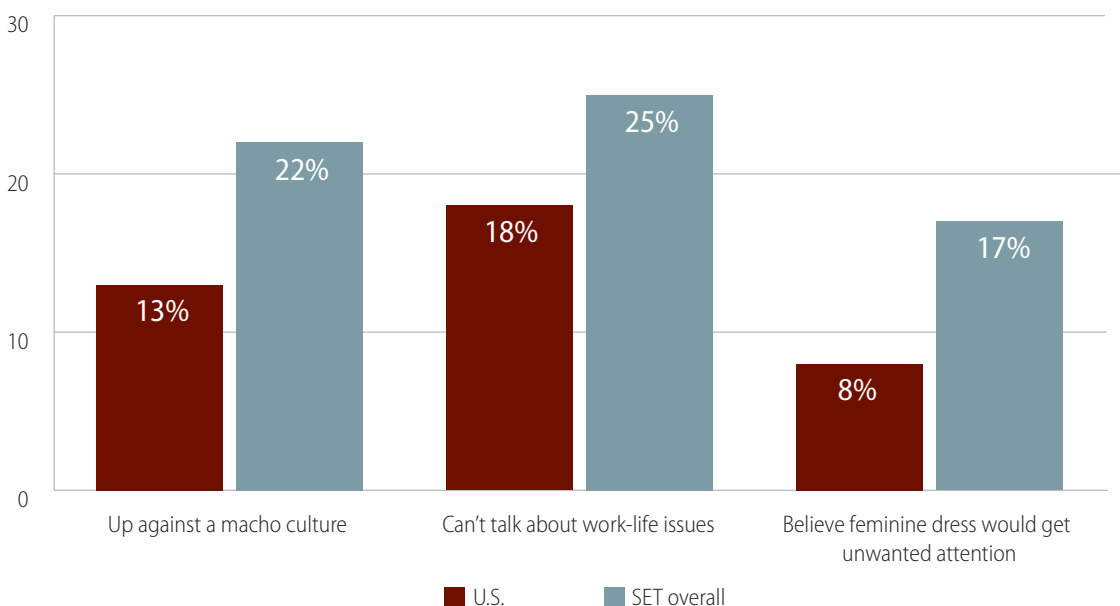
FIGURE 7.3
Company A: Stalled Career Paths
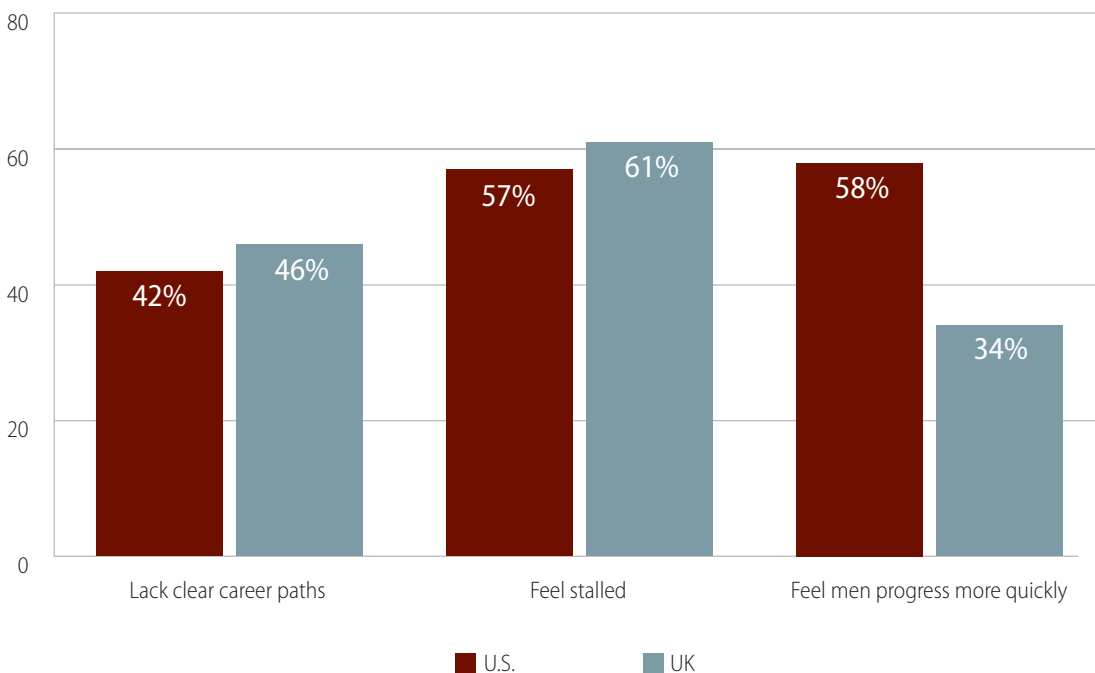
FIGURE 7.4
Company A: Extreme Job Pressures
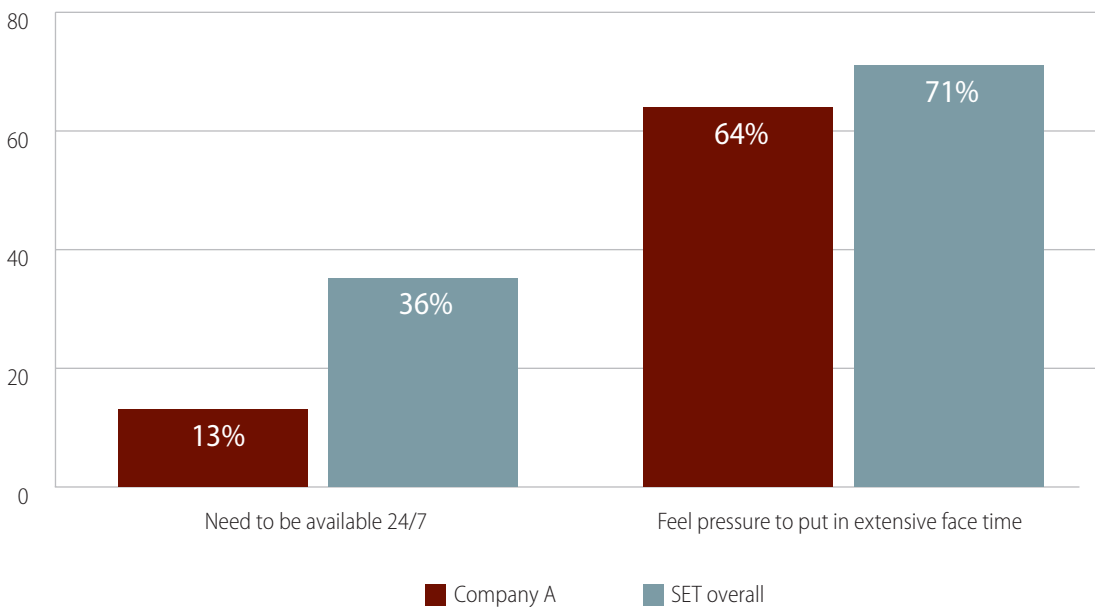
Extreme Jobs

According to our data, jobs at Company A are less extreme than in our larger national survey. Only 13% of respondents report the need to be available 24/7 (compared with 36% in the larger

survey), yet 66% of female scientists feel pressured to put in significant amounts of face time.

Maureen had just started at the company when we met her. A statistician, she had never worked in an extreme culture and didn't think that a pharmaceutical company would create extreme work pressure. "Boy was I wrong," she said during a focus group. In her work with lab teams, Maureen saw firsthand what a struggle it was for her colleagues—particularly mothers with young children—to deal with the tyranny of the research protocols and salvage any time away from the lab. In her words, "I would talk to coworkers and realize that they were held captive by whatever was happening in the lab. Experiments often span 36 hours and can't be left for more than 30 minutes—talk about being tethered to the lab." Maureen saw up close the push and pull SET women experience as they struggle wanting to succeed at work, and at the same time, look after loved ones at home.

COMPANY B

When we spoke with Amy, an extremely successful engineer at Company B, we asked her what it is like to be a woman in a male-dominated field. She doesn't see it that way. She told us, "[I am] an engineer in an engineer-dominated field….Yes, because I am a woman I have had some additional challenges but overall, I deal with them." She explained that for her, engineering was something that she was good at. Throughout her career, she had looked at senior people above her and said to herself "Hey, I could do that better." And she did. She went after each promotion actively—getting the experiences and taking the risks that needed to be taken. Now her senior leadership position allows her to help the women under her do the same. Not all women are as confident and ambitious as Amy, but she is a powerful role model proving that it can be done.

Women Engineers Love Their Jobs

Eighty-one percent of female engineers at Company B say they love their job. Like those in the Company A, they entered their careers full of enthusiasm and good intent. Nearly three-quarters (72%) enjoy feeling that their work contributes to society. And a large majority finds their work intellectually challenging. Indeed, 100% of women between the ages of 30 and 34 feel this way

FIGURE 7.5

Company B: Women Engineers Exhibit High Levels of Commitment

Legend: Ages 30–34 · Ages 35–39 · Ages 40+

Categories: Love their work; Find the work intellectually challenging and stimulating; Like being able to contribute to the well-being of society
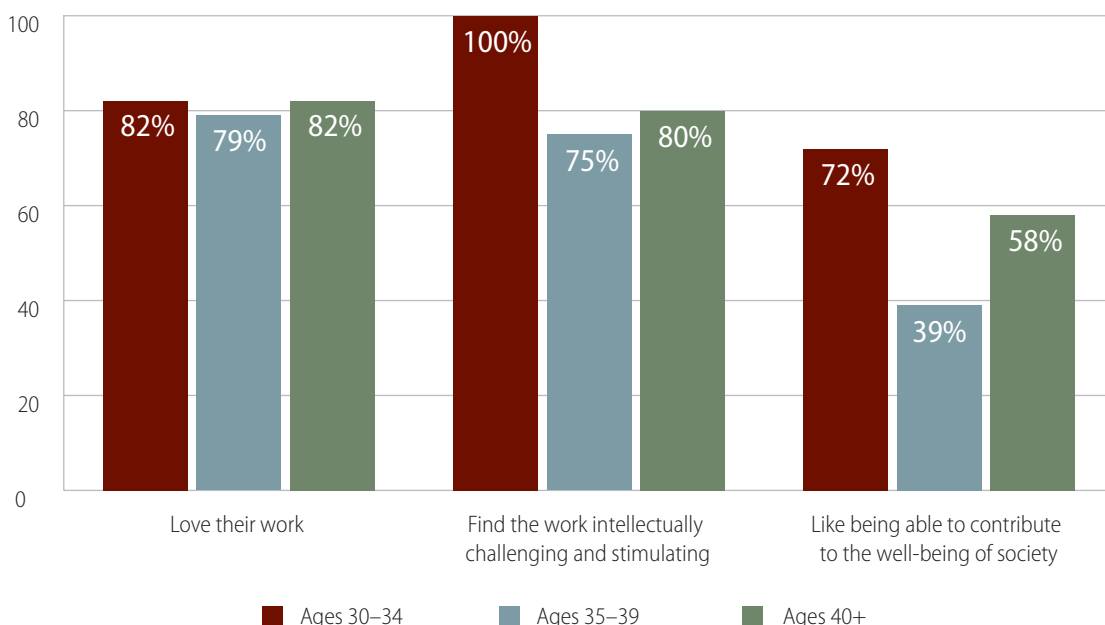
FIGURE 7.6
Company B: Prime Motivators for Women

	U.S.	Europe
Ability to contribute to the well-being of society	54%	67%
Being highly compensated	48%	58%
Receiving recognition from my company	61%	67%
Having a powerful position	17%	50%
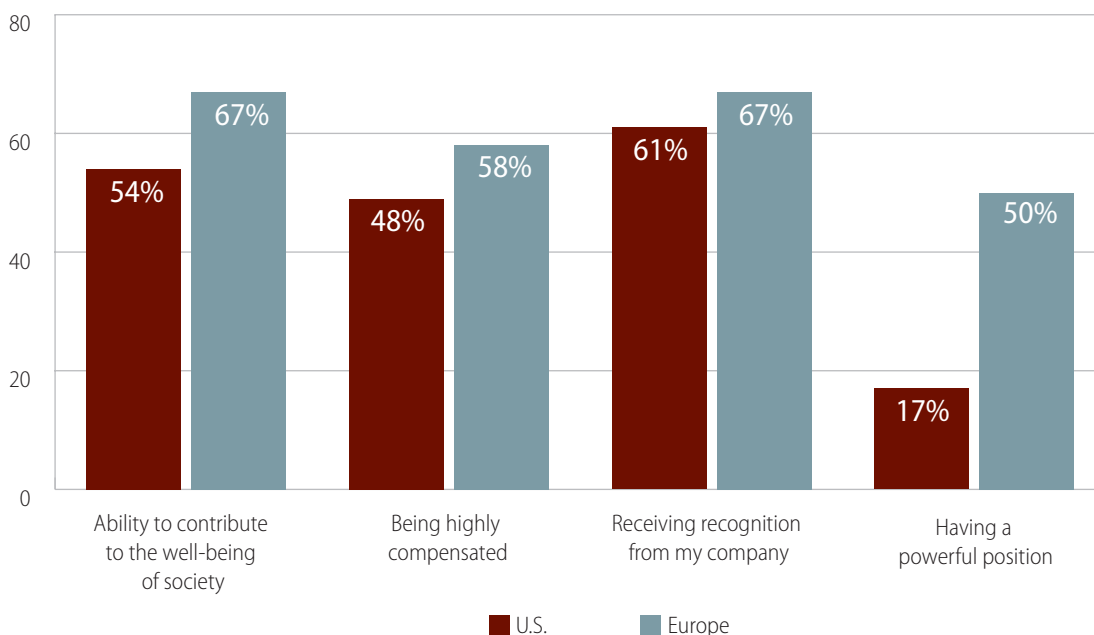
about their work. These extraordinarily high levels of commitment dwindle with age, particularly during the troublesome years between 35 and 39.

In both the United States and Europe, women working for this company were drawn to their jobs because they wanted to contribute to the well-being of society. In both regions "giving back" is a more powerful motivating factor than compensation. There is one striking difference between locations: Women at Company B in Europe are much more concerned with having a position of power than are their U.S. counterparts.

When it comes to ambition, women engineers at Company B rate higher than the average SET professional. Thirty-nine percent of women here, compared with 23% of women in the national survey, consider themselves to be extremely or very ambitious.

A Macho Hard Hat Culture and Isolation

Although women at this company love their jobs and have tremendous passion for their field, they find themselves dealing with a hostile culture that causes isolation. Thirty-eight percent of women engineers at Company B working in the United States say they are working in macho, hard hat cultures. And 45% of these women feel isolated on the job, compared with 17% of their male colleagues. Sixty percent of women feel excluded from the old boys' network. As figure 7.7 shows, these issues are mitigated in the company's European locations. There, female engineers feel less isolated, partly because they have greater access to role models and mentors (see figure 7.8). Sponsors, however, are rare for women in both locations.

Mysterious Career Paths

As a result of macho cultures and isolation, many female engineers at Company B feel that their careers have stalled. Women in Europe, who report less isolation, are less likely to share this feeling. Considerably more U.S. women working for Company B feel that they are not advancing—56% versus 39% in Europe (see figure 7.9). This phenomenon is linked to two causes: 56% of women working at this company in the United States believe that the road ahead is mysterious,

FIGURE 7.7
Company B: Macho Culture, Isolation, and Old Boys' Network

	U.S.	Europe
Up against a macho culture	38%	17%
Feel isolated in the organization	45%	17%
Old boys' network	60%	24%
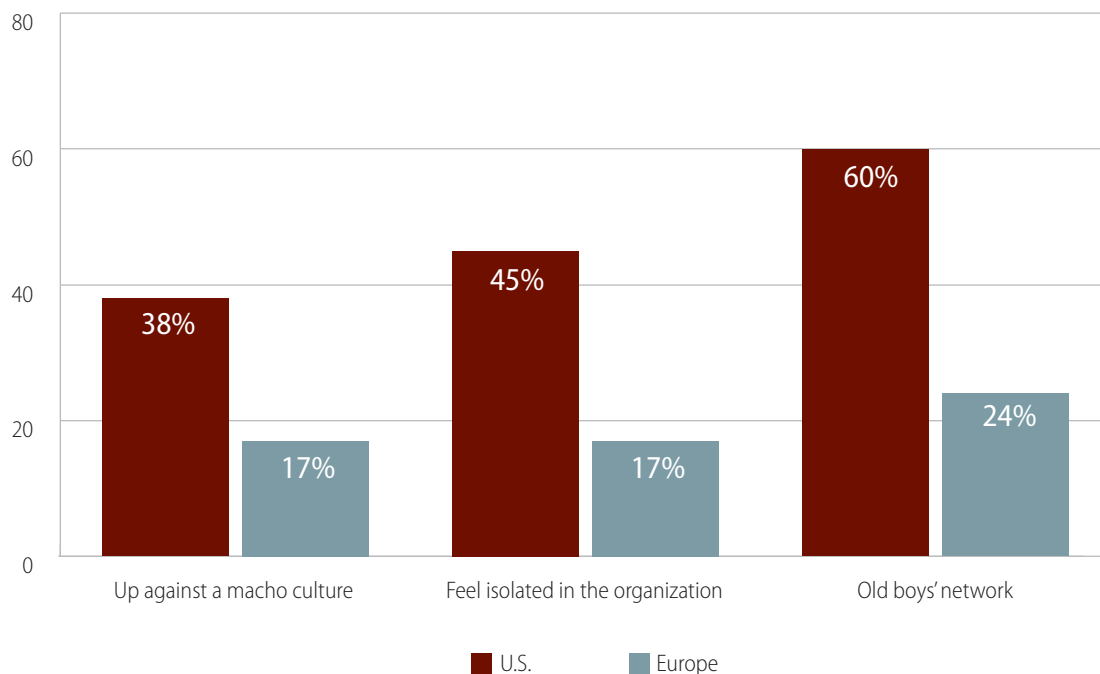
FIGURE 7.8
Company B: Role Models, Mentors, and Sponsors

	U.S.	Europe
Lack role models	62%	33%
Lack mentors	59%	42%
Lack sponsors	86%	75%
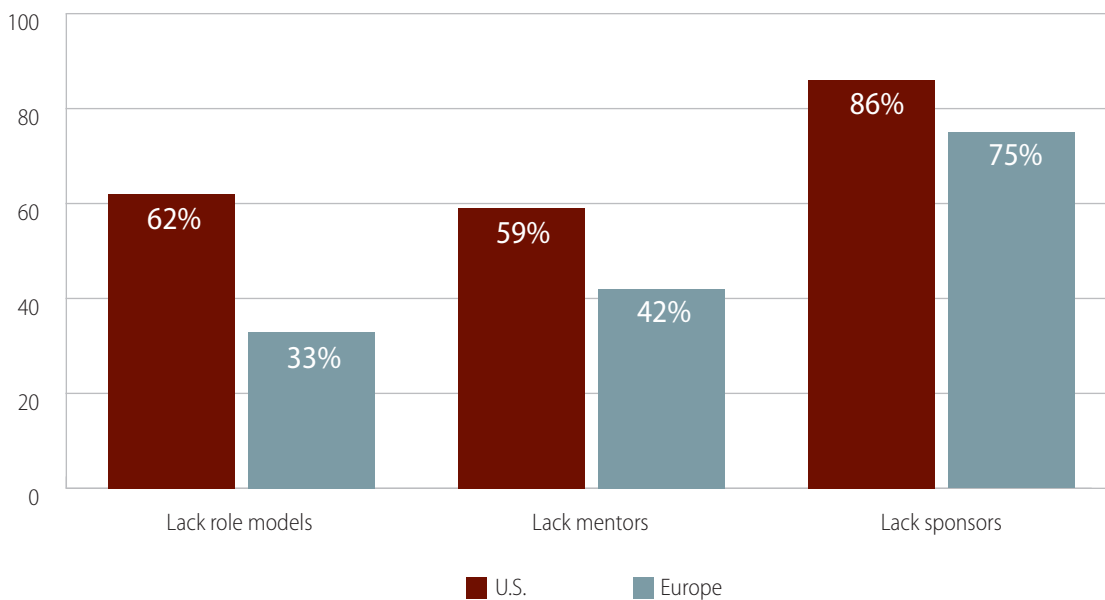
compared with just 33% in Europe. And 80% of women working in the United States (versus 50% in Europe) believe that "just being a man" gives a male colleague an advantage in the promotional stakes.

FIGURE 7.9
Company B: Stalling Careers and the Male Advantage
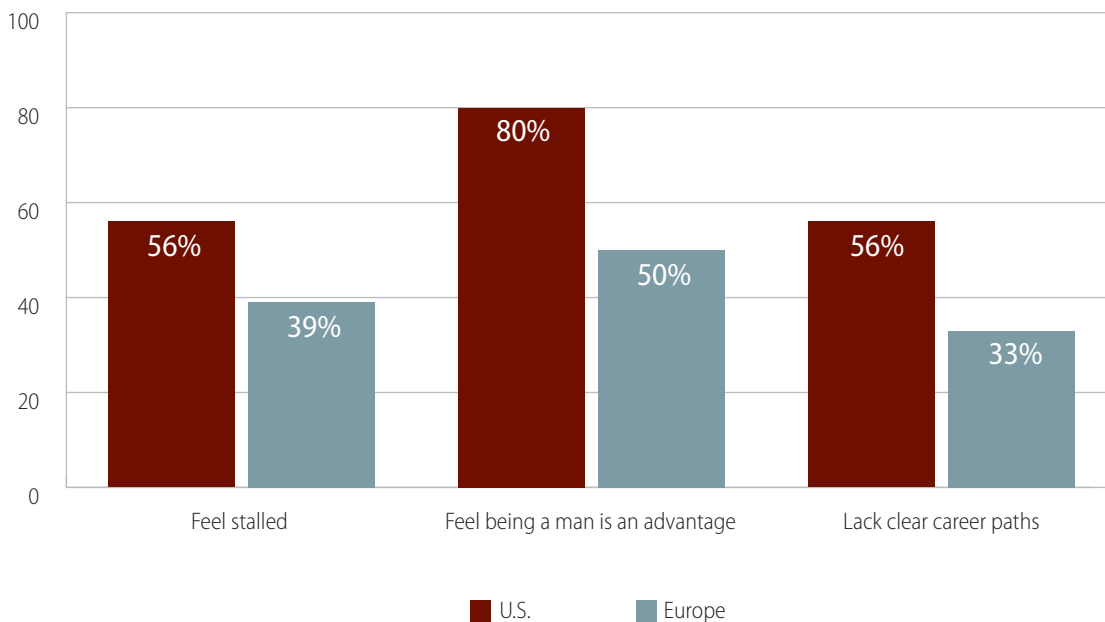
FIGURE 7.10
Company B: Extreme Job Pressures
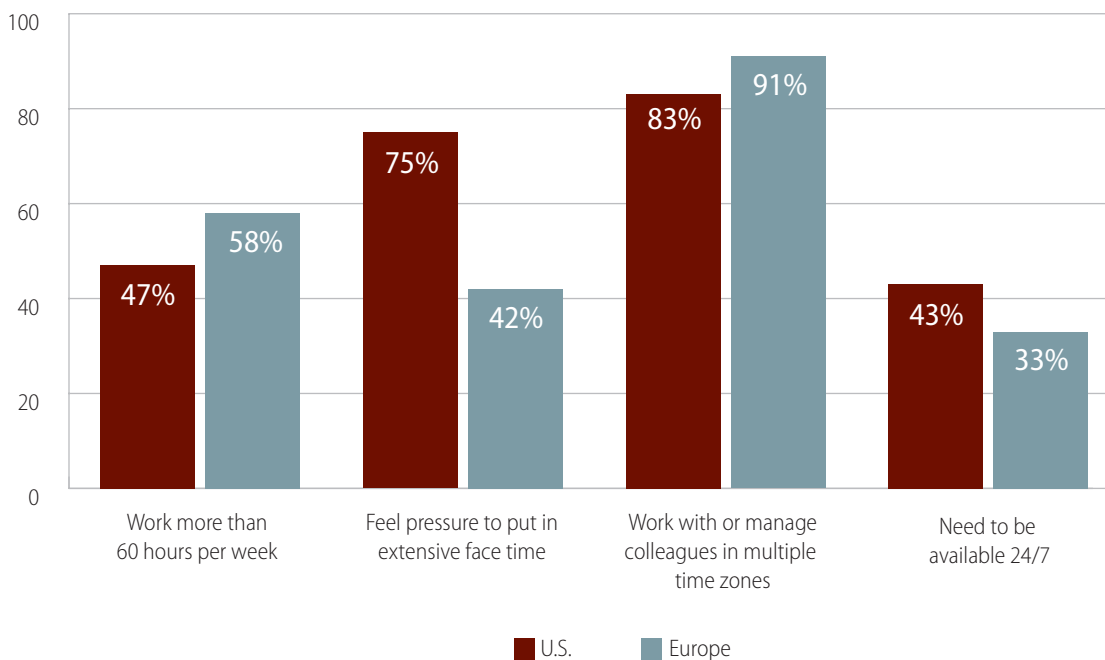
Extreme Jobs

The pressures of extreme work are ever present at Company B. On average, women clock 62.5 hours per week, which is considerably higher than the average SET professional. Interestingly,

women at this company in Europe are more likely to log onerous hours than those in the United States (58% versus 47%), although U.S.-based women deal with considerably more face-time pressure (75% versus 42%). The vast majority of female engineers (84%) in both regions report time pressure associated with dealing with customers located in multiple time zones.

As is true elsewhere, extreme job pressures at Company B take a special toll on female engineers because women—in both the United States and Europe—bear the lion's share of family responsibilities. Women in Europe, for instance, are particularly hard hit on the eldercare front. A full 33% (more than three times the proportion in the United States) have significant eldercare responsibilities. At Company B 46% of women, compared with only 17% of men, report significant childcare responsibilities, and 42% of these women say they can't even talk about childcare problems on the job.

In practice, that means that even women who appear to be juggling the demands of work and home successfully may be close to breaking point; they just don't feel comfortable airing the stress they're under. We met with Emily, an engineer based at a California facility, at the behest of her supervisor. Her boss described her as "a model for our female engineers—she balances her personal life with an ongoing ability to climb the career ladder."

Emily herself was not as convinced that she was a success story. She unconsciously twisted her wedding band as she discussed her dilemma. "I've reach a critical stage in my career. The next level represents a huge jump. The increase in status and money comes with way more hours and way more pressure. When I look at the people who hold those positions I only see men with stay-at-home wives. I've talked to these wives at various company functions, and I know that there's no way these men could do what they do without someone at home taking care of everything else. I would have to fork over half of my salary for a nanny to make this work. My husband's not leaving his job to stay at home with the kids. I honestly can't find a way to make this next promotion worth it."

COMPANY C

Sally, a successful computer engineer at a leading high-tech firm who was recently promoted to VP, believes her company is an invigorating place to work. "It is fast-paced—we are a company full of type-A personalities." She has figured out how to be successful at her "testosterone-heavy workplace." In her words, "the way to get ahead at this company is to raise your hand for every risky assignment…and attempt the diving catches." Every time she goes for one she asks herself, "What's the worst that can happen to me?"—a question she remembers her mom using all her life. She finds that this mantra reduces her stress level. Although she has learned to go out on a limb, Sally recognizes that diving catches are difficult for many women. She brings this up with the young women she mentors and tries to share her recipe for success.

Women Technologists Love Their Jobs

At Company C, 81% of female technologists love their jobs, and the majority find their work intellectually stimulating. Interestingly, more women working for Company C in India and China are drawn to their fields because they find the work stimulating and intellectually challenging (see figure 7.11).

A Macho Geek Culture and Isolation

A significant minority of women engineers and technologists at Company C believe that they are up against a geek culture, although fewer women working in India and China feel that way (see figure 7.12). On the other hand, while a geek culture is less problematic in India and China, women there are more likely to feel excluded from the old boys' network than their colleagues in the United States.

FIGURE 7.11

Company C: Women in Tech Are Deeply Committed to Their Jobs

Legend: U.S. | India and China
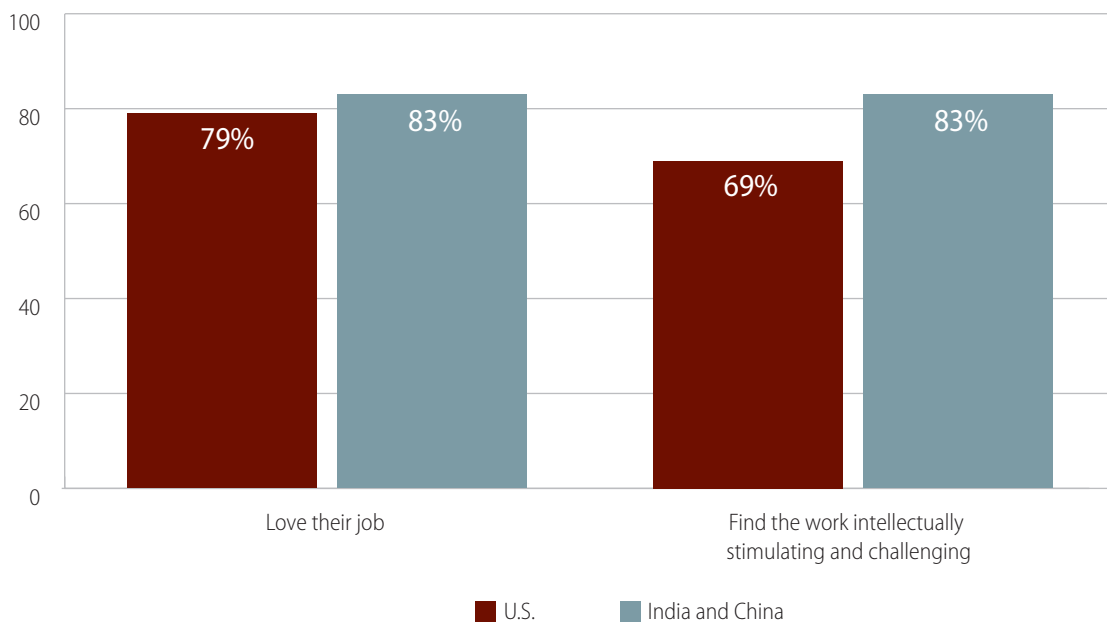
FIGURE 7.12

Company C: Macho Culture, Isolation, and Old Boys' Network

Legend: U.S. | India and China
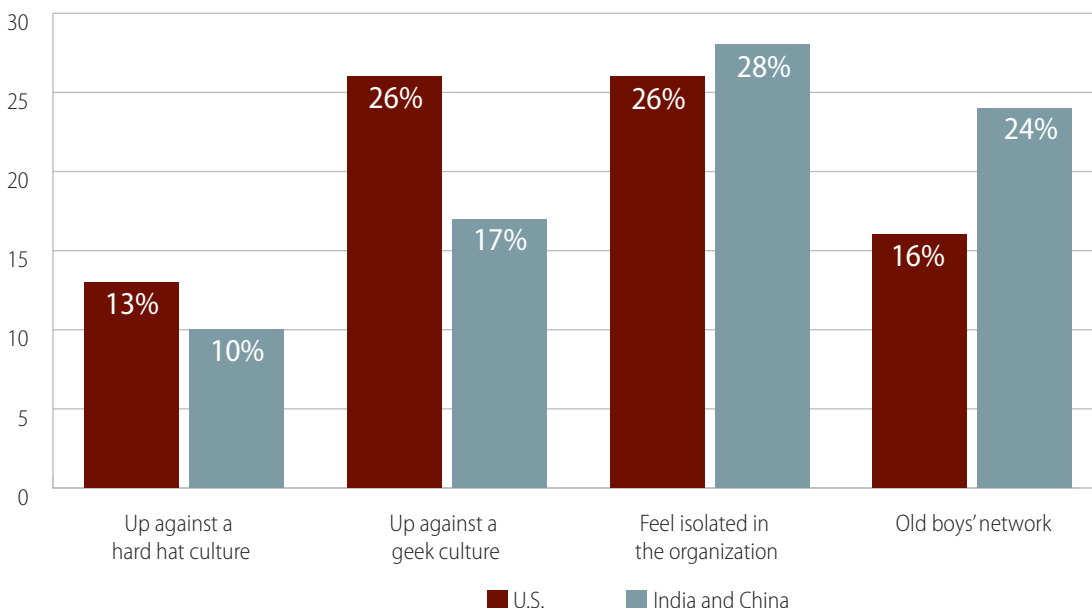
Mysterious Career Paths

Almost 70% of female technologists working in the U.S. operations of Company C report feeling stalled in their careers. As they see it, men move up while women get left behind. For many, this phenomenon is linked to mysterious career paths and a lack of mentors. Although the women

FIGURE 7.13
Company C: Stalling and Career Path Issues
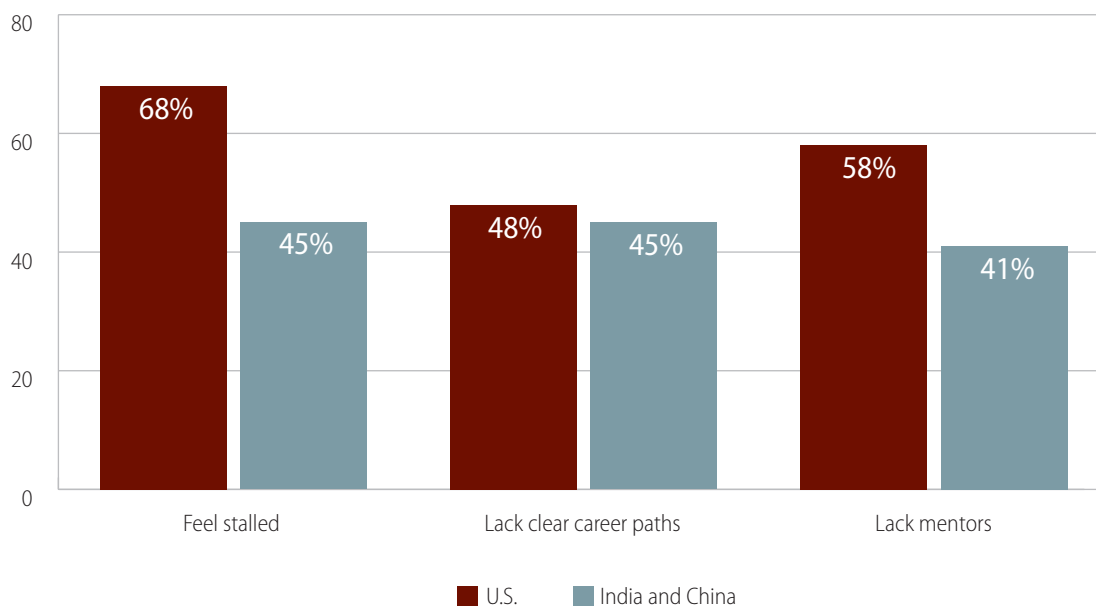
working in India and China experience a similar lack of clarity in career paths, considerably fewer feel stalled in their careers (see figure 7.13). What accounts for their ability to navigate career ladders successfully? These women are more likely to have mentors to show them the way forward.

FIGURE 7.14
Company C: Taking Risks: A Lose/Lose Proposition
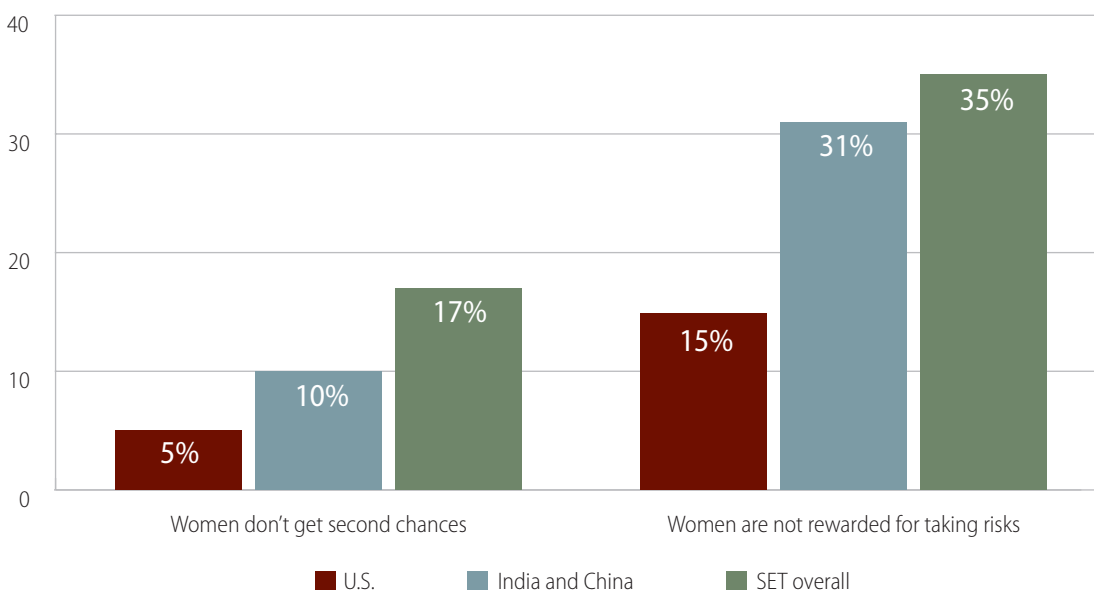
Risks and Rewards

As Sally described, risk taking is valued at this tech company. We heard time and again in focus groups at Company C that rewards come from taking risks and making the diving catches. "It's a common occurrence," said Reyna, a technologist and 20-year company veteran. "Disaster threatens, often in the early hours of the morning, in some far-off place like Romania. The guy who designed/created the system—and if it's crashing you can bet the lead person is a man—jumps on the first plane to Bucharest and spends 48 hours straight fixing the problem, averting disaster." She paused for dramatic effect. "He jumps back on a plane, and when he shows up the next morning, he's greeted with the tech equivalent of a ticker-tape parade—and, a little ways down the road, a promotion. I've never in all my years of creating products for this company sent something into the market that would crash. The kinks that cause these crashes should be resolved before a product is launched." The women nodded in agreement. "You're absolutely right," said one colleague, "I used to wonder why I was not reaping the same rewards and promotions as my male team members, but then I realized that playing Superman in an 'emergency management' situation trumps creating superior products."

WOMEN IN TECH IN FINANCE

A significant minority of women in tech do not work for a technology company. Almost a quarter (23%) work for a company in some other sector (manufacturing, finance, the media) that has a technology division to support its operations.

Consider the financial sector. Banking and finance depend on technology to function. Without elaborate technology, traders could not trade and myriad banking transactions would be much more difficult. In recent years, tech platforms in the financial sector have gained importance. Globalization and mega-mergers in the banking sector, for example, are just two trends that have upped the ante and placed a premium on technological sophistication. Whereas, in the past, technologists working in finance had the potential of being marginalized, now they have a central role and a certain status. In Athena Factor focus group discussions, "techies" reported that they are now being included in key meetings.

Given their dependence on technology, financial companies are devoting considerable energy and resources to developing work environments that appeal to tech talent. These efforts are paying off—particularly for women. Fully 55% of women working in tech in a finance company describe the culture at their firms as more "inclusive" and "collaborative" than at tech firms. Furthermore, they believed financial companies were "trying to make it better for women." Tech women in financial companies consider their workplace culture to be more supportive than typical technology companies (where many had previously worked).[46]

Financial companies have been particularly creative on the recruiting front. For many firms the key to attracting more women has been expanding recruiting filters. Technical positions in the financial sector are often open to talented individuals from a plethora of backgrounds. "Techies" include people with degrees in a whole variety of fields, from business to East Asian studies to linguistics. This willingness to recruit women without computer science degrees (only 30% of computer science graduates are female) has been extremely positive.[47] According to Athena Factor survey data, female technologists now make up 44% of all tech employees in the financial sector. Participants in our focus groups singled out sociology, music, and philosophy as degrees that work particularly well for tech trainees.

Despite the good news, tech women in the financial sector face some of the same challenges as women in technology firms. The most prominent example: Tech jobs in the financial sector are extreme. Eighty-six percent of women in tech in financial firms report having to work across multiple time zones, and 49% say they must be available 24/7. One focus group participant said she had to constantly "reacquaint" with her children after completing projects.

FIGURE 7.15
Company C: Extreme Job Pressures
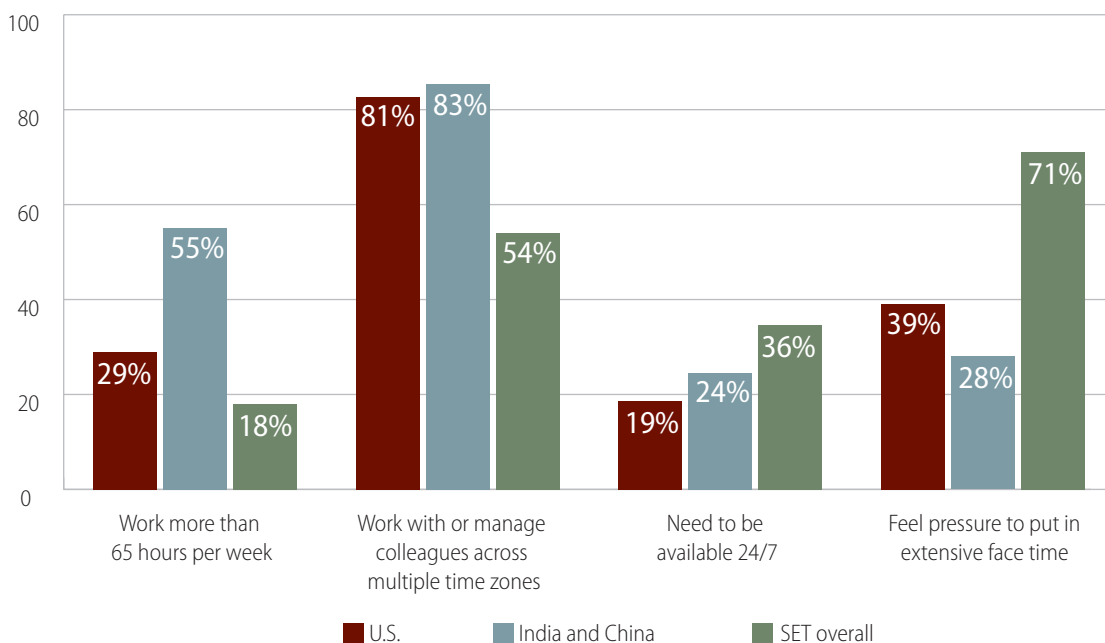
A qualifier is in order here. Tech women at Company C are less fearful about taking risks than elsewhere in SET. Here, most women believe they will get a second chance should they fail. The data show that at Company C only 5% of female technologists believe that women don't get second chances, which is much lower than in SET overall (17%). Failure seems to carry more risk for women working in India and China (10%) but even this figure is lower than the SET average.

FIGURE 7.16
Company C: Women and the Eldercare Burden
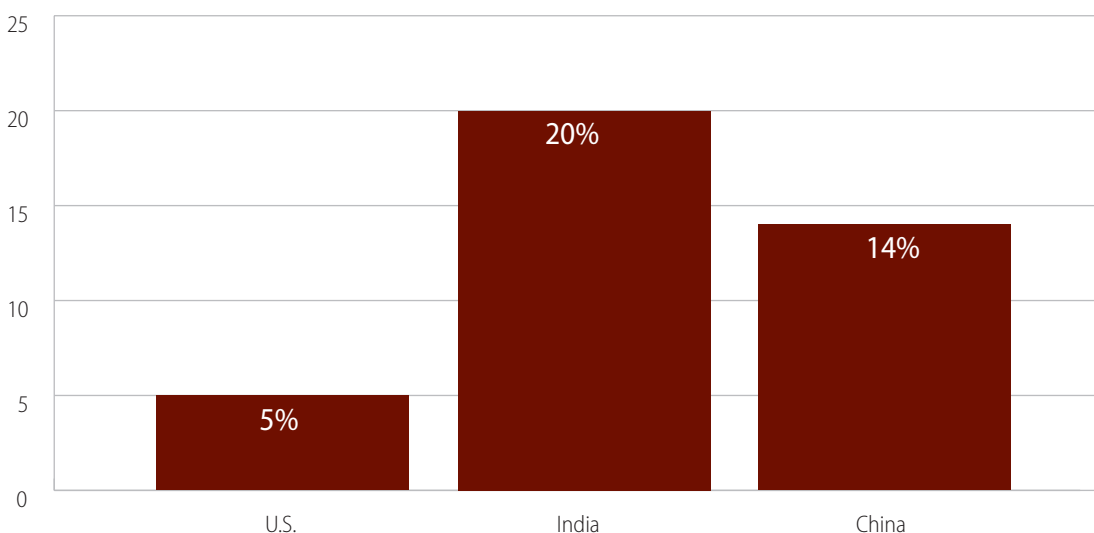
Although women working at this company feel that, by and large, they do not get penalized for diving and failing to catch, a significant minority believe they are not rewarded when they dive and succeed (see figure 7.14). The lesson here is that without robust networks, it can be hard to grab attention, even for a success story.

Extreme Jobs

Jobs at Company C are more extreme than the average across SET, particularly at operations in India and China. U.S.-based female technologists work, on average, 62 hours per week, while those in India and China log an incredible 73 hours per week. (For purposes of comparison, data from our national survey show that female SET professionals work 55.8 hours per week on average.)

In all three locations—the United States, India, and China—female technologists at this company are much more likely to be working with customers and colleagues in multiple time zones than women across SET. Face-time pressures, however, are less severe. Tech jobs, it seems, lend themselves to more flexible ways of working.

Previously, we discussed how and why extreme jobs disproportionately affect female professionals: Women shoulder a much bigger load of family care. This is as true in India and China as it is in the United States—but the burden of eldercare tends to be heavier in Asia. In fact, female engineers and technologists working in India and China shoulder an eldercare load that is three to four times higher than their U.S.-based peers (see figure 7.16).

Clearly, every company has its own distinct culture. But this in-depth look at three companies uncovers how the antigens we've identified in SET overall manifest themselves in specific settings. The findings of this microanalysis can inform the way other companies begin to think about their own corporate culture and how they might better attract and retain their talented women.

CHAPTER 8: THE BOTTOM LINE: UNNECESSARY LOSSES

Cumulatively, the five antigens we've diagnosed drive SET women from their jobs and from their chosen field, sometimes even before they start. The losses are deep and multidimensional. Not only do individual women lose out, but employers take a big hit. SET companies struggling with a serious talent shortfall can ill afford this massive female brain drain.

Quit rates are staggering: Over time, more than half (52%) of these highly credentialed women leave their private sector SET jobs. The losses are distributed unevenly across the climates of science, engineering, and technology. As shown in figure 8.1, female attrition is highest in technology and lowest in engineering, but across all three climates, it's considerably higher than men's. Some industrial sectors are particularly hard hit. For example, the female quit rate in pharmaceuticals and high-tech is double that of engineering services (see figure 8.2).

Where Do They Go?

Once they quit their private sector SET jobs, where do these women go? Roughly half (48%) move to a SET job outside the corporate sector. Many become self-employed, in some cases starting their own consulting firm.[48] Others move to the public sector or join a start-up (see figure 8.3).[49]

The other half abandon their SET training completely. Only one-fifth of these highly qualified women drop out of the workforce entirely, however. For most SET women it's not a question of off-ramping to become full-time wives and mothers. Rather, they are more likely to move to a non-SET job (either within the company or outside) to escape macho workplaces and extreme jobs. Many are clearly seeking one of those "pockets of sanity" described earlier. Hostile macho

FIGURE 8.1
Female Quit Rates Across SET

Each figure represents 10% of the total

FIGURE 8.2
Quit Rates for Select Microclimates

	Men	Women
Pharmaceutical	25%	41%
Engineering services	17%	24%
High tech	17%	41%

FIGURE 8.3
Where Women Go

49% use their training...   51% abandon their training...

Self-employed	Start-up company	Job in government or non-profit	Non-SET job in different company	Time out of workforce	Non-SET job in same company
22%	10%	17%	24%	20%	7%
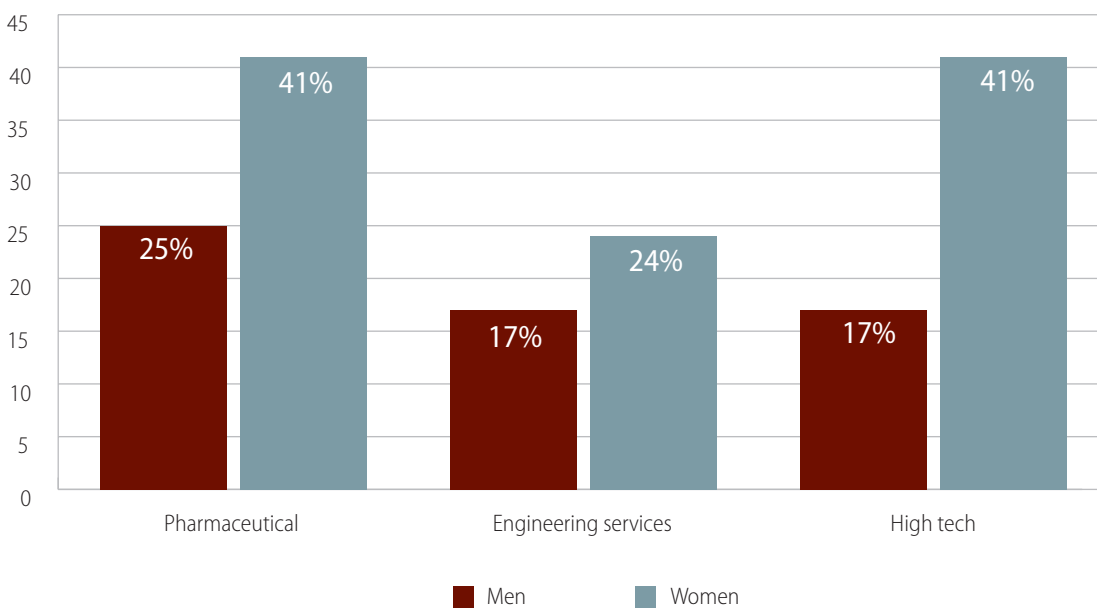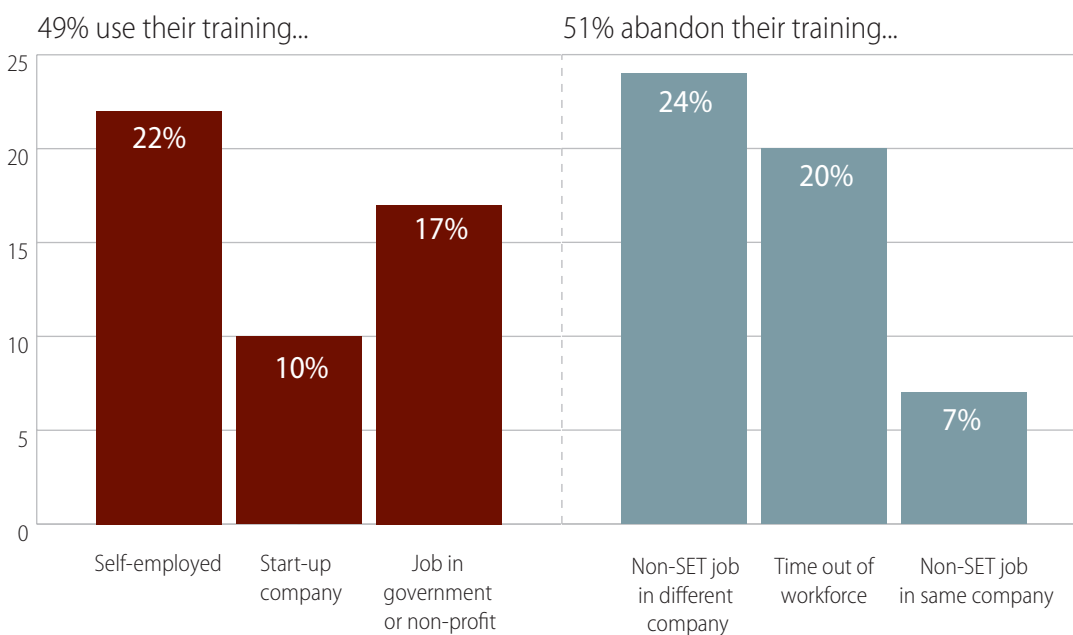
FIGURE 8.4
Why Women Leave
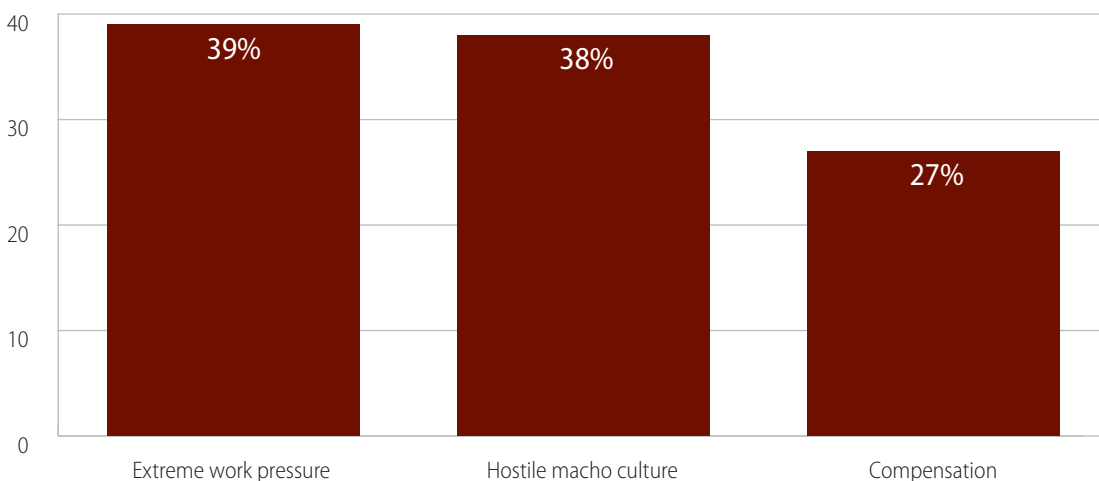
cultures and extreme work pressures are cited more often than a disappointing compensation package as reasons for leaving SET jobs.

The finding that half of SET women abandon their field is particularly problematic since these are uniquely qualified and unusually committed women. Many devoted years to acquiring their specialized skill set. The fact that antigens in SET cultures force them to give up on what they so passionately believe in is deeply disturbing.

Take Miranda, who recently earned a PhD in chemical engineering and now holds a prestigious postdoc position at an East Coast university. Despite numerous obstacles thrown up by unsupportive teachers and skeptical parents, she made it through high school and college with her love of science intact and embarked on her PhD intending to become an academic. However, instead of strengthening her resolve, her experiences in graduate school have caused her commitment to waver.

FIGURE 8.5
Women Who Quit Want On-Ramps
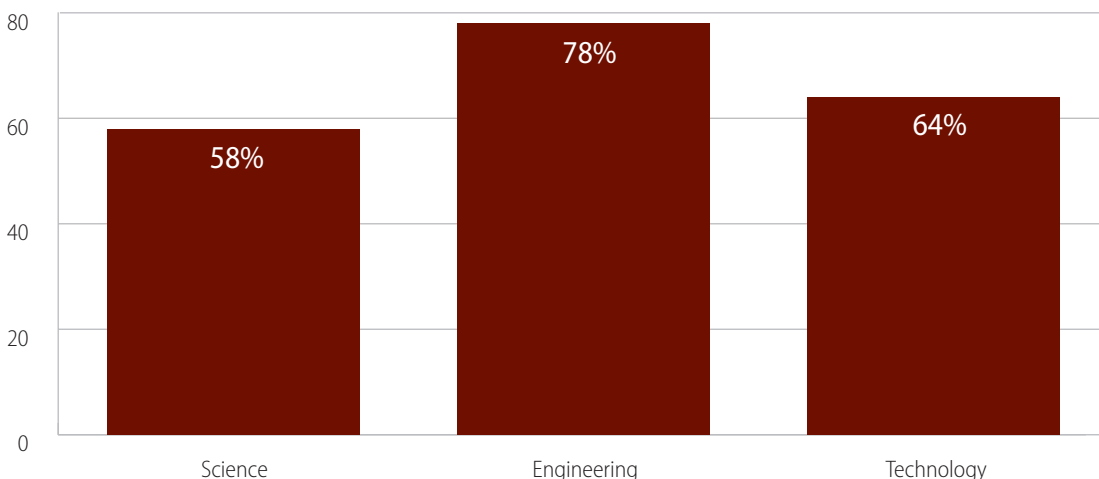
At a focus group of 17 female graduate students and recent PhDs in chemical engineering, Miranda shared her ambivalence: "Given the investment, I feel huge pressure to use my PhD. I mean, I've put five years of sheer hard slog into getting this degree. But when I look ahead I'm really turned off. What I see down the pike is hellish work hours in the seven-year lead-up to tenure, and then you're out on your ear. In this field no female has a chance of getting promoted. You just don't see it happening—there are no senior women out there. The top jobs are tied up by an in-group of men who look out for each other." Miranda confessed that she was on the brink of "giving up a career before it even gets started."

She was hardly alone. In fact, most of the women in that focus group wanted out. One talked about joining a brokerage house, another was about to take a job as a paralegal. Only three intended using their PhDs to pursue a career in their chosen field.[50] The disillusionment in the air was palpable.

A Ray of Hope

Despite massive quit rates and a worrisome tendency for SET women to abandon their field of expertise, the Athena Factor data point to one piece of good news. A large proportion of women who quit would like to come back to a private sector SET job. Indeed, many are seeking help on this front. Nearly two-thirds (64%) want companies to create on-ramping programs to help them get back on track (see figure 8.5). This finding points to an important opportunity for companies eager to recapture female talent. As we will detail in Chapter 10, GE and J&J are about to take up the challenge.

The business case for on-ramping programs is compelling. Making a lateral hire or engaging in an arm's-length search for a high-caliber SET person can be enormously expensive. For example, studies show that in the biotech field costs may exceed $250,000 for a successful hire.[51] In comparison, the cost involved in reattaching a former employee are often negligible.

PART II: ANTIBODIES: WHEN AND HOW TO INTERVENE

CHAPTER 9: THE FIGHT-OR-FLIGHT MOMENT

Although women are underrepresented in SET companies at all ages and stages of their careers, our research found a point at which attrition rates spike and women begin falling away in huge numbers. Figure 9.1 shows this break point.

The Break Point

Across SET, mid- to late 30s is the age range when female attrition speeds up considerably. Many women hit a perfect storm at this stage of their lives. Career struggles and childcare responsibilities intensify at precisely the same time, producing painful pressure.

As described in Chapter 4, many women in SET feel that they hit a wall in their mid-30s. Situated on the beginning rungs of management—holding the title of "director" or "staff engineer"—they face the much more difficult career progressions to middle and senior management without a mentor, sponsor, or road map. They are often newly aware of being seriously isolated in hostile macho cultures.

At precisely this same time, challenges on the home front widen and deepen. It is around age 35 that many SET women either have that long-delayed first child or fold in a second child. It is also an age when eldercare responsibilities ramp up.

Consider Marisa, a chemical engineer at an oil refinery in western Texas. This plant, like the few women engineers who work in it, is seriously isolated. When we met her at a focus group, her career was at a crossroads. Marisa had just been offered a promotion to production supervisor. She knew she should take this new job; she had been in technical support for six years and was ready for the next challenge. But it was a tough decision. No other woman held a senior position at the plant, and she didn't look forward to running a crew of hard hat guys. It was difficult enough dealing with crude behavior and dirty jokes as a peer, as a female boss it would be much worse. Marisa had also recently married (at age 33) and was contemplating starting a family; if she wanted

FIGURE 9.1
Female Attrition Across SET
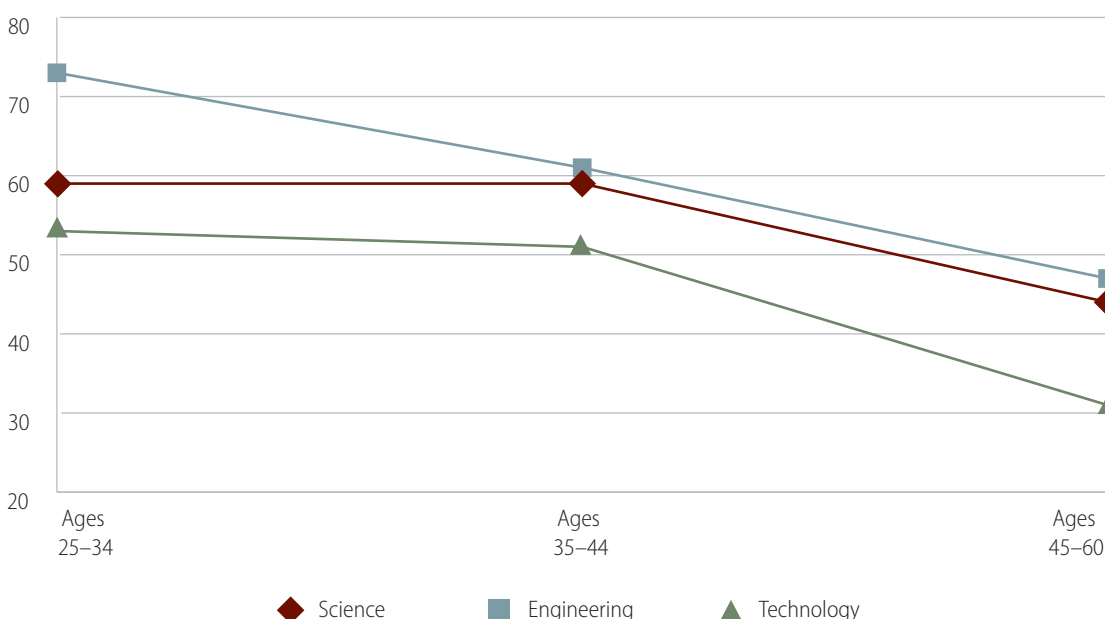
FIGURE 9.2
The Scissors in SET
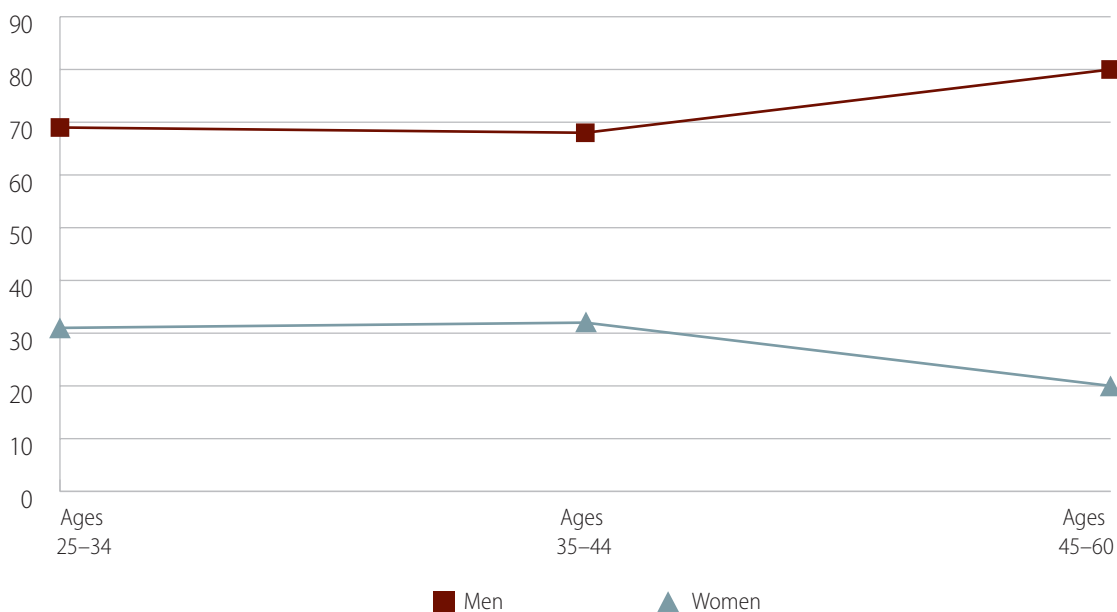
kids, time was not on her side. She knew that becoming a production supervisor involved extreme demands—long weekend shifts, unpredictable hours (if there were an emergency, she would have to be there no matter what the hour), and much greater responsibility.

Her manager advised her to go for the promotion. In his words, "Just put your family plans on hold for five years and do a stint as production supervisor. It will make all the difference to your career prospects." But ultimately, Marisa turned the offer down. She saw it as a "poisoned chalice." Although she loved her work and wanted her career to progress, she wasn't prepared to pay that high a price.

No wonder mid- to late 30s is a break point—it's a time when many women revisit their priorities and recalibrate their lives. Despite the fact that they love their work, a substantial number of SET women bail out—leaving their company or field altogether. As a result, senior leadership in SET companies remains overwhelmingly male, thus setting the stage for the next round of female dropouts.

As illustrated in our version of the classic scissors diagram, women in SET fall away rapidly after age 35, whereas men gain ground. Very few women are able to stay on track and reach the top rungs of the corporate ladder. Researchers have been producing scissors diagrams for years—showing how, in most fields, the career pathways of men and women increasingly diverge. The news here is that in SET companies, the falling away of women (and the ascendancy of men) is particularly steep and sharp.

Leveraging the Fight-or-Flight Moment

While spiking attrition is definitely a problem, it also signals an opportunity. If a company becomes proactive on this front, teasing out antigens from the corporate culture and stepping in with targeted interventions before the fight-or-flight moment, the payoff—in terms of the retention of female talent—can be huge. As shown in figure 9.3, in the U.S. labor market, cutting female attrition by 25% would add 220,000 highly qualified women to the SET talent pool.

FIGURE 9.3
Intervening at the Fight-or-Flight Moment

220,000 highly qualified women would return to the labor market.

65%
60%
55%
50%
45%
40%
35%
30%

25–34 yrs   35–44 yrs   45–60 yrs

— Current % of qualified female scientists, engineers, and technologists working in their fields

— Projected % if attrition were reduced through interventions
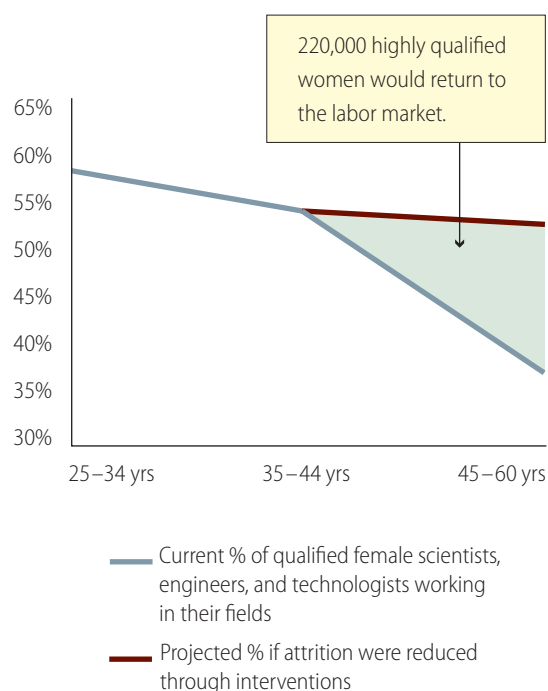
As we will see in Chapter 10, some companies have begun to intervene to staunch the female brain drain. Jonelle's story stands in marked contrast to Marisa's as an example of what happens when an oil company proactively seeks to retain female talent. Jonelle Salter, an offshore installation manager (OIM) for BP, is inching her way forward. While the company is not exactly planting rose bushes for her to stop and smell, it is offering arrangements attractive enough to ensure that this 32-year-old African-Caribbean woman engineer stays with the company.

Salter is extremely valuable to BP. She did a tour of duty on an oil platform off the coast of Aberdeen in the North Sea then worked on a gas platform in her native Trinidad, where she married and had a child. As the head person on an oil platform, Salter has been responsible for the health and safety of 80-plus workers and was trained to deal with physical extremes and the remote possibility of life-threatening emergencies: gas leaks, chemical spills, and helicopter crashes. To prepare for her position, Salter went through more than a year and a half of physically punishing, highly realistic simulations. "Think of subzero temperatures, ice coating all surfaces, making everything slick, gale force winds—and then a wall of fire, breaking pipes, oil gushing," she says. "It's easy to get rattled and make mistakes of judgment in these situations."

As an OIM in the North Sea, Salter was on a four-week rotation: two weeks offshore, two weeks onshore. But her offshore rotations were fraught with loneliness, as she was cut off from friends and family. Later, rotations were hard on her marriage. "I got irritable and brittle the Monday before leaving—I always seem[ed] to pick a fight with my husband. It's the tension of knowing you are about to leave for a while." After her maternity leave, BP created an onshore OIM position for her. It is more of a human resources role than a conventional OIM position and is better suited for someone with a small child.

Looking to the future, Salter sees the possibility of upward mobility at BP. She credits her mentor— a married woman with a son who is now a managing director for BP Norway—for her ongoing ambition. Salter says: "When I talk to her, I feel there's nothing I can't do."

FIGURE 9.4
Perceptions of Gender Disadvantage

- 65% — Junior women — Believe that simply being a man is an advantage in obtaining leadership positions
- 74% — Senior women — Believe that simply being a man is an advantage in obtaining leadership positions
- 46% — Junior women — Believe that it is harder for women to obtain the resources they need
- 59% — Senior women — Believe that it is harder for women to obtain the resources they need

■ Junior women   ■ Senior women

FIGURE 9.5
Women's Ambition Across SET

	Science	Engineering	Technology	SET overall
Junior women	26%	40%	38%	35%
Senior women	18%	23%	11%	14%

■ Junior women   ■ Senior women
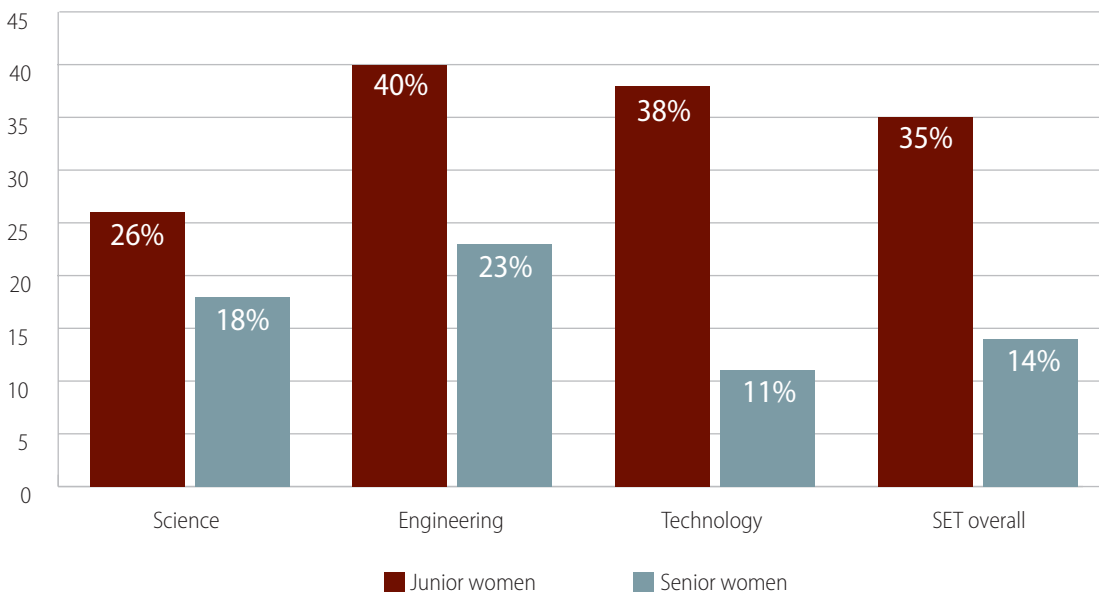
Salter also notes that BP offers a "9/80" schedule option that makes a huge difference to her ability to balance work and family. Under it, an employee fits a full-time schedule into nine days over the course of two weeks, taking the tenth day off.

Connecting Across the "Great Divide"

In focus groups, senior SET women who had made it through the fight-or-flight moment talked about a "great divide" between themselves and younger female colleagues. Many voiced frustration that they were unable to warn their younger sisters of the challenges ahead. The Athena Factor survey data demonstrate that junior women do indeed have "rose tinted glasses"—they have trouble anticipating the problems they will encounter. As figure 9.4 shows, senior women are more likely than junior women to believe that simply being a man is an advantage in obtaining leadership positions (59% versus 46%) and that it's harder for women to obtain the resources they need (74% versus 65%.).[52]

The fact is, young female scientists, engineers, and technologists join SET companies filled with enthusiasm and ambition. Empowered by sought-after credentials, many feel that the world is at their feet as they "execute against a particularly valuable skill set," to use the words of a 20-something female engineer who participated in a focus group.

Over time, however, SET women are worn down by macho workplace cultures, serious isolation, and the extreme demands of their jobs. They are also turned off and alienated by their lack of career progress. All too often their ambition seeps away and they downsize their dreams. The data tell us that when young women join SET companies, fully 35% of junior women consider themselves to be very ambitious. By age 45, that figure has fallen to 14% (see figure 9.5). This fall off in female ambition is much more dramatic in SET than in other sectors of the economy.[53]

The experience and goodwill of senior women could be enormously valuable to women embarking on careers in SET. Right now, these intergenerational connections are not being leveraged. Creating links across this great divide would be particularly valuable for women ages 35 to 40, when many of them are deciding whether to fight or flee.

CHAPTER 10: CUTTING-EDGE CORPORATE INITIATIVES

Rethinking the People Model

A massive female brain drain is not a foregone conclusion; with targeted interventions, SET companies can stem their losses. What's more, these companies are unusually well positioned to retool their people development model and make needed interventions. Why? Because many of the same competencies they've mastered in product development can be transferred to people development.

To succeed in SET sectors, companies like Johnson & Johnson, Cisco, Intel, and GE have all learned to wrestle with particularly challenging product cycles. Moving a new drug, a new engine, or a new chip from discovery through development and ultimately to market is often a long, grueling, and extremely expensive process. The costs for pharmaceutical companies are particularly high: Losing a promising drug at the 11th hour can be extremely costly.[54]

There are many parallels between product development and people development. Incubating talent takes many years and involves hefty expenditure. Even though newly minted electrical engineers or microbiologists bring with them valuable skill sets, a company still needs to invest heavily in these highly qualified individuals to realize their full potential. If an employee quits at the 11th hour—in this case, between the ages of 35 and 40—there are likely to be hundreds of thousands of dollars of sunk costs.

Company Initiatives

SET companies are beginning to respond to the talent shortage by applying lessons learned on the product side of their businesses.

Here are some of the areas where companies have developed interesting new initiatives:

- **Expanding recruitment:** Pfizer's Student Mentoring Program looks to stem losses among SET female graduate students. Google is striving to "widen the filters" to attract top-notch individuals who may not have technical credentials.

- **Targeting line and technical roles:** Alcoa's WOVEN and Manufacturing Manager Development Program encourage women to stay in line positions. Intel's Technical Leadership Pipelines Program for Women helps to keep female engineers on the technical track and positions them to advance to higher levels. Cisco's Global Telepresence Coaching program permits more effective mentoring of key female talent.

- **Tackling the fight-or-flight moment:** Johnson & Johnson's Crossing the Finish Line helps to promote female multicultural employees to senior management. Microsoft's Mentoring Rings gives junior women a better shot at crossing the great divide. At IBM, female flight is combated through its Flexible Leave of Absence program. And BT's flexible work program, Freedom to Work, is helping to keep female engineers on track.

- **Creating on-ramps:** GE in India has developed Restart, an on-ramping program designed to attract highly qualified SET women who have taken time out. J&J's ReConnections™ attempts to ensure a seamless return to work by off-ramped women, while MIT's Midcareer Acceleration professional development program is specifically designed to reintroduce off-ramped SET talent.

- **Fighting isolation:** Cisco's ETIP/ETAP program is creating a game-changer at the top by hiring a significant number of senior women at the VP level and above and providing support for successful assimilation.

- **Leveraging Athena traits:** IBM's Corporate Service Corps harnesses the altruistic attributes of women in SET by sending teams of employees to work in charitable organizations across the globe.

Now let's take a closer look at these 14 innovative programs.

EXPANDING RECRUITMENT

Pfizer: Yale Student Mentoring Program sponsored by the Women's Leadership Network

In 2004, the Women's Leadership Network (WLN) at Pfizer's Groton/New London laboratories had the honor of hosting the American Women in Science Conference. This annual event brings together female graduate students and senior female scientists from both the academic and private sectors. A top concern at the 2004 conference was the lack of mentoring programs for students interested in the private sector. In response to the concerns of these graduate students, the Pfizer WLN launched the Yale Student Mentoring Program in 2005.

Initially the motivation behind the program was purely altruistic—it was designed as a service for female graduate students. However, Pfizer began to realize that generating new interest in the private sector in high-caliber female graduate students would expand its own talent pool. Our focus group research found many SET women in the later stages of graduate study who felt alienated and stymied in academe—they talked about brutal work pressures and the seeming impossibility of women getting ahead (see, for example, Miranda's story in Chapter 8). As Lydia Pan, a PhD who was one of the architects of the student mentoring program at Pfizer and a Yale alumna herself, stated, "There was always only one type of role model when I was a graduate student, and that was an academic role model. A private sector role model was nonexistent, so it was much more difficult to explore career tracks outside of academia. From the feedback that I've gotten from the students, this is still true. Although the women at Yale do have an excellent internal network, there's still only one career model. Female graduate students simply don't have access to scientists in the private sector that they can identify with and look up to."

The yearlong Yale Student Mentoring Program asks mentors and protégées to commit to meeting for a couple of hours per month. These meetings can be as informal as getting a bite to eat or taking a tour of a Pfizer lab. Mentors have introduced protégées to their professional networks and organized get-togethers with other Pfizer colleagues. These meetings are often the beginning of robust personal relationships between mentor and protégée. In addition, mentors have introduced protégées to colleagues working at other pharmaceutical companies, further broadening the protégée's perspective on the industry.

By introducing students to the possibility of a career in the private sector, Pan says, this program raises awareness in ways that simply did not exist when she was in school: "Most of my contemporaries were…discouraged from looking at industry….It was considered a betrayal of your training to go into industry. Today, even if [female graduate students] are not actively discouraged from pursuing nonacademic career paths, many doctoral and postdoctoral students lack an appreciation of other career options for which their rigorous scientific training is a great asset." Joann Eisenhart, head of human resources for Pfizer's Global Research and Development division, agrees: "When I was completing my PhD in chemistry many years ago, it was difficult to get a sense of what it was really like to work in industry. As students, we had academic role models in the professors we worked with every day, but industry contacts were much more limited." With the WLN Yale Student Mentoring Program, Pfizer is beginning to open students' eyes to a more expansive set of possibilities.

Google: Widening the Filters

Google's recruiting methods are the stuff of legend—unorthodox surveys, atypical interview questions, and applicants who hail from a host of disciplines. Newly minted Stanford or Harvard grads with a degree in anthropology or musicology know that they have as good a shot at landing a coveted job at this highly regarded technology firm as someone with a computer science degree—provided they have a stellar track record. That's because Google hires "super bright young

talent" rather than "narrowly gauged techies." The company then commits to a great deal of on-the-job training.

At a time when the conventional practice in technology firms is to recruit exclusively from elite engineering schools, Google is interested simply in top-notch people. Emily Nishi, manager of the company's global diversity and talent inclusion program, says, "A lot of people…have taken nontraditional paths to get into Google. When we are interviewing and recruiting we look for what we call 'Googleyness,' which is really a holistic notion of a great candidate. We want people [who] come from a broad range of backgrounds and have diverse interests. At Google we think this makes for a more creative and more innovative person. We have several senior leaders…[who] have nontechnical backgrounds."

Job seekers needn't go far to find a Google recruiter. In fact, getting your foot in the door could be as simple as looking out your car window. The company recently posted a string of billboards depicting mathematics puzzles along major U.S. highways. Solving the puzzle leads you to a website that asks you to submit your résumé.[55]

Google's wider filters have enabled the company to recruit a relatively high percentage of women professionals. At undergraduate programs in computer science across the nation, only 25% of graduates are women.[56] At top schools the situation is worse. According to *BusinessWeek*, in 2004 fewer than 20% of those graduating from elite universities with degrees in computer science were women.[57] Google, however, has attracted many of these women. Fully 33% of Google employees are female.[58]

Google would like its internal makeup to echo the diversity of its users. As Nishi says, "It's very important to us that we have a workforce that best reflects our users from around the globe so that we can best anticipate their needs." While Google cannot yet claim a workforce that is 50% female, its wide recruiting lens certainly pushes the company in that direction.

TARGETING LINE AND TECHNICAL ROLES

Alcoa: Women in Line Roles, WOVEN, and Manufacturing Manager Development Program

The June 2006 Hidden Brain Drain Summit produced a watershed moment for the Alcoa team. As Barbara Jeremiah, executive vice president of corporate development said, "We've made strides in safety and employment strategies but realized we needed something more powerful than flex-time to retain and advance our female engineers." With more than 100,000 employees in 34 countries, the world's leading aluminum producer knew it was time to start innovating in this area. One significant challenge Alcoa faced was the low representation of women in location manager roles. As a consequence, there was a very limited pipeline of eligible female candidates for general manager positions. So Alcoa established a diverse "Women in Line Roles" project team to discuss the perceptions and needs of women who might be attracted to that career path and to evaluate changes that could be made to support their success. Four business unit presidents committed their time to the project. Initially limited to the United States, the project set out to identify the current condition of women in line roles, identify specific areas where the number of women could be increased, and formulate plans of action to reach those objectives. The work of the group continues, but several pilot programs have already begun. The Women in Line Roles project sparked two related initiatives within the company's Global Primary Products group (GPP).

The first, Women in Operations Virtual Extended Network (WOVEN)—to be launched as a pilot—is designed to help in the development, advancement, support, and retention of senior and midlevel females in operations roles within GPP. Through the WOVEN network, women will be able to meet and support one another virtually as they pursue their careers in operations. The network will also reach out to help women who make the transition into operations from other departments. Members will hail from the United States, Australia, Canada, Spain, Norway, and Suriname. Encouraging strong personal connections between women in operations with science,

engineering, and technology backgrounds can be a powerful tool for manufacturing companies. Among other benefits, fostering this network can be a key to luring more women into these operations roles.

The second initiative, the Manufacturing Manager Development Program, was not designed solely for female candidates, though inevitably some women will benefit from it. It prepares junior candidates for a line management career in a structured and accelerated timeframe. Guidelines for five job rotations—each lasting one to three years and leading to greater responsibility—were designed to provide exposure to different divisions and types of management experience (sales, marketing, finance, staff projects, Alcoa Business Systems, and line assignments). In this well-planned and monitored program, an individual could be ready to take on a plant manager role within six to eight years after joining the company.

The potential of this program for women is apparent in the career trajectory of a "star performer" who participated in one of our focus groups. This midlevel woman had been with the company for three years working at an Italian plant when she was asked, at short notice, to move to the Alicante plant in Spain to take over logistics. The relocation paid off, as she was promoted by a job grade. Three years later, when she returned to Italy as manufacturing manager, she was again promoted. "Back when there were three of us engineers in Italy…because I was the one that went to Alicante and did well, it was easier to choose me for the next promotion."

Intel: Technical Leadership Pipeline Program for Women

In 2006 Intel fashioned two projects to provide guidance for technical women about what it takes to advance. Situated within an established initiative (the Technical Leadership Pipeline program), the Technical Female Leadership Series and the Women Principal Engineers' Forum allow women to hone their readiness for principal engineering positions and encourage women to collaborate with managers and take their skills to the next level.

Intel's Technical Leadership Pipeline classes are offered throughout the year to both men and women to explain how to navigate the path to Principal Engineer (PE). Despite the availability of these classes, however, very few women were opting for paths leading to principal engineer; most chose a management track rather than a technology track.

To create more traction, Intel pulled together a group of female principal engineers and asked them what they thought should be done to get women excited about the principal engineering path. Their advice: Create a program designed specifically for women and taught by women principal engineers. This became the Technical Female Leadership Series.

Intel found that when female engineers are brought together in an intimate setting, they are much more likely to speak candidly about career concerns. General questions like, What kinds of qualifications do you need? Are publications important? Do you need to present papers at key conferences/meetings? If so, which ones? and, How do you go about getting the right kind of sponsorship? are addressed. But many discussions at the Technical Female Leadership Series center around balancing family responsibilities and career progression. How much travel is really necessary? Do you have to work 80-hour weeks? And how do you juggle family and children with the demands of a principal engineer position?

"We recognized that our high-potential female engineers were reluctant to ask their real questions in the general technical leadership classes that are male dominated," said Rosalind Hudnell, director of corporate diversity. "These sessions have become highly successful in exposing women to the technical path as well as to other technical women with similar backgrounds, career goals, and challenges. They are a critical reminder that role modeling is paramount in helping isolated populations navigate and understand not just how to be successful but to develop the belief that they can succeed."

Since the Technical Female Leadership Series was established in 2006, Intel has seen its female Principal Engineer population almost double. Response to the series has been so positive that Intel created an annual two-and-a-half day "Women Principal Engineers' Forum." Designed for female PEs, fellows (a higher level of technical achievement), and those likely to be promoted to PE, it offers an opportunity for participants to work on their technical skills. The Women PE Forum is 100% tech focused, with external speakers, peer coaching, and workshops on solving technical issues. Senior women are encouraged to take on stretch assignments and present their results to the group. Many participants appreciate the safe environment offered here. "These are senior technical women who are inventing the next generation of technology—which requires that they experiment, take risks, and stretch," said Hudnell. "The Forum provides a safe test bed for them to practice and get critical feedback from peers, mentors, and experts."

Ramune Nagisetty, an early participant in the Forum, was initially skeptical. She felt that Intel had always provided her with opportunities and didn't believe a program specifically designed for women was needed. However, as a stretch assignment for the Forum, Nagisetty was asked to develop a presentation on "Technology Challenges 2011" that pinpointed potential gaps in Intel's technology strategy five years out and in the sector as a whole. Never having created such a bold presentation, Nagisetty was hesitant, but her finished project—which she presented at the Forum—was extremely well received.

Looking back, Nagisetty says that had it not been for the Women Principal Engineers' Forum, she would never have pushed herself to develop such a presentation and would not have had a place to present even if she had done the work. "The Forum presented a great opportunity for me to communicate some bold ideas in a safe environment where I wasn't going to be criticized for being wrong or foolish. Women engineers at this level are often perfectionists and tend to be risk averse—but to advance to the next level you need to be able to stick your neck out, take some risks, and sometimes be wrong. It's the only way to build confidence. The Women Principal Engineers' Forum creates an environment to do that."

Cisco: Global Telepresence Coaching Program

Scheduled to launch in April 2008, Cisco's Global Telepresence Coaching Program is designed to provide high-potential Cisco women around the globe with professional coaching sessions on career planning and situational problem solving. Still in the planning stages, Cisco has assembled a group of 20 internal expert coaches who will deliver one to three coaching sessions via Telepresence (Cisco's state-of-the-art high-definition video conferencing system). The initiative is a collaboration between Cisco's talent strategy and executive development team and the Women's Action Network. The global reach of the program will allow Cisco coaches in California to work with Cisco women around the world (in Bangalore, Hong Kong, or Dubai). Cisco expects to provide more than 100 hours of coaching per month during a six-month pilot period. If the pilot is successful, the company plans to scale the initiative broadly across the Cisco Women's Action Network.

TACKLING THE FIGHT-OR-FLIGHT MOMENT

Johnson & Johnson: Crossing the Finish Line: A Career Acceleration Program

Johnson & Johnson recently developed an initiative that targets high-potential, director-level, multicultural women, many of whom are scientists and engineers. The pilot was so successful that J&J delivered the program twice in 2007—in September and in November at corporate headquarters in New Brunswick, New Jersey.

The company considers Crossing the Finish Line to be a "career acceleration program" for multicultural women and also a "primer for managers." The program is structured to provide these talented women with knowledge, skills, and strategies to enhance their abilities and further their careers. It also enhances supervisors' ability to create and manage an environment that leverages

diversity. The end result is higher retention rates and advancement of multicultural female SET talent at J&J. In the words of Lana Burrell, a program participant and a director in the oncology division, "Being able to see the next steps in my career is such a relief. I now have the tools to proactively get myself to the next level. Prior to this program I felt that my advancement was not up to me, but would just happen if I worked hard."

"This program helps us capitalize on talent that is reflective of the global environment and different from the traditional mold," says JoAnn Heffernan Heisen, chief diversity officer of J&J. "These women have specific and unique needs that are often not well addressed in traditional programs. This is not a remedial program for them but a career acceleration program because they are already recognized as high-potential talent."

So what does this initiative look like? To ensure a good cross-section of the business, participants are nominated by the VP for human resources at each J&J franchise. The global human resources vice president then selects 40 teams comprising a multicultural woman and her supervisor (80 people in all) to be part of the initiative.

The program includes knowledge building, strategy development, and practical application. It runs for a total of four days—two and a half days for the high-performing, high-potential women, one and a half days for the (mostly male) supervisors. The two groups overlap for half a day to allow the team members to connect. The women share what they have learned over the last two days, their bosses react, and the newly formulated teams start to create career development action plans to be rolled out when the training is over.

Two key components contribute to the success of this program. First and foremost is the direct participation of top management. The CEO and several members of the executive committee are physically present at Crossing the Finish Line sessions, providing participants with an exceptional opportunity to interact with company leaders.

Second is a team-building exercise that allows team members to uncover different perceptions. Each woman and her supervisor fill out a questionnaire about how an executive should handle a specific people management problem. The teams then discuss the responses, particularly focusing on disconnects between women and their bosses. This exercise demonstrates that even terrific managers who have great working relationships with female subordinates don't always "get it."

Feedback from participants in the program has been overwhelmingly positive: "A phenomenal leadership program for multicultural women," and "it was extremely encouraging to receive this type of focus and to be validated by our leaders" are typical comments. Vanitha Sekar sums it up best: "Every now and then I wonder did I do the right thing in going to the private sector, but that meeting made feel like I am in the right place."

Microsoft: Mentoring Rings

The Mentoring Rings initiative at Microsoft seeks to leverage the experience and goodwill of senior men and women to help junior women cross the "great divide." Its focus is on increasing the number of women who stay on track in their careers.

The program began in 2002 as an informal grassroots arrangement where one or two senior people mentored a small group of Microsoft employees. It was not originally geared to women but rather to any Microsoft employee who wanted a mentor. In 2005, the Microsoft women's affinity group, Women@Microsoft, launched a "mentoring ring" pilot that teamed a senior woman and senior man with a small group of junior women. Intrigued by positive feedback from the group and by the potential for creating connectivity with senior leaders, the business division decided to pilot a similar mentoring ring program.

Designed to help women accelerate their careers and strategize about how to obtain greater visibility, the Mentoring Rings pilot matched pairs of senior female executives with small groups

of junior women, selected according to their performance and level. Each ring had two senior women and 18 to 20 junior women; there were eight rings in total. Sessions were scheduled once a month over a six-month period. The senior female executives were coached to be more facilitators than mentors—not that they didn't also give advice. Their main function, however, was to help the junior women talk about top-of-mind topics concerning their work and career development at Microsoft. Participants benefited from both top-down coaching and peer mentoring. Being part of a group of 18-20 people, with facilitators rather than mentors, gave junior women the opportunity not only to speak openly about their career concerns but also to enlarge their networks.

Individual rings were given leeway to accommodate the unique needs of their members. Some groups, for instance, met twice a month but for only 45 minutes each time. Other groups skipped months so that their circles lasted longer than six months. Most mentoring ring leaders requested that each mentee prepare a talking point for one session, and all participants were encouraged to get involved in discussion.

Feedback from the first pilot was so positive that the business division initiated a second round in early 2007. This round added an important innovation: The 11 women tapped as mentors were asked to enroll a male peer as a partner. This enabled the women in the group to get a "man's view" on issues, and it gave senior men insight into what was on the minds of junior women. By creating an open discourse that includes both genders, Microsoft equipped its junior women with a framework to share perspectives on career development and professional aspirations.

As the program readies for its third round, additional tweaks have been made. Some rings, for example, will include only participants from a single division or functional area, such as marketing or product development. There will also be rings focused on specific topics, such as career paths or work-life challenges. The hope is that these specialized rings will demonstrate commitment to career development for women by certain business units and thereby increase retention.

Microsoft is already thinking about what comes next. Could the Mentoring Rings continue to multiply? Could there be a strategy ring targeting top talent with business unit heads as mentors? One thing's for sure: These rings are seen as enormously beneficial by those who participate and are having a ripple effect throughout the company.

IBM: Flexible Leave of Absence

Andrea Henderson graduated near the top of her engineering class at MIT in 1976. After being hired by IBM, she entered a 12-month development program where she trained to become a technical marketing rep. Four years later she was recognized by IBM as the top marketing professional in her region. That same year Andrea gave birth to her first child. Just three years later she left the company.[59]

Andrea's action is a classic example of the fight-or-flight moment. A women experiencing overload in her mid-30s can either push on and fight for career advancement, often to the detriment of her family obligations, or flee to focus prime attention on caring responsibilities. Believing firmly that no woman, or man for that matter, should have to make such a wrenching decision, IBM took action. In 1986 the company launched its first Work and Life Issues Survey designed to uncover why so many women were being forced off track. The survey revealed a harsh reality: More than one-quarter of all women at IBM reported difficulty balancing the demands of work and family life.[60] Company officials implemented a number of immediate policy changes and continued to field the survey every three years to gauge changes in the culture. The most far-reaching initiative to come out of this survey was the expansion of IBM's flexible leave of absence program.

The program, which dates back to the 1950s, lets employees remain connected to IBM even if they need to take an extended break from employment. The 1986 Work and Life Issues Survey prompted IBM to reassess its employees' work-life challenges; as a result, the leave of absence program was extended from one to three years.[61] As work-life constraints have evolved over time,

so too has the program. Today IBM's flexible leave of absence program can extend to five years for employees interested in taking educational or military leave.

To qualify for a flexible leave of absence, an employee has to work out an arrangement with his or her manager. It can be taken for any personal reason, from staying home with children to taking care of parents to running a marathon.

Annie Cheung, a vice president who spearheads IBM's Asian initiative, has taken a total of five leaves of absence over her 30-year career with IBM. Cheung's sabbaticals have ranged from unpaid childcare leave to a five-month paid leave to enjoy time off after an intense project overseas. "IBM is a wonderful employer. If you have a good track record and need a leave of absence, you can take it," she says. IBM encourages its employees to take advantage of the program because it believes that a balanced employee is a more productive employee. When Cheung spoke to her manager about taking a year off to spend time with her eldest son before he left for college, her manager complimented her: "I applaud you for doing this; more people should do what you do." When, after a year, Cheung felt like she needed more time with her family, she called her manager and, over the phone, extended her leave by another year.

IBM's flexible work programs apply to IBM centers across the globe and are considered a cornerstone of company policy. Due in large part to the flexible leave of absence program, 21% of IBM's executive employees are now women.[62] For IBM this program is "crucial to attracting, motivating and retaining key talent."[63] In the words of one employee, "I've received multiple offers from other companies but at the end of the day, the flexibility that IBM gives me…always tips the scale toward IBM…even when [I'm] offered significantly more money."[64]

BT Group: Freedom to Work

"Freedom to Work" is flexible work at its finest, and it's helping keep female engineers on track. At BT Group it now permeates the company's culture. The idea behind BT's program actually dates back to the mid-1980s, although it didn't kick into full swing until the late 1990s. A team based in Cardiff, Wales, who were working against the clock to eradicate possible millennium problems, was having problems coordinating with their counterparts in India. To solve the problem BT decided to allow employees to work wherever and whenever they wanted—as long as they got their work done. The result: better productivity and less absenteeism. Now Freedom to Work is available throughout the company. Employees are encouraged to develop their own schedules and work rhythms, if practical. They can balance working from home with long or short days at the office. Workers can also accrue blocks of vacation time to use during school holidays. The flexibility options provide opportunities for people with disabilities, those with caretaking responsibilities, and employees returning to work after a career hiatus or maternity break. Men take advantage of these policies as well as women—though Freedom to Work has had a particular impact on the ability of BT to retain its highly qualified women engineers and technologists.

CREATING ON-RAMPS

General Electric: Restart

The John F. Welch Technology Center (JFWTC) in Bangalore, India, is the largest of four GE global research centers around the world. Within its expansive 50-acre campus, technology teams from seven GE businesses do breakthrough research for GE. In all, some 3,700 scientists and engineers work at this center. This microcosm was chosen as the perfect place to roll out GE's new on-ramping program, Restart.

GE Global Research recognized that India, like the United States, has a huge untapped resource of highly qualified women who have opted out of the workforce. In May 2007, at a meeting with the GE Women's Network at JFWTC, K. Murali, the HR leader for GE Global Research, listened to network members discuss the struggle of finding work after taking time off for children. The face of India is changing not only economically, but also socially. The cultural standard of grandparents

living with the family to take care of grandchildren has shifted, so familial childcare can no longer be taken for granted. Many highly qualified working moms find they have no option but to off-ramp for a while. The problem is finding an on-ramp down the road.

GE wants to help these women get back on track and recapture this lost talent. This was the genesis of Restart. There are some role models at JFWTC. Kshira Muthanna took a 14-year hiatus when she raised two daughters, cared for parents and in-laws, and earned a PhD. After this long break, GE helped her to get back on track: "The first thing GE had to offer me was the orientation so that I could catch up to the same level as the grads and industry vets. I was open about asking for help, and they were open to providing me the support. It is a very small set of women who come back after such a break—it takes a lot of courage. When I was coming back I wanted to find my own identity and foster my passion. GE realized that I had a long break, but they gave me all the support I needed. Since then they have stretched me to the fullest so that I can perform at my best. That is unique. I have control over my career, and it makes me feel good to work in a place where people are willing to listen and give me opportunities."

At the organizational level, GE India plans to support the needs of female employees by expanding existing policies, such as adding "baby on the way" parking, offering postmaternity flex policies, building a mother-to-be room and a lactation room, and appointing a diversity leader at JFWTC.

The idea is to position GE India as an employer of choice for highly qualified SET women. Restart is an important part of this wider effort. The program will be launched in early May 2008, and GE expects to hire 10% of those who participate in the initiative—doubling its re-hire numbers overall.

Deb Elam, GE's global chief diversity officer, backs this initiative with enthusiasm: "The John F. Welch Technology Center in Bangalore has realized the huge untapped potential in terms of highly skilled women technologists; I'm thrilled they're stepping in with this great initiative." Across India, women hold 3% of managerial positions, so success at JFWTC could have significance beyond GE.

Johnson & Johnson: ReConnections

To reflect its commitment to sustaining the ambition of all employees, Johnson & Johnson is launching ReConnections—an on-ramping program tailored to Johnson & Johnson alumni. Although the program is open to women and men, the overarching purpose of ReConnections is to facilitate the return of off-ramped women to the workforce.

The program will begin with a pilot in 2008 and will be rolled out across the United States in 2009. The pilot will be deployed in either one functional area or business unit, and a target population of "on-rampers" will be invited to participate. The aim is to gather feedback throughout the pilot and share insights, allowing the participants to actively sculpt the program. As Wendy C. Breiterman, director of work/life programs, says, "We are piloting with the intent to listen and learn so that we can implement a program that supports the needs of the participants and leverages this important talent pool." Although the nuts and bolts of the program are still being fleshed out—and will continue to be throughout the pilot—the goal is to provide a wide variety of resources, online tools, and support for off-rampers to stay connected and for on-rampers to reconnect with colleagues, mentors, and networks.

Johnson & Johnson has developed a supportive work culture, and this naturally fostered an environment that brings women back. Through exit interviews and anecdotal feedback, the company has learned that most employees who leave Johnson & Johnson are interested in returning. The company's long-standing policy of service bridging, in which rehired employees receive company tenure for their total years at the company, supports the notion that time out should not be viewed negatively when an employee returns to the workforce. By leveraging the learnings and experiences of the pool of women who have informally on-ramped into the culture, Johnson & Johnson is well positioned to customize ReConnections to the needs of employees.

Over the past several years, Johnson & Johnson has made considerable progress laying the groundwork. It offers a consortium of "one size fits one" organizational flexibility policies as part of its Life 360™ work, family, and personal life services. Life 360 has embedded the value proposition for flexibility into the discussion and has created an online toolkit and process that facilitates employees' requests for flexible work arrangements. The program intentionally does not ask employees to supply a reason for their request. In this way, requests are approved not as an accommodation, but as a sound business decision. Further, Johnson & Johnson has responded to the high level of interest in job sharing by revising its headcount methodology. Now, two job sharers working a total of 40 hours count as one full-time equivalent employee. The comprehensive flexibility policy means that, at Johnson & Johnson, most jobs can be performed with some form of flexibility, so that potential on-rampers will have a wide range of options.

The program will embed the notion of workforce re-entry into the "off-ramping" conversation and create facilitated contact to keep those who are off-ramping in the loop and up to speed on the latest industry developments. For Johnson & Johnson, the success of the program will be measured not solely by how many employees on-ramp but also by how well the company advances and retains on-ramped employees. As JoAnn Heffernan Heisen, chief global diversity officer and founder of the Women's Leadership Initiative, explains, "At Johnson & Johnson, we think about the impact that we can have on individual lives for generations to come. ReConnections supports retention and advancement of talented employees while reflecting our commitment to 'Caring for the world...one person at a time.'"

Massachusetts Institute of Technology: Midcareer Acceleration Program

MIT's School of Engineering's Professional Education Programs knew that alums were having difficulty reentering the workforce after taking time out. Bolstered by the Hidden Brain Drain study, "Off-Ramps and On-Ramps," and their own research, they developed and launched the Midcareer Acceleration Program (MAP) in 2006.[65] MAP is an on-ramping program that targets high-caliber talent with technical backgrounds, including MIT alums.

Background research determined that midcareer professionals with substantial gaps in their résumés needed to update soft skills and technical expertise as well as demonstrate a commitment to returning to the workforce. MAP was therefore designed as a 10-month, quarter-time program that includes a four-day orientation, one full-semester academic course, multiple workshops, an applied learning project, and an internship.[66]

MIT recently welcomed a second batch of students; participants' ages range from early 30s to early 50s, and most have advanced degrees. The program has been enormously successful. The majority of students complete the program with either a job or a strategic plan to find a professional niche that matches their abilities and ambition.

FIGHTING ISOLATION

Cisco: Executive Talent Insertion Program (ETIP) and Executive Talent Assimilation Program (ETAP)

Though not designed as diversity initiatives or targeted specifically at women, the Executive Talent Insertion Program (ETIP) and Executive Talent Assimilation Program (ETAP) are poised to be game-changers for women at Cisco.

By hiring in a significant number of women at the VP level and above, the ETIP initiative is on course to create a critical mass of women in senior positions. In one fell swoop, it both eliminates isolation in the top ranks and creates a significant pool of female mentors and sponsors, who will in turn improve the career prospects for more junior women at the company. Annmarie Neal, VP, Talent@Cisco, explains the importance of ETIP/ETAP: "Moving the dial in this way impacts everyone; the policies cascade down and make the company a more inclusive place to work all around."

How did this innovative program get off the ground? At an executive staff meeting a year ago, CEO John Chambers noticed that most people in the room were homogeneous—and many had been with the company forever. When he asked how many had been at Cisco five years or longer, the majority raised their hands. Chambers' takeaway: To reflect the breadth and scope of its global operations, Cisco needed to diversify its executive ranks and change the face of leadership. He talked about transforming the Company to the next level—Cisco 3.0—to gain skills sets and meet the needs of a wide range of customers around the world.

Thus ETIP was born. The program was intended to disrupt the standard talent development process. Traditionally, Cisco hired talent in the early and middle stages of careers and then grew this talent into leaders. It was rare to recruit senior executives externally: Over the past five years only 18 hires at the VP level have come from outside the company. ETIP changes that reality. The program calls for 72 lateral hires over the next 18 months at the VP level and above. What's more, 35% of these hires need to be women and underrepresented minorities. "The goal is to create a fast track to leadership for these new streams of talent," says Neal.

Begun in April 2007, ETIP is off to a successful start—23 new VPs have been hired. Twenty-one percent of these new hires have been women and minorities, including the new CTO, an Indian woman. This is just higher than the crucial 20% ratio, the tipping point for women and minorities.

Cisco uses a three-pronged recruitment strategy for its ETIP program. First, the company works with two search firms that specialize in diversity. Second, it continues to use traditional search firms but stipulates that they must present a diverse slate for every position. Third, it has hired an internal executive recruiter—a woman—who works with job candidates and helps persuade a female or minority hot prospect that Cisco is a good fit. Neal says that while the company is, "first and foremost, trying to hire the very best candidate, an even better candidate might be the most talented candidate who is also a woman or minority who mirrors the marketplace."

A planned complement to ETIP is ETAP, the Executive Talent Assimilation Program. This program helps to assimilate new hires into the Cisco culture through the "3 E's": education, exposure, and experience. It will help new recruits build their internal network faster. ETAP also imparts less-obvious lessons, such as the ten "must-knows" at Cisco that aren't in the employee handbook. To take two examples: Don't confuse working together with having relationships— contacts are fine, but relationships return your calls; and PowerPoint is Cisco's lingua franca— think of how much more effective you are in France when you learn French.

ETAP will invite new senior recruits to the Executive Action Learning Forum, a 12-week strategic initiative where VPs—organized in teams of about 15—gain exposure to John Chambers and other senior leaders. The Forum gives them the opportunity to work together on a real-time business issue as well as facilitating connections with established leaders in both domestic and international divisions of the company.

This new assimilation program will create a support infrastructure and "a collaborative environment" for senior recruits. It is designed to move them successfully from "day one through year one." Working with collaborative technologies, Neal's team connects with the new recruits on a regular basis, helping them navigate the nuances of Cisco's culture, so they can be most effective. There are even some one-on-one sessions, which allows for customized brainstorming and feedback. Many new senior recruits welcome help developing and positioning a "First 90-day Plan."

ETAP aims to increase "stickiness" by giving new senior hires the tools they need to succeed— particularly females and minorities who may be the most at risk. ETAP's goal is to push the retention rate to 75% of lateral senior hires—a sharp increase over the traditional 50%.

LEVERAGING ATHENA TRAITS

IBM: Corporate Service Corps

A brand new initiative at IBM—the Corporate Service Corps—attempts to tap into the desire of employees to improve the lot of humankind. While not specifically targeting female talent, this program will undoubtedly reinforce the Athena traits discussed in Chapter 1. It's likely to turn into a retention tool for IBM women.

The Corporate Services Corps, which got off the ground in 2008, sends 12 teams of IBM employees to partner with charitable organizations and nongovernmental organizations in emerging-market economies across the globe. The projects that corps members participate in echo those of corporate philanthropy, but this is not the program's only aim. As Randy MacDonald, senior vice president of human resources attests, "This is a management development exercise for high-potential people at IBM."[67] The idea is that through philanthropic work, highly talented employees can deploy their passion, hone their skills, and translate their competencies to up-and-coming regions of the global economy.

Employees selected to participate in the Corporate Service Corps partake in an intensive three-month prep course to familiarize themselves with the local language, culture, and economic and political realities of their assigned region. The program, which it describes as a "corporate version of the Peace Corps," is already immensely popular. It has attracted more than 5,000 applicants for 100 slots, making it one of IBM's most competitive employee programs.[68] Interestingly, almost half of the participants in this first phase are female. IBM sees the initiative as being a long-term training tool; it is also likely to bolster the retention of female talent. As we understand from the Athena Factor survey research, SET women are seriously motivated by opportunities to give back.

CHAPTER 11: GOING GLOBAL

Moving to the global context, many of the opportunities and challenges described in Chapters 1 through 9 are amplified. Not only are SET shortages and shortfalls more pronounced in Europe and Asia than in the United States, there's an even bigger treasure trove of female talent in other backyards around the world.

The Athena Factor research does not allow us to create a comprehensive global picture of female talent in SET, but we are able to shed light on SET women in certain key contexts—particularly China and Russia. Most important, we're well positioned to highlight some major opportunities for talent-starved multinational corporations seeking to expand in markets around the world.

Our findings are based on focus group research. In the twelve-month period November 2006 to November 2007 we carried out targeted focus groups in Shanghai, Hong Kong, Moscow, Geneva, London, and Sydney. We talked to more than 100 highly qualified SET women between the ages of 25 and 45, all currently working for global companies—some U.S.-based, some Europe-based.

The following are some highlights from our global focus group research.

- **In China and Russia the female talent pipeline in SET is surprisingly rich.** These countries boast a large pool of highly credentialed women. Focus group participants in Shanghai and Moscow told us that in many engineering fields women comprise 50% to 60% of the graduating class, and women are often the top students; it is not rare for the entire top decile to be female. The existence of these large pools of highly credentialed SET women is due, in part, to the educational policies and culture of the Communist era. In Maoist China, women were said to "hold up half the sky." In the USSR, equal opportunity prevailed and women were encouraged to enter fields that, under capitalism, had been off limits to females—heavy industry, petrochemicals, and the like.

- **SET women around the world prefer to work for global companies.** Chinese and Russian women prefer to work for multinational companies—they see Chinese- and Russian-owned companies as misogynistic, tightfisted, and reluctant to invest in good people development practices. Within the universe of global companies, U.S. firms are preferred—they earn high marks on the nurturing talent front and are seen as woman-friendly. This point was stressed in focus groups in Geneva and Sydney as well as Moscow and Shanghai. Japanese-owned companies were singled out for criticism (low wages and disrespectful of women) as were French-owned companies (arrogant and, again, disrespectful of women).

- **SET women prefer global companies because of their ethical standards and their track record on safety and environmental issues.** This is a huge lure in Russia and China. In focus groups in Moscow and Shanghai, SET women talked about how much they appreciated the higher ethical standards of U.S.- and Europe-based multinationals (less corrupt, fewer bribes). They also stressed the weight they gave to higher safety standards. One Russian female engineer pointed out that in heavy industry, the number of on-the-job injuries in Russian-owned companies is 10 times that of U.S.-owned companies. As a single mother, this fact was extremely important to her. A Chinese female engineer told us she was "appalled" by the degradation of the environment caused by Chinese-owned companies. It was the main reason she had opted to work for a U.S.-based company.

- **In many parts of the world, the old boys' club is alive and well.** In SET companies in Europe and Australia as well as in Russia and China, male dominance of top jobs and key social networks continues to block the advancement of women. Excuses run the gamut from "She hasn't put in time on the coal face" to "She's never worked in the smelter" to "If a women gets a top job it's 'through the bed'—because she's slept with her boss." In Shanghai and Moscow, focus group participants pointed out that the high officials (Moscow) or top Party cadre members (Shanghai) have always been male and continue to have a lock on power.

- **SET women in China and Russia are hungry for leadership training.** Despite a rich talent pipeline, women in these countries have trouble breaking into the senior ranks. In the Communist era women were not promoted and therefore not part of the inner cadre of party officials who had a lock on power. Thus there are few role models for young ambitious women—less so than in either the United States or Western Europe. The desire for leadership training, coaching, and mentoring is huge, starting with better access to English language training. In both Shanghai and Moscow, focus group participants saw poor language skills as a significant barrier to advancement, limiting use of company intranet sites and inhibiting contact with expat bosses. They believed their male colleagues had much better access to language and leadership training.

- **In China and Russia women seem minimally burdened by childrearing.** Women in these countries fully expect to work full-time for their entire working lives and appear to have no problem adhering to the lockstep progressions of the male competitive model. This expectation—the seeming lack of a need for longer runways and on-ramps—appears to derive from two aspects of these cultures. First, in choosing to work through the childbearing and childrearing years, women are simply doing what their mothers and grandmothers have done before them. As one Russian woman put it, "I don't know what it looks like—staying home, not having a job and coworkers." Second, many women are either childless (birth rates are extremely low) or have a lone child (China has had a one-child policy for many years). In Moscow, among 17 participants in our focus groups, eight women had no children, eight had one child, and one had two. In Shanghai the picture was similar. (These findings are supported by our global companies' survey—76% of SET female employees in China did not have children, compared with 45% of their U.S. counterparts.)

- **For SET women around the world, eldercare issues loom large.** Particularly in Russia and China, women have enormous ongoing responsibilities for parents, parents-in-law, and other elderly relatives. In Shanghai, the women in our focus groups talked about mothers- and fathers-in-law with broken health and no social security living in their spare room. In Moscow, women talked about a whole slew of older relatives, devastated by perestroika, who need help with market rents and health-care charges. The older generations in China and Russia are heavily dependent on their children—or more specifically, on their daughters. In both countries, the culture dictates that daughters shoulder the bulk of this burden. And indeed they do, as do their female counterparts in India. Our survey of technology workers in China and India found that more than half (52%) report coping with eldercare responsibilities while working (compared with only 19% of the U.S. women). In Shanghai, female engineers and scientists in their late 20s and early 30s spent a lot of time talking about the eldercare burden. One participant pointed out that in China, the eldercare challenge was compounded by government policy: "I am part of the first generation of one-child families. With no siblings and no cousins I face the prospect of looking after—and supporting—four

FIGURE 11.1

U.S.-Based Companies Have an Edge in Global Market for SET Talent

	"Woman-friendly"	Safety	Environment
U.S.-based	★	★	★
Russian	—	—	—
Chinese	—	—	—
French	—	★	★
Japanese	—	★	★

elders: my parents and my husband's parents. My in-laws are already living in our spare room." In the Shanghai and Moscow focus groups, many of the women devoted 20–25% of their income to keeping parents afloat.

To better situate our focus group findings, let's now turn to some key challenges in the global talent pipeline.

Shortfalls and Talent Constraints

As discussed in Chapter 1, in many regions around the world companies are beginning to experience shortages in the supply of SET labor.

Demand for SET skills has reached new heights across the globe—driven by high rates of growth in Asia and robust expansion in Europe and North America. The Bureau of Labor Statistics projects that by 2016 there will be more than 1.5 million computer specialist job openings in the United States.[69] Globally, demand for SET talent is outstripping supply. BITKOM, Germany's association for high-tech companies, recently reported that 62% of BITKOM companies lack specialists in IT and communications.[70] The Indian National Association of Software Services Companies estimates a shortage of some 500,000 tech workers by the year 2010.[71] China is experiencing serious shortfalls on the quality front. And McKinsey & Company asserts that only 10% of the 1.6 million qualified engineers in China have skill sets that allow them to work at international standards—due in part to the fact that at Chinese universities, engineering programs focus on imparting theoretical rather than practical knowledge.[72]

Although the picture looks bleak, the news is certainly not all bad. As we've shown, highly qualified SET women represent a potential solution to the global talent shortfall. Rich pools of female SET talent can be found in many countries.

Deep Pockets of Female Talent

In Maoist China, women worked alongside men in fields traditionally considered male strongholds—steel foundries and the like. While women have had some setbacks since China's move toward a market economy, by and large Chinese women in SET are still doing well in the educational system and in the labor market. As of 2002 women represent 54.4% of those graduating from technical secondary schools.[73] There's also some evidence that Chinese women continue to do well in tertiary education in SET fields. In our focus groups in Shanghai, participants reported that women comprised 40% to 50% of graduating classes in computer science and engineering. Data collected from Renmin, a major Chinese university, supports this claim: There, women comprised 53% of master's degree recipients in engineering in 2006.[74]

The educational policies of the Communist era also created a plentiful supply of qualified SET women in Russia and Eastern Europe. For example, in the Soviet Union, nearly 40% of engineers and 80% of physicians were female.[75] In East Germany women comprised more than half of all students in computer science and related majors.[76] In a similar vein, during this era women received 73% of all mathematics and computer science degrees awarded in Bulgaria.[77] The proportion of women in SET has fallen slightly since the fall of Communism but there remains a pool of highly skilled women and a tradition of female prowess in SET.

A rich female talent pool is not limited to current and former communist states. Turkey, a largely Muslim nation with a strong secular tradition, has a surprisingly large female talent pipeline in SET (23% of engineering graduates are female). And in Western Europe, France and Spain do particularly well, graduating significant numbers of female engineers and outperforming Germany and the United Kingdom in this field.[78]

According to figures compiled by the Indian Institute of Technology, 24% of engineering graduates are women. Particularly eye-catching is the fact that 40% of these highly credentialed women are

currently unemployed. If these women could be persuaded to reconnect to their careers, they would fill nearly half of the SET talent shortage in India.[79]

Reverse Brain Drain

According to Deepak, a graduate of the Indian Institute of Technology: "As recently as three years ago, I was set on becoming a New Yorker. I was climbing the ladder at a top-ranked company and beginning to put down roots. I bought an apartment on Manhattan's East Side and acquired an American girlfriend. And then India took off. I figured that if I went back and got in on the ground floor of this boom, the sky would be the limit. I would be able to create wealth in a way that's just not possible in America, where the most I could become was a highly paid professional. Add to that the comfort I would derive from being close to my family and being able to align my work identity with my cultural roots, and it becomes an unbeatable deal. So 18 months later, here I am back in Mumbai, the CFO of a rapidly expanding Indian-owned high-tech company."

For reasons ranging from wealth accumulation to cultural identity, highly skilled Chinese and Indian nationals currently working in America and the United Kingdom are heading home. Estimates are that India's economic boom will draw as many as 20 million Indian citizens, currently resident in the United States and the United Kingdom, back to India, lured by opportunities that transcend what they can find abroad.[80]

Due in part to their own burgeoning labor shortages, India and China have embraced this trend and made "encouraging the brain gain" official state policy. The Chinese Ministry of Personnel has created an "improving services for returned students" program which features job introduction centers for returned students in the cities of Shenzhen, Shanghai, and Fujian, as well as preferential treatment for returnees (allocating more living space and allowing family members to move to cities where returnees find jobs).[81]

Similarly, India has established programs aimed at luring highly qualified Indians currently working abroad. The tenth Five Year Plan of the Indian government calls for the use of fellowships programs to bring Indians home.[82] In addition, since 2001 the Indian government has provided billions of dollars in "soft loans," which require no collateral, to students wishing to travel abroad for their education. The expectation is that these students will return to India in short order.[83]

India and China have a diaspora model of education—large numbers of Indian and Chinese nationals study abroad, particularly targeting U.S. universities. In the past the majority of these students chose to remain in the United States. Today many choose to go home. According to data compiled by the Rochester Institute of Technology, in the late 1990s a mere 20% of Chinese students who graduated in the United States returned to China; today that number is close to 75%.[84]

FIGURE 11.2
Total Patent Applications Granted by Country[85]

Country	1992 Granted applications	2005 Granted applications	Percent change
China	3,966	53,305	+1,244.04
Japan	92,100	122,944	+33.49
Russian Federation	7,897	23,390	+196.18
United States	97,443	143,806	+47.58

United States Running Scared

So what does this add up to for the United States? Partly because of the shortfalls and brain drain described above, the United States has begun to lose ground in scientific and technological innovation (see figure 11.2).

The 21st-century global economy is driven by scientific and technical innovation. While the United States still leads the way, Asia is quickly gaining. Until recently, a key factor behind America's success has been its ability to attract the best and the brightest from around the world. According to a report recently published by Duke University, for instance, more than half of all Silicon Valley start-ups in the 1990s were founded by immigrants.[86] Furthermore, 41% of patents filed in the United States in 2006 had a foreign national listed as the inventor.[87] Now the supply of foreign or noncitizen talent is threatened on two fronts.

We've already talked about a reverse brain drain to India and China. Compounding this problem are regressive trends on the immigration front, which show up most clearly in limits on H-1B visas. Because of security concerns following the 9/11 attacks, the cap on H-1B visas has been set at 65,000, which doesn't begin to satisfy demand. In each of the last three years, the cap has been reached at an earlier date in the year, pointing to a great deal of unmet demand for highly skilled foreigners, many of whom have SET qualifications (see figure 11.3). Business leaders are increasingly frustrated by the rigidities of U.S. immigration policy. Alcoa CEO Alain Belda is a case in point. Belda, Moroccan-born and a citizen of Brazil, came to the United States in the early 1990s when immigration rules were looser. He is particularly well placed to understand the price paid by restrictive policies that increasingly prevent Alcoa from filling key positions in the United States with highly qualified foreign talent. In his view, this is putting U.S.-headquartered companies at a competitive disadvantage.[88]

FIGURE 11.3

Demand for H-1B Visas in the United States[89]

	2005	2006	2007	2008
Visa quota	65,000	65,000	65,000	65,000
Month quota reached	October '04	September '05	May '06	April '07 (Cap reached one day after being opened for petitions.)

Conclusion

Despite these legitimate complaints, the larger truth is, in the United States and around the world, the supply of SET talent is not keeping up with demand. While some strategies designed to up the limit for H-1B visas in the United States have the potential of somewhat expanding the labor supply in specific contexts, these solutions do not provide long-term answers because there simply is not enough SET talent to go around. The answer lies in radically expanding the labor pool by tapping into qualified women already in the pipeline, those highly qualified, extremely committed female scientists, engineers, and technologists described in this report. The upside here is huge. By tapping into women in their own backyard, companies can quickly and significantly expand their talent pool. Bringing back just 25% of the highly qualified SET women who have left the labor market—or stopping them from leaving in the first place—would add 220,000 highly qualified women to the SET talent pool. In a global economy where such talent drives the competitiveness of nations, that's a goal worth rallying around.

APPENDIX

METHODOLOGY

The research consists of four surveys (one U.S. survey and three company surveys), 28 focus groups, and numerous one-on-one interviews.

The U.S. survey was conducted online among 2,493 U.S. women and men, aged 25 to 60, with training in fields related to science, engineering, or technology who have held a position within SET in the for-profit sector at some point in their career. (Training was indicated by an undergraduate or graduate degree that focused on science, engineering, or technology. Technology training could also be indicated by current or past employment in a technology profession.) It is important to note that not all respondents are currently employed in the SET field for which they were trained; that is, the survey captures women who have taken an off-ramp either from employment or from the SET fields. Interviews averaged 23 minutes and were conducted between June 14, 2007, and July 9, 2007. The sampling frame consisted primarily of panelists from the Harris Poll Online database and was supplemented with a sample provided by Survey Sampling, Incorporated. Data were weighted to be representative of the U.S. population of college graduates on key demographic characteristics (age, sex, race/ethnicity, education, region, and household income). Propensity score weighting was also used to adjust for respondents' propensity to be online and join Harris's panel. The final sample includes only respondents with training in science, engineering, or technology who have utilized this training in employment in a for-profit/private sector organization. The base used for statistical testing was the effective base.

The company surveys were conducted within three multinational corporations between August 22, 2007, and October 1, 2007, and included 1,910 respondents (men and women) employed either full- or part-time. Each company represented one of the three climates of science, engineering, and technology. Data was not weighted for representativeness. A finite population correction was applied.

The surveys were conducted by Harris Interactive under the auspices of the Center for Work-Life Policy, a nonprofit research organization. Harris Interactive was responsible for the data collection, while the Center for Work-Life Policy conducted the analysis.

In the charts, percentages may not always add up to 100 because of computer rounding or the acceptance of multiple response answers from respondents.

HIDDEN BRAIN DRAIN TASK FORCE

In February 2004 Sylvia Ann Hewlett (Center for Work-Life Policy and Columbia University), Carolyn Buck Luce (Ernst & Young), and Cornel West (Princeton University) founded the Hidden Brain Drain Task Force, a private sector task force focused on realizing female and multicultural talent over the career lifespan. The 43 global corporations that comprise the task force representing 3 million employees and operating in 152 countries around the world are united by an understanding that the full utilization of the talent pool is at the heart of competitive advantage and economic success.

The Athena Factor: Reversing the Brain Drain in Science, Engineering, and Technology is the fourth piece of research completed by the Hidden Brain Drain Task Force. A companion article by Sylvia Ann Hewlett, Carolyn Buck Luce, and Lisa J. Servon, "Stopping the Exodus of Women in Science," was published in the June 2008 issue of *Harvard Business Review*. The first cycle of research "Off-Ramps and On-Ramps: Keeping Talented Women on the Road to Success," was published by *Harvard Business Review* as an article and a research report in March 2005. The second cycle of research culminated in "Leadership in Your Midst: Tapping the Hidden Strengths of Minority Executives," published by *Harvard Business Review* in November 2005. A companion report, *Global Multicultural Executives and the Talent Pipeline*, was released in April 2006. A follow-up study of Latinas, *Sin Fronteras: Celebrating and Capitalizing on the Strengths of Latina Executives*, was published in October 2007. A third cycle of research, "Extreme Jobs: The Dangerous Allure of the 70-Hour Workweek," was published in *Harvard Business Review* in December 2006. A companion report, *Seduction and Risk: The Emergence of Extreme Jobs*, was released in February 2007. A sequel to *The Athena Factor*, focusing on women in tech in the financial sector, will be released in fall 2008. In 2009 the task force will launch a major new study on "Bookend Generations: Leveraging Talent and Finding Common Ground."

HIDDEN BRAIN DRAIN TASK FORCE

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Center for Work-Life Policy

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Carolyn Buck Luce
Ernst & Young

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Merrill Lynch

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* Moody's Foundation

Morgan Stanley

New York Times Company

Novartis Pharmaceuticals

Orrick Herrington & Sutcliffe

* PepsiCo

* Pfizer

* ProLogis

Sanofi-Aventis

Schering-Plough

* UBS

* Unilever

UnitedHealth Group

* White & Case

Withers

World Bank

Xerox

* Steering Committee

ADDITIONAL FIGURES BY CHAPTER

Figures from Chapter 2

FIGURE A2.1
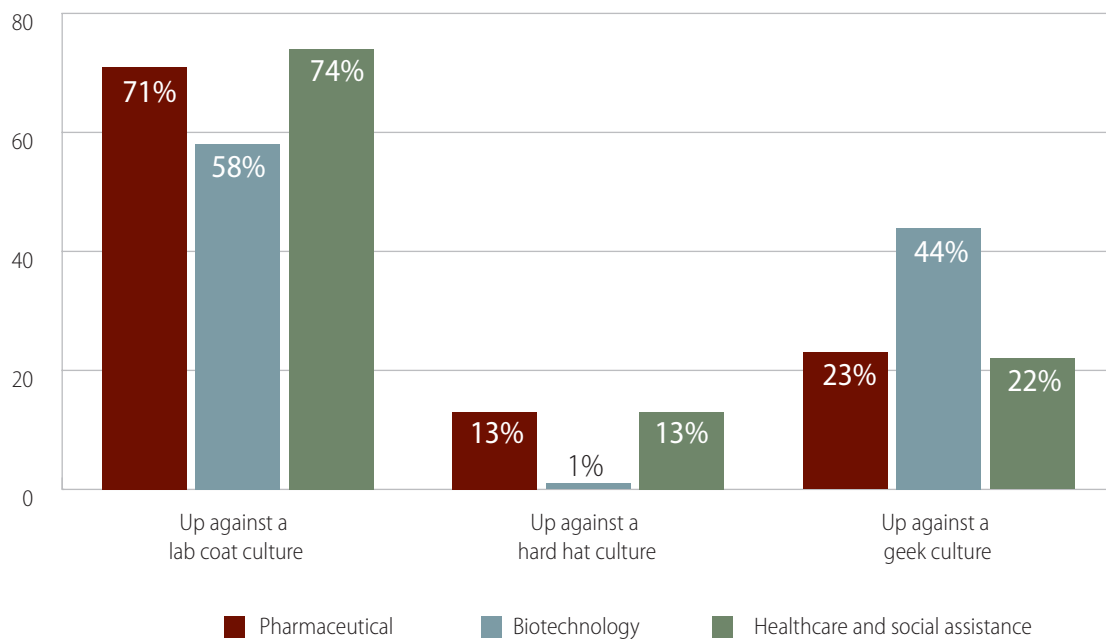## The Macho Culture Across Science Microclimates

FIGURE A2.2
The Macho Culture Across Engineering Microclimates
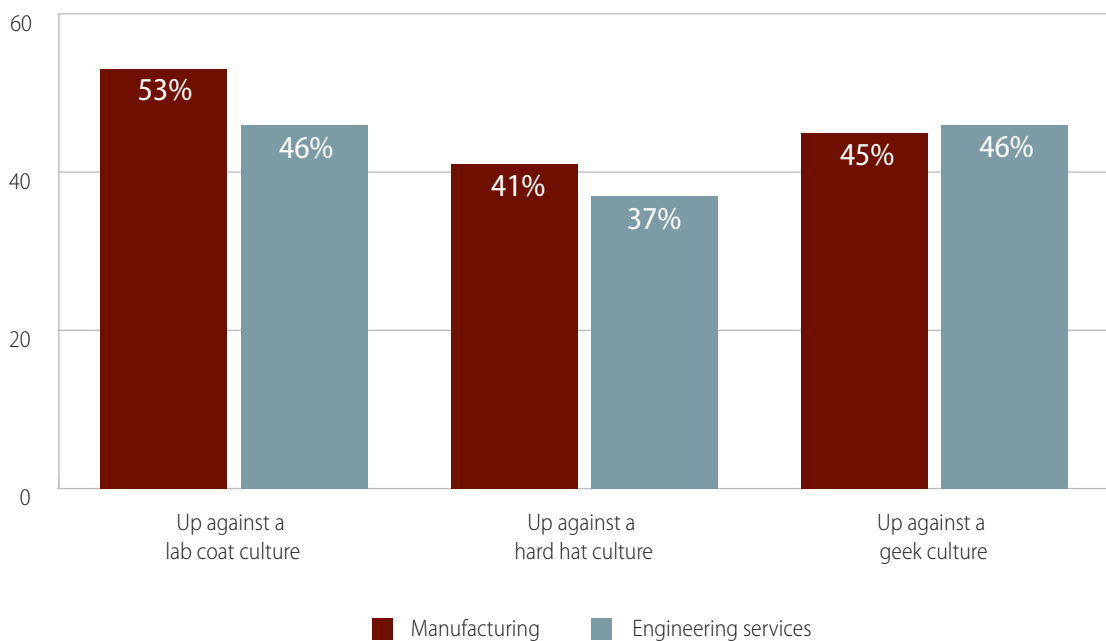
FIGURE A2.3
The Macho Culture Across Technology Microclimates
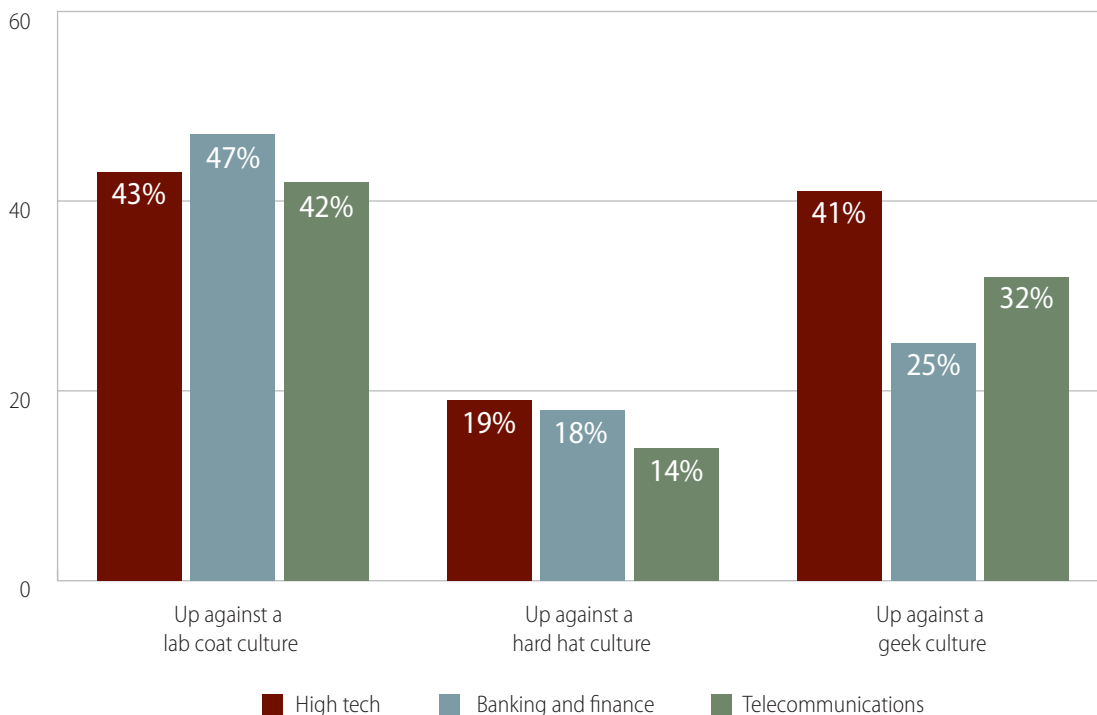
FIGURE A2.4
Key Macho Behaviors Across Science Microclimates
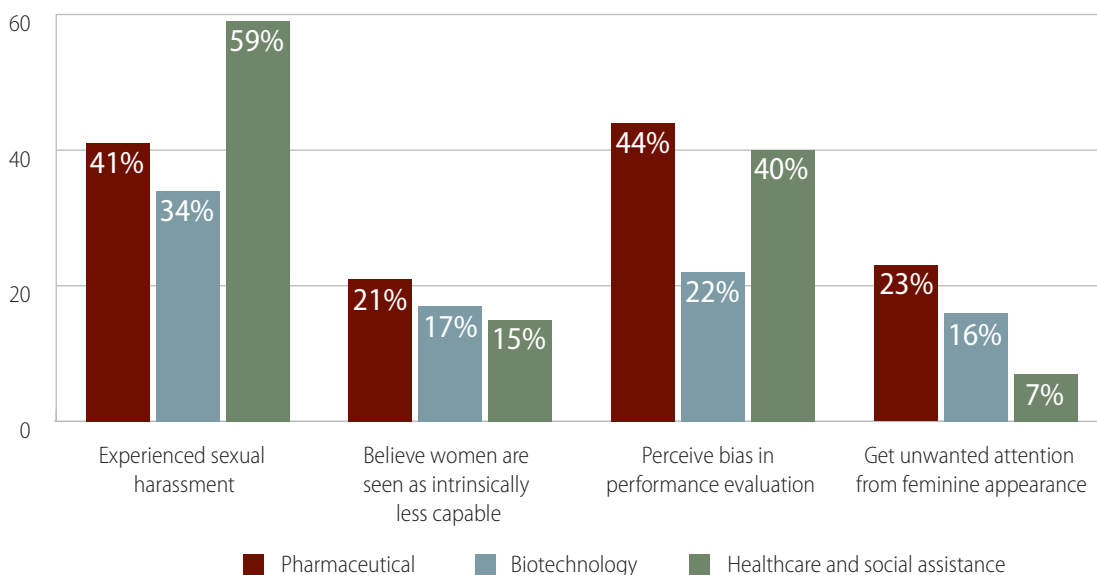
FIGURE A2.5
Key Macho Behaviors Across Engineering Microclimates

Legend: Manufacturing, Engineering services

	Manufacturing	Engineering services
Experienced sexual harassment	64%	70%
Believe women are seen as intrinsically less capable	32%	21%
Perceive bias in performance evaluation	50%	43%
Get unwanted attention from feminine appearance	35%	31%
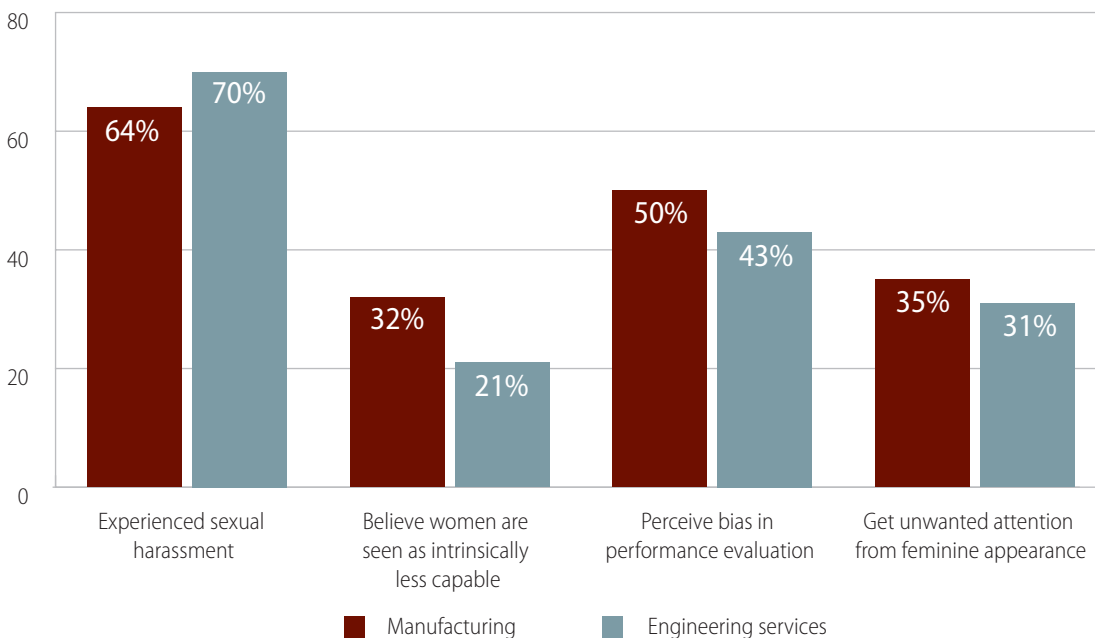
FIGURE A2.6
Key Macho Behaviors Across Technology Microclimates

Legend: High tech, Banking and finance, Telecommunications

	High tech	Banking and finance	Telecommunications
Experienced sexual harassment	65%	66%	75%
Believe women are seen as intrinsically less capable	20%	33%	33%
Perceive bias in performance evaluation	41%	61%	48%
Get unwanted attention from feminine appearance	13%	17%	22%
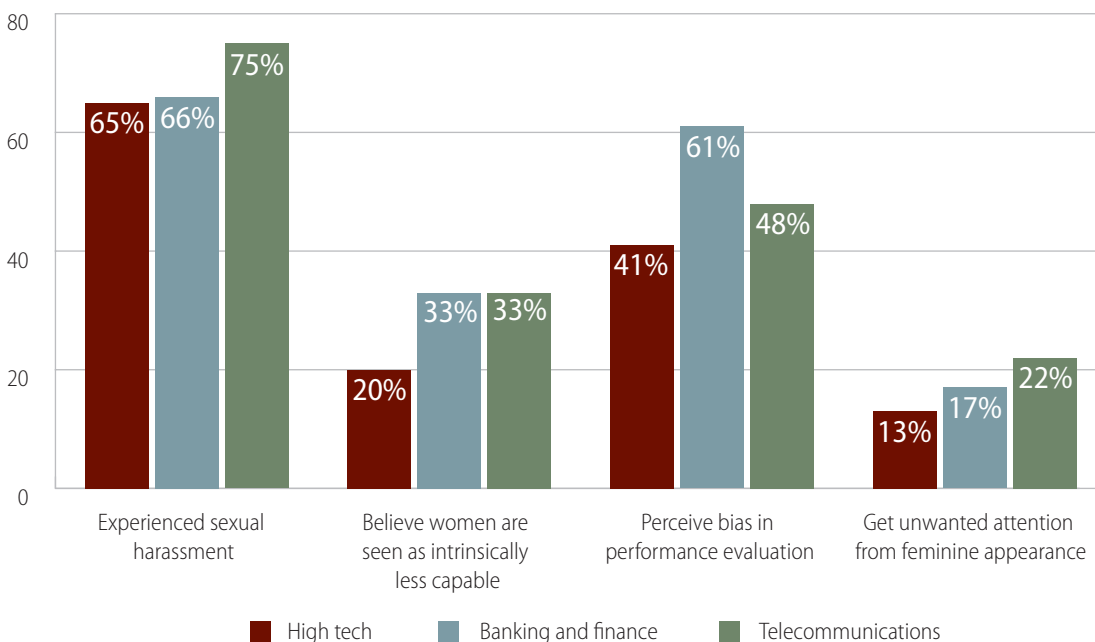
FIGURE A2.7
The Macho Culture Across SET, by Age
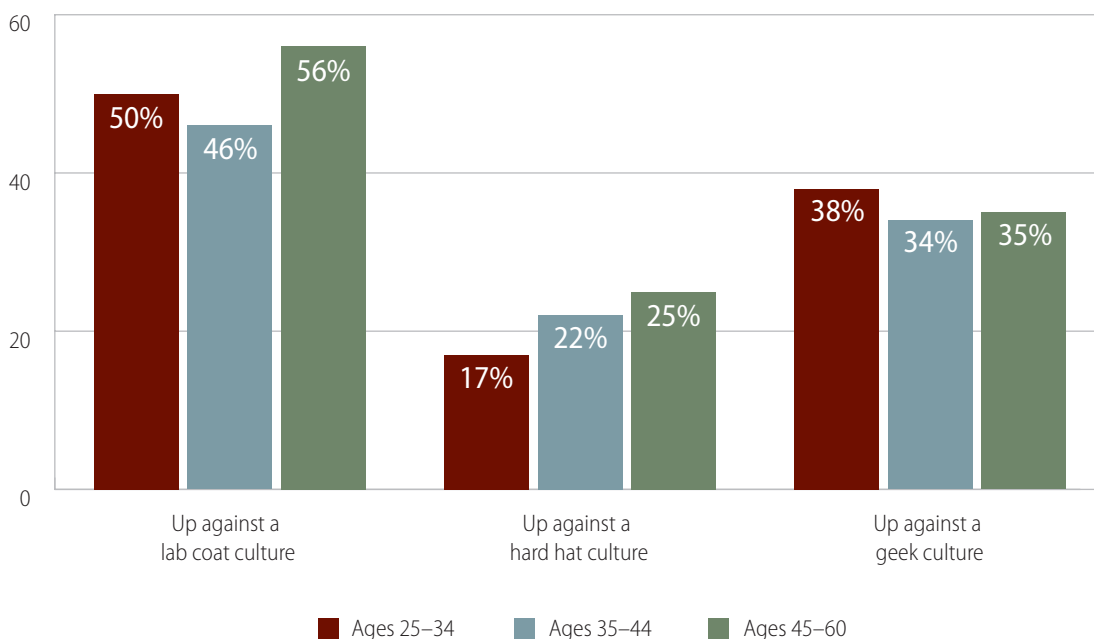
FIGURE A2.8
Key Macho Behaviors Across SET, by Age
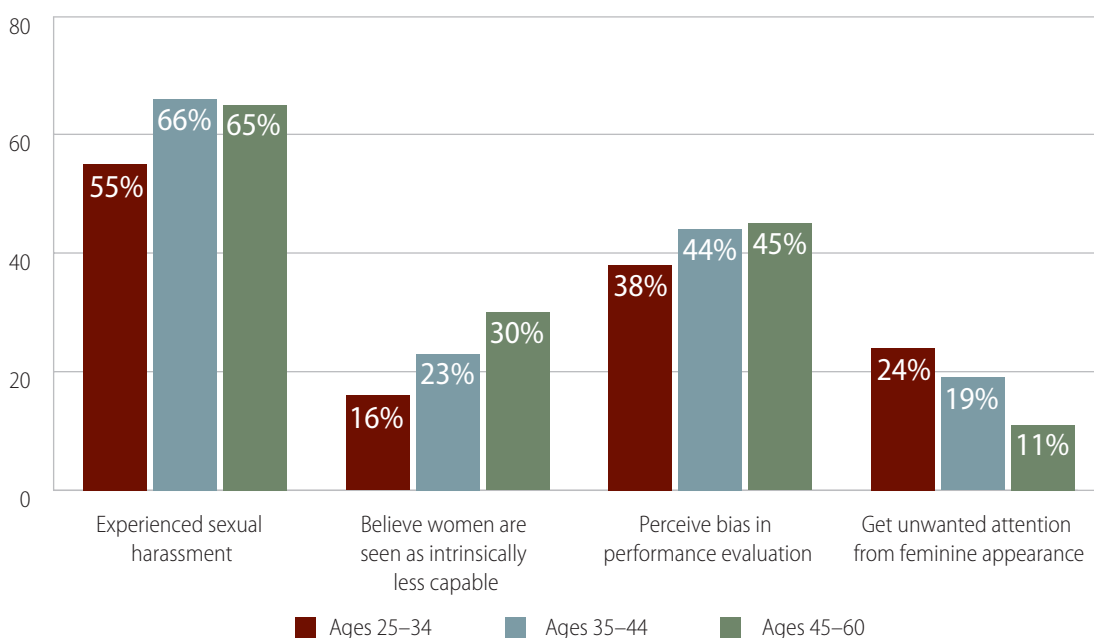
Figures from Chapter 3

FIGURE A3.1
Lack of Role Models, Mentors, and Sponsors Across Science Microclimates
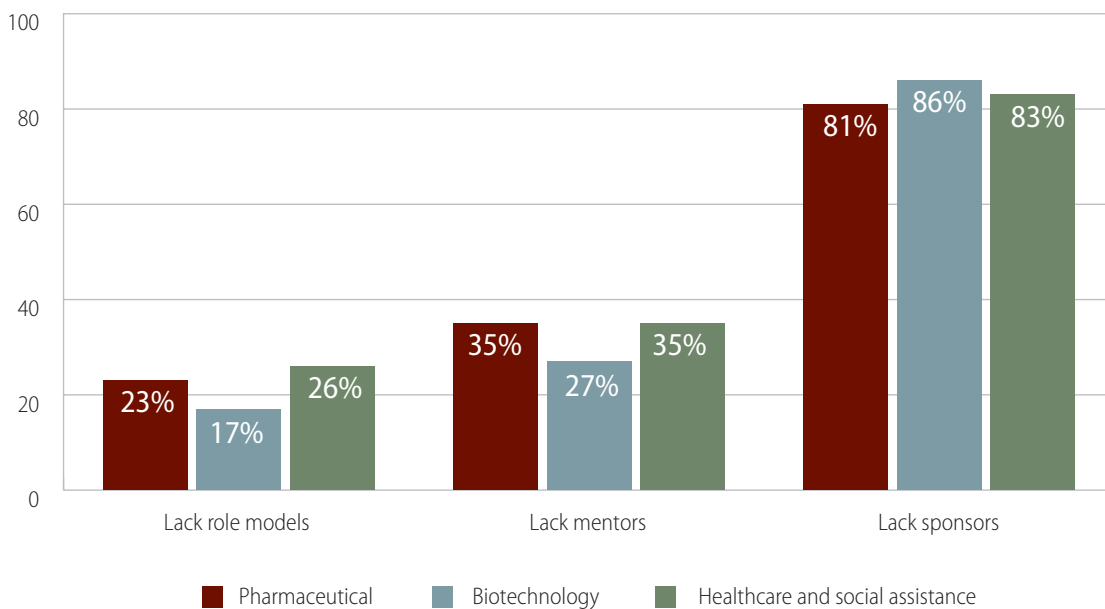
FIGURE A3.2
Lack of Role Models, Mentors, and Sponsors Across Engineering Microclimates
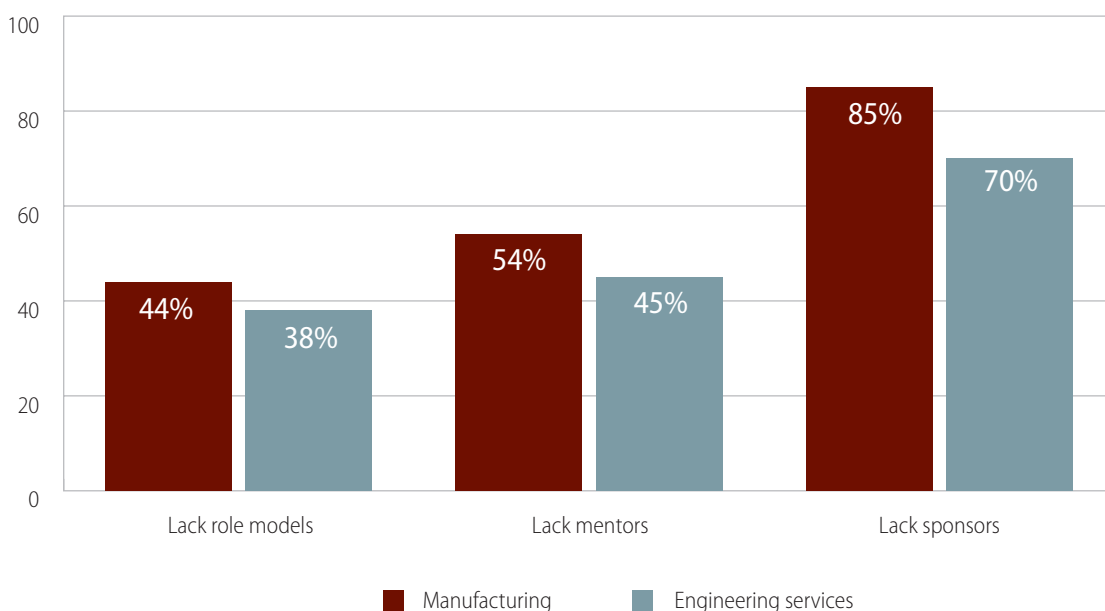
FIGURE A3.3
Lack of Role Models, Mentors, and Sponsors Across Key Technology Microclimates
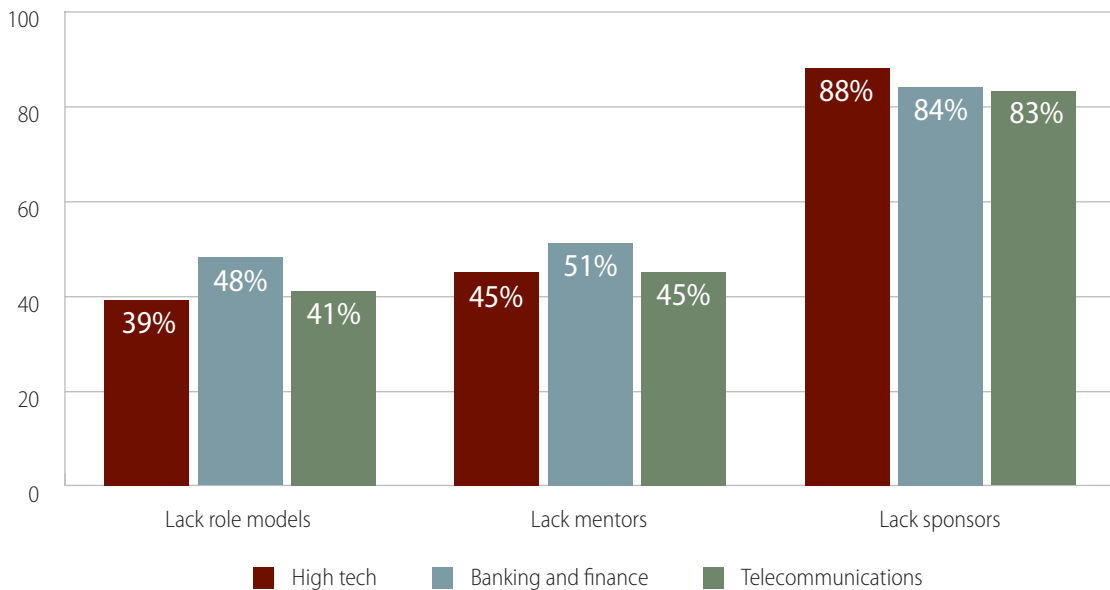
FIGURE A3.4
Isolation Across Science Microclimates
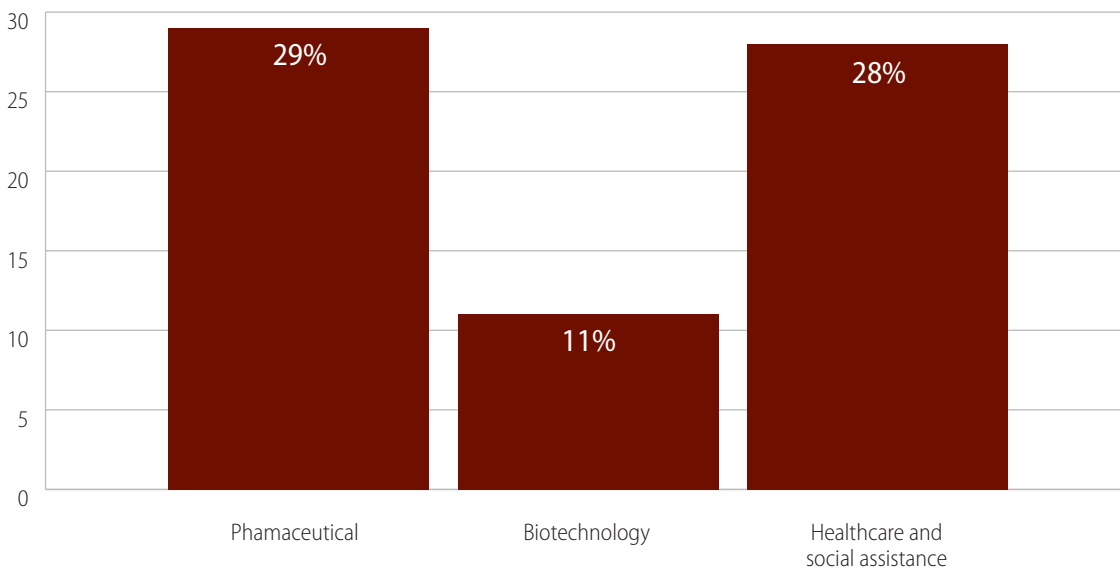
FIGURE A3.5
Isolation Across Engineering Microclimates
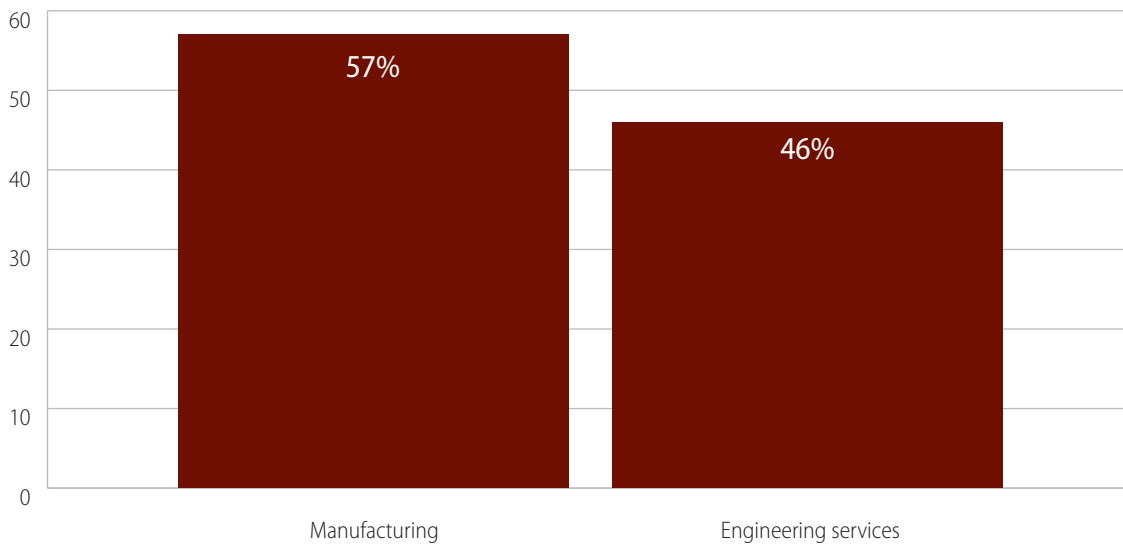
FIGURE A3.6
Isolation Across Technology Microclimates
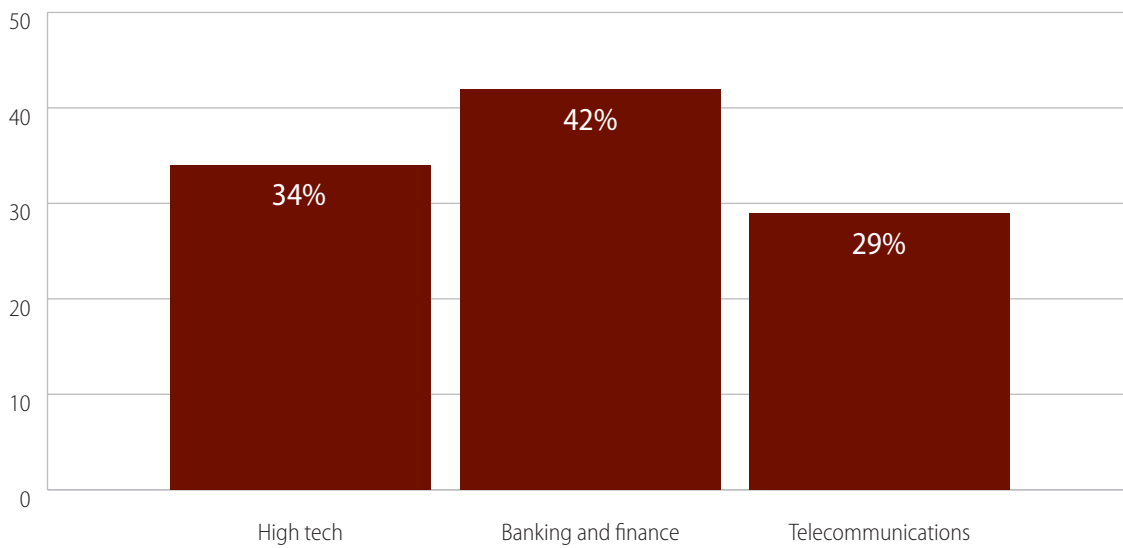
Figures from Chapter 5

FIGURE A5.1
Risks and Rewards in SET

Bar chart showing percentages for three categories by field (Science, Engineering, Technology):

- Women have difficulties with risk (does not translate into success): Science 32%, Engineering 35%, Technology 37%
- Women are not given second chances: Science 12%, Engineering 21%, Technology 18%
- Women don't get the recognition they deserve: Science 25%, Engineering 30%, Technology 36%

Legend: ■ Science ■ Engineering ■ Technology

FIGURE A5.2
## Risks and Rewards in Science, by Age

Bar chart showing percentages for three categories by age group (Ages 25–34, Ages 35–44, Ages 45–60):

- Women have difficulties with risk (does not translate into success): Ages 25–34 26%, Ages 35–44 35%, Ages 45–60 35%
- Women are not given second chances: Ages 25–34 8%, Ages 35–44 12%, Ages 45–60 14%
- Women don't get the recognition they deserve: Ages 25–34 20%, Ages 35–44 29%, Ages 45–60 27%

Legend: ■ Ages 25–34 ■ Ages 35–44 ■ Ages 45–60

FIGURE A5.3

Risks and Rewards in Engineering, by Age
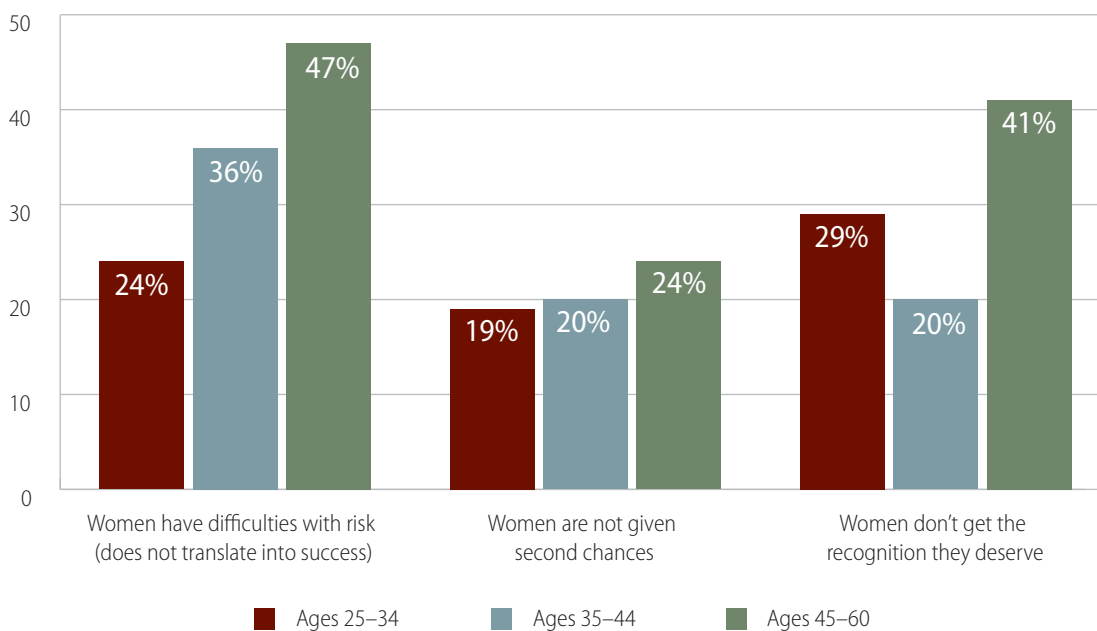
FIGURE A5.4

Risks and Rewards in Technology, by Age
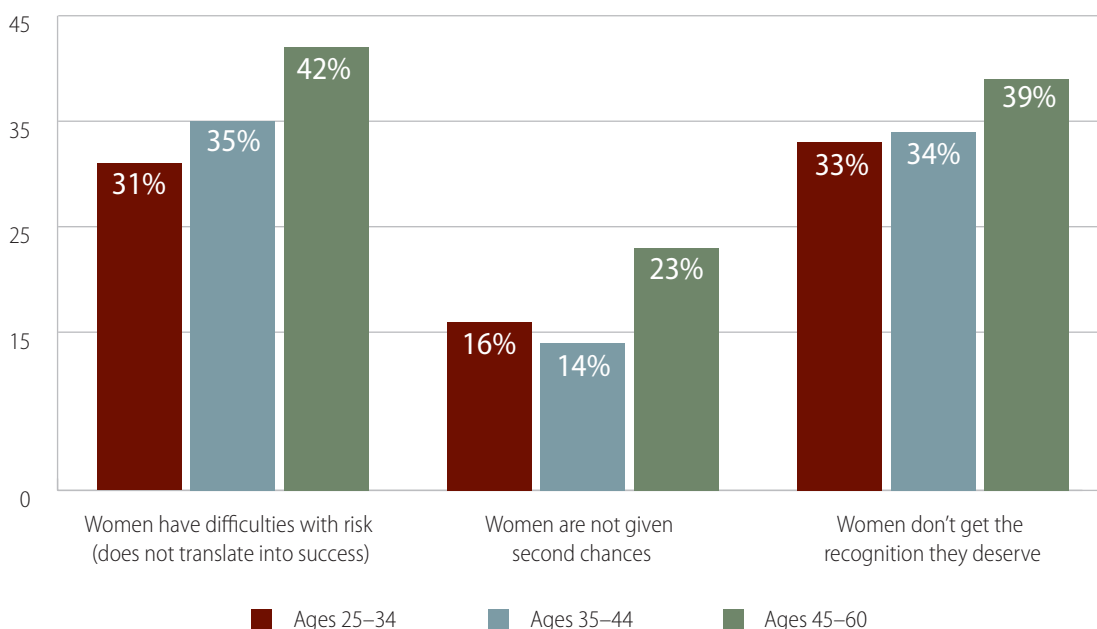
FIGURE A5.5
Creator versus Executor, by Age

Women are pushed into execution roles — Ages 25–34: 35%, Ages 35–44: 38%, Ages 45–60: 47%

Women do not have equal access to the creator role — Ages 25–34: 34%, Ages 35–44: 42%, Ages 45–60: 45%

■ Ages 25–34　■ Ages 35–44　■ Ages 45–60
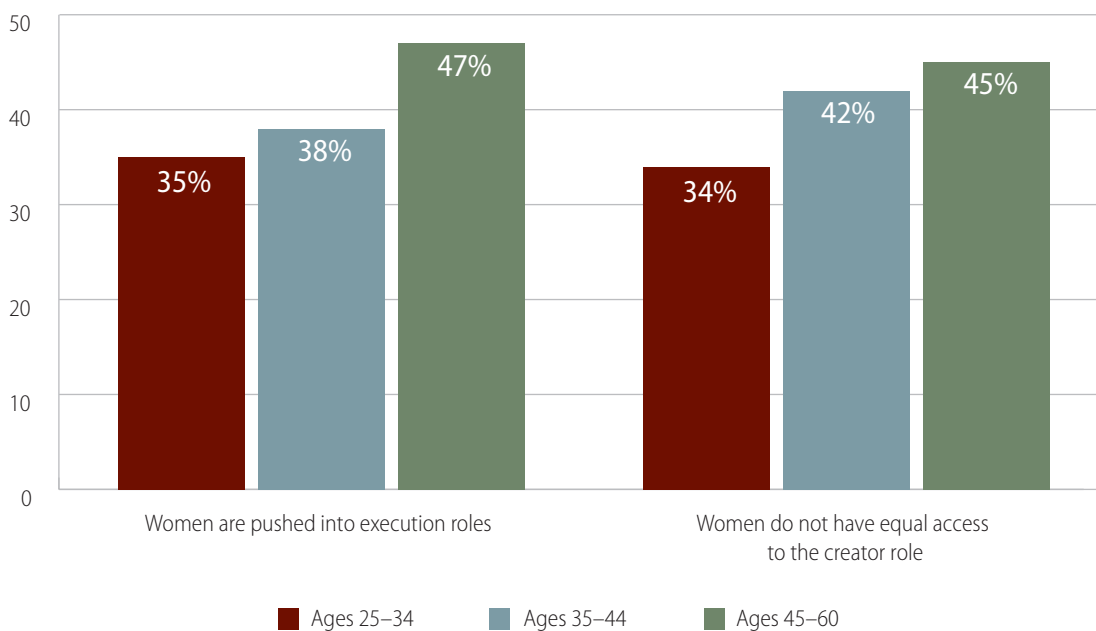
FIGURE A5.6
Creator versus Executor in Science, by Age

Women are pushed into execution roles — Ages 25–34: 32%, Ages 35–44: 41%, Ages 45–60: 33%

Women do not have equal access to the creator role — Ages 25–34: 35%, Ages 35–44: 52%, Ages 45–60: 38%

■ Ages 25–34　■ Ages 35–44　■ Ages 45–60
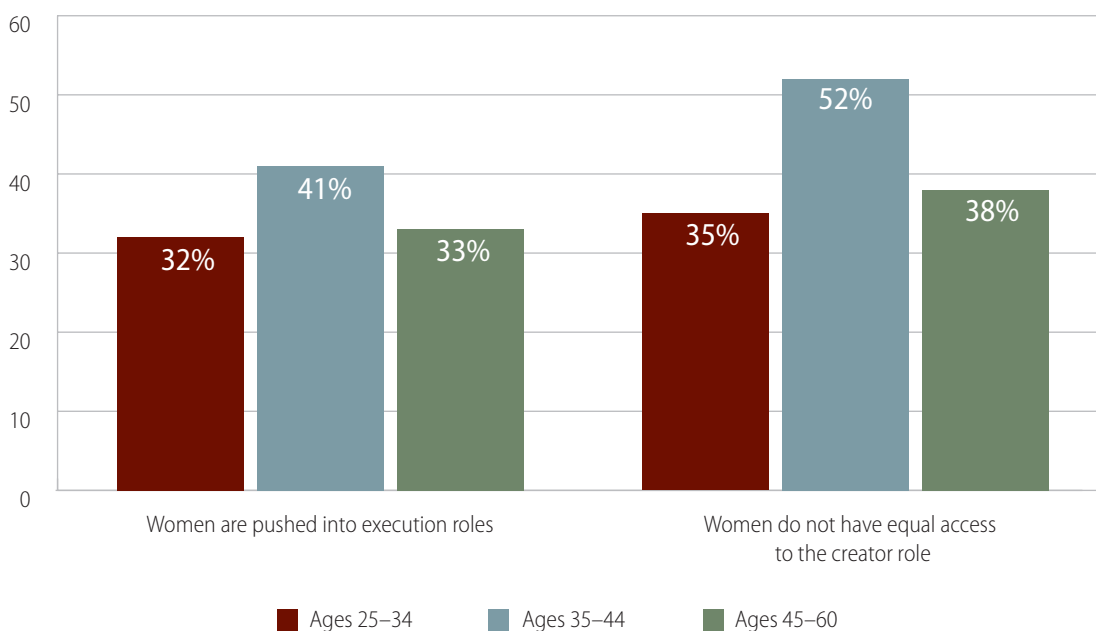
FIGURE A5.7
Creator versus Executor in Engineering, by Age

Women are pushed into execution roles: Ages 25–34: 28%, Ages 35–44: 35%, Ages 45–60: 47%

Women do not have equal access to the creator role: Ages 25–34: 26%, Ages 35–44: 42%, Ages 45–60: 50%

Ages 25–34 ■   Ages 35–44 ■   Ages 45–60 ■
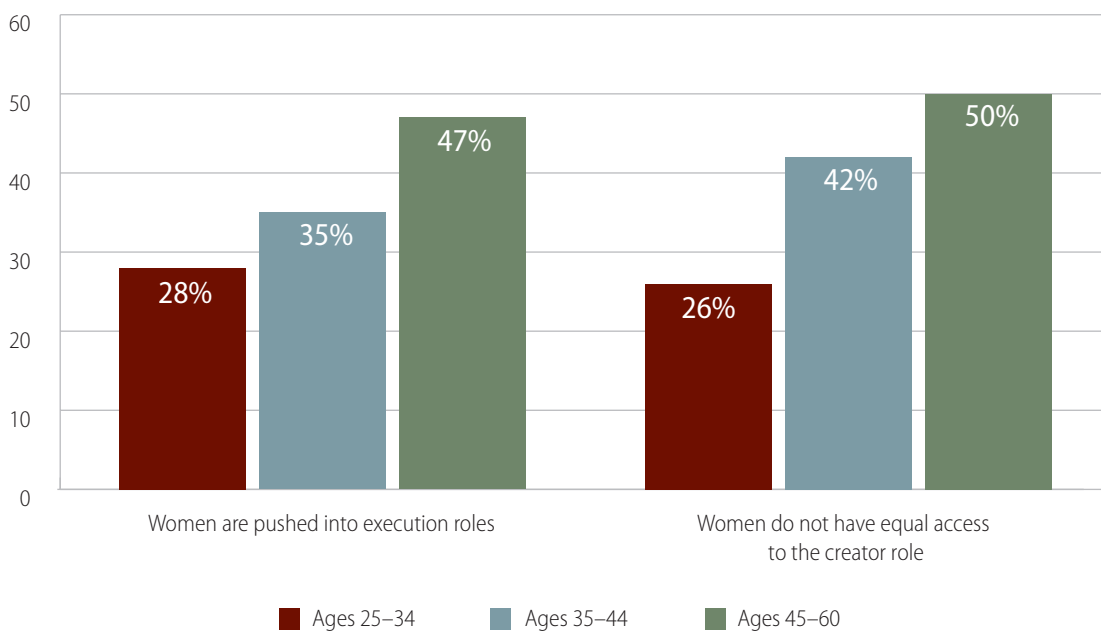
FIGURE A5.8
Creator versus Executor in Technology, by Age

Women are pushed into execution roles: Ages 25–34: 39%, Ages 35–44: 38%, Ages 45–60: 54%

Women do not have equal access to the creator role: Ages 25–34: 36%, Ages 35–44: 39%, Ages 45–60: 47%

Ages 25–34 ■   Ages 35–44 ■   Ages 45–60 ■
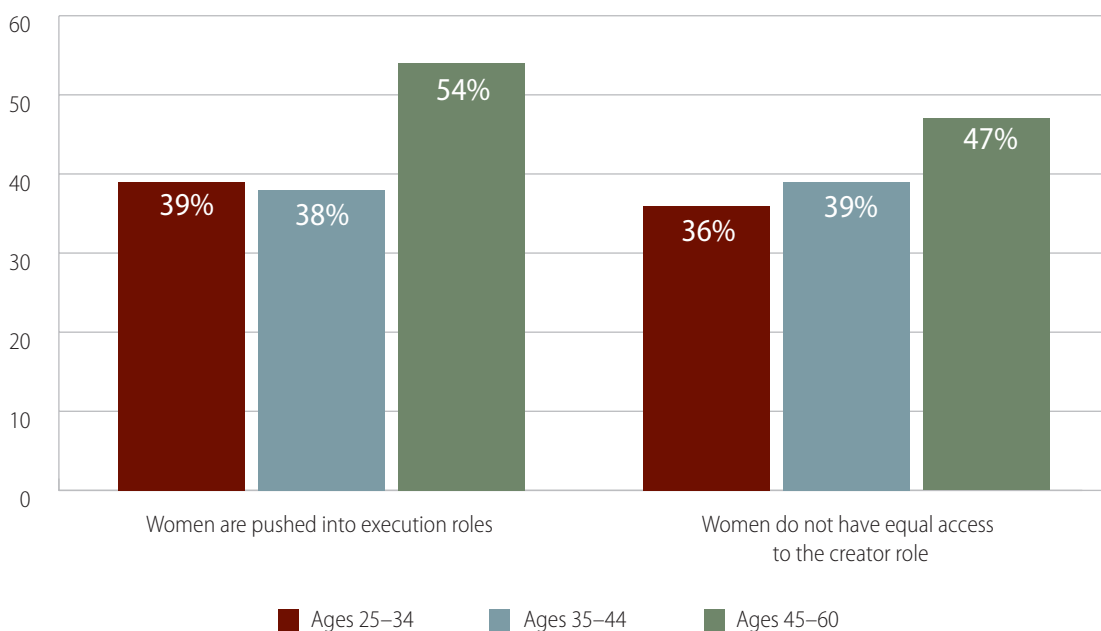
ENDNOTES

1   We would like to acknowledge four studies that center on the advancement of women in SET: The Athena Project, a British-based study of women in SET in academia begun in 1999, www.athenaproject.org.uk; Massachusetts Institute of Technology, *A Study on the Status of Women Faculty in Science at MIT*, 1999; Yu Xie and Kimberlee A. Shauman, *Women in Science: Career Processes and Outcomes* (Cambridge, MA: Harvard University Press, 2003); and Nancy Ramsey and Pamela McCorduck, "Where Are the Women in Information Technology?," National Center for Women & Information Technology, February 5, 2005.

2   See Appendix for full methodology.

3   Luke Timmerman, "Scramble for Scientists: Shortages Threaten to Slow Growth of Booming Biotech Industry," *National Post*, May 23, 2007.

4   Benjamin J. Romano, "Gates Sees Engineer Shortage Looming," *Seattle Times*, November 17, 2007; Luke Timmerman, "Scramble for Scientists: Shortages Threaten to Slow Growth of Booming Biotech Industry," *National Post*, May 23, 2007; Katrin Bennhold, "As Jobs Sit Empty Europe Debates Its Future," *International Herald Tribune*, January 26, 2007; Diana Farrell and Andrew J. Grant, "China's Looming Talent Shortage," *McKinsey Quarterly* no. 4 (2005), 70–79; "Survey: The Battle For Brain Power," *The Economist*, October 7, 2006.

5   Bureau of Labor Statistics, "Occupational Outlook Handbook, 2008–2009," U.S. Department of Labor.

6   Jerry Luftman, "Is There a Tech Talent Shortage?" *Information Week*, January 14, 2008.

7   The National Association of Software and Service Companies aids companies that are interested in outsourcing. Somini Sengupta, "Skills Gap Hurts Technology Boom in India," *New York Times*, October 17, 2006.

8   William Underhill, "A Sharp Departure," *Newsweek*, March 24, 2008.

9   Carter Dougherty, "Labor Shortage Becoming Acute in Technology," *New York Times*, May 10, 2007.

10 Robert Pear, "High Tech Titans Strike Out on Immigration Bill," *New York Times*, June 25, 2007.

11 Amanda Millner-Fairbanks, "Girls Make History by Sweeping Top Honors at a Science Contest," *New York Times*, December 4, 2007.

12 Amanda Millner-Fairbanks, "North Carolina Student Wins $100,000 Intel Science Award," *New York Times*, March 12, 2008.

13 National Science Foundation, Science and Engineering Indicators, 2006.

14 Research participants who requested privacy are referred to by first name only.

15 Jane Jorgenson, "Engineering Selves: Negotiating Gender and Identity in Technical Work," *Management Communications Quarterly* 15, no. 3 (February 2002): 364.

16 Ibid., 363.

17 Gerhard Sonnert argues in "Women in Science and Engineering: Advances, Challenges, and Solutions," *Annals of the New York Academy of Sciences* 869, no. 1 (April 1999): 34–57 that a greater representation of women in science will improve the quality of science as a whole. This is because women's different life experience tends to widen the variety of research topics chosen and enlarge the range of hypotheses.

18 Corporate Leadership Council, *The Effort Dividend: Driving Employee Performance and Retention through Engagement* (Washington, DC: 2004): 18a.

19 Lawrence H. Summers, remarks at NBER Conference on Diversifying the Science & Engineering Workforce, Cambridge, MA, January 14, 2005. http://www.president.harvard.edu/speeches/2005/nber.html.

20 Ben A. Barres, "Does Gender Matter?," *Nature* 442 (July 13, 2006): 134.

21 Jorgenson, 366.

22 Ibid., 351–352. According to Jorgenson, researchers point to "a typical adaptive response on the part of many women who measure the requirements of success in male terms and attempt to assimilate by disqualifying their femininity and by matching male styles of behavior."

23 Ibid., 365.

24 Ibid., 364.

25 Virginia Valian, *Why So Slow? The Advancement of Women* (Cambridge, MA: MIT Press, 1998).

26 Virginia Valian, "The Advancement of Women in Science and Engineering." *Women in Chemical Workforce: A Workshop Report to the Chemical Sciences Roundtable* (Washington, DC: National Academies Press, 2000): 26.

27 Madeline E. Heilman and Aaron S. Wallen, "Penalties for Success: Reactions to Women Who Succeed at Male Gender-Typed Tasks," *Journal of Applied Psychology* 89, no. 3 (June, 2004): 416–427.

28 Alice H. Eagly, Steven J. Karau, and Mona G. Makhijani, "Gender and Effectiveness of Leaders: A Meta-analysis," *Academic Psychology Bulletin* 117, no. 1 (January, 1995): 125–145.

29 Frances Trix and Carol Psenka, "Exploring the Color of Glass: Letters of Recommendation for Female and Male Medical Faculty," *Discourse and Society* 14, no. 2 (2003): 191–220.

30 Ben A. Barres, "Does Gender Matter?" *Nature* 442 (July 13, 2006): 136. As a result, some researchers argue that the processes surrounding these decisions must be changed. Others have found that gender bias exists in terms of salaries and promotions as well. In their analysis of data from the Society of Information Management, Truman and Baroudi found that women received lower salaries than men even when the researchers controlled for job level, age, education and work experience. They also found a disproportionately high number of men in the managerial ranks. Gregory E. Truman and Jack J. Baroudi, "Gender Differences in the Information Systems Managerial Ranks: An Assessment of Potential Discriminatory Practices," *MIS Quarterly* 18, no. 2 (June, 1994): 129–142.

31 Laurie J. Flynn, "Compressed Data: Survey on Women's Role in Silicon Valley," *New York Times*, April 23, 2001.

32 According to M.K. Ahuja, "research has shown that although women can benefit as much from mentoring on men, there is a lack of female mentors in organizations." M.K. Ahuja, "Women in the Information Technology Profession: A Literature Review, Synthesis and Research Agenda," *European Journal of Information Systems* 11, no. 1 (March, 2002): 20–34.

33 Informal networks such as old boys' networks are used for information sharing and for exposing protégés to potential mentors. According to Ahuja, who studied women in technology, such networks become "increasingly important for advancement within the organization and within the field." Women's lack of participation in these networks, asserts Ahuja, is a primary social barrier blocking women's advancement in the technology industry. Our research indicates that the same dynamic holds in science and engineering as well.

34   For purposes of Genzyme's benchmarking study, "senior managers" were defined as the top 20% of the grades within each of the job families.

35   See, for example, Paul R. Sackett, Cathy L.Z. DuBois, and Ann Wiggins Noe, "Tokenism in Performance Evaluation: The Effects of Work Group Representation on Male-Female and White-Black Differences in Performance Ratings," *Journal of Applied Psychology* vol. 76 no. 3 (1991): 263–267. They show that women are rated less favorably than men when they comprise less than 20% of the workgroup but that this effect is reversed when more than half of the workgroup is female.

36   This is featured as a case study in Sylvia Ann Hewlett, *Off-Ramps and On-Ramps: Keeping Talented Women on the Road to Success* (Boston, MA: Harvard Business School Press, 2007): 181–191.

37   Other research in the field confirms our finding that women in SET experience more restricted opportunities for advancement than do men (see Magid Igbaria and Jack J. Baroudi, "The Impact of Job Performance Evaluations on Career Advancement Prospects: An Examination of Gender Differences in the IS Workplace," *MIS Quarterly* 19, no. 1 [1995]: 107–123). According to Ahuja, lack of clarity in career paths is one factor contributing to the finding that men and women follow different paths to power, which results in the presence of fewer women as they move higher in the hierarchy (see Ahuja, "Women in the Information Technology Profession," 22).

38   Although Caucasians make up the majority of women earning master's degrees in SET (52%), Asian women earn far more SET degrees (12%) than do African-American and Hispanic women (5%). More Asian women earn master's degrees in SET (12%) than in other fields (4.5%). National Science Foundation Education Statistics.

39   A review of social risk taking by Elizabeth Arch (see "Risk Taking: A Motivational Basis for Sex Differences," *Psychological Reports* 72, no. 3 [1993]: 6–11) found that women are more risk averse than men. Males are more likely to see a risky situation as a challenge that calls for participation while females tend to respond to these situations as threats that encourage avoidance.

40   According to Judy B. Rosener (see "Ways Women Lead," *Harvard Business Review*, [November–December 1990]: 119–125), "as women entered the business world, they tended to find themselves in positions consistent with the roles they played at home: in staff positions rather than line positions [and roles] supporting the work of others."

41   Rob Goffee and Gareth Jones, "Why Should Anyone Be Led by You?" *Harvard Business Review*, January 2001, 77.

42   For more information, see Sylvia Ann Hewlett et al., "Extreme Jobs: The Dangerous Allure of the 70-Hour Workweek," *Harvard Business Review*, December 2006, 49–59.

43   The comparison data for "other sectors" was derived from the Center for Work-Life Policy's Extreme Jobs survey. This survey was designed to measure the specific points of job extremities for full time employees in the top 6% income bracket. See Hewlett et al., "Extreme Jobs"; and Sylvia Ann Hewlett et al., *Seduction and Risk: The Emergence of Extreme Jobs* (New York: Center for Work-Life Policy, 2007).

44   The Athena Factor company surveys were conducted within three large multinational corporations, each company representing one of the three SET climates. See Methodology in the Appendix.

45   For a description of the two-body problem in academia, see Mary Ann Mason and Eve Mason Ekman, *Mothers on the Fast Track: How a New Generation Can Balance Family and Careers* (New York: Oxford University Press, 2007): 13–14.

46   These data and insights derive from a forthcoming study from the Center for Work-Life Policy, "Women in Tech in the Financial Sector," sponsored by Credit Suisse, Goldman Sachs, Intel, Merrill Lynch, and NYSE Euronext.

47   National Science Foundation, Science and Engineering Indicators, 2008.

48   We assume here that all of the women who move to self-employment do so in a SET-related field. Although our survey does not enable us to verify this assumption, our qualitative research provided significant evidence that many of these women become independent contractors for the firms they left.

49   According to a study of engineers, women do better when they move out of "elite engineering cultures" and into more bureaucratic or public sector workplaces, which tend to raise fewer issues about women's technical competence. See Judith S. McIlwee and Gregg J. Robinson, *Women in Engineering: Gender, Power, and Workplace Culture* (Albany, NY: SUNY Press, 2002).

50   Society at large bears a significant cost in granting PhDs. At the Fu Foundation School of Engineering at Columbia University, the average price tag of a fully funded PhD engineering student is $67,000 per year. It takes most students five years to earn a PhD making the total cost $335,000. A significant portion of this cost is paid for by fellowships and grants, which places the burden squarely on taxpayers and ultimately on society.

51   W. Mark Dale and Wendy S. Becker, "A Case Study of Forensic Scientist Turnover," *Forensic Science Communications* 6, no. 3 (July 2004). http://www.fbi.gov/hq/lab/fsc/backissu/july2004/research/2004_03_research04.htm.

52   This perception is confirmed by other research in the field. The groundbreaking MIT study found that women science faculty felt "marginalized and excluded" from significant roles in their departments. One of the principle causes of marginalization for women was a lack of resources equal to those of their male counterparts. The survey revealed that men and women received inequitable distributions of space, the amount of salary paid from individual research grants, and teaching assignments. In interviews, women claimed they felt "invisible" and "excluded" from positions of power within their departments resulting in declining morale and job satisfaction. The MIT report asserts that such factors are a direct cause of the stagnation of women faculty at MIT. At the time of the report, the number of women faculty in the school of science had not changed in 20 years. MIT, *A Study in the Status of Women Faculty in Science at MIT*, 1999.

53   Hewlett, *Off-Ramps and On-Ramps: Keeping Talented Women on the Road to Success* (Boston, MA: Harvard Business School Press, 2007): 181–191.

54   It can take eight to 12 years and massive R&D investment to get a drug to market—commitments which translate into billions of dollars. Pharmaceutical companies don't break down the costs for individual drugs, however, the most widely quoted figure is that the average cost to develop a new drug was $802 million in 2001 according to the Tufts Center for the Study of Drug Development (November 1, 2001), a figure that is somewhat controversial; see also Robert Pear, "Research Costs for New Drugs Said to Soar," *New York Times*, December 1, 2001. Eli Lilly, the sixth-largest drug maker, expects that by 2010 the cost of finding a single new drug may reach $2 billion; see Alex Berenson, "Blockbuster Drugs Are So Last Century," *New York Times*, July 3, 2005.

55   Robert Lemos, "Do You Have What It Takes to Join Google?" *CNET News.com*. Available at: http://www.news.com/2100-1032_3-5412099.html.

56   National Science Foundation, latest available data is 2004.

57   Alex Salkever, "Technology's Too-Small Sisterhood," *BusinessWeek*, May 12, 2004.

58   "100 Best Companies to Work For," *Fortune,* Febuary 4, 2008.

59   E. Jeffrey Hill et al., "Twenty Years of Work and Family at International Business Machines Corporation," *American Behavioral Scientist* 49, no. 9 (February 2006): 1165–1183.

60   Ibid., 1169.

61   Ibid., 1170.

62   www.workingwomen.com. See also Sylvia Hewlett, *Creating a Life: Professional Women and the Quest for Children*, (New York: Miramax, 2002): 329.

63   Hill, "Twenty Years of Work and Family at International Business Machines Corporation," 1177.

64   Ibid.

65   Sylvia Ann Hewlett and Carolyn Buck Luce, "Off-Ramps and On-Ramps," *Harvard Business Review*, March 2005, 43–54.

66   Massachusetts Institute of Technology, "Midcareer Acceleration Program," http://web.mit.edu/mitpep/map/overview.html.

67   Claudia Deutsch, "Volunteering Abroad to Climb at IBM" *New York Times*, March 26, 2008.

68   "IBM's Corporate Service Corps Heading to Six Emerging Countries to Spark Socio-Economic Growth While Developing Global Leaders." IBM press release, http://www-03.ibm.com/press/us/en/pressrelease/23743.wss

69   The U.S. Bureau of Labor Statistics defines total job openings as the sum of employment increases and net replacements. Employment increases for this sector are 804,000.

70   "Study: Lack of Skilled Workers Costs German Economy Billions," *Deutsche Welle*, October 23, 2007.

71   "Capturing Talent," *The Economist*, August 16, 2007.

72   Diana Farrell and Andrew J. Grant, "China's Looming Talent Shortage," *The McKinsey Quarterly* no. 4 (2005): 8.

73   The National Bureau of Statistics: Department of Population, Social Science, and Technology (China), "Women and Men in China Facts and Figures 2004."

74   Data obtained in October 2007 by the Center for Work-Life Policy on graduate matriculation numbers in engineering from Renmin University.

75   Theodore Gerber and David Schaefer, "Horizontal Stratification of Higher Education in Russia: Trends, Gender Differences, and Labor Market Outcomes," *Sociology of Education*, vol. 77, no. 1 (January 2004): 43; Carol Strickland, "Preventative Medicine Soviet Style," *New York Times*, June 17, 1990.

76   Dolores L. Augustine, "Socialist 'Silicon Ceiling': East German Women in Computer Science," in *Proceedings of the 1999 International Symposium on Technology and Society: Women and Technology: Historical, Societal, and Professional Perspectives*, eds. A. Brown and D. Morton. (New Brunswick, NJ: Rutgers University, 1999).

77   Caroline Simard, "The State of Women and Technology Fields Around the World," Anita Borg Institute for Women and Technology. http://anitaborg.org/files/womenhightechworld.pdf.

78   Data from OECD.STAT Extracts. Available at http://stats.oecd.org/wbos/default.aspx.

79   P. P. Parikh and S. P. Sukhatem, "Women in the Engineering Profession in India," The Indian Institute of Technology, Bombay, June 2002.

80   Khozem Merchant, "Economic Revival Could Lead to 'A Reverse Brain Drain'," *Financial Times*, December 9, 2003; Aritha Rai, "Indians Find They Can Go Home Again," *New York Times*, December 26, 2005.

81   David Zweig, "Competing for Talent: China's Strategies to Reverse Brain Drain," *International Labor Review* 145 (March, 2006): 68.

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