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The New Division of Labor in Massachusetts

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In The New Division of Labor, *Levy and Murnane describe a world of work re-shaped by computers where workers whose jobs can be reduced to steps based on rules are replaced, and where jobs that require judgment or negotiation are enhanced. The authors test the hypothesis of Levy and Murnane's work with a close look at Fall River and New Bedford. These cities, with high unemployment and low rates of educational attainment, show patterns of job replacement by computers as compared with Massachusetts as a whole — a wealthy state with high rates of education, which shows a pattern of jobs enhanced by computers. Finally, the authors focus in on the recent bank mergers in southeastern Massachusetts for indications of what our future holds.*

The Luddites, loosely organized bands of cottage and factory workers, roamed the English Midlands in the early 1800s, destroying machines that vastly increased output per worker and thereby sharply reduced employment and wages.[1] In 1812, the English army broke the rebellion and many Luddites were jailed and some hanged. As early as ten years before, English laws banned machines that replaced workers.

Oddly enough, David Ricardo, the leading economist of the time who supported free markets as the best economic policy, agreed with the Luddites that machinery, under certain conditions would cause unemployment.[2] He argued, however, that the gains in production would probably eventually increase employment. While the Luddites opposed the negative effects of machinery on their lives and on the quality of their products rather than the machines themselves, Luddites became emblematic of romantics who oppose all machinery and who seek to stop progress.

As in England, the Industrial Revolution in the United States saw the continuing growth of new technology that increased output but reduced the

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employment and wages of workers skilled in previous technologies. Early unions and social reformers tried to mitigate the degrading effects of industrialization but were largely unsuccessful. During the last two decades of the nineteenth century, for example, after a series of strikes led by the powerful mule-spinners union who fought a losing battle over wage cuts, Fall River and New Bedford mill owners replaced mule-spinner machines with ring-spinning machines, which required less skill and strength to operate.[3]

After World War II, the new industrial unions such as the United Auto Workers (UAW) negotiated work rules to protect their members from the wage-cutting tendencies of automation. As a general strategy, the UAW was willing to accept fewer jobs in exchange for higher wages in the face of advancing automation and foreign competition. The UAW lost almost two-thirds of its 1.5 million members between the late 1970s and 2003.[4]

Computers and related telecommunication technology pose the newest and most pervasive threat to jobs and to the wages of low-income workers. Those who analyze the effects of computers fall into two general camps: those who argue that computer technology will eliminate most high-paying blue collar and clerical jobs, leaving low-wage or part-time jobs in service industries, and on the other side, those who argue that computer technology will create more than enough high-paying jobs for those with computer skills. Jeremy Rifkin, for example, predicts that while computers create some good jobs for lucky college graduates, the majority of workers replaced by computers will spill over into low-wage, non-benefited jobs, driving down those wages even lower.[5] On the other hand, Peter Drucker believes computer technology eliminates drudgery in factories and offices and creates a large demand for the high-paying jobs held by those skilled in the new technology.[6] Drucker's answer for displaced workers and their children is better schooling to enable them to learn the new skills.

A new approach to understanding the effects of computer technology on jobs focuses on how computers interact with human intelligence. According to Levy and Murnane in *The New Division of Labor*, computers enhance jobs that require judgment and problem solving such as those in the professions of medicine, law, and education, by increasing productivity and wages in those jobs.[7] Employment in technology will increase to service these computer-enhanced professions, supporting Drucker's vision of technology driving the economy toward more employment with higher wages.

At the same time, computer technology replaces jobs that can be reduced to a set of rules, such as the work done by bank tellers. Rules-based jobs are found in both low-wage and high-wage employment. Computer technologies can replace check-out clerks, most blue-color factory workers, and many low-wage office jobs, such as those of file clerks, but they also replace or de-skill high-end jobs that can be reduced to rules, albeit complex rules such as those of stock-marker traders and bank-loan officers.

Current computer technology, the authors argue, cannot replace jobs that require real-time judgment, and these may be low-wage jobs. Computers, for example, cannot clean a room or care for an infant, both of which require more mobility and judgment about immediate circumstances than computers can now perform. Computers can attach a door to an auto chassis on an assembly line, but they cannot make a left-hand turn into oncoming traffic. Nor can computers effectively negotiate conflicts between people. Negotiation requires recognition of fine distinctions in arguments and the ability to adjust to subtle signals between the negotiators. Computers do not even help very much except with filing information. Although proven to be inefficient, meetings are still generally preferred over other forms of complex communication and negotiation. In many occupations, judgment is not easily separated from rules-based decisions. Many medical decisions, for example, seem more rules-based than judgment-based, but the interpersonal nature of the job leads patients to demand human interaction. People want doctors to explain their illnesses and sympathize with them, they want to talk with their lawyers about their legal problems, and they want to be able to exchange ideas with their teachers while being instructed by them. In the authors' terms, computers have not replaced these jobs because satisfying patients, clients, and students requires human interaction and negotiation — skills and abilities that computers do not have.

The difficulty in replacing workers with computers does not lead to higher wages for these jobs, however, because there is a large supply of people who can do them. In other words, the authors agree with Rifkin that people replaced by computers may add to the supply of labor in the non-computerized service sector, driving wages down in those fields. But they also agree with Drucker and Ricardo: computer-enhanced jobs will more than make up for the jobs lost to automation.

Computer and other electronic technology also contribute to outsourcing, the other major cause of job loss in the United States. Low-cost electronic technology cannot replace people in telephone marketing and other telephone services, for example, because these jobs (like those of doctors, lawyers, and teachers) require negotiation and human interaction. But information technology (IT) can shift these jobs to English speakers in low-wage countries.

Massachusetts has benefited more than almost every other state from computer technology. While constant innovation has not always favored the Massachusetts high-tech industry (the collapse of Digital and Wang in the 1980s are cases in point), there can be little doubt that the development and uses of computer technology have contributed to Massachusetts' standing as third among states in per capita income. Fall River and New Bedford represent the other side of the story where we find job replacement by computers (and outsourcing), little gain in computer-enhanced jobs, and low-wage jobs in service sectors that cannot be replaced by computers.

Fall River and New Bedford:
Computer Technology & Employment

Fall River and New Bedford, are located fifteen miles apart in southeastern Massachusetts. They evolved from different economic stimulus in the nineteenth century, but they developed into similar cities in the twentieth. Fall River grew quickly into a major textile center in the early 1800s by taking advantage of a "falling river" to generate power to produce small quantities of yarn and cloth and later using the abundant water in the flats below the mill to dye and finish the larger quantities of cloth produced by steam power.

New Bedford's natural harbor and access to rail transport helped it become the world's leading whaling port in the early century, producing whale oil for light and lubricants. When petroleum products eliminated the market for whale oil in the late 1800s, New Bedford turned to finely woven textiles aided by the city's high relative humidity, which helped hold the finely spun and woven fibers together.

Of the two cities, Fall River, with its coarsely woven product, was first to succumb to competition from low wages in the South, in the late nineteenth century. New Bedford's textile industry followed south soon after World War I, when the automatic humidifier and more efficient machinery eliminated its advantage over the South in making finely woven cloth.

Both cities sought to replace their textile industries with clothing and other cloth-based product employers. With cheap, skilled labor and subsidized space in the abandoned textile mills, they successfully attracted clothing manufacturing jobs from New York City shops for some time. But these businesses eventually also drifted south and overseas, with NAFTA delivering the final blow during the 1990s. At the beginning of the twenty-first century, the two cities look alike in population, employment, and social characteristics. Fall River and New Bedford have about 90,000 inhabitants each, steadily declining from their peaks of about 130,000 and 140,000, respectively in the 1920s.[8]

Statistics for unemployment, poverty rates, median family income, and high school and college graduation rates suggest that these two cities fall on the wrong side of the division of labor. Blue-collar cities that suffered from sharp declines in manufacturing, they usually rank first and second in the state in unemployment, with lower median income and higher poverty rates than the state. As Levy and Murnane would predict, education rates are also quite low in New Bedford and Fall River.

Table 1. Economic and Social Characteristics, 1969 and 1999
Fall River, New Bedford, Massachusetts, and the nation

	Unemployed Rate	*Poverty Rate*	*Median Family Income*	*H.S. Grad. Rate*	*College Grad. Rate*
1969					
FR	5.1%	10.8%	$ 8,289	25.6%	4.3%
NB	5.1%	11.9%	$ 8,230	27.8%	3.7%
MA	3.7%	6.2%	$10,835	58.5%	12.6%
U.S.	4.4%	10.7%	$ 9,590	52.3%	10.7%
1999					
FR	7.0%	14.0%	$ 37,671	56.6%	10.7%
NB	8.7%	17.3%	$35,708	57.6%	10.7%
MA	4.6%	6.7%	$ 61,664	84.8%	33.2%
U.S.	5.8%	9.2%	$ 50,046	80.4%	24.4%

Source: 1970 and 2000 Census of the Population

In 2002, 22 percent of all employment in the region was in education and health services, having passed manufacturing at 19 percent.[9] The major employers in both cities are hospitals. The University of Massachusetts Dartmouth, located almost exactly between Fall River and New Bedford, is the other major employer in the region.

Over the past thirty years, both unemployment and poverty rates have increased in relation to rates for the state and the nation. In 1969 and 1999, the years these data were collected, the business cycle was close to its peak with unemployment rates for the state and the nation around 4 percent in 1969 and 5 percent to 6 percent in 1999. Unemployment rates in Fall River and New Bedford, however, increased from an average of 5 percent for the two cities in 1969 to an average of 8 percent in 1999, while poverty rates increased from an average of 11 percent to an average of 16 percent, roughly double the rates for Massachusetts and the nation. Median family income in the two cities fell relative to the state, from 76 percent in 1969 to 59 percent in 1999 of the state's median family income.

Juxtaposing the labor markets in Fall River and New Bedford with labor markets in Massachusetts provides a more direct test for theories in *The New Division of Labor.* We examine if the two cities show characteristics of labor markets dominated by computer-replaced jobs within a state labor market characterized by computer-enhanced jobs.

While basically a theoretical discussion of the effect of computer technology on labor markets, Levy and Murnane use the 1970 and 2000 Census of the Population to test their hypothesis.[10] They argue that increases from 1969 to 1999 in Managers & Administrators and Professional Occupations & Technicians are consistent with increases in computer-enhanced jobs. The increases in Service Workers and Sales Related Occupations are consistent with an increase due to the economic expansion over the period in jobs that computers cannot do. The declines in Administrative Support and Blue Collar Workers are consistent with computer replacement in those jobs.

The same variables over the same time period for Massachusetts show a pattern similar to that of the United States (Table 2). The differences between the U.S. and Massachusetts patterns support Levy and Murnane's hypothesis. Computer enhanced jobs (management and professions) increased in Massachusetts, a state economy focused on high tech jobs with a well-educated work force, from 26 percent in 1969 to 41 percent in 1999, more than the increase in the United States as a whole (from 21 percent to 33 percent). The loss of Administrative Support and Blue Collar employment, jobs that computers can replace was greater in Massachusetts (from 54 percent to 34 percent) than in the nation as a whole (from 56 percent to 30 percent)

Table 2. Changes in Percentage of Employment between 1969 and 1999

Fall River & New Bedford, Massachusetts and the nation

	FR & NB MA			*U. S.*		
	1969	*1999*	*1969*	*1999*	*1969*	*1999*
Computer Enhanced	13%	22%	26%	41%	21%	33%
Service & Sales	18%	29%	20%	25%	20%	26%
*Computer Replaced*69%	49%	54%	34%	56%	39%	

Source: 1970 and 2000 Census of the Population

The patterns of change in the labor markets in Fall River and New Bedford are quite different from those in Massachusetts and the nation as a whole. Averaging the data for the two cities, which are very similar, the increases in computer enhanced jobs (management and professions) between 1969 and 1999 was substantially less, from 13 percent to 22 percent, than the increase for the state as mentioned above. The increase in Service Workers and Sales Related Occupations was larger for the two cities (18 percent to 29 percent), substantially higher than the increase for the state

(20 percent to 25 percent). These are typically low-wage jobs, probably filled in part by displaced workers from manufacturing. The percentage loss of jobs that can be replaced by computers is similar for Massachusetts and these two cities, but the percentage of jobs in these categories remains quite high in Fall River and New Bedford, forecasting continuing economic problems for these cities. These results are consistent with Levy and Murnane's hypothesis.

Computer-enhanced jobs probably require more knowledge of mathematics. Once again, Fall River and New Bedford fall behind the state on this score. The Massachusetts Comprehensive Assessment System (MCAS) is a series of tests in Math and English Language Arts required for a public high school diploma that ranks among the most difficult in the United States. Students are ranked by the tests as Advanced, Proficient, Needs Improvement, or Failing. In 2001, 21 percent of students in the SouthCoast region, which includes both cities, ranked as either Advanced or Proficient in Math compared to 45 percent for the state.[11] The English Language Arts scores were also lower, 40 percent for the SouthCoast region and 50 percent for the state ranked as either Advanced or Proficient.

Banking in Southeastern Massachusetts

It's 10 A.M. on Saturday. A long line of customers patiently waits for a turn with one of six bank tellers in a neighborhood branch bank. A pleasant young woman standing by the queue smiles and greets customers, directing a Portuguese-speaker to the appropriate teller. The longest line is outside at the two-lane drive through. The ATM in the entryway does a brisk business as well, and a few people are waiting to meet face to face with a customer service person who stares into a computer screen to open accounts or track loan payments.

Bank of America's (BofA) red visuals dominate the décor replacing all traces of Fleet Bank's trademark green and navy blue. Another bank conversion in New Bedford, and this time job losses did not make the headlines. The lean, mean Fleet had already shed enough employment during the mergers and acquisitions of the previous decade — a 31 percent decline in bank employment from 1993 to 2003 in southeastern Massachusetts, or a loss of 683 jobs.[12] Fleet acquired NBB Bankcorp (formerly New Bedford Institution for Savings) and Shawmut Bank in 1995. In 1996, Bank of Boston acquired BayBanks as a hedge against Fleet, creating BankBoston and eliminating more jobs. In 1999, Fleet acquired BankBoston and consolidated its operations.

Another round of mergers between October 2003 and July of 2004 reduced employment in banking in the area by another 500 jobs. Late in 2003, Connecticut-based Webster Bank merged with FirstFed Bank head-

quartered in Swansea. The merger resulted in a loss of 150 jobs.[13] A few months later, BofA merged with Fleet Bank, a move that would result in a 14,000 job loss in Massachusetts. The BofA did not close many branches in Southeastern Massachusetts because Fleet had already taken care of the messy downsizing during the decade before.

In January 2004, Pennsylvania-based Sovereign Bank announced the acquisition of Seacoast Financial Services, the parent company of New Bedford-based Compass Bank. In contrast to the big regional bank (Fleet) taken over by a giant national bank (BofA), the acquisition of Seacoast by Sovereign Bank caused far more job losses in Southeastern Massachusetts. Headquartered in downtown New Bedford, Compass employed over 350 mostly back office workers servicing forty-seven branches.[14] The state-of-the-art building was built in 1999, on the site of the main police station that was razed to make room for the new jobs that would help revitalize downtown New Bedford. Compass Bank was granted $1.2 million in Tax Increment Financing in return for retaining 188 employees and creating 192 new jobs.[15] Compass executives, for the most part local boys who made good, were very visible on community boards and supportive of many mainstream charity efforts.

"You could have heard a pin drop" said twenty-five-year Compass employee, Nancy Keith, when she heard the announcement with her co-workers in the Union St. lunchroom about the Sovereign take-over.[16] Nancy had worked her way from teller to the back office records department manager, which required her "to know a little bit of everything" about 90,000 files, from opening and closing legal documents, researching microfilmed bank statements, and keeping back files of bank records. In retrospect she said, "I should have put it together the year before, when plans to convert microfilm to scanned imaging fell through." Still, with her years on the job and ability to handle complex projects, she said, "I first thought that maybe I would be offered a position to stay on after the conversion." But by July 2004, Nancy and the thirteen others in her department had been laid off. Although those in the branch offices remained, the rest of the back office departments, 352 workers, who averaged fifteen years seniority in customer information, collections, call centers, facilities, and money wiring, were eliminated.

Nancy was eligible for job training. She upgraded her computer skills and is now seeking a new position, but this time probably not in banking. "A lot of my skills are transferable, but I tend to be overqualified." Nancy's work is an example of the kinds of jobs remaining in banking: some requiring a high skill level, for example, analysis of information retrieved by technology and others require lower skill level such as those needed in a cashier. She told us that she fell into a career in banking; she has a college degree in education. "Many of the jobs are out of the area so I'm facing a three-hour or more extension of the work day with commuting." She stays in touch

with her former co-workers who still get together once a month at a local restaurant. She reports that for the most part, people have been finding other positions, some at better pay than before. Nancy and her co-workers were offered a modest severance package of two weeks pay for every year worked, up to twenty-six weeks pay and a year extension on health benefits.

In comparison, top brass at Compass took care of their own with generous golden parachutes, including a $15 million package ($4.6 million in lump sum severance) for CEO Kevin Champagne, $7.3 million for James McDonogh, CEO of Abington Savings (which was acquired by Seacoast just prior to the Sovereign merger), and several other payouts to top executives in the $1 to $3 million range.[17] With a hint of betrayal in her voice, Nancy notes that "with just $1 million less in his package, Kevin could have taken a lot better care of all of us; he's not looking anyone straight in the eye these days."

Bank mergers in Southeastern Massachusetts are not just about the job loss numbers. They are part of a massive restructuring of work caused largely by new technology. The drivers of bank mergers are centralization and consolidation to cut operating costs and expand market share of customers. When two banks merge, it is often the back office facing the highest rates of redundancy. Jobs, such as filing computer data from ATM transactions, posting mortgage or credit card payments, and generating account statements, are shifted away. For example, four loan-processing centers now serve the entire United States.[18] It is estimated that the Fleet/BofA merger will reduce operating costs by 30 percent, which translates into savings of $1.1 billion for the company.[19]

Loan processing, which in the past used armies of underwriters with desks and file cabinets in local bank branches is one of the key jobs eliminated by automation. The decision-making in mortgage lending is a prime example of a task defined by rules-based logic. In the past, underwriters would assemble information about the borrower including employment, monthly income, credit history, ability to repay, and other debt obligations. An underwriter, in part because a customer may have other ongoing dealings with the bank, would weigh additional criteria to arrive at a decision. For example, a credit history that had improved from five years ago or the knowledge that a spouse who is at home with a baby is going back to work full-time in six months could change a "no" to a "yes." The loan officer would use pattern recognition and intuitive knowledge to arrive at a decision. The loan officer would look for patterns in the history and draw on his or her intuitive sense in arriving at a decision.

With automation based on software applying rules-based logic, the human underwriter has almost been eliminated. One of the widely used software packages, the Fannie Mae Desktop Underwriter ©, takes statisti-

cal models of previously approved loans and their default rates to create a scoring mechanism that arrives at an approval or rejection of the application. Software-based underwriting has automated the steps that are taken before reaching the underwriter — application input, scoring and credit analysis, gathering client documents. These clerical back-office jobs are no longer needed to prepare a loan application for review by the underwriter software. Not even the reams of paper to prove credit worthiness pass human hands; the faxed documents are scanned directly into the computer. "What used to be fifty or sixty underwriters are no more than twelve in a large bank."[20]

On the positive side, the customer can get an approval as quickly as a half an hour and can close within three days. On the downside, as many as 30 percent of credit scores are inaccurate, the rejection thresholds are set to avoid a second review. In the past, an underwriter could factor in exceptions to the rules or work with a borrower to clear up credit issues, but not anymore. This kind of automated system, designed for volume, can absorb an additional one hundred applications anywhere in the system without any need to hire more staff.[21]

On the other end of the customer service spectrum, BofA's Premier Banking services target high net worth customers ($100,000 to $1million) who have a direct line to their personal banker/financial advisor. A team of sixteen personal bankers serves just three hundred and fifty select customers.[22] These bankers can still take the time to build trust, listen and make judgments as they make recommendations to their customers. This front-line/high-end dichotomy is a byproduct of service job automation.

Automation and information technology has enabled banks to cut operating costs through consolidation and mergers but it also increases the ability to cut costs by outsourcing key banking operations. Outsourcing is not new; banks have historically used outside services from legal services to bonded couriers that play a support role for several local banks. But the integration of information technologies with outsourcing is new. As a rough estimate, for every one bank employee, there are two outsourced jobs supporting bank operations.[23]

The automation of service industries like banking, combined with the introduction of new information-based technology not only replaces workers but also fragments the work process and distributes it beyond any given geographic territory. Banks provide both services of holding and investing money and servicing debt and products, such as mortgages, IRA's, credit cards, and personal and commercial loans and lines of credit. With banking deregulation, banks are also permitted to offer other products like insurance and securities.[24] Just as deregulation and digitalization have brought about a convergence so that a phone company or a cable company can both sell Internet services, automation and integration of information technology

broadens the local scope of banks to a national and international business platform. In this model, local communities and workers can be left behind to suffer the consequences of job loss, but the products and services remain in the community in the physical form of ATM kiosks or streamlined retail branches and through Internet and phone access to services not locally based.

There is also a wide spectrum of services that customers willingly do for themselves on home computers, from bill paying to airline e-ticketing. Automated speech recognition technology that calls up account data, retrieves information, and connects to other phone numbers has already replaced thousands of jobs.

While local and domestic outsourcing has been an ongoing process in banking, information-based technology has given rise to a new wave of foreign outsourcing often called off-shoring. Again the shifting of jobs off shore is not new, ranging from the loss of rules-based jobs to the outsourcing of routinized services like credit card processing or writing software code. What is new about recent off-shoring is that these new positions require higher skills and advanced degrees. Take this report on a company in India as an example:

> Inside Infosys Technologies Ltd's impeccably landscaped 22-hectacre campus in Bangalore, India, 250 engineers develop IT applications for BofA. Elsewhere in the city, Infosys staffers process home loans for Greenport Mortgage of Novate, Calif. Near Bangalore's airport, at the offices of Wipro Ltd., five radiologists interpret 30 CAT scans a day for Massachusetts General Hospital.[25]

The *Boston Globe* reported in May, 2004, that BofA may hire up to 1,500 software programmers through the Continuum Solutions subsidiary in India. According to ex-BofA managers and contractors, work that costs $100 in the United States gets done for $20 in India. Although not unique to banking, the anticipated trend toward greater off-shoring in Banking and Securities has put 2.3 million jobs in banking at risk, with an estimated potential to shift $17.5 billion in operational and technical costs overseas by 2010, according to a July 15, 2004, report by industry analyst Celent Communications.

Recently in Southeastern Massachusetts as in the rest of the country, credit unions, community savings banks, and specialty niche banks are competing for the customers who are turned off by the big mergers. In New Bedford and Fall River, the BCPbank headquartered in Portugal opened four branches in the area last year to offer services to the more than 400,000 Portuguese speakers in the area.[26] "The emerging polarization between giant banks and small banks represents the future of the industry" according to banking analyst Gerald Cassidy.[27] While the number of banks has

declined 40 percent in the United States since the 1970s, two hundred new local banks were formed in 2000.[28] While successful in attracting new customers turned off by big banks, small banks that grow to medium size like Rockland Trust with fifty-two branches and $2.4 billion in assets may be prime targets for larger banks.[29]

Conclusion

The description of Fall River and New Bedford as economically depressed cities within a rich state holds no surprises, but Levy and Murnane give some insight into the mechanism by which these cities continue to fall behind the rest of the state. They are losing rules-based jobs to computer technology at about the same rate as Massachusetts, but these jobs are going to non-computer service jobs, at best, in Fall River and New Bedford and to computer-enhanced jobs in other parts of the state. This does not bode well for Fall River and New Bedford. They will likely continue to lose jobs to computer technology with little prospect of gaining computer-enhanced jobs.

Fall River and New Bedford lag behind in income and education. During successive waves of job loss during the past thirty years, living-wage union manufacturing jobs fled due to shifting global forces outside of the region. Some of these workers were retrained and were reabsorbed into lower-wage health care, retail trade, and other service-based jobs, while high-tech business was booming in other parts of Massachusetts. The current transformation from service-based economies to the information age signals a major technology-driven shift that has accelerated the pace of change and the ability to shed labor.

In the past, a downsized worker might be able to retrain and find employment in another sector albeit at a lower standard of living (particularly if the job was in an organized shop). But today, local labor has to compete globally with labor markets that have an abundant supply of both cheap and educated, higher-skilled workers. Many computer-enhanced jobs seem likely to follow rules-based jobs out of the United States. Low-wage countries like the Philippines, China, and India can use computer and communication technology to supply thousands of engineers, radiologists, and financial analysts with offshore-ready college degrees.

Jobs not easily automated or outsourced such as those in retail trade, wholesale distribution, front-line health care, human services, child care, building trades, and primary sector jobs in agriculture and seafood harvesting and processing will be key areas for the future of work in Southeastern Massachusetts. Most of these jobs are low-wage and non-union with limited benefits and security. Agriculture and seafood processing of this sort require seasonal labor, often immigrant labor. These workers, mostly supplied by temp companies, exist on the flip side of automation, doing manual tasks

such as painstakingly trimming fish filets after they have passed through a skinning machine.

At the end of *The New Division of Labor*, Levy and Murnane suggest education based upon pattern recognition rather than facts or rules to prepare students for computer-enhanced jobs. They also suggest teaching interpersonal skills for negotiation-based jobs and praise MCAS exams in Math and English Language Arts as steps in the right direction, because the former focuses on pattern recognition (for example, geometry) and the latter focuses on communication skills.

The authors do not comment on union representation. Rules-based jobs in New Bedford and Fall River were represented by unions that raised wages and benefits, while the non-computer service jobs that laid-off workers have spilled into are not represented by unions. This probably contributes to the decline in wages. Organizing these sectors, however, may prove both difficult and unrewarding. Although Wal-Mart is a tempting target for union organizing, the growing number of people who are applying for these jobs and Wal-Mart's practice of replacing jobs with computer technology, as well as Wal-Mart's strong opposition to unions, will make organizing very difficult. Service jobs that can't be replaced by computer technology or be outsourced are far better targets for job-hunters while computer-enhanced jobs may be a better target for union organizers.

The speed of technological change that drove the Luddites to smash machinery continued after their defeat. Within twenty years, virtually all poor children over the age of five in the cities of the Midlands were working from dawn to dusk in hot and dusty factories producing wealth for others. While there is little evidence that computer technology, which moves as fast and as relentlessly as the Industrial Revolution, will produce the same squalor, there is strong evidence that this revolution will leave a large class of low-wage jobs without benefits in its wake.

Notes

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