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AUTHOR Maxwell, Nan L.; Rubin, Victor

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ABSTRACT

The outcomes and implementation of career academy programs in California were examined in a study of one school district's efforts to implement a uniform career academy model in 1990-1996. A cohort of approximately 10,000 students who were sophomores in the district's comprehensive high schools between 1990 and 1993 were followed through high school and several years thereafter. Approximately 14% of the cohort members were enrolled in career academies. The data on student outcomes were subjected to a multivariate analysis. The academy students were more likely to be female and African American. Relatively well developed career academies increased their students' academic knowledge and skills, increased the probability that students would attend postsecondary education, decreased the need for later remediation in English, and increased the probability of university graduation for students who were otherwise not likely to even attend a university. The career academies were somewhat less successful in increasing students' workplace skills. The following characteristics of successful career academies were identified: a relatively complete curriculum; a school-within-a-school that sheltered students from hostile or indifferent school environments; large amounts of start-up resources; a committed program head; and school and community support. (A description of the research and data analysis methods is appended. The bibliography lists 15 references.) (MN)

RESEARCH SERVING CALIFORNIA

CPRC REPORT

Career Academy Programs in California: Outcomes and Implementation

Nan L. Maxwell and Victor Rubin

Policy Research Program

CALIFORNIA POLICY RESEARCH CENTER
UNIVERSITY OF CALIFORNIA

California Policy Research Center
University of California

1950 Addison Street, Suite 202
Berkeley, California 94720-7410

Phone: (510) 642-5514
Fax: (510) 642-8793
Publications ordering information: (510) 643-9328
http://www.ucop.edu/cprc
E-mail: cprc@ucop.edu

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Authors and Acknowledgments

Nan L. Maxwell is a professor and chair in the Department of Economics and executive director of the Human Investment Research and Education (HIRE) Center at California State University, Hayward. Victor Rubin is an adjunct associate professor in the Department of City and Regional Planning and a former research associate at the Institute of Urban and Regional Development, University of California, Berkeley. He is currently director of research for PolicyLink, a national nonprofit advocacy, research, and communication organization with offices in Oakland and New York City.

The views and interpretations expressed in this report are those of the authors and may not reflect those of the sponsoring institutions or the Regents of the University of California. A book by the same authors, covering this research in greater detail—*High School Career Academies: A Pathway to Educational Reform in Urban School Districts?*—was published in November 2000 by the W. E. Upjohn Institute for Employment Research.

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Executive Summary

The basic underpinnings of the educational reform movement known as school-to-career, or school-to-work, are that students will be more motivated to study, will perform better in high school, and will fare better in the labor market and in higher education if their high-school experience is directly connected to the world of occupations, careers, industries, and professions.

California has put considerable support into a school-to-career model known as the career academy since Assembly Bill 3104 was enacted in 1985, which offered competitive planning grants of $25,000 to 10 schools to initiate these programs, and $50,000 per year for initial implementation. Three years later, Senate Bill 605 created the Partnership Academies program, offering planning grants of $15,000 and implementation grants of $67,500 per year. That program is still in operation as an extensive network of training and technical assistance. In 1999, 180 schools in 35 counties received support.

This approach is the basis for one of the most expansive restructuring efforts currently under way in California secondary education, although elements of it have been in place for more than a decade. After nine years of research and observation of school-to-career (STC) programs in one California school district, starting in 1991, we sought to answer a number of questions related to the ways career academies can reform urban high schools to increase education and workplace knowledge and skills. As part of the process we examined high-school transcripts, administered post-high-school surveys to several thousand students, and undertook site visits to academies, schools, and district offices.

The Career Academy Model

This educational reform is being driven by the transformation of the nation's economy to one based on services and information processing, which rewards investments in "human capital" more than physical labor. Economic and labor-market changes, coupled with the perceived failure of high schools to prepare a large segment of students for stable employment, have set the stage for major changes.

In theory, by showing students the possibilities of employment in high-wage, interesting jobs, those who were previously alienated from school will see the relationship between their studies and a successful life. By integrating academic courses with first-hand experience in industries that are hiring locally, students should leave high school with skills leading to employment in the area. Both the increased motivation to learn and the acquisition of work-placed knowledge and skills should increase students' inclination to stay in school and to learn the course material—set in accordance with high state and national academic standards.

The career academy is the most thoroughly developed STC program model in practice. It builds a "school-within-a-school," integrates academic and vocational learning into a specific career or industrial focus, and creates a cohort of students who take four core classes throughout their high school and stay with a small group of teachers. This clustering of students and teachers creates a strong emotional, social, and academic support system

and isolates and "protects" students from what may well be an alienating, ineffective school.

Although career academy models vary across the state, they share several core elements: the school-within-a-school structure, integrated academic and vocational curriculum, and employer and workplace involvement.

This model was instituted in our case study district beginning in 1985, the first year such programs appeared in California. Its evolution from a few idiosyncratic demonstration projects to a districtwide strategy framed our analysis and helped answer some key questions about career academies. In this summary we briefly discuss answers to the questions below. Other questions are addressed in our complete report.

- Is this an appropriate educational strategy for all students in all schools?
- Is it an appropriate educational strategy for developing a local labor force?
- What components are necessary for a successful career academy?
- What is the appropriate scale for career academies?
- What support is necessary for them to be effective?

The Case Study District

The school district we studied is fairly typical of California's large, inner-city public school systems. It serves over 50,000 students and contains six comprehensive high schools. Over 90% of the district's students are from groups considered to be ethnic minorities, more than one-quarter have limited English proficiency, nearly 40% receive free lunches, and the average daily attendance is only slightly over 80%. Educational outcomes for the district's students are generally poor.

The district's career academy program grew out of small, home-grown innovations started by teachers in the mid-1980s. The first academy was established in 1985, and was in the first group to receive state funding. By 1996, about 14% of the district's high-school students were in career academies, although the proportion of students enrolled in any school varied from 4.5 to 50.4%. The largest jump in the number of academies came in 1997, following the adoption of a districtwide STC plan. Because the career academy model was at the heart of this plan, 20 new academies were added in the next two years, raising the total to 33 by 1998.

The district's academies during our study period represent the full range of development, from recent startups to several nationally known, highly regarded prototypes. They were implemented under varying conditions, with different levels of completeness, resources, dedicated staffing, and school-level support. This diversity in capacity among academies in the same district is a common phenomenon in cities that have embraced the model.

Although the district established policies to ensure inclusiveness and heterogeneity, academy students differed from nonacademy students in their demographics, parental background, and prior knowledge and skills. They were more likely to be female and African American and less likely to be Latino and Asian than nonacademy students. A smaller percentage of academy students were from the special education and limited-English-proficiency populations. These differences existed in part because the academies were developed in areas where populations had the lowest socioeconomic status.

Thus, enrollment varied greatly among the schools and academies, and academies occupied somewhat different niches in each

school's overall environment. The smallest high school, which also had the highest proportion of poor students, had the largest proportion of students in academies.

Student Outcomes

School success. Relatively well-developed career academies increased their students' academic knowledge and skills, compared to those taking other high-school programs. When academy program components that can build knowledge and skills are in place, there is strong reason to expect the program to raise the educational outcomes of many students.

Career academies in the district increased high-school completion rates and made noteworthy improvements in several aspects of academic achievement beyond high school. They increased the probability that students would attend postsecondary education, decreased the need for later remediation in English, and increased the probability of university graduation for students who were otherwise not likely to attend, much less graduate.

The increase shown in grade-point averages may be particularly important in that it crosses a critical threshold for males, African Americans, and Latinos: the difference is between a D/D+ average and a C average. Even though the average is still low and is hardly an indicator of postsecondary success, raising the grade-point average (GPA) into the C range could open postsecondary doors for students. Almost all of the academies increased GPA, with the notable exception of the two less comprehensive programs.

Work success. The district's career academies were somewhat less successful in increasing workplace skills. The percent of individuals working in a job related to their high-school program increased only for females, Latinos, Asians, and those who speak English proficiently. None of the groups had high rates of entering fields related to their high-school course of study. Even with the positive career academy influence, no more than 8% of former students work in a field related the focus of their high-school program.

However, relatively few academy students in our study were exposed to key work-based-learning components of the program. Only about 37% had internships, and for those students the experience was extremely positive. Over 90% reported that the internship made them realize the importance of doing well in school. The internships appeared to be a source of both academic and work-based training, with well over 80% of the interns using reading, math, and writing skills on the job.

Policy Implications

Is the career academy an appropriate educational strategy for all students in all schools? Not surprisingly, academy students got more out of the program when they and their school put more into it. Successful academies raised their students' academic knowledge and skills and also provided a positive social climate that independently raised the probability of increased learning. These successful academies had strong community support, long-established funding sources, a well-developed curriculum that students actually completed, and students who were capable of taking full advantage of it.

Perhaps because the programs studied were concentrated in economically impoverished areas, academy students who were not generally successful by state standards were successful in comparison with nonacademy students in their own schools. Thus, academies that

seem to be ineffective according to benchmarked standards may be quite effective when comparing the educational outcomes of students in similar circumstances. Conversely, academies that meet local or statewide benchmarks may not always have outcomes that exceed other courses of study at the same school.

Career academies cannot erase all of the academic problems associated with our educational and social systems, nor can they erase all of the knowledge and skill deficiencies that students bring to high school. Clearly, other reforms must be implemented in conjunction with career academies if all students are to leave school prepared to face the labor market and educational challenges of the 21st century.

Is the career academy an appropriate educational strategy for developing a local labor force? Career academies can decrease the gap between the low level of skills that labor-market entrants generally have and the relatively high level of skills employers require if the mismatch is defined in terms of academic skills. This would occur because academy students left high school with greater levels of academic knowledge and skills than did nonacademy students, and because a greater percentage of career academy students attended postsecondary education. However, academies such as the ones in our study may have only a limited capacity to meet narrowly defined job-specific skills that local employers are seeking (e.g., dental technology).

Few differences existed between the wages and employment of career academy and nonacademy students in the first few years after they left high school. However, this community's program was less directly geared than some others toward building a pipeline to employment because of circumstances in the local labor market. Many other school-to-career programs are similar in this respect.

What components are necessary for a successful career academy? The most important challenge for program planners and administrators is to ensure that all the program components are set in place. That may sound almost tautological, but the experience of school reform indicates the need for this warning. Successful career academies had several characteristics in common, specifically:

- A relatively complete curriculum
- A school-within-a-school that sheltered students from hostile or indifferent school environments and provided a social support system of teachers and peers
- Large amounts of startup resources in terms of time (staff and curriculum development), equipment, and internships
- A program head whose commitment, energy, and devotion led and inspired teachers as well as students
- School and community support, including business support for work-based-learning components.

What is the appropriate scale for a career academy? The complexities of successful academy operation are noted in our complete report, and caution against wholesale adoption of the model. Among the factors to consider in determining scale is the academy's smallness, so students can feel special and supported. A school, particularly a smaller one, that consists entirely of career academies, may face fairly intractable scheduling problems, particularly with elective classes. Moreover, not all teachers and students are suited to this style of teaching and learning.

What support is necessary from partners for effective career academies? Strong support for the strategy is required at the site prior to an academy's implementation, and throughout its lifetime.

Widespread and genuine support of *teachers* is essential to developing and executing the curriculum necessary for the career academy. Without support from *parents and the community,* career academy programs will remain undeveloped or underdeveloped, because opposition or ambivalence will retard their growth. *Principals and district administrators* hold the key to scheduling teachers and classes, providing funding and guiding student enrollment, as well as setting content standards, curriculum practices, and educational goals.

A Final Word

Successful career academies represent an ambitious agenda for basic changes in the way schools are run. They may be worth the effort, as there is evidence that in the right circumstances the new curriculum, social support, and work experiences the academies offer can make a very important positive difference in the lives of many students. The challenge for educators is to create and replicate those enabling circumstances for the right teachers and students, without losing academic rigor or growing so large that the academy's special qualities would be lost.

Career Academy Programs in California: Outcomes and Implementation

Nan L. Maxwell and Victor Rubin

Introduction

Students will be more motivated to study, will perform better in high school, and will fare better in the labor market and in higher education if their high-school experience is directly and realistically connected to the world of occupations, career paths, industries, and professions. This is the basic concept underlying the reform movement known as school-to-career (STC), or school-to-work. The premise is at once straightforward and at the same time thoroughly controversial.

Although it provides the basis for one of the most expansive restructuring efforts currently under way in California secondary education, elements of the approach have been in place for more than a decade in selected high schools and school districts. Early experiences, pilot projects that were sustained and gradually replicated in other schools, provide a unique window on implementing this new way of teaching and learning, and on assessing their outcomes for students.

This report summarizes nine years of research and observation of school-to-career programs in one California school district. We ask and answer the general question, "In what ways can career academies reform urban high schools to increase education and workplace knowledge and skills?" Using high-school transcripts and post-high-school surveys of several thousand former students in one district and the observations of their teachers and principals, we provide California policymakers and educators with information about where the STC approach has been and where it may be headed.

The driving theme for educational reform in STC centers on transforming the American economy to one that is based on services and information processing, and that rewards investments in "human capital" more than physical labor. When the changes in the economy and labor market are coupled with the perceived failure of high schools to adequately prepare a large segment of students for stable employment, the stage is set for major changes.

In theory, by showing them that employment in high-wage, interesting jobs is possible, students who were previously alienated from school will see the relationship between their studies and a successful life.[1]

When the academic courses are integrated with first-hand experience of careers in industries that are hiring locally, students should leave high school with skills leading to employment. Both the increased motivation to learn and the acquisition of work-placed knowledge and skills should increase students' inclination to stay in school and to learn the course material.

The academy's clustering of students and teachers creates a strong support system that isolates and "protects" students from what may well be an alienating, ineffective school.

School-to-career reforms also dictate that course materials meet high state and national academic standards, rather than a norm or expectation of low performance, as was often the case with traditional high-school vocational education.

The career academy is the STC program model that is, arguably, the most thoroughly developed in practice. The academy builds a "school-within-a-school," integrates academic and vocational learning into a specific career or industrial focus, and creates a cohort of students who take four core classes throughout their high school and stay with a small group of teachers. This clustering of students and teachers creates a strong emotional, social, and academic support system and isolates and "protects" students from what may well be an alienating, ineffective school.

This is the academy model that was instituted in our case study district beginning in 1985, the first year such programs appeared in California, and it is this period of evolution, from a few idiosyncratic demonstration projects to a districtwide strategy, that framed our analysis and helped answer the following six questions:

- Is the career academy an appropriate educational strategy for all students in all schools?
- Is the career academy an appropriate educational strategy for developing a local labor force?
- If career academies become commonly available, what gaps remain in curriculum offerings?
- What components are necessary to build a successful career academy?
- What is the appropriate scale for a career academy program?
- What support is necessary from partners for effective career academies?

Answers to the first three questions provide information to policymakers and educators about which students are well served by career academies, and answers to the last three provide information to program designers and administrators about building successful programs.

The Evolution of Policies and Programs

Responses to the "Skills Crisis"

The crisis in knowledge and skills was brought to national prominence with the 1983 National Commission on Excellence in Education's influential report known as *A Nation at Risk*. The commission characterized these deficiencies as fundamental nationwide problems of education and economic competitiveness. The report was blunt and eminently quotable in its pronouncement about the inability of our educational system to provide necessary technical knowledge and skills or to reverse "a rising tide of mediocrity," and called for curriculum revision such that all high-school graduates would master the "New Basics."

The STC reforms initiated during the early 1990s built upon and broadened the New Basics. Educators and employers initiated partnerships to integrate high academic achievement with active learning in real-world jobs.[2]

Three pieces of federal legislation codified many of the consensus ideas about best practices in the new integration of school and work. These were "Goals 2000: Educate

America Act," the "Carl D. Perkins Vocational and Applied Technology Education Act of 1990" (Perkins II), and the "School-to-Work Opportunities Act" of 1994.

A complete STC system was to provide students with the skills necessary to succeed academically in high school and continue their education, yet also impart the industrially and occupationally specific human capital necessary for them to succeed in the labor market. The belief was that providing work-based skills only, in lieu of academic knowledge and skills, would reestablish the two-tiered, inequitable education system that had been embodied by curriculum tracking. Instead, school-to-career reforms would provide both work-based and academic knowledge and skills to all students.

Within California, in 1992 the Department of Education's High School Task Force issued a landmark report entitled *Second to None: A Vision of the New California High School,* which identified many of the ideals and strategies later embodied in the federal Goals 2000 and School-to-Work legislation. The report stressed that high schools must be restructured to adapt "to the needs of an urban, industrial society . . ." The report stated that we need to

> engage our students in strengthened curriculum; prepare more students for college and also to prepare students to qualify for technical preparation programs and jobs; develop outcome-based accountability; provide effective support and reduce the dropout rate; establish an environment of professionalism for school faculty; initiate effective parent, business, and community involvement; and make instructional and organizational changes to allow students to reach these levels.

The 1994 federal School-to-Work Opportunities Act was largely consistent with this vision and initiated a massive planning process

Within California, a 1992 report stressed that high school must be restructured to adapt "to the needs of an urban, industrial society."

in California. The resulting state School-to-Career Plan reflects, but moves beyond, the experience that the state had already gained through its Partnership Academy program and its implementation of Perkins II.

A fully realized school-to-career system would require comprehensive changes in how high schools teach and classify students. Successful curriculum integration would allow high-school students to gain workplace knowledge and skills without reducing their attention to academic achievement.

The complete STC system would encourage active participation by business, postsecondary education, and community sectors. The high-school programs would be fully articulated with community colleges and universities. All parties would have access to current labor-market information about the skills in demand, and the curriculum would convey a portable set of skills that had been validated by national boards.[3]

Adherence to the standards would provide students with the flexibility to pursue either employment opportunities or continued education upon high-school graduation.

The Career Academy Model

The career academy model has received considerable support in California for many years, predating the policy initiatives described above. In 1985, Assembly Bill 3104 established the career academy model by offering $25,000 competitive planning grants to 10 schools. Each site in the initial period received $50,000 each year to implement the academy. This bill

Academies cluster small groups of teachers and cohorts of students who stay together for many of their courses throughout their high-school career.

was followed three years later by Senate Bill 605, which created the Partnership Academies program: planning grants of $15,000 and implementation grants of $67,500 per year. That program is still in operation, with 180 schools in 35 counties receiving support in 1999. An extensive network of training and technical assistance is also now in operation.[4]

School-Within-a-School Structure

Academies create structures within schools for grades 9 to 12 or 10 to 12 by clustering small groups of teachers and cohorts of students who stay together for many of their courses throughout their high-school career. Typically, a team of three to five teachers works with approximately 50 students (two classes) per grade.

The school-within-a-school approach provides a more personalized and supportive learning environment and creates a strong peer and teacher support system for working hard in school. The clustering of teachers enables collaborative work that can focus on the educational and developmental needs of the students. It also promotes active involvement of parents in the educational process.

Integrated Academic and Vocational Curriculum

Career academies integrate curriculum around a career theme in a field for which employment is growing in the local labor market. The curriculum combines both technical and academic content, usually through one technical and three academic classes each semester. (Technical in this sense means a laboratory or a setting in which it is possible to work with equipment and procedures characteristic of the industry or profession.)

Career academies expose students to a whole range of occupations in an industry and give students the option of pursuing advanced technical and academic training at the community college and university level. Although this openness to university education is not universal in models across the country, it was a central outcome of California's statewide planning process.

Employer and Workplace Involvement

Employer representatives from the academy's career field help plan and guide the program and are involved as speakers, fieldtrip hosts, job supervisors, and mentors for individual students. Students often engage in career awareness in the initial year (e.g., attend job fairs, take field trips, hear speakers), and connect with mentors in the second year. Students usually have an internship related to their career interests in the summer between the junior and senior year, and (at times) undertake part-time employment during the senior year.

Research Framework and Methods

With the proliferation and diversification of STC programs comes an increased need for scrutiny. Preliminary research studies have suggested that career academies reduce dropout rates, increase postsecondary attendance, and improve job performance and work attendance.[6]

But systematic research is relatively sparse, and many key questions have not been addressed. If school-to-career strategies are widely implemented, they will displace existing programs and require considerable resources and significant retraining of thousands of teachers. The stakes are high, and the best time to ask

tough questions about the potential of STC strategies is now, when they are relatively new.

Our approach to program assessment was to examine the growth, implementation, and outcomes from career academies in one large, urban school district in California. While any case study approach to program evaluation is subject to the criticism that findings result from the idiosyncrasies of one specific district, the in-depth perspective on program operations, model implementation, and student outcomes from this approach cannot be replicated with large-scale random program evaluations. Moreover, our results are highly consistent with those of the most recent experimental model-based evaluation.[7]

Our research results are based on rich quantitative and qualitative data. Quantitative data include information from transcripts of three classes in the district's high school and of students from the district who applied to or attended the nearby state university, and survey responses to questionnaires administered to the students in our high-school population.

Qualitative data include information from site visits conducted over nine years (1991-1999) and, in 1999, systematic interviewing of all directors of academies (that were at least one year old), five of the six high-school principals, district program administrators, and various academy partners. We combine the two types of analyses—the multivariate analysis of student outcomes and the qualitative analysis of program processes—to answer our six research questions.

Multivariate Analysis of Student Outcomes

We assessed the academies' potential to build postsecondary success for students using individual-level student data to compare academy students to others who were not in the program. The analysis focuses on the high school

Preliminary research studies have suggested that career academies reduce dropout rates, increase postsecondary attendance, and improve job performance and work attendance.

and postsecondary experiences of three cohorts of public-school students who were sophomores in the years from 1990–1991 through 1992–1993.

Fourteen percent of the district's students in these cohorts were enrolled in a career academy. We followed these 10,102 students through high school with individual-level data from the district on grades, demographics, and related factors, through their initial foray into either postsecondary education or the labor market, with a survey sent to them about one-to-three years after they left high school (about 1,200 former students responded).

We also followed the educational progress of former students from the district in their efforts to attain a degree from the local California State University by analyzing the individual-level student records of all academy and nonacademy students from the district who applied, enrolled, or attended that university (about 1,500 students).

We used these data to assess the career academy's influence on student outcomes in high school, in the labor market after the student leaves high school, and in postsecondary education. Because students enter high school with nine or ten years of formal education and about 14 years of out-of-school experiences, all of which affect their subsequent academic performance, our analysis statistically controlled for initial differences using multivariate methods (primarily ordinary least-squares and probit analysis). We also isolated the independent influence of the experience

of being in an academy from the effect that the academy has on raising students' knowledge and skills. (See the appendix for details of our quantitative methods.)

Qualitative Analysis of Program Implementation

Our need to understand how the programs evolved in the case study community was motivated by the central importance of implementation issues in education reform. The academies both require and instigate the restructuring of many features of a school, and they require additional financial and human resources.

If the strategy cannot survive the development and implementation phase in a large school district, theoretical elegance or anecdotal persuasiveness may not matter. In fact, sometimes the largest barriers to change are not ideological disagreements, but more mundane facts of school life such as bell schedules and seniority clauses in union contracts.

Academies that operated in our district during the study period represent the full range of development, from recent start-ups to several that were nationally known, highly regarded prototypes. They were implemented under varying conditions, with different levels of completeness, resources, dedicated staffing, and school-level support. This diversity in capacity among the academies in the same district is a common phenomenon in cities that have embraced the model and allowed us to highlight the program's strengths and challenges.

Sometimes the largest barriers to change are not ideological disagreements, but more mundane facts of school life, such as bell schedules.

Academies in the Case Study City

The school district we studied is fairly typical of large, inner-city, public school systems throughout the state. It serves over 50,000 students and contains six comprehensive high schools. Over 90% of the district's students are ethnic "minorities," over one-quarter have limited English proficiency, nearly 40% receive free lunches, and the average daily attendance (the percent of days that a student came to school) is only slightly over 80%. Educational outcomes for the district's students are generally poor by most comparative, aggregate standards.

The career academy program within the district grew out of small, home-grown innovations that were started by a number of teachers in the mid-1980s. The first academy was established in 1985, and was in the first cohort of those receiving state funding. Within four years, it was joined by academies in five other fields. The program continued to expand in the early 1990s. One academy was initiated in 1991 and two more followed in 1992.

By 1996, about 14% of all the public high-school students were in career academies, although the proportion of the student body in any school that was enrolled in an academy varied from 4.5 to 50.4%. The largest jump in the number of academies came in 1997, the first full school year following the adoption of a districtwide STC plan. Because the career academy model was at the heart of the district's plan for STC in high schools, 20 new academies were added in the next two years, raising the total to 33 by 1998.

To support the academy's growth, the city council, sitting as the city's redevelopment agency, appropriated an average of roughly $1 million annually for their expansion and enhancement, from 1990–1991 through

1998–1999. Both the city and district reasoned that, in the short run, increasing the academic and workplace skills of the city's students in line with the needs of the labor market would lead to students being more readily hired and retained by local employers. Over a longer period of time, the city's economic base would expand as firms were attracted to the city's ready supply of appropriately educated workers.

This appropriation of funds enabled academies to support additional planning and curriculum time for teachers, obtain new equipment, provide hundreds of stipends for student work internships, hire greater numbers of tutors, recruit mentors, take more field trips, develop more robust advisory committees, and engage "industry liaisons" to assist with all of this additional recruiting and coordinating.

The city's financial support was contingent upon meeting performance benchmarks, spelled out in each year's contract. Not surprisingly, the development of academies often centered around achieving the benchmarks that were given the most attention—those concerned with educational attainment.

This emphasis on grades, attendance, graduation, and similar outcomes stemmed from the shared belief by educators, employers, and some city policymakers that the local labor market was moving rapidly toward a knowledge-based economy in which fewer higher-quality jobs would be open immediately to high-school graduates. The result was that the career academy programs, especially the older, more established ones, became more heavily focused on preparing students for higher education than on immediate job placements.

This education-focused vision led to a career academy model in which programs were expected to increase students' performance in five ways:

An education-focused vision led to a career academy model in which programs were expected to increase students' performance in five ways.

- The rigorous academic standards set by the programs, the integrated curriculum, and the work-based learning component of the program were expected to increase the academic and workplace knowledge and skills that the students take from high school.
- The contextual learning environment within the academy was expected to increase the students' motivation to continue to higher education by showing them the necessity of education in today's labor market, and by increasing the connection between academic content and the work itself.
- The work-based learning component of the program and the emphasis on building workplace skills were expected to increase employment opportunities and wages for students as they enter the labor market.
- The emphasis on the changing requirements of the labor market and the need to maintain and increase knowledge and skills in demand by employers was expected to enhance students' interest in and capacity for lifelong learning.
- The increased knowledge and skills gained in high school were expected to increase students' ability to continue into post-secondary education and to turn increased education into better jobs in the long term.

Students and Schools

The district established policies so that the career academies would reflect a heterogeneous group of students representing all levels

of prior academic achievement. The district wanted to avoid enrolling only high achievers or, conversely, taking only those with academic problems. In theory, all academies had the same administrative processes including formal application, entrance requirements, recruiting procedures, requirements to remain in the program, and opportunities, such as internships. The district's policies explicitly referred to inclusion of students at risk of school failure.

Despite this commitment to inclusiveness and heterogeneity, academy students differed from nonacademy students in their demographics, parental background, and knowledge and skills brought to high school. Academy students were more likely to be female and African American and less likely to be Latino and Asian than were nonacademy students. A smaller percentage of academy students were from the special education and limited-English-proficiency populations.

These differences result in part from the focused development of career academies at high schools whose student populations represented the lowest socioeconomic status. This emphasis also meant that enrollment varied greatly among the schools and academies and that academies occupied somewhat different niches in each school's overall environment. The smallest high school, which was also the school with the highest proportion of poor students, had the largest proportion of its students in academies.

For students who had internships the experience was very positive, helping them realize the importance of doing well in school and providing both academic and work-based training.

Once academies were free to set their own size, their targets and actual enrollments varied widely, in keeping with school size, demand, and the teachers' capacities and preferences. The actual enrollments ranged from 85 to 221 in 1994–1995 and averaged 121 that year.

The Academy in Practice

Notwithstanding the importance of the career academy model to the district, a complete academy program had not yet been achieved at all the sites by 1999. Academies did generally succeed at keeping their students together, with nearly 80% of students in designated academy courses enrolled in that academy. This may not at first seem noteworthy, but getting to this percentage represented a major accomplishment, since "school-within-a-school" strategies present schoolwide problems in the assignment of teachers and students.

The academy programs were less thoroughly implemented in many other respects. For example, across the district, academy students took an average of only about 13 academy semester-length courses, whereas the full prescribed academy curriculum constituted 22 courses over three years. Only 23% of the academy students took as many as 20 courses. Such incomplete academy course completion often resulted from students not being enrolled in the program for the full period of time. Only about 28% were enrolled in their sophomore, junior, and senior years, the intended duration of the program. Fewer than 60% of academy students were enrolled in both their junior and senior years.

Relatively few academy students in our study were exposed to key work-based-learning components of the program. Only about 37% had internships. For those students who did have internships, the experience was extremely positive. Over 90% of the interns

reported that the internship made them realize the importance of doing well in school. Internships also provided both academic and work-based training, with well over 80% of the interns using reading, math, and writing skills on the job. Also, only about 31% of students had a mentor, despite this being the goal in most years, and many of the mentors met their students only a few times.

Despite a model that emphasized teacher interaction and group cohesion, the teaching staffs tended to fluctuate from year to year, with only 23.4% of the teachers remaining in an academy for all four consecutive years during this study. In every case, an academy had a solid core of two or three teachers, some of whom had been with the program for over a decade by 1999, and who undertook most of the extra work. They were typically complemented by a larger number of teachers who rotated in and out for one- or two-year stays.

The components of the career academy model were implemented with varying degrees of completeness in different academies. Most of these differences can be traced to one of two sources: 1) different levels of outside funding to each academy, and 2) different school environments with different populations.

Academy development was not uniform among the six high schools. Generally, the schools in lower-income areas had the largest number of academies, while the two high schools in higher-income areas had fewer programs, less conformity with the overall model, and fewer outside resources.

It was in the high schools with students from the middle of the socioeconomic strata that the strongest, most comprehensive career academies emerged. Within this stratum of schools, the right mix existed of pressure for reform and teachers with creative ideas and

The components of the career academy model were implemented with varying degrees of completeness in different academies, and academy development was not uniform among the six high schools.

leadership skills. While overall conditions in these schools were still challenging, they were not as difficult as they were at the two schools whose students came from the lowest socioeconomic status (e.g., dropout rates were not so extreme, absenteeism was not so high, and the facility was generally more manageable).

The lowest-income schools faced extreme challenges that resulted in uphill battles for their academies to maintain a cohesive and stable staff, coherent curriculum, full class schedule, and adequate facilities. Because of these limitations, their academies were not as strong or complete as they might have been in more favorable environments. In cases where schools managed to develop important, effective program elements, these tended to be in extracurricular activities and in personal support for students, rather than in the core courses.

The variation in academy development among schools is typical of a large district, even where, in theory, the same model was to be followed for each academy. However, the real world of urban schools does not establish conditions congenial to the carefully constructed models of either educational reformers or researchers. School inequalities and the lack of uniform or constant resources and conditions may make the effort to understand the causes of student outcomes more complex, but they are best appreciated not as distractions but rather as central factors in this story.

Perhaps our most conclusive finding is that the career academy model has the potential to positively affect educational outcomes in California.

Student Outcomes

Perhaps the most conclusive finding of our study is that the career academy model has the potential to positively affect educational outcomes in California. Relatively well-developed career academies increased the academic knowledge and skills of their students, compared to those taking other high-school programs. When the academy program components that can build knowledge and skills are in place, there is strong reason to expect the program to raise the educational outcomes of many students.

Our study shows that career academies made noteworthy improvements in several aspects of academic achievement beyond high school. They increased the probability that students would attend postsecondary education, decreased the need for remediation in English at the university, and increased the probability of graduating from the university for a group of students who were otherwise not likely to attend, much less graduate.

However, our study also uncovered several caveats to these accomplishments. First and foremost, career academies must build academic knowledge and skills for their students. In most circumstances, their positive influence on students' postsecondary achievements was through increased academic knowledge and skills. Students' exposure to careers and heightened motivation, while valuable, cannot be considered a substitute for building knowledge.

Second, the career academy's influence cannot fully overcome the disadvantages that students from inner-city public high schools face in the university. Reducing high-school dropout rates and moving students into postsecondary education may be necessary conditions for improving educational outcomes, but they are not sufficient to ensure success after high school.

Third, career academies do not necessary benefit all students equally. For example, in this analysis, African Americans and Latinos showed no direct gains in postsecondary outcomes that were associated with being in an academy. These groups did make significant gains through increasing their academic knowledge and skills while in the program, but the additional "independent effect" of being in an academy was not significant for them.

Finally, not all academies improve educational outcomes for their students. Academies without critical program components in place did not necessarily increase their students' knowledge and skills. Without the complete, or near complete, implementation of the model, the results will be modest at best.

In the following sections we present a more detailed examination of the findings about the influence of academy programs on students.

Academic Performance in High School

Academies Raised Student Knowledge and Skills

The career academy increased the academic knowledge and skills taken from high school by participants, as Table 1 shows. The increase in grade point averages may be particularly important because it crosses a critical threshold for males, African Americans, and Latinos: the difference is between a D/D+ average to

Table 1

High-School Outcomes for Academy and Other Students

	GPA		Percent Graduated High School		Percent Now in Job Related to High School	
	Average	**Change**	**Average**	**Change**	**Average**	**Change**
Total	2.12	**0.176**	84.5	1.0	4.9	**1.0**
Gender						
Male	1.97	**0.195**	80.5	*1.1*	4.8	*0.7*
Female	2.25	**0.225**	86.7	0.8	5.0	**1.2**
Race/Ethnicity						
African American	1.84	**0.224**	78.4	0.0	5.7	0.8
Latino	1.91	**0.113**	76.5	4.6	4.8	**2.8**
Asian	2.67	**0.264**	93.7	no est.	4.9	**0.3**
English						
English	2.11	**0.217**	84.9	0.3	4.6	**1.1**
LEP	2.13	**0.202**	82.8	4.3	6.0	0.2

"Average" shows the mean value for all students, and "change" shows how much the number would increase for an academy student, all else being equal. For example, the average GPA for all students was 2.12, and the predicted influence of being in an academy was an increase of 0.176, which would result in a GPA of 2.396. Numbers in bold are based on statistically significant ($p \leq .05$) coefficient estimates; those in italics are $p \leq .10$. A "no est." means that the equation could not be estimated. (All Asians in academies graduated from high school.)

a C average. Even though the average is still low and hardly suggests postsecondary success, being admitted to (and achievement in) college is often far more difficult for students with a high-school GPA below a 2.0. Hence, raising the GPA into the C range could open postsecondary doors for students. Almost all of the academies increased GPA, with the notable exception of the two less comprehensive programs.

Although the career academies were successful as measured by GPA, they were somewhat less successful in increasing workplace skills taken from high school. As Table 1 also shows, the career academy increased the percent of individuals working in a job related to their high-school program only for females, Latinos, Asians, and those who speak English proficiently. None of the groups had high rates of entering fields related to their high-school course of study. Even with the positive career academy influence, no more than 8% of former students work in a field related to the focus of their high-school program.

Academies Increased High-school Graduation

Research consistently has supported the finding that career academies lower dropout rates. In simple comparisons of outcomes, we found that former career academy students were about 2.5 times less likely to drop out of high school than those who were not in academies.

Approximately two years after leaving high school, more than 92% of former academy students had a high-school diploma or equivalent, as compared to 82% of students from other programs. However, our multivariate findings showed that the career academy

increased graduation rates over nonacademy students only by building students' academic knowledge and skills. That is, academy enrollment increased high-school GPA, which in turn increased the probability of graduating from high school.

Better Attitude Towards High School

Apart from grades, we expected that a positive high-school experience rooted in the realities of the work world would imbue students with some lasting positive attitudes and understandings about how to study, and the value of education.

Some of the qualities that we explored through our survey several years after graduation indicate students' capacity to learn (e.g., whether their high-school program helped them to acquire good study habits and to meet deadlines). Other items focused on whether they had developed a good understanding of the connection between learning and earning (e.g., a positive attitude toward education, training, and self-motivation).

Former career academy students were much more likely than other students to report that their high-school program provided a set of skills that would help them to keep engaged in what has come to be known as "lifelong learning." This greater capacity for lifelong learning was centered in students who had attended the few academies that implemented the model more thoroughly and, presumably, had provided more social and academic support.[8]

Former career academy students were much more likely than others to report that their high-school program would help them to keep engaged in "lifelong learning."

Explaining the Academy's Impacts

Three sets of interrelated factors help to explain the impacts of the academies on students' achievement in high school. The academic preparedness that students bring to high school, their school environment, and the extent of their exposure to the career academy program all affected the outcomes and explained the varying capacities of career academies to increase GPA.

Our research revealed differences in student backgrounds and in the thoroughness of the model's implementation at each site. The academy students who entered high school with higher levels of achievement were more likely to take a full load of academy courses than those students with lower entering achievement scores. For example, 37.3% of the students with the highest math achievement level upon entry took nearly a full academy course program by the time they finished high school, compared to only 32.8% of the lowest-achieving students.

The differences in these proportions are relatively modest, but they mask more substantial differences among the various schools and programs. There was a striking range in the level of outcomes for each academy. With respect to educational outcomes, the key differences among the sites were:

- The career academy raised GPA in seven of the nine programs.
- The career academy increased GPA at the time of leaving high school for students with different levels of English achievement in 10th grade, but were less successful at raising GPAs for students at low levels of math achievement in the 10th grade.
- The career academy did not increase GPA in every high school, perhaps because of the differences in school circumstances. In the two high schools where the academy did

not increase GPA, the programs were less well-developed than at the other schools. They had fewer integrated or specialized courses, fewer community partners, often few or no paid internships, and fewer than 10% of students whose academy course work approached a full load.

- More academies improved GPA for students with a nearly full academy course load. Only two academies raised GPA in high school in cases where students took fewer than 12 courses. In contrast, all the academies increased the GPA of students who had at least 20 academy courses.

These findings are consistent with the recent Manpower Demonstration Research Corporation evaluation of academies nationally, which also emphasized the importance of having a relatively complete program and long-term experience in order for students to realize significant gains in academic achievement.[9]

The Academy's Influence After High School

Postsecondary Education More Likely

Former academy students were more likely than their counterparts to attend postsecondary education. The magnitude of the difference depends on whether the student goes to a two- or four-year institution. When attendance rates at community colleges and four-year institutions are combined, there is only about a 10% difference between academy and nonacademy students.

In contrast, when only four-year schools are considered, about a 40% difference exists in favor of the academy students. This is impressive, especially in light of the increasing demand for an educated workforce. Also, since the community colleges' entrance requirements are much lower than those of four-year institutions, the difference is a very striking

In the two high schools where the academy did not increase GPA, the programs were less well-developed than at the other schools.

indicator of academies having fostered academic success.

We were also interested in the extent to which the results can be attributed to the effects of having been in an academy, independent of the students' scholastic achievement. With the exception of two of the strongest sites, we found that career academies per se did not independently increase the probability of attending college. Instead, they build academic knowledge that in turn increased postsecondary education.

In addition, as Table 2 shows, career academies increase postsecondary education only for some demographic groups. Although males and Asians show increased enrollment in four-year universities after having been in career academies, being in a career academy did not appear to have an independent influence on postsecondary enrollment for females, African Americans, and Latinos.

The route to postsecondary success generally lies in the knowledge and skills that career academies built. These educational gains are the key, and should not be overlooked or mistaken for other aspects of the program. Career academies cannot afford to substitute "motivation" and "career exposure" activities for the acquisition of hard academic skills. They must build academic knowledge and skills in order for students to succeed after they leave high school. Motivation and career awareness may be valuable tools for getting students to learn, but do not appear to be effectual without being accompanied by academic rigor.

Career academies cannot afford to substitute "motivation" and "career-exposure" for the acquisition of hard academic skills.

Mixed University Performance

Given the emphasis placed in the academies on gaining access to higher education, the logical next question concerns how well these students fared once enrolled. When we examined students from this district who entered a nearby campus of the state university, we found distinct differences between academy students and others.[10]

A higher proportion of academy students than nonacademy students applied to the university, but a somewhat lower percentage were accepted. As compared with nonacademy students, the career academy students entered the university with an equivalent academic achievement in high school (as measured by GPA), even though on average their socioeconomic status was lower.

This suggests that the academies encouraged a wider spectrum of students to apply to university and, not surprisingly, some applicants whose grades and test scores were lower did not get in. Yet overall, the academies helped a greater proportion of students from lower socioeconomic strata to get started in the university. Their increased academic achievement in high school increased their rate of university acceptance.

The career academy also reduced the need for college remediation courses in English, both on its own and by increasing academic knowledge and skills brought from high school. While the academy's influence on reducing the need for remediation is encouraging, the rates of remediation were still extremely high for students from this district. Over one half of academy applicants and 40% of nonacademy applicants needed both math and English remediation before taking university-level course work.

Even though the career academy lowered the marginal probability of needing remediation, 70% of the university applicants still needed some type of remediation before starting university-level course work. This lack of preparation for college-level course work dramatically increases the time and costs of completing a baccalaureate degree. The high remediation rates should serve as a warning that, overall, high-school programs in this district are not successful at preparing for a four-year university.

Short-term Labor-Market Outcomes

Career academies had very little impact on employment and wages in the years immediately after students leave high school, as shown in Table 2. This is inconsistent with the state's goals for the program and, to a much lesser extent, the local priorities in the case study city. STC programs have often been touted as a means to provide local labor markets with the skilled workforce that businesses demand, to provide students with a variety of transferable skills within a particular career cluster, and (as a result) to raise wages and improve employment opportunities.

Our study shows no evidence that currently operating career academy programs produce this outcome in the first two or three years after high school. Career academy students in general fare no better than their nonacademy counterparts in wages after they leave high school, although academy enrollment has had an effect on increased hours worked for females and English speakers.

This could result from the district's building academies that did not have as many strong or direct links to job placements with specific

Table 2

Postsecondary Outcomes for Academy and Other Students

	Percent Attending 2- or 4-Year College		Percent Attending 4-Year College		Hours Worked		Hourly Wage	
	Average	Change	Average	Change	Average	Change	Average	Change
Total	74.7	0.6	40.4	**2.4**	27.8	**3.27**	7.34	-.71
Gender								
Male	68.4	1.7	35.8	**3.8**	29.9	3.11	7.21	.36
Female	78.0	-0.2	42.8	*3.0*	26.7	**3.40**	7.41	-.97
Race/Ethnicity								
African American	69.5	*-2.5*	32.5	0.9	30.1	*4.32*	6.65	-.31
Latino	58.8	*4.7*	21.9	3.2	29.7	.58	7.27	*-.31*
Asian	85.2	1.3	53.9	**6.6**	22.4	2.40	8.19	-1.87
English								
English	75.8	-0.1	43.9	*4.4*	27.7	**3.76**	7.52	-.97
LEP	69.8	**4.6**	25.1	1.0	27.9	.96	6.49	.44

"Average" shows the mean value for all students, and "change" shows how much the number would increase for an academy student, all else being equal. For example, the average rate of enrollment in a four-year college for all students was 40.4%, and the predicted influence of being in an academy was an increase of 2.4%, which would result in a percentage of 42.6. Numbers in bold are based on statistically significant ($p \leq .05$) coefficient estimates; those in italics are $p \leq .10$.

employers or industries as academies in some other cities. However, because youth frequently make a number of transitions between employment opportunities before settling into specific work patterns or a "career," perhaps we should not expect to see immediate employment gains resulting from this type of program.

Although the career academies in our study did not increase employment and wages for their graduates in their first several years, they might do so over a longer period of time for several reasons. Over the long term, labor-market success may be enhanced because of three types of educational improvements:

1. Academies may help students in the labor market by building the knowledge and skills they take from high school. In fact, because a higher GPA in high school leads to increased wages, and because the career academy increases GPA, students from career academies may ultimately be helped in the labor market.
2. Academies did significantly increase college attendance and the articulation of students from high school to postsecondary education, which may ultimately increase their employment and wages.
3. Academies may stimulate interest in lifelong learning and an ability to engage in continued study. If so, employment opportunities and wages of career academy students might increase throughout their working life as they acquire additional human capital.

Although the career academies in our study did not increase employment and wages for their graduates in the first several years, they might do so over a longer period of time.

Implementing the Academy Model

In 1996, the school district formally adopted the academies model for organizing its high schools and began the process of realizing that objective. In a separate document, we present the voices of academy directors and high-school principals three years into that process as they described the components that make an academy successful and the challenges of implementing the model. The five components they mentioned are: an effective human resource system; a supportive administration; a usable management and information system; ongoing communication; and sufficient resources. In this section we use this information to summarize the program's strengths and its principal challenges.

Strengths of the Program

Perhaps the biggest strength described by academy directors, principals, and district office staff is the sense of community among academy teachers and students. Many directors and district managers see a fundamental asset of their academy as being the network of social support that leads to better educational outcomes. For example:

> The academy is a different way of dealing with things, connections with the students with a particular teacher as a "home base." Then they buy into the program, the school, themselves. The academy answers the question for the students of "Is there a safe place for me?"

> The academy is a vehicle for all community stakeholders to work together to improve student achievement in a personalized small learning community. (district office staff member)

Perhaps the academy's biggest strength is the sense of community among academy teachers and students.

Academy directors confirmed this feeling with a rating of program components. A "small group of faculty working together" was rated as highly important by 94.1% of the academy directors, and 88.2% regarded as highly important a "small group of students taking classes together." Nine of the 18 directors talked about the collaboration of teachers in a small learning community as the academy's major asset, especially the common preparation time spent with other teachers in developing an integrated curriculum and discussing interventions for individual students.

Academy directors also saw the program's work-based learning component as a major strength. Ten of the 18 directors thought one of the best things about the academy program was providing students an opportunity for hands-on, experiential learning through internships, job shadowing, or lab classes. As one director stated:

> The hands-on experiential learning is really an essential part of the program. I think it is one of the most exciting things the kids can be involved in because that is really going to put some meaning in what they are learning.

Perhaps the strongest support statements came from the principals, who have fewer vested interests in maintaining the programs than the academy directors or the district office. Two of the five principals thought the academies had a positive impact. One commented with cautious optimism about program expansion:

> So far the academies are working well, and if we can get all the teachers to understand and know the concept it should be quite successful. The structure

of the academies is a good one; it is just a matter of getting the teachers motivated to work together as well as the students.

Challenges

Of course, many practical problems exist in implementing the academy program, particularly because of its placement within a larger high school and school district. Perhaps the most pressing problem is that of scheduling. In fact, when a key district program staff member was asked to identify the three major problems facing academies, the answer was "scheduling, scheduling and scheduling."

Institutional constraints in the labor agreement, such as six-period scheduling and the clause that teachers have only two different classes to prepare each semester, place limits on the capacity and flexibility of student and teacher schedules. Limiting scheduling to only six periods presents problems because students cannot always schedule the four academy courses, and limiting teacher preparations to two can mean that teachers must teach in more than one academy (e.g., a teacher of government and history might have to teach in two academies since not enough government and history courses exist within one academy). Scheduling common times for faculty to meet and prepare material is difficult. Scheduling multiple aspects of the curriculum also poses difficulties:

> Some of the challenges we face are scheduling these [school and work-based] activities accordingly. The directors and teachers work with the School-to-Career Liaison to coordinate and schedule the activities, but many times it can be so overwhelming for everyone involved. Transportation issues also pose concerns, being that the buses do not run throughout the day. However, I do believe that these activities enhance the school and [that it is] an advantage to the students to get a reality-based exposure to the real world.

Perhaps the most pressing problem in implementing the academy program is that of scheduling.

Administrative support and leadership was another key area identified as critical in implementing an academy. Virtually all the directors (94.1%) ranked "district support" as being of high importance for the success of their academy. An academy director, while praising the school's principal, eloquently stated the positive potential of administrative support:

> Now, because of the continuity we have been able to enjoy under new leadership, the new principal, he's the only principal I've worked with that I've actually learned from. We are really a team. If we can build a team, we can delegate to other teachers. Otherwise, the first few years we were reinventing the wheel every year. When you have a good principal he can do [a lot] for you. When he came along we had less staff turnover. We were losing good people left and right under the other administration. And they were undermining our program. One administrator told me, "I don't know why you are working so hard, we might not let you do this, you know." I stood up and said "you must be crazy," I was so mad. But with this principal we were allowed to do whatever we wanted. He wasn't afraid that is what good leadership does.

Unfortunately, few academy directors had such praise for administration. Only 37.5% of the directors thought they had a high level of district support—the third-lowest score of the 17 components. Because it was rated as being so critically important, district support had the widest discrepancy between high

A major challenge for the academies is raising resources to support their increased cost. Career academies require extra resources to succeed.

importance and low incorporation of any item on the survey.

District officials suggested that their perceived lack of support by academy directors reflects inconsistencies between the two groups' views of their roles and responsibilities. Whatever the underlying reason for this discrepancy, our research suggests that providing sufficient support for academies is a critical challenge.

Finally, a major challenge for the academies is raising resources to support their increased cost. As special programs distinct from the regular high-school program, career academies require extra resources to succeed (such as funding for internship stipends or for teachers' extra time to create an integrated curriculum). However, a key to the academies' long-term growth and health is their gradual institutionalization into the school district's core operations, rather than their replication as externally supported programs.

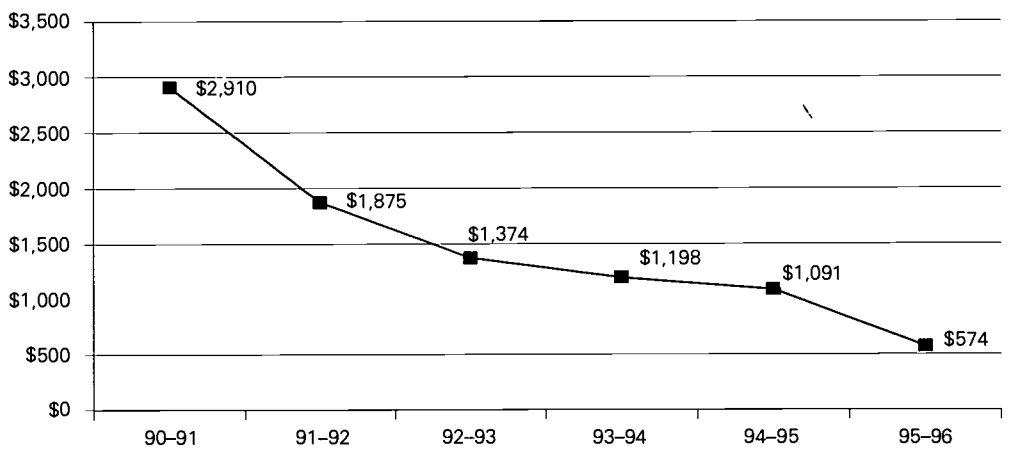
The patterns of expenditures and services from 1990 to 1998 can be characterized by three broad generalizations:

1. In the early years, the costs of starting an academy and developing its curriculum were funded with city support.
2. During later years, as the district assumed these responsibilities, the extra time that teachers spent implementing the model was not fully compensated. For example, many academy directors suggested that managing an academy remains a stressful full-time-plus job, whether paid or not. Many academy directors reported working long uncompensated hours, suggesting a high burnout rate.
3. Economies of scale are realized with program expansion, although problems are encountered if the program "goes to scale."

As Figure 1 shows, the additional cost of educating a student in a career academy fell from

Figure 1

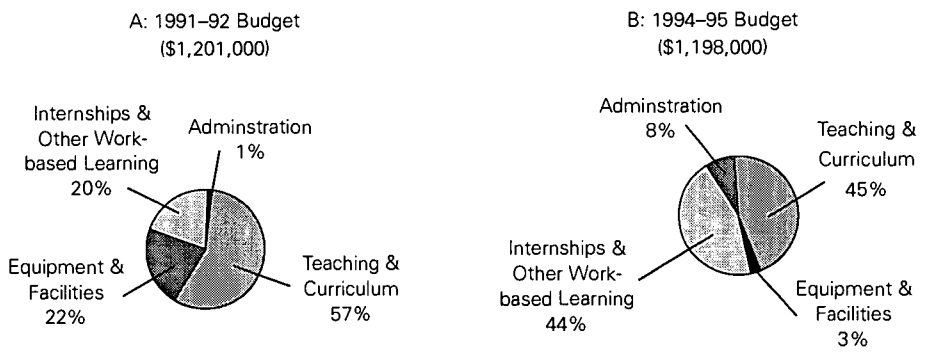
Redevelopment Funds Budgeted for Academies Per Student



Numbers reflect the total amount of the municipal redevelopment budget for the academies for each year divided by the total number of students who were enrolled in participating academies that year.

Figure 2

Change in Allocation of Redevelopment Dollars to Academies Over Time



Data are from contracts between the school district and the city for each program year. Teaching & Curriculum includes certificated salary and benefits, teacher substitutes, in-service payments, instructional supplies, tutor benefits, and consultants. Equipment & Facilities includes noninstructional supplies and equipment. Internships & Other Work-based Learning includes student stipends, field trips, transportation, and industry liaisons. Administration includes printing and consultants.

nearly $3,000 to about $574 as curriculum became developed and teachers learned the model (Figure 2). However, expansion creates a host of other problems, including increased scheduling conflicts.

Internships, an integral part of the career academy program, are expensive and the need for their funds does not diminish over time (Figure 2). In fact, as academy startup costs decrease, the cost of internships increase and become a greater portion of the additional program costs. In our case study city, internships were offered at little or no cost to employers, which hampered the development of a tradition of employer-paid internships.

Policy Implications

Career academies are a potentially effective strategy for education reform, and academy programs can facilitate postsecondary success for inner-city, public high-school students. Notwithstanding a positive conclusion at this most general level, three important caveats are in order:

1. Career academies are effective only when they build students' academic skills. Program designers should resist a quick-fix approach that substitutes career exposure or work experience for serious academic preparation, or that channels students into highly specialized job-specific training without broad grounding in basic academic skills.
2. Not all career academies are equally effective at building students' academic knowledge nor do their programs enhance learning for all students equally. Diverse influences are not necessarily a problem in a large school district, but administrators must understand that (a) every academy needs certain basic components and commitments to make a real impact, and (b) not all groups of students benefit equally from career academy programs.
3. Career academies, by themselves, cannot compensate for inadequate education prior to high school. Even where the career

academy increased student academic outcomes, these were relative measures. Overall, the performance indicators were low by statewide or national standards. Career academies have not yet been shown capable of providing all types of students with the knowledge and skills needed to succeed in college, and their record of overcoming the academic achievement deficits that students bring to high school is not yet persuasive.

With this brief summary, we now answer the six questions we raised at the beginning of this report.

Implications for Students

Is the career academy an appropriate educational strategy for all students in all schools? Not surprisingly, we showed that academy students got more out of the program when they and their school put more into it. Successful academies not only raised the academic knowledge and skills of students, they also provided a positive social climate that independently raised the probability of increased learning. These successful academies had strong community support, long-established funding sources, a well-developed curriculum that students actually completed, and students who were capable of taking full advantage of the curriculum.

Perhaps because the programs in the study were concentrated at schools in neighborhoods with low socioeconomic status, academy students who generally were not successful by state standards were successful when compared to nonacademy students in their own schools.

Academies that seem to be ineffective when held to benchmarked standards may be quite effective when their students' educational outcomes are compared to those of nonacademy students in similar circumstances. Conversely, the student outcomes of academies that meet local or statewide benchmarks may not always exceed those of students taking other courses of study at the same school.

Academies may be undervalued if they are held to statewide standards but operate in very dysfunctional schools, or if they have student populations that are not prepared for high-school academic work. Initial knowledge and skill deficiencies cannot be remediated for all students in a three-year period, especially if the school environment is not conducive to learning. This is not to say that high academic standards should not be developed and maintained. Indeed, our study findings strongly suggest that maintaining high academic standards is a necessary condition for post-secondary success.

Career academies cannot erase all of the academic problems associated with our educational and social systems, nor can they erase all of the knowledge and skill deficiencies that students bring to high school. Clearly, other reforms must be implemented in conjunction with career academies if all students are to leave school prepared to face the labor market and the educational challenges of the 21st century.

Is the career academy an appropriate educational strategy for developing a local labor force? Career academies can decrease the skills mismatch if the broadly defined mismatch refers

Other reforms must be implemented in conjunction with career academies if all students are to leave school prepared to face the labor market and the educational challenges of the 21st century.

to the general gap between the low level of skills that labor-market entrants generally have and the relatively high level of skills employers require. Such a convergence would occur because academy students leave high school with greater levels of academic knowledge and skills than nonacademy students, and because a greater percentage of career academy students attend college.

In contrast, if the skills mismatch is narrowly defined as the mismatch between the job-specific skills that local employers are seeking (e.g., skills in dental technology) and the skills of new entrants, then the career academies may have only a limited capacity to alleviate it.

We found few differences between the wage and employment of academy and nonacademy students in the first few years after completion of high school. Academy students did not move directly into positions left unfilled by skill mismatches. However, because of the local labor market, this community's program was less directly geared than some others toward building an employment pipeline.

If career academies become commonly available, what gaps remain in curriculum offerings? If career academies are not for all students and are not effective at all sites, our research findings challenge administrators to determine the students and areas in which the program should be offered. Although our data are insufficient for such a detailed assessment, our findings raise several considerations.

Individual learning styles may determine whether or not academies are appropriate for all groups of students. A commonly held perception among school-to-career advocates is that 70% of students learn best when the learning is in context. This means that as many as 30% of the students may learn better in more traditional settings.

We found that not all groups benefitted from career academy programs, making us cautious about universal adoption.

For the 70% who learn best in context, the labor market may not be the most compelling context for all of them. Instead, some students may benefit from a different type of integrated or contextual situation. Because our study found that not all groups benefitted from career academy programs, we should be cautious about universal adoption.

Some students may need to prepare for jobs immediately after high school or are not suited for college studies. Traditional curriculum tracking and the traditional vocational curriculum was tailored to their needs. If the benefit of career academies lies in their ability to increase academic knowledge and skills and the probability of attending college, then these academies may not provide enough direct support for such students.

Although most school-to-career advocates think both options should remain open and available through the same program, our case study suggests that the challenge of serving both objectives well may be hard to resolve—particularly in a community where academies are strongly oriented toward postsecondary education. Moreover, because universal relevance is often ascribed to the academy model, such a challenge may be difficult to acknowledge directly.

Implications for Program Design and Administration

Site administrators need to consider the following aspects of the career academies program in designing and building successful programs. A high level of implementation requires sustained, creative, inclusive, and systematic planning.

What are the components necessary to build a successful career academy?

The most important challenge for program planners and administrators is to ensure that all program components are set in place. That may sound basic, almost tautological, but the experience of school reform is rife with impressive labels covering little of substance. Successful career academies had several characteristics in common, as noted below.

- A relatively complete curriculum. Principals and program directors can support the staff and curriculum development process. Without that support, courses may be labeled as being part of an academy, but not be substantively changed. Both academic learning and motivation suffer as a result.
- A school-within-a-school that shelters students from hostile or indifferent school environments and gives a social support system of teachers and peers. The appreciation of and loyalty to the "community" of the more effective academies is very significant, and clearly contributes to positive outcomes. Students, teachers, academy directors, and principals consistently praised the virtues of the small learning community provided by the career academy.
- Large amounts of startup resources in terms of time (staff and curriculum development) and internships. Clearly, several important cost factors must be considered when implementing career academy programs, especially if internship wages are included. The extra staff time needed for preparation and management is significant, as are the equipment needs of programs geared to the latest technologies.
- A program head whose commitment, energy, and devotion lead and inspire other teachers as well as students. The key question of institutional development is how sufficient numbers of skilled, motivated teachers can be identified, nurtured, and supported. To some extent, having the model incorporated into the day-to-day fabric of schools reduces a great deal of stress. Nonetheless, leadership and creativity are still very necessary qualities.
- School and community support. The more effective academies had active advisory committees whose participants did most of their work outside of the meetings, and who could be counted on for personal help and organizational resources as well as financial contributions. In the district we studied, parental and community support were instrumental in initiating and developing career academies in schools, and business support was instrumental in supporting their work-based-learning components.

When a new approach to teaching and organizing high schools moves beyond the experimental or demonstration-project stage and becomes widely adopted, the basic systems, incentives, and organizational culture of the schools and central district office need to incorporate the characteristics required by the model. Integration becomes central to overall curriculum development and training, not to only a small group of teachers in a high school.

What is the appropriate scale for a career academy program?

How widespread should the adoption of the career academy strategy be? The potential has prompted a number of districts to convert entire high schools to collections of academies. Our findings on the complexities of successful academy operation should give pause to the idea that career academies should be widely implemented within a school district or be "wall-to-wall" within a school. The

following points should be considered in determining the scale of the program.

Much of the success of career academies may lie in their smallness. Small programs can create an intimate "school-within-a-school" environment in which students feel special and supported. It is unclear whether this same environment can be created if an entire school is comprised of career academies. In fact, creating wall-to-wall academies would create a hierarchy of academies within a school, and possibly replicate the kinds of negative distinctions associated with curriculum tracking.

Career academies are expensive undertakings when fully realized. Subsidized work internships are very costly if provided for the majority of academy students. The amount of additional teacher and staff time to fully realize the model is substantial, especially in the first several years. Of course, the long-term strategy may be one of cost reductions based on incorporating academy functions within the core mission and budget of the school system so that the costs become central to the running of the high schools.

In some situations, the employers may pay the interns from their own budgets. Once the costs are borne by any party, the cost-effectiveness question is particularly relevant. If the educational benefits of the academy are not greater than those of traditional programs, even small additional costs are not worth the investment.

A school that contains only career academies may face fairly intractable scheduling problems, particularly with elective classes, and in smaller schools. The solutions include reducing the number and diversity of electives available to a given student, combining students from two academies in the same class, and assigning the same teacher to two or even

Much of the success of career academies may lie in their smallness.

three academies. These arrangements lose much of the curricular focus of having the academy in the first place. Other conundrums of scheduling exist that will take serious work to overcome in a program taken to this scale.

There may not be place for teachers and students who do not want to be in academies. When part of a school's curriculum lies outside of the academies, teachers and students who are not suited to this style of teaching and learning can be shifted to nonacademy courses. This is not possible if schools or districts consist entirely of academy programs. This also raises the possibility that significant numbers of teachers who do not have the interest, focus, and commitment that the programs need will be assigned to them anyway.

What support is necessary from partners for effective career academies?

It is important to ensure support for the career academy approach at the site prior to its implementation, and to continually build that support over time. Successful programs require support from the constituencies below.

Widespread and genuine teacher support is essential to developing and executing the career academy curriculum. Such programs will not be successful unless teachers believe that an integrated, challenging curriculum can and should be the means for students to achieve postsecondary success. No analyses, case studies, or administrative edicts can match the influence of teachers who genuinely relate their classroom experiences to peers who take on something new, unfamiliar, and perhaps threatening.

Without parental and community support, career academy programs will remain undeveloped or underveloped, because opposition or ambivalence will retard their growth.

Similarly, parents and others in the community must believe that career academies can facilitate students' postsecondary success. Without their support, career academy programs will remain undeveloped or underdeveloped, because opposition or ambivalence will retard their growth. Career academies that were developed in schools believed to be most in need of reform, remained much less developed than those in schools that had somewhat higher socioeconomic status and overall college attendance rates. Unless the school community is convinced that reform is necessary and that career academies are the appropriate vehicles for that reform, change will not occur.

Principals and district administrators must support career academy development. Site administrators hold the key to scheduling teachers and classes, providing funding, and guiding student enrollment, and will do so in the way that fits their vision of instructional leadership. District administrators decide the focus and emphasis of staff development days and set content standards, curriculum practices, and educational goals, based partly on past practice and partly on the current districtwide reform strategies.

A Final Word

These conditions for the success of career academies represent an ambitious agenda for basic changes in the way schools are run. However, career academies may well be worth the effort, since the right circumstances, the new curriculum, social support, and work experiences offered by the academies can make a very important, positive difference in the lives of many students. The challenge for educators is to create and replicate those circumstances for the right teachers and students, without losing academic rigor or growing so large that the special small-school qualities of academies would be lost.

APPENDIX

Methods and Data

Our evaluation of educational reform includes analysis of both institutions and individuals. We employ a qualitative assessment of the program's development and implementation at both the district and program level, as well as a quantitative assessment of individual student outcomes. In our qualitative assessment, we follow the district's effort to implement a uniform career academy model along with the development of nine unique career academies from 1990–1996. In this analysis we uncover many necessary ingredients for developing successful career academies, as well as many impediments to their growth and implementation.

Our quantitative assessment of individual student outcomes uses data from the population of high-school students who were sophomores in the district's comprehensive high schools between 1990 and 1993. We followed this cohort of about 10,000 students through high school and through their first several years after high school. Because about 14% of these students were enrolled in career academies, our study is a rare opportunity to follow a large population of students in career academies and compare their high-school and postsecondary experiences with those of their contemporaries who did not enroll in career academies.

In general, the qualitative analysis focuses on programs' development and implementation, while the quantitative analysis augments and supports its conclusions. The quantitative analysis focuses on student outcomes, while the qualitative data contextualizes and supports its conclusions. What follows is the general framework that is used in each analysis. Keep in mind that, although the discussion here presents fairly distinct qualitative and quantitative methods, the analysis undertaken reflects a blending of approaches.

QUALITATIVE ANALYSIS

We examined the development and implementation of career academies using a qualitative framework grounded in the reporting that was done for the city government-sponsored evaluation of the academies. The reports that were written as local evaluations were circulated locally for several years, and the findings were subjected to extensive feedback and recommendations from teachers, administrators, community partners, funders, and local policymakers.

Analytical Framework

The city government provided targeted funds to the school district for the academies, and the performance-based contract governing these funds required an annual independent evaluation. Because these yearly evaluations overlapped the period during which our population of students was in high school, its findings and data can be used to determine the program's evolution over five school years. Evaluation occurs at two levels: program and district.

At the program level, aggregate student outcomes from each career academy (relatively stable) were compared annually against city-mandated benchmarks in several areas: academic achievement, program enrollment and retention, attendance, and graduation. We expected academy outcomes to improve as an academy matures, develops its programs, and gains resources. Where program-level outcomes did not improve or meet city-mandated benchmarks, site visits and interviews with academy directors, principals, district personnel, and community partners helped identify problem areas. By tracing the evolution of career academies through the eyes of students, teachers, and administrators,

and by tracking the changes that occurred in the outcomes, management, and structure as the districtwide program expanded, we assessed the program's viability and utility.

The yearly evaluation also included indicators of the management of individual programs, such as curriculum, master schedules in the school, requisitions, schedules of field trips and speakers, and assignment of mentors. Each year, documentation included the programs' progress in meeting city and district-set objectives in these areas and the factors that may have enhanced or inhibited timely and effective implementation. This gives us a sense of the degree of institutionalization that occurred.

At the district level, the program objectives set by the city and district also specified several important steps for developing academies' curriculum, undertaking long-range planning, and generating community support. These objectives included securing of other funding and in-kind resources, and expanding the academies program throughout the district. Each year the evaluation analyzed the extent to which the new programs were implemented according to the model, and noted examples of effective implementation as well as possible barriers. In all cases, the approach taken was not to create a single "grade" or summary judgment about the new materials and institutional arrangements, but to work with the district and the city to develop criteria against which progress could be measured from all parties' perspectives. Three levels of assessment of the district's progress toward meeting these objectives were undertaken:

1. Timely progress: Were the tasks specified by the objectives completed on schedule or, if not, did the district document the impediments to the timely completion of the tasks?
2. Quality and effectiveness: How well did the new plans and materials meet the needs of the students, teachers, and administrators? How much new support was created for the academies within each high school, in the district administration, and in the community?
3. Change: How did the most recent years' outcomes compare to previous years?

Qualitative Data Sources

The complexity of developing, implementing, and administering a career academy—a school-within-a-school within a districtwide bureaucracy—is daunting. Many requirements of the career academy model are difficult to accommodate within the traditional school framework. To assess whether each career academy is institutionalized within the school, or is at least moving in this direction, we evaluated a large array of data. During our annual evaluations, we conducted dozens of visits to school sites, attended training meetings, conferences, and staff meetings, and conducted numerous formal interviews and informal conversations with teachers, administrators, community partners, local policymakers, funders, providers of technical assistance, and students. Each year we surveyed interns and supervisors for feedback on work-based learning, the Work Experience Surveys. We draw on these data sources for the qualitative analysis of career academies.

On-Site Interviews

To analyze the administrative and management support structures for the career academies, we conducted on-site interviews of 18 academy directors, five principals, and the district office. (The one remaining principal did not return phone calls and faxed requests for an interview.) Each on-site visit to the academy directors consisted of a conversational interview that focused on a set of questions about structure and current status of the academy program; future of the program; issues in school-based learning; and issues in work-based learning.

Each of the on-site conversational interviews with the five principals focused on a set of questions about current operations of the academies in the context of the school; administrative issues for academy programs; and issues of program expansion.

The on-site conversational interview with the district's School-to-Career director focused on the same questions that were posed to the academy directors and principals. The director was specifically asked to respond to these questions from the district office's perspective and to address the responses from the academy directors and principals. (Their aggregated responses were stripped of all remarks that could possibly be used for identification and were provided to the director prior to the interview.) Site guides for the interviews were developed by the evaluators and given to the district for review. Extensive training was provided to the four site interviewers, who were employees of the evaluators' research institutes.

As part of this data-collection effort, we asked all the directors to complete a questionnaire asking them to rank 17 different components of the academy's program in terms of their importance and the degree to which they were incorporated. The 17 components were listed in the contract between the school district and the city and were divided into four categories:[11]

- program goals (build work skills for labor-market entry; build academic skills for college attendance; build skills necessary for articulation into a community college program);
- school-based learning (integrated academic and vocational curriculum; articulation agreements with higher education; contextual teaching within a career focus; team teaching);
- work-based learning (career exploration; mentoring at the work site; job shadowing, field trips, integrated internship; school-based enterprises); and
- support (district support; small group of faculty working together; small group of students taking classes together; business-community support).

Academy directors were asked to use a five-point scale to measure the importance and incorporation of each program element.

We examined each program component along two dimensions: the percentage of academy directors who rated the program component as "highly important" (4 or 5 on a scale of "not essential" to "most essential") and the percentage who related it as "highly incorporated" (4 or 5 on a scale of "not integrated" to "well integrated"). Thus, we determined for each program element the percent of academy directors who believed that it was an important part of the program and the percent who believed it was well incorporated into their program.

Local Evaluation Files

The local evaluation files contain data in two primary areas: administration and management, and academy development. The data are valuable for conveying not only the characteristics of the academies and their evolution over time, but also the differences that can arise between a program specified on paper and the actual program the students experienced.

Academy Development. We have fairly extensive information on the availability and use of the academies' curriculum. Annual scheduling information of all classes offered in the district allows for yearly comparisons of the availability of and enrollment in academy-designated courses. For example, the composition of the teaching teams in each career academy gives us the degree of staff continuity or, conversely, the rate of staff turnover. The proportion of enrollment targets attained, in terms of students admitted into the program and the enrollment of the students in the designated courses, gives us insights into the academy's growth.

Additionally, in 1992–1993 and 1993–1994, the curriculum of eight of the nine career academies was examined extensively. Teachers were assigned to prepare curriculum guides following the district's prescribed format, which required three sections for each curriculum guide: program materials, course materials by grade level, and integrated projects. The program materials included sections on the overall philosophy behind each career academy program.

Additionally, curriculum guides were to include materials for every academy course at each grade level (10th, 11th, 12th). Finally, each career academy was asked to develop projects that integrated the academy courses and the career themes. The school district administration expected at least three integrated projects for each grade level by the summer of 1994, the point at which the measurements of completed work were taken.

Work Experience Surveys

As part of the city's evaluation effort, yearly surveys were administered to the student interns and their intern supervisor and, in two of the years, to students' mentors. The set of surveys of interns had the highest response rates. This instrument included basic information about the internship (e.g., the industry, occupation, work hours, and relationship to respondents' career goals); the availability of training; an assessment of skills used on the job (reading, math, writing—both use and level); the quality of the job as a learning experience (e.g., their interest level, use of abilities, development of skills); the relationship of this work to school; and a comparison of this internship to other employment they may have had.

Parallel surveys were administered to each intern's supervisor, although response rates were lower. That survey asked about the supervisor's relationship to the student, interactions with district personnel, the supervisor's assessment of skills used (reading, math, writing, computers—both use and level), and a comparison of the student to other students and employees.

Finally, for two years (1993 and 1994) a small percentage of mentors assigned to the students were surveyed. Mentor surveys included information on the type of interactions (e.g., activities, counseling), possible outcomes of mentoring (e.g., personality, educational change in student), and the mentors' satisfaction with program, training, and experiences. While the surveys of mentors further our understanding of the program, the low response rate and the relatively low percentage of students who had mentors (about 25%) preclude its analysis.

QUANTITATIVE ANALYSIS

Our quantitative analysis examined the career academy's influence on 1) knowledge and skills acquired in high school, 2) postsecondary education, and 3) work outcomes at a point about two years after high school. We estimated value-added educational production functions that specify knowledge and skills taken from high school as a function of career academy enrollment, initial knowledge and skills, and controls. In other words, educational outcomes are modeled as a function of inputs into the process.

We distinguish between the youth and adult labor markets when modeling postsecondary outcomes. In contrast to adults, young people move frequently within and between work and educational experiences. This movement means that traditional human-capital models do not always predict youth activities. Instead, education and labor-market outcomes during the first two or three years after high school often result from high-school experiences and demographics, including family background. This is reflected in all of our analyses.

While the key independent variable in all analyses designates whether a student was in a career academy, all analyses include controls for race and gender because education and labor-market outcomes vary along these lines. All estimations also control for limited English proficiency and enrollment in special education, because of the (presumed) lower levels of productivity that these characteristics hold. Perhaps most importantly, all analyses control for knowledge when students entered their high-school program.

In estimations of outcomes from high school, we use the standardized achievement score in the sophomore year to measure initial-period knowledge. In estimations of postsecondary outcomes, we

use high-school Grade Point Average (GPA) when the student left high school to measure initial-period skills. Controlling for initial-period skills is extremely important because it is often correlated with subsequent activities (e.g., high-school program, attending postsecondary education) that affect outcomes. As a result, their omission as control measures can bias estimates of program impacts.

All multivariate equations were estimated under three different sets of specifications: 1) using a binary career academy variable to indicate a student's enrollment in a career academy; 2) using a vector of binary variables to indicate a student's enrollment in a specific career academy; and 3) stratifying equations by school, student's entering test scores, or level of academy coursework.

These alternative specifications allow us to assess 1) the aggregate impact of the career academy approach; 2) the impact of each specific academy; and 3) the impact of the career academy within the same school environment, for students with relatively equivalent levels of preparation, and for exposure to an academy's curriculum.

Knowledge and Skills Acquired in High School

We first examine whether career academies increase knowledge and skills taken from high school. Because achievement tests were not administered to all students in the 12th grade, we use GPA to measure knowledge and skills taken from high school. This use of GPA draws two potential criticisms, however.

First, career academy teachers could have different grading standards from those used in the school as a whole. In this case, GPA, as a knowledge and skill measure, is invalid if career academies artificially increased a career academy student's GPA. To examine for this possibility, we compared grades in academy courses and grades in equivalent nonacademy courses. With only one exception, there was little evidence that the career academies grade on a different standard from the rest of the school. In fact, in all but these two academies, analysis suggests that grades in career academy courses are *lower* than grades in comparable courses offered outside of the career academy.

Second, schools could attach a different value to the same grade. Although relative heterogeneity exists among the schools in our sample as compared to samples that have schools from different districts, heterogeneity in grading standards could still exist. To control for this potential, we use the individual's GPA that has been divided by the school average GPA as our dependent variable. Because this measure captures the career academy's impact (for example) on raising GPA (knowledge and skills) above the school's average, it controls for different grading and achievement that may exist among the schools.

Our value-added educational production function that links knowledge at the time the student leaves high school with career academy program enrollment is therefore specified as:

$$\mathbf{1:}\ GPA_i - \bar{GPA}_{school} = \alpha^g + \sum \alpha^g_j Acad_j + \sum \alpha^g_k Demo_k + \sum \alpha^g_1 K\&S_1$$

where:

$GPA_i - \bar{GPA}_{school}$ = the individual's grade point average divided by the average grade point average at the school,

Academy = 1) a vector of binary variables that indicate the career academy in which the respondent is enrolled, or
2) a binary variable that indicates enrollment in a career academy,

Demo = a vector of demographic variables that controls for the respondent's gender, race/ethnicity, English proficiency, and special education status,

K&S = a vector of variables that measures the respondent's academic achievement in the 10th grade.

Because the dependent variable is constructed as deviation from the school mean, estimation of this equation answers the question, "Does the career academy program increase GPA above the average of the school?" We use Ordinary Least Squares (OLS) to estimate the equation. Significant and positive coefficients on the career academy variables with the inclusion of all control variables suggests that career academy enrollment increases the academic ($\alpha_j^g > 0$) skills taken from high school.

In equation 1, career academy students are compared to all nonacademy students in the district. When equations are stratified, different comparisons are made. Stratification by school shows how career academy students compare with nonacademy students *in their school.* This controls for many of the unobservable environmental factors that could bias estimations. Stratification by entering test scores compares career academy students with nonacademy students *who have the same level of academic achievement when they enter high school.* This controls for much of the unobservable individual heterogeneity in achievement that could bias estimations. Finally, stratification by academy coursework shows how career academy students fare with different levels of academy "treatment."

Postsecondary Education

To assess whether the career academy increases postsecondary education, we ask the question, "Does the career academy 1) *directly* increase postsecondary education and interest in lifelong learning, or 2) *indirectly* increase both of these outcomes through academic skills acquired in high school?" To answer these questions we estimated educational production functions with the dependent variable measuring educational outcomes:

2: $\text{Educ} = \alpha^e + \sum\alpha_j^e \text{Acad}_j + \sum\alpha_k^e \text{Demo}_k + \alpha_i^e \text{GPA}_i$

where:

Educ = a vector of 1) binary variables with 1 indicating that the respondent achieved the designated level of education, and
2) categorical variables indicating the respondent's interest in lifelong learning,

GPA = the individual's GPA when leaving high school.

The first set of dependent variables are cumulative measures that capture whether a student completed or is progressing toward a particular educational milestone: high-school graduation, attending a two- or four-year college, and attending a four-year college only. This analysis assesses the ability of the career academy (or high-school program) to help individuals advance to the next level of education. The second set of dependent variables measures the respondent's perceived preparation for lifelong learning that the high-school program afforded.

We use a series of probit analyses to estimate educational benchmarks and learning measures that are constructed as binary variables. Ordinary Least Squares produces inefficient estimates of program impacts in such cases. We use OLS to assess the impact of career academies on categorical lifelong learning measures. If the coefficients on the career academy variables are positive and significant ($\alpha_j^e > 0$), the career academy program increases education directly. If these coefficients are not significantly related to education ($\alpha_j^e = 0$) but do significantly increase academic skills in high school ($\alpha_i^g > 0$ from equation 1), which in turn increase education ($\alpha_j^e > 0$), the impact of the career academy is indirect, and operates by increasing human capital in high school.

Should indirect effects be present, we confirm their existence by re-estimating equation 2 without GPA as a control. If career academies significantly increase educational outcomes indirectly by increasing knowledge and skills taken from high school, the coefficient on academies will be significant without inclusion of GPA and insignificant with its inclusion.

The difference between a direct or indirect effect could be important for the approach taken by, and outcomes expected from, school-to-career reforms. If career academies exert an indirect effect on postsecondary outcomes, their ability to facilitate postsecondary outcomes lies in their ability to increase students' knowledge and skills. The route to postsecondary success is through building academic abilities; and the career academy is a mechanism through which these abilities can be strengthened. Without increasing knowledge and skills, the career academy will not facilitate postsecondary success unless direct effects exist.

A direct effect, in this case, implies that the career academy facilitates postsecondary outcomes through some mechanisms other than enhancing academic knowledge and skills. It could be, for example, that career academies increase the students' motivation or that they build job or education networks that facilitate the transition from high school into either work or postsecondary education. In either case, such impacts would be independent of acquiring academic skills in their own right.

Postsecondary Work Experience About Two Years After Leaving High School

We also examine the career academy's ability to increase positive labor-market outcomes about two years after leaving high school. More specifically, we ask the question "Does the career academy 1) *directly* increase postsecondary labor-market outcomes or 2) *indirectly* increase outcomes through academic skills acquired in high school?" The work outcomes of interest include hours worked, wages, and self-perceived workforce preparation. For estimations of hours worked and perceived workforce preparation we estimate:

$$\textbf{3: } Work = \alpha^h + \sum\alpha^h_j Acad_j + \alpha^h_i GPA_i + \sum\alpha^h_k Demo_k + \alpha^h_i Grad + \alpha^h_1 Enr$$

where:

Work = 1) the average numbers of hours that the respondent worked or
2) a vector of variables that measures perceived workforce preparedness,

Grad = a binary variable indicating whether the respondent graduated from high school,

Enr = a binary variable indicating whether the respondent is enrolled in classes.

For estimations of wages, we include hours worked (Hrs) on the right-hand side to control for the impact of differential labor supply and estimate:

$$\textbf{4: } Wage = \alpha^w + \sum\alpha^w_j Acad_j + \alpha^w_j GPA_i + \sum\alpha^w_k Demo_k + \alpha^w_1 Grad_l + \alpha^w_1 Enr + \alpha^w_i Hrs$$

where:

Wage = the respondent's (log) hourly rate of pay.

Each of these estimations (3 and 4) assesses the ability of the career academy to increase labor-market opportunities during the school-to-career transition period. We use probit analyses to estimate equations with binary measures of workforce outcomes, and OLS to assess the impact of career academies on hours worked, (log) wages, and categorical workplace-preparation variables.

If the coefficients on the career academy variables are positive and significant ($\alpha^h_j > 0$), the career academies increase labor-market outcomes directly. If these coefficients are not significantly related to labor-market outcomes ($\alpha^h_j = 0$) but do significantly increase academic skills in high school ($\alpha^g_i > 0$ from equation 1), which in turn increase work ($\alpha^h_j > 0$), the career academy's impact is indirect, and operates by increasing human capital in high school.

Educational Experience at the University

Finally, we are interested in observing the career academy's influence on each successive step through the university: entrance into, route through, and exit from. By examining the academy's influence on the progression through each step, we can determine the points at which it helps students through college and the points at which it has no influence. It may be at the latter points that other interventions are needed. We examined the university outcomes and activities of individuals from our district who applied to the local university from 1990 to 1998 for a degree program.

We first assess the academy's influence on entrance into college as measured by acceptance to and enrollment in the university. This analysis answers the questions, "Does the career academy help students gain admission to a four-year university?" and "Does it help ensure that students enroll once admitted?"

We then assess the academy's influence on the route taken through college by examining the need for remediation and the transfer status of students. Undertaking remediation and transferring to the university, usually from the community college, often lengthen the time for students to earn a degree. This analysis answers the question, "Does the career academy help the student move through the university in a timely manner?"

Finally, we examine the academy's influence on the student's exit from the university as measured by dropping out, academic dismissal, and graduating, as well as by the student's academic achievement at exit (GPA). This analysis answers the question, "Does the academy facilitate positive postsecondary educational outcomes for its students?"

We empirically model a student's entrance into the university as a function of career academy enrollment, individual demographics, high school of origin, and academic preparation, such that:

$$\textbf{5: } \text{entrance} = \alpha^{ent} + \alpha_j^{ent}\text{Acad}_j + \alpha_i^{ent}\text{GPA}_j + \alpha_k^{ent}\sum\text{Demo}_k + \alpha_l^{ent}\sum\text{hs}_i$$

where:

entrance = a vector of variables measuring a student's entrance into the university,

hs = a vector of variables designating the student's high school, and other variables are defined above.

The coefficient on career academy (α_j^{ent}) is a measure of the direct association between the academy and the student's probability of attending or enrolling in the university. The interpretation follows that outlined for the above equation. This estimation also allows us to trace the *indirect* influence of the career academy on postsecondary education through high-school GPA. If the career academy increases academic achievement in high school and high-school GPA increases the probability of entrance into college ($\alpha_j^{ent} > 0$), the career academy indirectly increases the probability of postsecondary education by increasing high-school GPA.

We explicitly examine the direct and indirect (through GPA) influence of the academy in *all* outcomes in a summary of our results. For these analyses, we re-estimate equations without including GPA on the RHS (e.g., $\alpha_j^{ent} = 0$). Within this formulation, the coefficient on career academy captures both the direct (e.g., α_j^{en}) and indirect impact through GPA (e.g., $\alpha_j^{g} * \alpha_j^{ent}$). The indirect impact is then measured by the difference between the coefficient estimates without GPA (total effect) and with GPA (direct effect).

Equation 5 is also used to examine the route that the student takes through the university by replacing the left-hand side of the equation with the need for remediation and transfer status. This modeling

implicitly argues that the factors used to admit and enroll students are correlated with the route through the university. Because acceptance to and enrollment in the university, remediation, and transfer status are all binary variables, we use probit analysis for all estimations of equation 5.

Finally, we assess the academy's influence on exit from college in terms of academic achievements in the university (GPA), dropping out, academic dismissal, and graduating. We initially model the student's academic achievement at the university so that subsequent analysis can examine, through achievement in college, the direct and indirect influence of the academy. We model academic achievement in college as a function of enrollment in a high-school career academy, academic achievement in high school, individual demographics, high school of origin, and the route through college. Both needing remediation and transferring to the university, the constructs for route through college, are negative influences because students often use these mechanisms to acquire academic skills that could have been learned in high school. Thus:

$$\textbf{6: collegegpa} = \alpha^c + \alpha_j^c \text{Acad}_j + \alpha_i^c \text{GPA}_i + \alpha_k^c \sum \text{Demo}_k + \alpha_l^c \sum \text{hs}_l + \alpha_m^c \sum \text{route}_m$$

collegegpa = the student's grade point average when leaving the university,
route = a vector of variables designating a student's route through the university (remediation and transfer), and other variables are defined above.

The coefficient on career academy (α_j^c) estimates its independent, direct influence on academic achievement at the university and its interpretation follows that outlined above. The coefficient on the academic achievement in high school (α_i^c) allows us to trace the indirect influence of a career academy on academic achievement in this university as outlined above. Since GPA is a relatively unbounded continuous measure, we estimate equation 3 with OLS.

Our final model examines exit from college as a function of career academy enrollment, academic achievement in college, and individual demographics, such that:

$$\textbf{7: exit} = \alpha^x + \alpha_j^x \text{Acad}_j + \alpha_n^x \text{collegegpa}_n + \alpha_k^x \sum \text{Demo}_k$$

exit = a vector of variables indicating the type of exit from the university (dropping out, academic dismissal, and graduating), and other variables are defined above.

The career academy's influence on exit from college is modeled as both direct (α_j^x) and indirect, through college GPA ($\alpha_n^x \neq 0$ assuming $\alpha_j^c \neq 0$). Our modeling suggests that neither high school nor route through college independently influences exit from college. Rather, these factors indirectly influence a student's exit from college through college GPA (equation 6). Because each of these exit categories is a binary measure, we estimate these equations with a probit analysis.

Quantitative Data Sources

Our primary source of information for the quantitative analysis is known as the City Student Database (CSDB), which was constructed for this study. This database followed a cohort of 10,110 students who were sophomores in the city's public schools in 1990–1991, 1991–1992, and 1992–1993. About 14% (1,407) of these students were enrolled in one of the district's nine career academies. The remaining 8,703 students, who were never enrolled in a career academy, became our "nonacademy" comparison group. The years of analysis covered in this study allowed for some time to elapse for high-school completion by spring 1996, when the post-high-school survey was sent. Quantitative information about these students was collected from two sources: district data files and post-high-school surveys.

District Data Files

This database contains data from two different sources: student transcripts and general district files. The transcript data are a complete census of course work each student took in or transferred into the district. Information includes, for each course taken, the year and month of enrollment, course number and title, course grade, and grade level of the student at the time that the course was taken. We used this data to construct individual GPAs, and a curricular history that included career academy course work compiled at the end of each semester (fall, winter, and summer).

Because a student's GPA is based on school records, we avoid biases that could result from individual reporting of grades. Data files were also constructed from each student's demographic file. This includes the student's test score in each year in school, attendance in each semester, gender, race, and school. This information was linked to the transcript database with a unique identification number that was generated to prevent linkage with all other databases in the CSDB, a condition of the agreement to release the data for this study.

Post-High-School Surveys

Data on students' post-high-school activities were obtained from a survey that was mailed to each of the 10,110 students for whom we had district files. To enable this mailing, the district provided names, addresses, and the first and last school attended. Confidentiality prevented using district data files to identify career academy students in this file. Instead, we identified career academy students *in this mailing* from the names in the Local Evaluation Files. The post-high-school surveys were mailed to students at five high schools from May to October (with follow-ups lingering through December) of 1996, when former students were between one and three years out of high school if they had graduated on-time.

Surveys were mailed to three "populations": academy students at five schools (n=1,257), nonacademy students at five schools (n=6,804), and the students at the high school for which academy student status was not available in the Local Evaluation Files (n=2,041). The questionnaires that were sent to each population were virtually identical, with all of the differences limited to the first page and reflecting specific differences in the respondent's high-school program. For example, only career academy students were asked about their internships and mentoring. A total of 1,228 surveys were returned: 981 from nonacademy students, and 247 from academy students. Response rates were higher for individuals in the academy sample.

We intentionally focused questions on what was referred to in the survey instrument only as the student's "high-school program." The respondents' self-determination of high-school programs allowed us to ask *identical* questions of academy and nonacademy students and to have them provide answers about high school that did not presuppose (from us) participation in any specific program structure or curriculum.

If the questions had been differently worded for each group (e.g., "high-school programs" and "academy programs"), the responses might have reflected answers to different questions. For example, an academy student who wanted to focus high-school courses around college-preparatory activities may have been dissatisfied with the high-school program if the academy program was not sufficiently scholarly. However, the student may have been satisfied with the academy experience overall because of its other qualities.

The questionnaire allows for responses that cover both dimensions of the experience. The post-high-school questions were structured around five types of information: post-high-school educational outcomes; post-high-school labor-market information; expectations about education; the labor market

and the city as a place to live; assessment of the high school and program; and general demographic information. Respondents to the post-high-school survey had their responses linked to their transcript and district files to create the CSDB.

Of critical import are the questions used to measure the dependent variables on lifelong learning. We used responses to the survey instruction: "Check the box that indicates how well your high-school education helped you to . . ." obtain 13 different work- and education-related types of knowledge and skills. Respondents were given four options with which to rate the efficacy of their high-school program: "a great deal," "somewhat," "a little," or "not at all." These measures were specifically designed to capture three sets of qualities: "workplace" skills, "education" skills, and "school-to-career" skills. We use the four "education" items to capture the career academy's potential for building a capacity for lifelong learning.

Data from the University

For analyzing outcomes at the four-year university, we draw our data from a medium-size CSU using all applicants to degree programs who had graduated from a single district's high schools between 1990 and 1997. This data set includes information on all of the district's graduates who 1) applied for admission, whether or not they completed the process; 2) were denied admission; 3) were admitted to the university but did not enroll; or 4) enrolled in the university. The data set contains information on individuals who had applied from 1990 through December 31, 1998, with data on university activities updated through spring 1999. In many ways, the university from which the data are drawn is typical of comprehensive, urban universities throughout the country. About 65% of the students reside within the county of the university's main campus and another 19% reside in the county of its satellite campus. No demographic group is a majority.

University records include nearly complete information on student demographics, year and high school of graduation, and type of application (e.g., transfer and first-time freshman). High-school transcript information (GPA) is available for many applicants, although information is not always available for individuals who did not complete the application process or who transferred from community colleges. For all students who enrolled in the university, information is available about the student's exit status, their university GPA, and their major. We identified career academy students in this database with a listing of students from district records that was compiled as part of a mandated yearly evaluation of the program.

Potential Estimation Caveats

Our specification, modeling, and data use are compromises between alternative specifications that meet our evaluation goals and steps to minimize biases in parameter estimation. We examine potential issues and complications in estimations that our approach may present in order to more clearly define the limits of our analysis.

Case Study

The idiosyncrasies that exist within any case study can produce conclusions applicable only to one environment. While this critique cannot be dismissed out of hand for any case study, we believe that our methodology appropriately evaluates programs for educational reform. The district and city portrayed in this study are typical of many inner cities and public schools throughout the country. They illustrate the obstacles facing reform efforts in any community by showing the political pressures and bureaucratic structures that exist. While the specifics of such pressures and structures are, indeed, idiosyncratic, their general form is in no way unique.

Sample Selection

The primary criticism of our quantitative analysis would lie in the nonrandom assignment of students into the academy programs. This criticism arises because the "ideal" analysis of program outcomes is one in which "counterfactuals" are estimated. Outcomes from academy programs must be compared to those that would have existed for participants had the program not existed. If counterfactual outcomes are known, they could be compared to the actual outcomes that occurred under the career academies. This would assess the value of the academies.

Of course, as with any study, counterfactuals are not known. Our study simply assumes that the outcomes for nonacademy participants with the same background characteristics provide an estimate of counterfactual outcomes. While this is far from perfect, we believe that it best suits the goal of this study: to assess the potential of the career academies as a "real world" educational reform.

A typical method for quantifying counterfactual outcomes is the random assignment of individuals into control (e.g., nonacademy) and treatment (e.g., academy) programs. The control group provides an estimate of counterfactual outcomes. However, as we know, random assignment to high-school programs is not a policy option in the "real world" of high schools. Thus, program outcomes from such an experiment may or may not approximate those outcomes that will exist once the program is implemented. In an actual school district, students (or their parents) will be given a choice of programs, and program selection becomes endogenous to program outcomes. The random assignment of students to control and treatment groups therefore will not reflect a potentially important dimension of choice that affects outcomes once the program is implemented.

Still, we must address the issue of sample selection even if our goal is to reflect "real world" circumstances. Without any controls for sample selection, our estimates of program outcomes would be distorted by differences in observed and unobserved characteristics of students in different programs. Our single-equation estimation of program outcomes without random assignment contains statistical controls for observed heterogeneity in students and implicit "controls" for unobserved heterogeneity. We checked for potential biases along observed heterogeneity lines by initially including controls for Heckman's sample selection in 1) choosing an academy program; 2) taking initial period achievement tests (knowledge and skill control); and 3) responding to the survey. However, λ was never significant and did not affect career academy coefficient estimates.

Our strongest control for unobserved heterogeneity lies in our initial-period control for knowledge and skills. If the unobservables that increase educational outcomes in high school are capitalized into 10th-grade test scores, our parameter estimates of program impact will not contain biases from unobservables. Our inclusion of initial-period controls for knowledge and skills is akin to estimating a fixed-effect model. This is a common technique employed to purge estimates from biases that result from unobserved heterogeneity. We note that our analysis stratified by students' initial academic knowledge also controls for unobserved heterogeneity by confining estimations to students with similar characteristics.

Multicollinearity

Our quantitative study relies on a value-added educational production function framework that models educational outcomes in terms of educational inputs and processes. The career academy is the educational process of interest. While differences existed among schools within the district in the degree to which the career academy model was implemented, the administrative adherence to the model caused curriculum components (e.g., integrated curriculum, internships) to be highly correlated. This correlation precludes including curriculum components directly into the parametric analysis. By confining our estimation to an aggregate measure of career academy (as outlined above), we cannot assess

the influence of the individual component with our quantitative analysis. We rely on the qualitative data for this assessment.

Our modeling of the career academy educational process is therefore confined to the binary measures of enrollment in the individual career academies, which capture the totality of the subprocesses embedded within. By using binary variables for individual academies, we also keep open the possibility that the whole is greater than the sum of its parts. That is, the career academy educational process can be implemented in a variety of ways. For example, a program could have an emphasis on heavily integrating its curriculum while placing less emphasis on work-based learning or, conversely, could place relatively more emphasis on work-based activities.

We note that in the nonstratified analyses, in which a single academy binary variable measures programs' impact, our estimates of the influence of the career academy may be biased downward because of the inclusion of academies with incomplete programs. Since the coefficient on the binary academy variable includes the impact of weak programs, its size may increase when fully implemented program models are evaluated. This downward bias, however, may accurately measure the impact of the academy as it is likely to occur in the "real world." If political pressures and administrative structures influence the development and implementation of career academy programs—and our study suggests that they do—then estimates of program outcomes of career academy students may reflect those that would occur in a situation where both complete and incomplete programs exist.

Instrumental Variables

Modeling the outcomes of education is complicated by the mediating role of family background. One common "solution" to this dilemma uses instrumental variables that are computed from estimations of family background to replace variables on RHS (right-hand side) of the equations. This reduced-form approach models as instruments the factors that we model as inputs to educational outcomes. In this approach, the instruments reflect both the direct and indirect impacts of their predictors. We use a structural approach to untangle these effects by using initial-period knowledge and skills to capture both academic abilities at high-school entrance and background factors. This implicitly assumes that the students' academic skills at high-school entrance measure all background influences that would affect the knowledge and skills taken from high school.

Error-terms Bias

Unobserved variables that are correlated with independent or dependent variables can bias coefficient estimates. In research using educational production functions, this problem exists because many of these unmeasured variables vary systematically with school district (e.g., they reflect the environment surrounding the production). We minimize this type of bias because our single-school district represents a relatively homogeneous educational environment. Because pupil-teacher ratios, per-pupil expenditures, class sizes, and most policies and procedures are all relatively constant, the estimated educational benefits associated with career academies are less likely to reflect spurious correlation than are estimates from a data set containing multiple districts.

NOTES

1. Stern, 1994.
2. State of California, 1995; OERI, 1994; USDOL, 1991.
3. For example, see Ravitch, 1995 a, b.
4. California Academy Support Network (http://casn.berkeley.edu).
5. Stern, 1992, 1989, 1988; Dayton et al., 1992.
6. Dayton et al., 1992; Kemple and Snipes, 2000; Kemple, 1997; Kemple and Rock, 1996; Stern et al., 1988.
7. Kemple and Snipes, 2000. This research, conducted by the Manpower Demonstration Research Corporation, compared students who attended and did not attend selected academies in a number of different cities. In our other publication (Maxwell and Rubin, 2000) we discuss the advantages and limitations of the different methodological approaches.
8. Maxwell and Rubin, 2000.
9. Kemple and Snipes, 2000.
10. Maxwell, forthcoming.
11. HIRE Center Report 99-3A is available by emailing hire@csuhayward.edu.

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