

CHAPTER 5

KEY FINDINGS

At first glance, the experience of Lawrence workers in the late 1990s would seem to suggest that the cards are stacked against less-skilled workers in Massachusetts' high technology economy. Despite being surrounded on many sides by high-wage, high-technology development, Lawrence continues to have a high concentration of low-skilled jobs and low-wage workers.

It is clear that, on the whole, job growth in high-technology development heightens the demand for well-educated workers relative to lower-skill workers.⁵⁰ The need for more college-educated workers with technical degrees created by these industries has begun to be recognized and has entered into the public policy dialogue.

While jobs strategies focused on producing highly-skilled professionals are a necessary part of economic planning for the Commonwealth, strategies such as these are generally long-term and targeted toward a relatively young, college-bound population. What can be done to help the part of the state's population that is unlikely to be reached by these efforts, such as older workers? What can be done in the shorter run for working families who do not earn the wage necessary to fully support a family?

My research suggests the high-technology economy is, in fact, creating a niche of living-wage jobs for people who do not have college degrees. These jobs share certain attributes that we should take into account when considering job interventions on behalf of the working poor. The key findings, to be examined in more depth later in this chapter and borne out in brief firm profiles, are:

- ***The highest proportion of living-wage jobs seems to be found in high technology manufacturing.***
- ***The jobs in high technology manufacturing which offer the highest wages to non-college workers are those jobs that are most complex, and require the most technical aptitude, flexibility and/or judgement of their workers. Specifically, this seems to create a niche for electro-mechanical and computer technicians in local manufacturing industry.***

⁵⁰ Ibid. Massachusetts Technology Collaborative.

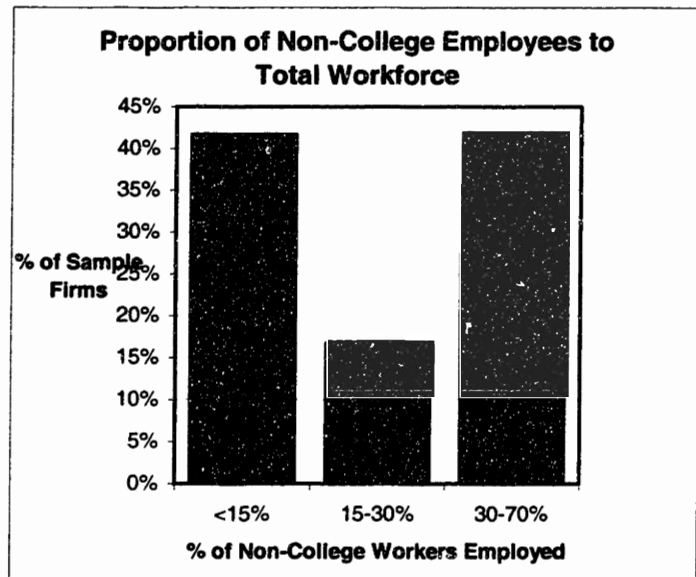
- *In many living-wage firms, there is a fairly high premium on directly relevant work experience and aptitudes, rather than specific skills per se.*
- *Temporary staffing agencies are a major source of recruitment for firms experiencing shortages of qualified non-college workers.*
- *The firms which are not experiencing shortages of qualified workers by and large recruit workers through methods that would tend to disadvantage Lawrence residents.*

Finding: The high-tech economy contains a niche of direct, living-wage employment for non-college workers.

Implication: There may be as many as 1,800 annual non-college living-wage job openings within 15 miles of Lawrence each year.

Despite widely held perceptions about the deteriorating quality of work for people without college degrees, my research suggests that there is still a significant pool of good jobs to be had for this population in the region. At the very least, the high-tech manufacturing and business services sectors continue to provide significant (though perhaps not sufficient) living-wage job opportunities for non-college workers in Massachusetts.

As mentioned in the previous chapter, this sample represents over 10,000 jobs in the three manufacturing sectors (SIC 36: Electronic & Electrical Equipment, SIC 35: Industrial Machinery & Equipment, and SIC 38: Instruments and Related Products), and the business services sector (SIC 73) in the Northeast Region. Among the sample, non-college workers represent more than 30% of the total workforce, with average firm non-



college employment at a comparable 28%. In total, these firms employ approximately 2,980 workers who lack four-year college degrees.

The majority of non-college employment in these two sectors in fact pays a living-wage (or slightly less, that is, between \$9.50 and \$12/hour), according to the standards outlined in the previous chapter. Of the firms interviewed who employ non-college workers, 46% pay \$12/hour or more, with benefits, for entry-level positions for non-college workers. This translates into roughly \$24,600 yearly before tax income, which compares favorably to the living-wage outlined in the previous chapter. An additional 23% pay between \$10 and \$12/hour with benefits for entry level work. This translates into between \$21,000 and \$24,600 before taxes, which would represent a significant increase in income for the large portion of Lawrence residents with high-school degrees earning less than \$17,000/year. Thus, living-wage non-college jobs represent 21% of all jobs (regardless of educational background) held by these firms.

At a conservative annual turnover rate of 8%,⁵¹ this level of employment translates into 165 non-college job openings per year in the sample alone. (For additional detail on employment opportunity by industry sectors, see graph below).

The primary purpose of this research is to give the author a qualitative sense of employment trends and requirements in the above-mentioned sectors. As mentioned in the methodology chapter, I do not claim that these results can be used to compose reliable estimates of employment opportunity in these sectors across the region. However, I do think these figures can be important indicators of trends and directions so that, despite their statistical inadequacy, it is important to extrapolate them to regional employment. If this is done, applying percentages of living-wage employment (by SIC Code to capture differences across industry sectors) to total regional employment (also by SIC Code) the findings are striking.

In short, we find that there may be as many as 21,170 living-wage job opportunities in these three sectors in the region (which together represent over 137,000 jobs). At an annual turnover of 8%, this may mean that the over 4,100 regional employers in these sectors are hiring 1,793 people for living-wage jobs each year. This number is fairly significant, particularly given that it does not represent all employment, but only a few sub-sectors, and may represent an

⁵¹ Most firms interviewed cited annual turnover rates of 8-10%. One outlying firm, with an annual turnover of 65%, has been eliminated from this estimate.

important opportunity for a jobs intervention that could train and match a few hundred Lawrence residents with these jobs each year.

Employment Findings for Sample Firms by Industrial Sector

	Total Emp.	Total Non College Emp.	Avg. Non College Emp. Per Firm	Avg. Non College Emp. Across Sample	Total Living-Wage Jobs	Avg. Living-Wage As % of Total Emp.	% Non College Jobs Which Pay Living wage	Annual Living-wage Job Openings @ 8% Turnover
Total	10,005	2,980	28%	30%	2,059	21%	69%	165
SIC 35: Industrial Machinery	2,380	425	11%	18%	425	18%	100%	34
SIC 36: Electronic & Electrical Equip.	1,320	313	38%	24%	313	24%	100%	25
SIC 38: Instruments	2,730	1,445	64%	53%	1,321	48%	91%	106
SIC 73: Business Services	3,575	797	17%	22%	234	7%	29%	19

What is perhaps most striking about the different living-wage employment rates within industries is the prominence of Instruments and Related Products as a living-wage employer. This sector is relatively small compared to the other two manufacturing sectors (2.28% of regional employment vs. 4.10% and 3.15% respectively) and has a very low growth rate compared to all other industries in the sample (-3.49% from 1995 to 1997).

Employment Projections for Regional Industry
(based on employment findings above)

Industrial Sector	Total Jobs In Region	Projected Non College Jobs	Projected Non College Living-wage Jobs	Projected Annual Non College Living-wage Job Opportunities @ 8% Turnover
Total	137,166	34,680	22,410	1,793
SIC 35: Industrial Machinery	21,029	3,755	3,755	300
SIC 36: Electronic & Electrical Equip.	27,335	6,489	6,489	519
SIC 38: Instruments	15,173	8,028	7,339	587
SIC 73: Business Services	73,629	16,408	4,827	386

This finding suggests important directions for further research into less skilled employment in instruments manufacturing, but should be treated with caution for methodological as well as substantive reasons. Substantively, the quantity of living-wage employment opportunities in this field may imply a number of things: perhaps absolute employment in this sector is declining while semi-skilled work increases or, alternatively, perhaps all work in this sector is declining and less-skilled work is for some reason slowest to respond. Either would have distinct implications for using this sector for an employment intervention. Methodologically, my findings may substantially overstate employment opportunities because of the small size of the sample.

Finding: Of the two sectors examined – High-Tech Manufacturing and Business Services – the majority of high-quality, non-college employment can be found in manufacturing occupations. There seem to be few living-wage opportunities in the business service sector.

Implication: Job training programs should target high-technology manufacturing.

My interviews seem to indicate that the majority of high-quality employment opportunities for non-college workers are in manufacturing jobs. For example, all of the firms interviewed with a significant (more than 10%) non-college workforce employ those workers in manufacturing. The fact that non-college jobs continue to be predominantly in manufacturing is a bit surprising given the proliferation of service sector jobs in the region. This fact may be obscured when using standard economic indicators to examine the regional economy because, in many cases the manufacturing jobs I encountered are housed in firms that are formally classified as “service” businesses. For example, one business service firm in the sample splits its operations between service provision (such as software programming) and manufacturing of related devices (such as software systems). Another example of the pitfalls of using SIC Code information to project changes in the workforce is that temporary firms are always classified as service firms, despite the fact that many temp firms in MA place the majority of their workers into manufacturing situations.

The flip side of this finding is that, despite very high employment in the region, the business services sector seems to offer a relatively low proportion of living-wage job opportunities (as demonstrated above, only 7% of all jobs and 29% of non-college jobs pay

living wages, significantly lower than any manufacturing sector). This finding is upheld qualitatively by my interviews, which reveal significant segmentation by skill and wage at a firm level in the business services sector. Two examples serve to illustrate this trend:

- a) A number of computer and data processing firms provide software and computer technical assistance to large regional corporations, but employ almost no people without college degrees.
- b) Alternatively, subcontractors such as security providers employ a vast majority of non-degreed workers who provide security to nearby corporations, but the wages are fairly low.

Nonetheless, due to the sheer numbers of people employed in the business services sector, and the tremendously high 1995-97 growth rate of 23.14% even a low proportion of living-wage non-college jobs creates more jobs annually than, for example, smaller sectors with higher proportions of living-wage jobs.

My findings about the business services sector seem to suggest an important area for further research, insofar as the dramatic growth of this sector may have troubling implications for the employment of people without college degrees.

Finding: Higher wages for entry-level positions are correlated with non-traditional manufacturing work.

Implication: *Target complex electro-mechanical assembly and technician positions.*

Why would high technology manufacturers pay living wages to any segment of their non-college workforce, given the relative abundance of people lacking college degrees? First we should look at the nature of the jobs which are well paying, which seem to be primarily in the following areas: electronics assemblers and technicians, and secondarily computer operators. Perhaps unsurprisingly, these seem to be the most complex of the range of non-college positions that I encountered in my research (see cases in text boxes for further detail). Specifically, high quality employment in these sectors seems to be most likely in:

1. ***Jobs that require workers to monitor and troubleshoot high-technology production systems***, insofar as employers feel that this requires a higher level of mechanical and technical skill, as well as responsibility and flexibility. For example, in discussing with one temporary staffing agency the difference between assemblers positions (which pay on

average \$9-10/hour) and technician positions (which pay \$12-\$14/hour) – a differential that held in a number of other manufacturing firms as well – the recruiter noted that the fundamental difference was the ability to “identify and fix bugs.” He noted that in some cases the job title is a bit fungible – for example, he encounters a number of “assembly technician” jobs, which require workers to be able to identify bugs in the product but not be able to fix them – but it is basically organized around the concept that workers are capable of preventing faulty products from moving through the production cycle and out to the customer.

2. ***Manufacturing jobs for products with short life cycles:*** short product life cycles mean constant change in the workplace, which can be encountered in any variety of industries, including firms that make customized products, such as laboratory instruments, and/or that serve a quickly changing market (such as software firms). Constant change in the workplace makes it necessary for employers to hire workers who: a) are capable of learning, including the ability to read, critically reason, and do basic mathematical calculations, and b) have some understanding of the concepts underlying the production process, which can guide them as their work responsibilities change.

For example, one bio-technical supply firm provides processing instruments to laboratories in the region. Because these instruments must be customized to the specific use of the lab (according to the process and materials they employ), they are made in small lots, which change often. As a result, this human resources director needs workers who are capable of reading the specifications he receives from clients and re-calibrating their machines on a regular basis.

3. ***Jobs based on the use of complex, highly firm specific technologies and/or very specialized skills:*** According to human resources directors, there are a number of jobs which require an “intuitive feel” for unusual and complex technologies which they believe job seekers cannot develop solely through training. For jobs such as these, firms are in the difficult position of having to locate workers with direct experience in the technologies that they use, which is often quite rare. As a result, the labor market available to these firms is quite narrow, and necessitates a higher wage in order to attract qualified candidates. In many cases, this translates into a wage premium being placed on job experience in specific and relatively narrow fields, a finding that seemed robust across high-technology firms.

For example, the human resources director at one manufacturer of telecommunications equipment states that college degrees are almost irrelevant in her hiring decisions. She, and company management, feels that they can only hire people who have one to two years experience working directly with their product because the technology used is new and extremely complex. They believe that the skills needed are so specialized that they cannot be effectively taught, and must be learned through use.

Formally, most of the living-wage jobs identified in this study are classified as electronic and bio-technical assembly or technician positions. Alternatively, the poorer quality jobs seem to be characterized primarily by the fact that the skills and judgement required are fairly standardized and slow to change. For example, a number of the lower-paying firms are engaged in types of production or service provision that cannot be automated economically. Similarly, many functions of building maintenance staff would be excessively expensive to automate at this point in technological development. For these jobs, training is easier for the firm and fewer baseline competencies are required.

Promising Job Descriptions for Non-College Workers

Technicians

The position of technician for computer, electronics or biotechnology firms accounts for a large portion of the higher-wage jobs available to workers who do not have college degrees. The firms interviewed attest to the difficulty in finding people with this level of skills in the external labor market and temp firms confirm that they too are experiencing fairly severe shortages of technicians.

Technician positions fall into two basic categories: manufacturing and testing. In the companies interviewed, the bulk of manufacturing technicians are responsible for monitoring and troubleshooting automated production and/or assisting in computer aided manufacturing of software and hardware. Testing technicians, on the other hand are responsible for testing products and correcting production errors, primarily in software and hardware, though secondarily in biotechnology. At many of the companies there is much overlap between the skills and attributes of trained engineers and technicians. In some cases, as one Human Resources Director indicated, the only difference between engineering and technician positions is the four - year college degree itself.

In almost all cases, technician is not an entry-level job. Firms either seek people with two years related experience from outside, or promote technicians internally from the ranks of assemblers. Generally the firms using internal promotion to fill these positions find this method effective, even in the cases that require currently employed assemblers to obtain associates degrees in technical fields in order to be promoted. In these cases, the firms encourage employees to obtain this training through full tuition reimbursement and are generally successful in using this mechanism to encourage people to upgrade their skills.

Assemblers

There seems to be a split in the requirements and corresponding wages of assembler positions. A number of firms employ fairly low-skilled assemblers for jobs requiring high levels of precision, jobs which tend to be fairly low-paid. However, a segment of firms in the electronics, computer and biotechnology fields employ electro-mechanical assemblers who receive between \$10 and \$12/hour with benefits. These firms tend either to: a) organize production in teams, thus requiring that workers be cross trained in a number of workplace functions, or b) use the assembler to monitoring highly-automated production, rather than to conduct manual assembly, such as welding or soldering.

While these seem to be good jobs, with relatively little training requirement, employers do not on the whole report any difficulty finding adequate candidates to fill their assembly openings. In

Finding: Living-wage firms with certain job requirements are having moderate difficulty recruiting qualified non-college employees.

Implication: *Some living-wage worker shortages can be filled by an appropriate job training program, particularly in firms with the complex work structures described above.*

The evidence from these interviews suggests that there may be a limited shortage of non-college workers qualified in technical fields. On the whole, employers that pay living-wages to non-college workers are not experiencing difficulty finding and retaining employees, even given the tightness of the Massachusetts labor market in early 1999. Nevertheless, approximately 20% of the firms report hiring and retaining non-college workers to be challenging. Given my estimate that firms in these sectors in the region hire more than 1,790 workers for living-wage jobs each year, this may indicate significant difficulty in filling approximately 360. They might therefore welcome the assistance of a job training program in preparing people for this work.

Finding: Firms report difficulty finding workers with necessary aptitudes, rather than skills per se.

Implication: *Shortage of necessary aptitudes implies that an effective job-training program should emphasize broad-based technically relevant education rather than the development of specific skills.*

Aside from the fact that they are high-technology manufacturers, living-wage employers who are having difficulty finding qualified non-college workers have little in common in terms of the products they produce (in this case, telecommunications software, products for the biotechnology industry and temporary staffing services serving a range of high-tech industry), and the specific responsibilities entailed in the work.

Rather, what these firms share is a need for similar aptitudes in their prospective employees. For the firms that are not temporary agencies (for which it is hard to generalize about the work requirements) these aptitudes include:

- **“High Technical Aptitude:”** The firms hiring non-college workers for living-wage jobs, particularly those experiencing difficulties securing qualified candidates, are seeking employees who have an ability to grasp the principals underlying the technologies they use, which employers termed “high technical aptitude.” Firms cite this aptitude as necessary because their products change often and their work requires troubleshooting, both of which require the worker to understand the functions of the technology used. (See Case Two in this chapter for an in-depth example.)
- **Ability to read blueprints and instructions.** Firms need their workers to conduct basic calculations and read instructions and blueprints because of frequent changes in the work. Workers must be able to read accurately process new information, according to human resources directors. While some of positions require facility with math, this is less frequent.
- **Ability to troubleshoot:** Across the board employers placed value on the ability to fix problems in production when they occur, although this is especially true for technicians who have primary responsibility for testing. This ability appears highly correlated with wages in this sample.
- **Dependability:** When asked what they seek in job applicants almost all employers (perhaps unsurprisingly) cited dependability as a key factor in the hiring decision. When asked how they identify this trait, most reported seeking applicants with long and relatively stable work histories.

Finding: Employers place a premium on community college training or directly applicable experience.

Implication: Jobs training program should, primarily, help people access community college training and, secondarily, build base of relevant experience.

If higher-wage non-college employers are seeking aptitudes rather than skills, per se: how do they screen job applicants for an aptitude? To measure job candidates’ aptitudes and technical proficiencies, the employers I spoke with all look first and foremost for one to two years of related experience. This desire on the part of employers translates into a wage premium on experience. Unfortunately for those seeking to enter these fields, many employers seem to feel that there are few training and education interventions which can be substituted for necessary

experience. Furthermore, it is not clear from my interviews where one enters this ladder, that is, what entry-level positions exist that do not require experience.

When asked what training (short of a bachelor's degree) could be substituted for direct job experience, employers most often cited associates degrees in technical fields from community colleges. The cited reason for this is that these technical degrees provide people with a broad range of supporting courses that help them understand a variety of facets of their work. Employers were particularly positive about programs that include strong coop or internship elements, and in some cases are even willing to substitute it for the two-year experience requirement, because of their difficulty finding the necessary experience at the wages they are offering. However, the ability of coop programs to help people gain access to jobs requiring experience should not be overstated – in many cases employers view it as a distant, but necessary, substitute because of the tight labor market in Massachusetts right now.

Finding: Temporary staffing firms are a major source of full-time recruitment for living-wage companies experiencing worker shortages, who wish to “try-before-you-buy.”

Implication: Job training could incorporate similar screening mechanism, without some of the drawbacks for employees using this system to locate full-time employment.

Examining how these firms recruit job applicants provides insight into their employment needs. Perhaps most striking, all of the firms which are experiencing shortages of non-college workers use temporary staffing firms as their primary source of recruitment. When asked about the services these temp firms provide, all cited the importance of being able to “try-before-you-buy.” Insofar as they value aptitudes which are not readily measured through existing standards – such as “the ability to work in teams” or “technological facility” – these firms place a premium on observing job candidates’ capacities prior to making a permanent commitment to the employee. In other words, these firms are paying a premium to learn more about their workers prior to hiring them. (However, the trend toward increasing use of temp firms for permanent recruitment is true across industries in the U.S., and is likely to be particularly true in tight labor markets. Thus, it may be a bit exaggerated to establish a causal association between work that requires technical aptitudes.)

This need is mirrored in the demand for temp company services. For example, in the case of one temporary firm interviewed for this research, approximately 30% of its business (it normally employs between 65 and 70 non-college workers at any given time) is “temp-to-perm.” The remaining 70% is “truly temporary” which is to say, workers who the firm does not have any intention of hiring permanently, who are employed to meet temporary fluctuations in demand.

Finding: Employee referral and Internet recruitment are the major sources of recruiting for living-wage firms not experiencing shortages of workers, a fact which would tend to disadvantage workers from Lawrence.

Implication: Lawrence residents may need assistance in accessing these job opportunities.

The use of temp firms for recruitment seems to be much less prevalent among living-wage firms not experiencing shortages of workers. In almost all cases these firms recruit primarily through employee referral programs and Internet employment advertising. One can only speculate about the reasons for this difference: temp firms may only be used by firms for which other recruitment networks are not adequate; alternatively, firms experiencing shortages may require unusually high levels of skills and aptitudes from entry-level workers.

Unfortunately for job seekers wishing to access these jobs, hiring through employee referral tends reproduce the social and demographic make-up of the workforce. In this case, because Lawrence residents are not fully tapped into social networks of employees at living-wage firms in the region, finding out about employment opportunity at these firms will be significantly more difficult.⁵²

⁵² Wilson, William Julius. *When Work Disappears: The World of the New Urban Poor*. New York: Alfred A. Knopf, 1996.

Case 1: Telecommunications Equipment: Regional Premiums for Experience in the High Tech Sector

This firm is a leader in network telecommunications – including data, video and audio systems, as well as integration of telecommunications systems – and conducts manufacturing, sales and customer service for all of its products. The firm's competitive edge comes from its large market share and its ability to continually introduce new technological innovation faster than its competitors. Approximately 15% of its Massachusetts workforce of 200 is in non-degree positions, which are composed mostly of assemblers and manufacturing technicians, though secondarily of shipping and receiving personnel and administrative assistants.

Hiring is difficult across the board for this firm, not only because the industry is relatively new but also because direct experience in network communications (for example, wide area networking and large area networking) is an absolute prerequisite for employment. The two non-college positions for which recruiting experienced job applicants are assemblers and manufacturing technicians.

Assemblers, who are paid \$10-\$12 per hour with benefits, are responsible for assembly and computerized testing of telecommunications equipment. Manufacturing technicians, paid \$12-14, are responsible for troubleshooting software systems to a component level, requiring previous systems level experience with computers.

Perhaps unfortunately for the firm, the human resources director feels that there is really no type of training that can substitute for experience, thus helping job applicants improve their prospects for employment. Consequently, there are few steps this firm can take to prepare new workers for these jobs. They have started doing recruiting from private colleges and state schools, however, as well as instituting college cooperative programs that place candidates in the workplace part time while still in school. To date, the firm has not worked with community colleges, though it does not particularly object to the quality or type of education.

The firm's primary recruitment mechanism for manufacturing jobs is temporary staffing firms, which it uses for recruiting expertise and the ability to "try before you buy." Additionally, the firm has been aggressive in recruiting people laid off from other firms in the industry.

Case 2: Security Services: Low-wage Business Services Serving High-Tech Industry

This firm, a leader in the security services industry, employs over 2,500 people in Massachusetts, including 250 in Northeastern Mass, and serves upper-tier corporate clients such as universities, laboratories and high-tech office parks in the Greater Boston region. This is a high-growth industry, with such firms experiencing annual growth rates in the range of 22 to 30%. Furthermore, with 65% annual turnover, it generates an abundance of job opportunities in the region. The increasing demand for these services is directly tied to the development boom along the Routes 495 and 128.

The vast majority of employees (roughly 95%) serve as uniformed security officers, with starting salaries of \$7 to \$9/hour (the most common starting salary this year is \$8.50), compensation for 60% of health benefits and no holidays or paid sick days. Employees receive 3-4% pay increases with each level of advancement, and can advance to approximately \$23,000/year in about three years. Training, such as an associates degree or military experience, increases entry-level wages by about \$.50/hour (to an average of \$9/hour, though this premium may decrease when the economy cools off), and tends to speed the rate of advancement, but does not fundamentally alter employment opportunities. Work hours are often non-traditional – including nighttime, weekends and holidays – until workers gain seniority.

The hiring criteria for entry-level security officers are fairly basic – the firm's primary concern is that applicants have a clean police record and a steady work history and that they pass credit and drug tests. Secondly, successful applicants need to speak basic English (to communicate with clients) and be able to fill out reports on suspicious activities. As security systems become more computerized, the firm also needs people with basic computer literacy. However, the firm provides training in both communications, report writing, and computers, so these abilities are not a primary concern.

This firm is having tremendous difficulty attracting qualified candidates because of current tightness of the labor market. They perceive that virtually everyone in the region who is employable has been employed, leaving them only candidates who have serious barriers to work, such as problems holding a job and/or criminal histories. The firm does not use temp services to for recruitment because, as the vice president for human resources put it “essentially, we are a temp firm.”

Interestingly, this firm is much more creative than most in its recruiting practices, perhaps out of necessity. For example, it provides van transportation to the workplace from various cities around the region for people lacking cars, and it secures approximately 30% of its hires through community recruiting, particularly through civic clubs, veterans associations and associations targeting ethnic and immigrant communities. However, it does not recruit through welfare offices or other programs targeting “disadvantaged” communities because the recruiting agents perceive that these populations are likely to have problems “dealing with work” or gaps in their employment history, causing the firm high screening costs and low applicant/hire ratios. This is the cited reason why the firm employs few people from Lawrence.

Case 3: Biotechnology Manufacturing: Living Wage Jobs in the High Tech Manufacturing Sector

This firm, which employs 2,000 people in Massachusetts, in addition to its international production operations, specializes in producing materials for use in bio-technology laboratories, a number of which are centralized in and around the Boston area. Approximately 20% of its US workforce does not have a college degree, and is composed primarily of quality control and manufacturing technicians, in addition to materials handlers and administrative assistants.

This firm scrambles to find an adequate pool of job candidates, despite the fact that it hires only approximately 30 people per year. Specifically, the human resource director cites difficulty finding recruits with high technical aptitudes and necessary experience, despite paying relatively high entry level wages of \$10-12/hour plus benefits for manufacturing technicians, and \$12-14/hour for quality control technicians. He believes that most candidates with the requisite one to two years of experience in biotechnology or electronics assembly are unwilling to accept even the firm's relatively high entry-level wages.

As a result, the firm has broadened its recruitment mechanisms in recent years. It has begun to recruit directly out of community college electronics and biotechnology associates programs. Despite the lack of hands-on experience, this employer is quite satisfied with the ability of the students he receives to navigate the necessary technologies (he cites the fact that they get trained in a range of related fields, including math, basic science, and assembly and testing technology). However these programs cannot produce workers quickly enough to meet the firm's hiring needs, and he faces significant competition for graduates, who have placement rates of 95 to 100%.

In addition, the firm depends heavily on recruitment through temporary firms. The temp agency is responsible for all recruiting, testing and screening, and the firm has the opportunity to experience the quality of new employees work during a six month "try-before-you-buy-probation period." However, given the tight labor market in Massachusetts, the human resources director notes that even the temp firms are having difficulty finding qualified candidates.

Case 4: Limited Non-College Employment in Computer Services Firms

As mentioned previously, my interviews reveal relatively little non-college hiring in the burgeoning regional “computer and data processing services” field. One good example of this phenomenon is a software maintenance firm, which provides outsourcing services to regional corporations, and focuses on defect correction, testing and firm-specific software enhancement. This firm employs 125 people in Massachusetts, with annual transactions of \$31 million in 1998. This firm is a relatively new, formed in 1991, and is considered a high-growth company, which in many ways characterizes the high-technology entrepreneurship associated with Massachusetts high-tech development.

Almost all the firm’s employees have four-year college degrees with the exception of a few administrative staff. The human resources director, who is active with a regional recruitment initiative, sees this as the norm for small to midsize software firms, for the following reasons:

- 1) Smaller and startup firms like hers cannot afford to invest in training and so must hire people with relatively high skills.
- 2) Firms like hers are also very dependent on informal hiring networks that tend to limit their contact with candidates lacking college degrees.
- 3) Many of the entry level functions – such as data entry, administrative and payroll work – have been automated, eliminating less-skilled staff positions.
- 4) As a supplier of outsourcing services, their work is relatively specialized and peripheral. Therefore many related services (such as some portion of administration) are performed by the company purchasing their services rather than the outsourcing firm.