

**SECTOR-BASED TRAINING STRATEGIES: THE CHALLENGES OF MATCHING
WORKERS AND THEIR SKILLS TO WELL-PAYING JOBS**

Harry J. Holzer

McCourt School of Public Policy

Georgetown University

December 2015

This paper has been prepared for the Symposium on the Changing Structure of Work at the US Department of Labor, December 10, 2015.

DISCLAIMER: This report was prepared for the U.S. Department of Labor (DOL), Chief Evaluation Office. The views expressed are those of the authors and should not be attributed to DOL, nor does mention of trade names, commercial products, or organizations imply endorsement of same by the U.S. Government.

Abstract

This paper reviews what we know about sector-based training strategies to date, and why they have become so popular with policymakers. It also reviews several major challenges to expanding them while trying to maintain their quality. These challenges include the fact that only workers with strong basic skills and employability are likely to benefit from these strategies; the likely tradeoffs between short- and long-term impacts and between general and more specific training; the difficulties of replicating and scaling the best models; and uncertain future labor demand. The paper concludes with a number of policy recommendations in light of the challenges sector-based strategies face.

In a labor market that rewards worker education and skills very heavily, and where employers frequently complain about their difficulties finding workers with appropriate skills, how can we provide less-educated workers the skills they need to attain well-paying jobs?

Increasingly, policy makers and labor market practitioners have turned to “demand-driven” or “sectoral” training to meet the skill needs of both workers and employers. This model has been used to train both for disadvantaged adults and youth, as well as workers dislocated from previous jobs. It has recently been embraced by the Obama Administration in its job training initiatives, by Congress in its recent reauthorization of federal job training programs, and by governors and mayors around the country.

Despite the apparent enthusiasm for demand-driven training, and its widespread adoption, there are some major challenges involved in bringing these programs to a scale sufficient to really improve outcomes for less-educated workers, while maintaining program quality. For instance, some workers might not have sufficient basic or employability skills to be able to master the training (often of a technical nature); and sometimes the training might be too narrow or specific to be portable to other firms and economic sectors when they change jobs. In addition, practitioners might have difficulty replicating and scaling the most successful models observed elsewhere; and identifying high-demand sectors and jobs over time while meeting their evolving skill needs might be difficult as well.

Below I briefly review what we know about demand-driven training, including the evaluation evidence. I will try to account for the enthusiasm with which these models have been embraced, as well as the challenges of expanding the best of them. I will then propose some solutions to these challenges, both specific and general in nature.

I. What are Demand-Driven Strategies and Why are They So Popular?

Job-driven or sector-based training actively tries to match worker skills on the supply side of the labor market with what employers seek on the demand side of the market. While they need to engage with specific employers, they also target broader economic sectors, usually at the local or regional levels, with the following characteristics:

- Overall employment has grown and will likely continue to do so;
- employers seek at least moderately (or middle-) skilled employees, with some need for postsecondary education or training but below the level of a bachelor’s (BA) degree;
- employers have had some difficulty meeting their skill needs, and are therefore open to assistance with both hiring and training; and

- the sub-BA jobs pay well enough for workers in them to escape poverty and perhaps enter the middle class.

Sectoral training typically involves creating a “partnership” between several institutional actors – employers or their industry associations, training providers (often community colleges), workforce boards and an *intermediary* organization. The intermediary often takes the lead in recruiting the industry and educational partners, figuring out employer skill needs, establishing the training guidelines, recruiting low-income workers to these programs and providing them with supports, and ultimately making sure employers get job candidates who will perform well and meet their needs. A range of different organizations can play the intermediary role; some (like the Wisconsin Regional Training Partnership or Jewish Vocational Services) have traditionally focused on a few key industries like health care or manufacturing, while others (like the Chicago Jobs Council) have a broader focus on the sectors leading local or regional economic growth. Community-based organizations can also play the intermediary role.

The sectoral model first appeared in specific localities the 1980s, mostly in health and elder care, and then began spreading to other locations and sectors in the 1990s (Conway and Giloth, 2014).¹ Today they are most frequently found in health care, advanced manufacturing, information technology, construction, transportation/logistics, and hospitality to fill jobs with specific skill requirements that often fall short of BA degrees.

Closely related to sector strategies are “career pathway” models, which combine classroom training, work experience and credential attainment to move workers through a set of jobs and occupations within particular sectors, such as health care (Fein, 2012). As an example, a health career pathway could begin with a certified nurse assistant (CNA) credential and related employment while eventually leading to a licensed practical nurse (LPN) degree and perhaps ultimately a BS degree in nursing.

The pathways can begin in high school, as part of a district’s career and technical education (CTE) offerings, and involve certificate or AA (or AS) attainment in community or four-year colleges as well. The work experience components can be provided through apprenticeships or other forms of work-based learning. Programs often seek to provide “on and off ramps” between the labor market and educational institutions at various points along the pathways, to meet the needs of both younger and older students and workers, including those who are either disadvantaged or dislocated from earlier jobs.

Since most of the demand-driven training occurs at the local or regional level, many efforts to expand this training have focused there. The most important of these is the National Fund for Workforce Solutions, with financial support from several national foundations (Dyer, 2014). But

¹ Among the earliest models in the 1980s were the Extended Care Career Ladder Initiative (ECCLI) in Massachusetts, the Paraprofessional Healthcare Institute (PHI) and its Cooperative Home Care Associates (CHCA) in New York, and Focus: Hope which helped trained machinists for the auto industry in Detroit.

important activity occurs at the state level too, often with encouragement from the federal Departments of Education and Labor.

Nearly a decade ago, Pennsylvania was one of the first states to begin organizing their workforce strategies around key economic sectors; since then, many others have followed suit. A range of competitive grant programs in the Bush (43) and Obama Administrations supported their expansion at the state and regional/local levels during this time period.² At this time, most states use sector strategies and career pathways as parts of their workforce strategies (National Governors Association, 2013). Various networks of states have been organized to support this development.³ It is now also being encouraged by the newly reauthorized Workforce Innovation and Opportunity Act (WIOA), as well as by a set of workforce initiatives under by the Obama Administration (National Skills Coalition, 2014; White House, 2014).

What accounts for the rapid and widespread adoption of sector-based and pathways approaches in workforce development in the past decade? I would argue that several factors have contributed to this. For one thing, by the 1990s there was growing dissatisfaction with more traditional forms of job training for adults and youth that were more disconnected from the world of higher education, and from employers and labor demand as well. Evaluation evidence of programs funded by the Job Training Partnership Act (JTPA) showed modestly positive impacts on earnings for adults that tended to fade with time, while those for youth were zero or even negative (Heckman et al., 1999). Partly as a result of these findings, funding for training in JTPA and its successor, the Workforce Investment Act (WIA), has continually diminished over time (though worker use of services provided by One-Stop centers grew). Since the labor market returns to higher education credentials were rising over the same time period, and especially after Pell grant funding for higher education among the poor began rising as well, the focus of workforce development shifted to higher education and especially community colleges.⁴

Workforce practitioners and policy advocates also came to see the value of a “dual customer” approach in which employers as well as disadvantaged workers are seen as clients, whose interests need to be served. In such an approach, the training for workers would be more carefully tailored to existing jobs, which the trainees would now have much better chances of

² These grant programs included the High Growth Job Training Initiative (HGJTI) and Workforce Innovation in Regional Economic Development (WIRED) grants during the Bush administration; as well as the Trade Adjustment Assistance Community College and Career Training (TAACCCT), Workforce Innovation Fund and Social Innovation Fund grants during the Obama years. See Haskins (2014) for an account for how evaluation evidence was used to structure the programs under President Obama.

³ State networks that have been set up to help them develop systemic approaches with measured outcomes include the National Network of Sector Partnerships, the Alliance for Quality Career Pathways, and the Pathways to Prosperity Network.

⁴ Heinrich et al. (2011) and Andersson et al. (2013) show nonexperimental evidence of significant positive impacts of WIA training on employment outcomes for disadvantaged adults but less so for displaced workers. The growth of Pell grants during the past decade and their use in workforce programs, especially for independent and older students, is documented in the College Board (2013).

obtaining (Conway and Giloth, 2014). If employers were pleased with the trainees whom intermediaries sent their way, they were more likely to participate in the future, perhaps expanding the numbers of such workers whom they hired. Other employers in the sector were then more likely to participate in the partnerships as well, and perhaps mold their workplace organizations and human resource (HR) functions accordingly.

And, very importantly, governors began to see sectoral training as part of their state economic development activities. For major employers whom they were recruiting to the state, or trying to retain, helping them meet their skill needs would come to play an important part of the benefits provided by the state as part of that process. Unlike other kinds of economic development activities – which often amount to a zero sum game nationally in which states bid against each other to lure major employers away from their competitor states – the sectoral training approach generates net new value added for the employers and their workers, and are therefore better from a national perspective (Bartik, 2012).

All of these considerations gained more weight as employers in key sectors also became increasingly and vocally dissatisfied with their own abilities to recruit and retain skilled workers, at either the BA level or below. At least in theory, this problem should not really exist in well-functioning labor markets – or at least not for very long. A rising demand for workers at a particular skill level should, all else equal, cause wages to rise for that skill; workers, in turn, should then invest more in obtaining those skills, so that shifts in the supply of the skill follow the shifts in demand (Becker, 1996).

There might be some temporary local shortages, during which workers obtain the necessary skills, and perhaps move geographically to areas of strong demand; but eventually the adjustment process should occur (Blanchard and Katz, 1992; Goldin and Katz, 2008). Indeed, the large relative wage increases associated with higher education, beginning around 1980 or so, kicked off such a process; in response, higher education enrollment soon began to rise. And, though there was a long time lag before adjustments in the supply of students with postsecondary credentials began to occur in sufficient quantities to meet the demand for them, this seems to finally be happening at the national level.⁵

⁵ Autor (2014) shows that the premium to workers with college degrees has finally flattened in the 2000s because the growth in the supply of college-educated workers has finally caught up with labor demand for them. Weakness in the aggregate labor market, especially in the aftermath of the Great Recession, contributed to flat or declining real earnings of workers at all education levels. But Beaudry and Sand (2013) argue that there has even been some reversal in the relative demand for higher education and cognitive skills in the labor market during this time period. Autor (2015) argues that the bursting of the technology bubble around 2000 and the housing/financial market bubbles in 2006-08 likely contributed to this reversal, while rising imports (especially from China) reduced labor demand at all levels.

Yet, employers in key sectors continue to complain about their inability to recruit and retain such workers; their complaints have now persisted, and grown more vocal, for years or even decades.⁶ Some economists have been skeptical about these claims – arguing that employers always complain about their workers’ skill levels. Wage increases have failed to materialize in any such labor markets since 2000, and these economists infer that there must not be any real skill shortages in these markets (Rothstein, 2012). Others argue that on-the-job training appears to be shrinking nationwide, which also seems inconsistent with notions of skill shortage (Cappelli, 2014). Lengthy vacancy durations in manufacturing appear to be quite rare, despite the vocal complaints of employers in that sector (Osterman and Weaver, 2014). Separately, a body of research has shown that demand in the middle of the labor market – defined as employment and wage trends in occupations whose average wages have been in the middle deciles of the wage distribution - has been shrinking over time, and that therefore it should not be difficult to meet skill needs there (Autor, 2010; Naimovich and Siu, 2012).

At the same time, the claims about tight labor markets (if not full-fledged skill shortages) in particular sectors and regions might be at least partly legitimate. While part of the middle of the labor market is shrinking – specifically, the well-paying production and clerical jobs available to workers with high school or less education – other parts that require some postsecondary education or training, like health technicians or very skilled production workers, seem to be growing (Holzer, 2015a). And it is frequently in these sectors that employers complain the most about their ability to attract and retain skilled workers.

Given these difficulties, why aren’t real wages growing? Perhaps we will soon observe more such growth, especially in key labor market sectors, as we recover more fully from the Great Recession. On the other hand, such increases might continue to be limited in industries facing strong international competitive forces (like manufacturing) or other pressures to contain costs (health and elder care) or generate higher profits (From the capital markets); and this is especially true if employers feel that their relative wage increases in the past did little to resolve their skilled labor supply problems.⁷ For these reasons, limited real wage growth alone is not sufficient to prove that firm difficulties with skilled labor aren’t real.

Regarding on-the-job training, some observers question whether it is declining in the aggregate (Lerman, 2015); and, in sectors like health care and advanced manufacturing where the supply of skills seems limited, employers are more engaged in newer efforts to generate more such supply (Ross, 2015). But it may not always be economically sensible for firms to invest in such training,

⁶ See Shemkus (2015) and the Manufacturing Institute (2014) for examples of press accounts and reports that claim a strong shortage of workers with middle-level skills in manufacturing and other key sectors of the economy.

⁷ In conversations with private employers one often hears that the jobs they are trying to fill (like those for machinists and precision welders in advanced manufacturing) already pay quite well, after wage increases in earlier decades, but that the skills needed are still not being generated in sufficient quantity. Some discuss the inability of current high school graduates to master the technical nature of the training many now provide or employability skills as measured by drug tests. Many prefer to adjust to high and unfilled demand along other “margins” such as recruiting activity or outsourcing the work to other firms.

given its general nature and the limited skills of the potential trainees. A variety of market failures might also limit their willingness to provide such training, or to create high-paying (or “high road”) jobs, where their ability to be competitive is based on high worker productivity and low turnover rather than just low labor costs (Appelbaum et al., 2003; Ton, 2014).⁸

Overall, the validity of employers complaints about their hiring difficulties in the middle of the skill distribution, and especially on technical jobs, continue to be debated. But, in the meantime, employer concerns in this area resonate with many in the political and policy arenas, and they frequently turn to sectoral strategies to try to better meet these needs.⁹

And, finally, rigorous evaluation evidence on the impacts of sectoral training on the earnings of disadvantaged workers became available. These consistently show relatively large positive impacts of about 30 percent for both adults and youth within two years of the beginning of training.¹⁰ These impacts are much larger than those that have been observed for JTPA or WIA more generally. Given the strong earnings premium associated with attaining at least some postsecondary credentials – particularly those with technical content – any efforts that help disadvantaged workers gain more such credentials (above what they would obtain anyway) should generate similarly large effects on their earnings as well.¹¹

This combination of vocal employer concerns, consistency with economic development strategies and strong evidence of successful impacts has propelled demand-driven strategies to the forefront of the workforce development field.

II. What are the Major Challenges that Limit Expansion of Demand-Driven Strategies?

Despite the popularity of job-driven/sector training strategies, and the widespread efforts to expand their use, we face some significant challenges in trying to do so.

⁸ Labor market failures that inhibit additional training include lack of information among employers about how to provide more of it, wage rigidities that prevent them from paying lower wages to trainees for general training, and coordination failures that keep small firms from sharing the fixed costs of setting up and managing training. Unions often played the latter role in construction or manufacturing in earlier decades. Employer investment in training their workers will also be limited if they think their basic skills are weak or that they will have high turnover, which might explain why American employers tend to provide much more training to their professional and managerial employees than to others.

⁹ See the National Research Council (2015) for a recent report highlighting the difficulties of generating employees with middle-level technical skills relative to employer demand for them.

¹⁰ See Maguire et al (2010) for rigorous evidence on impacts from three well-known sector programs and Roder and Elliott (2011) for evidence from a program called Year Up for youth. Popovich (2014) reviews data on inputs and outcomes of National Fund sites while Michaelides et al. (2015) provides quasi-experimental evidence on impacts of programs supported by the National Fund in Ohio.

¹¹ Backes et al (2015) and Stevens et al. (2015) show strong labor market returns to a range of more technical certificate and associate degree programs in Florida and California very recently.

A. Job-Driven Training: For Whom?

Job-driven training seems to constitute an effective anti-poverty strategy while, at the same time, it meets the needs and concerns of employers in the hiring process. Yet there can sometimes be tensions between these two policy goals.

Simply put, to maintain the confidence of employers, the workforce intermediaries must only send them workers whose skills and pending performance are not in doubt. This, in turn, requires the intermediaries to screen out any candidates whom they view as potentially weak along these dimensions – either sooner or later in the process. In addition, the frequently technical nature of the training requires that trainees have fairly strong basic academic (or “foundational”) skills, with reading and math abilities at least at the 9th or 10th grade levels.

In other words, job-driven strategies can be successful antipoverty efforts for those who currently are among the working poor, with solid workforce attachment and good basic skills, but not among the hard-to-employ with poor reading/math skills and perhaps other barriers to steady employment like substance abuse or depression (Zedlewski and Loprest, 2001). James Heckman’s notion that “skill begets skill” (Heckman, 2008) has some strong support in this context. And the percentages of Americans whose basic skills are deficient are quite high, relative to residents of other countries (OECD, 2013).

This tension between who can benefit from sectoral training and who most needs the help constitutes a real barrier to attempts to expand such training on community college campuses, where most such training now occurs. Community colleges around the country are largely open-access institutions, with few admissions requirements beyond having a high school diploma or general equivalency degree (GED). Yet, before students can take courses for academic credit in many places, they must demonstrate proficiency in reading and in math (usually at the level of Algebra 1). Because of their inability to do so, as many as 60 percent of community college entrants are assigned to “developmental education” (or remediation) classes from which most never successfully emerge (Bailey et al., 2015).

For this and other reasons, the completion rates of students who enter community college AA or AS programs are very low. Without counting those who transfer to four-year colleges to pursue BAs, only about 20 percent in associate’s programs overall and somewhat higher in certificate ones.¹² The completion rates for older students are below these averages and for younger students right out of high school they are higher. But, while many of the younger ones plan on transferring to a four-year college for a BA, only 25 percent actually transfer and only 15 percent get the BA.

¹² Completion rates in AA programs for students out of high school are about 30 percent (Backes et al., op. cit; Holzer and Dunlop, 2012) but much lower among older, independent students. Completion rates in certificate programs are in the 40-50 percent range.

Reforms in the academic requirements for admission to for-credit classes, and in how “developmental education” is administered, could potentially improve the ability of many students to enter and complete job-driven training programs. Successful “bridge” programs and other efforts in the K-12 years might also help address student deficiencies before they arrive at community college.¹³

But, even among those who can avoid remediation or for whom it is successful, an inability to pass important “gateway” classes – like anatomy in health technology programs – likely limits success for others. (Goldrick-Rab, 2010). To become a machinist, or even a precision welder, math requirements are not trivial. The degree programs in these cases are often for AS rather than AA degrees; the market value of the former very often exceeds that of the latter (Backes et al., 2015; Stevens et al., 2015), but with higher math and science requirements along the way.

Of course, not all health technology or manufacturing programs are quite as academically rigorous as these. Some of the less rigorous ones require individuals to complete certificates, rather than AA or AS degrees. And these can frequently have greater labor market value than AA degrees (though less than AS ones, as noted by Backes et al., op. cit.).

At the same time, the certificate programs do not always provide academic credit, which might limit their appeal and their usefulness in a “career pathway,” since they cannot count towards higher degree attainment. Indeed, whether a certificate program has academic credit or not can often be fairly arbitrary, with similar programs in adjacent districts or states being treated differently (McCarthy, 2014). But those that do not confer credit, or are short-term in nature, cannot currently be paid for with Pell grants, thus limiting their usefulness to many low-income students.

B. Short- and Long-Term Impacts: General v. Specific Training

Another source of tension in demand-driven training strategies involves the extent to which training is specific to certain occupations and sectors or more general. Part of the appeal of sectoral training, and likely part of its effectiveness in raising earnings of disadvantaged workers, is the direct participation of employers in devising it, and the availability of good-paying jobs with those employers when workers finish it. Such training is often quite specific to an industry and an occupation (or a set of occupations on a career pathway). In some cases, community colleges even obtain contracts to provide “customized” training to individual employers.

So what happens when workers change jobs and employers, and perhaps industry sectors? We currently have little evidence on this, since the rigorous evaluations went out only 2 years after the point of “random assignment” to the treatment and control groups. Furthermore, the dynamic

¹³ See Long (2014) and Bettinger et al. (2013) for reviews of evidence on development programs and their impacts. Martin and Broadus (2013) show significant impacts on GED attainment and college enrollment of the LaGuardia Community College Bridge program, though success rates remain quite low.

nature of US labor markets imply that high-demand sectors today might not be the same ones tomorrow, as we will note further below, which could increase involuntary turnover over time.

There might well be some tradeoff between the amount and quality of general training these individuals receive, which might be better for their longer-term earnings prospects, and the specific training which is clearly better in the shorter term. As noted earlier, employers will be less interested in the former, and will invest fewer of their own resources, the more general the training is. The firm might still be willing to provide some training, but it would have to be paid for out of worker wages; and if these wages are downwardly rigid, the training will not occur.

Accordingly, there is a stronger argument for investment of public resources in such training when the latter is at least partly general; President Obama and others have frequently said that the training must be “portable” to merit public support. This needn’t always be absolutely true – there might be equity-based reasons to support relatively specific training, if that training goes to workers who would not be hired and trained by employers in the absence of government efforts. But, on average, more general training is somewhat better in the long run, given the frequency with which workers change jobs, and the dynamic and uncertain nature of future labor demand.

Of course, there are also key worker benefits to the more specific parts of the training. For one thing, it helps them accumulate the work experience that the labor market rewards. And there is some reason to be hopeful that the sector-specific training has some valuable general content. For instance, there has been strong evaluation evidence that Career Academies, which provide sector-specific education and training to high school students within broader high schools, have large impacts on their earnings. For at-risk young men, these earnings increases are nearly 20 percent in magnitude. And quite importantly for this discussion, they last for eight years after the assignment to treatment and control groups, with little sign of erosion, despite the fact that many students change employers and industry sectors. Evidently, students learn something about the labor market from their training and work experience that seems portable across employers and sectors. And there has also been some evidence that apprenticeships with particular employers have some lasting effects after workers switch occupations or industries, at least in other countries.¹⁴

Clearly, getting the right balance between specific and general training should be a high priority for those building demand-driven programs. For instance, when workers obtain an AA or certificate from their training, the credential should signal to other employers the potential breadth of the worker’s skill-building. A new trend in this work towards smaller, “stackable” credentials along the career pathway could make these signals even more apparent, as would

¹⁴ See Kemple (2008) for evidence on the long-term effects of Career Academies while Geel and Backes-Gellner (2011) show that vocational training in Europe generates general skills with lasting impacts even after workers change jobs and sectors.

other reforms in the credentialing process in the US to make the process easier for workers and firms to navigate and less fractured and duplicative while making the credentials themselves more transparent (Lumina Foundation, 2015).

And, in a world where demand shifts will always cause some amount of worker displacement and therefore obsolescence of specific skills, strengthening the potential availability of high-quality “lifelong learning” to all who need it is critical as well. In addition, workers trained in the past in particular high-demand occupations, like welding, might have few of the more technical skills employers now seek in those same occupations (Uchitelle, 2009); making it easier for them to upgrade those occupational skills would be helpful to them and to employers who seek those skills and have difficulty finding them.¹⁵

C. Replicating and Scaling the Best Models

Current efforts to scale demand-driven training programs in states around the country, and federal support of those efforts, have been at least partly driven by the strong impacts that were found in the rigorous evaluations of sector programs cited above. But the three or four programs in question had each been in the field for years and had developed reputations for high quality. Can these be easily replicated in newer efforts? And can we scale these successful efforts, building job-driven workforce systems rather than isolated training programs?

The problem of replicating and scaling successful but small model programs has vexed social and educational policy efforts for years in many contexts.¹⁶ A particular effort to do so in the context of demand-driven training occurred around efforts to replicate the Center for Employment and Training (CET) in San Jose CA. While not a specifically sectoral program, CET had some other elements common to such efforts – particularly the close relationships between intermediaries who ran the program and employers in the community who often hired the trainees afterwards. The strong program impacts on worker earnings observed in the evaluation of the original program excited the field and led to desires to replicate and scale the approach elsewhere. But subsequent efforts to do so by the Department of Labor were difficult, and ultimately not successful.¹⁷ Indeed, the close relationships between employers and intermediaries in San Jose (mostly within a fairly tight-knit Hispanic community) proved one of the most difficult aspects of CET in San Jose to replicate elsewhere.

Some analysts, like Mark Elliott of the Economic Mobility Corporation, have argued strongly that it takes years to build these successful programs and relationships. Intermediaries must gain experience in what works and what doesn’t, and they must prove to employers that they are trustworthy; in other words, the program and relationships need time to mature, and this process

¹⁵ For evidence on within-occupations skill upgrading see Autor and Handel (2009).

¹⁶ For instance, very large impacts of pre-school in programs like Perry and Abecedarian from the 1960s and 1970s have been difficult to replicate in larger programs at the state level. See Cascio and Schanzenbach (2014).

¹⁷ See Melendez (1996) for evidence of large impacts in the San Jose cite but Miller et al. (2005) for disappointing impacts in the replication study conducted by the Department of Labor.

should not necessarily be rushed in efforts to scale these programs, or to rigorously evaluate them (Elliott and Roder, 2015).

Even where successful programs are replicated at the firm level, we often find dozens or even hundreds of partnerships at the state level (National Governors Association), but the scale of each in terms of numbers of students trained and hired can be very small. Still, a few recent efforts to achieve scale in building demand-driven programs seem to be bearing fruit in this regard and are noteworthy. The National Fund described above has built sectoral training programs in over thirty localities and regions around the country, and it has learned many lessons in the process that are likely benefitting their newer efforts (Dedrick, 2014). Other efforts to scale sector programs at the local or state level have similarly borne fruit.¹⁸ It might still take years to build the partnerships and successful efforts, but we are no longer doing so in a knowledge vacuum.

Another prominent effort to watch is the Health Professions Opportunity Grants (HPOG), run by the US Department of Health and Human Services (HHS). Beginning as part of the federal American Recovery and Reconstruction Act (ARRA) in 2009-10, over 30 sites were given HPOG grants to build health care training programs in the one sector where rising demand over time is virtually a certainty, due to the ongoing process of Baby Boomer retirements. HPOG is an effort to build a systemic approach across many localities and states that can perhaps be replicated in other industries, if it proves successful.¹⁹

While these efforts are encouraging, there are some other structural problems that might limit successful scaling – and these reside in the community college system. These 2-year colleges remain the primary training providers in sectoral efforts around the country. In many ways, this makes sense – as noted above, the role of community colleges in workforce development has steadily grown for decades, as higher education plays a more and more important role in the US labor market. Many low-income students earn certificates or associate degrees in order to increase their earnings with jobs in health care, IT, manufacturing and other parts of the service sector; and the experience that the colleges have gained in providing this service remains very important as we seek to scale up their involvement in sector-specific strategies.

At the same time, some major problems remain. The over 1200 community colleges around the country vary a great deal in their abilities to carry out the workforce functions we now expect from them. Traditionally, their primary missions have been more academic than workforce-related – and that continues to be the case for most. Preparing workers for academic transfer to four-year colleges remains what most focus on – even if the percentages who actually transfer, and who ultimately complete a BA, remain quite low.

¹⁸ See Leung (2014) for a description of SkillWorks in Boston as an example of a sectoral approach that achieved some scale at the municipal level.

¹⁹ For a description of HPOG see the Administration for Children and Families (2015).

For students who expect a certificate or an associate's degree as their final product, and who want to enter the workforce quickly thereafter and earn a strong return, the overall statistics are grim, as we noted earlier. But, in addition to the problems associated with low academic preparation for many students, the institutions themselves generate difficulties. Very little academic or career counseling of any kind is provided in many places, and too little structure exists for many students to be correctly guided along to their careers (Bailey et al., 2015). This might be less true of new sectoral workforce programs developed with industry input than it is more generally at these colleges, but it remains a broad concern.

Furthermore, the colleges face other disincentives in trying to scale up sector-specific efforts. Most of their (often tenured) faculty are trained to teach liberal arts, not health care or IT; the latter instructors need to be hired as adjunct faculty from the private sector. The costs of providing such instruction are often higher per student in technical classes than in the liberal arts – due to high costs of equipment and labs (as well as the salaries needed to be paid to nursing or engineering teachers).

But colleges get the same tuition payments and the same subsidies from the state, regardless of the classes students take, and regardless of whether they complete the coursework and obtain a well-paying job afterwards. As a result, the incentives and limited resources facing the colleges limit their ability or willingness to expand the very courses that offer the greatest labor market rewards. This is particularly true in an era of very tight budgets, and given the multitude of roles we expect community colleges to play.

Engaging employers at scale can also be very challenging. American employers are extremely heterogeneous in terms of exactly what and how they produce, their human resource (HR) activities, their size and locations, and overall attitudes. Small- and medium-sized employers frequently know very little about workforce development outside their current approaches; and the fixed costs of engaging them in partnerships can be very high. Efforts to engage them in partnerships are necessarily very “retail” in nature. Among larger employers there is more knowledge among their HR staffs but less so among top executives who often have other priorities.

Many employers are also quite skeptical about participating directly in publicly-funded activities of any kind. Though this is somewhat less true today than in earlier periods, policy activities at the state and federal levels remain fairly “siloed” within their respective agencies, as are funding sources. For instance, federal workforce development funding is available through WIOA, the Perkins Act (for CTE), the Higher Education Act, Temporary Assistance to Needy Families (TANF) and even Supplemental Nutrition Assistance Programs (SNAP, or Food Stamps). State and local authorities have often learned to “braid” the many sources, and common performance rules and measures (especially under WIOA) are helping. “Alignment” across agencies is growing. But many funding sources are also temporary – especially competitive grants – and a

lack of permanent sources makes it harder for partnerships to become sustainable over time, as well as scalable.

As long as the structural problems remain, and incentives to expand expensive workforce instruction remain limited, scaling up successful efforts will remain problematic, in my view.

D. Uncertain Future Demand

How do we know when demands for certain skills are sufficiently strong, relative to their supply, that it makes sense to build sectoral training programs and career pathways in those areas? And how do we build demand-driven training systems in a dynamic labor market when future demand itself is so uncertain?

The answer to the first question has been made somewhat easier by the enormous growth in the availability of and access to employment data in the past several years (Zinn and Van Klunen, 2014; Reamers, 2015). Inferences about the levels of and trends in employment demand in any particular state can be made from a variety of sources.

The best of these are often the administrative education and earnings data in the state longitudinal data systems (SLDS) which the Obama administration has urged them to make public and to analyze themselves. The educational data contain records on each individual student who has participated in public education in the state, including at all public postsecondary institutions. These data are frequently linked to those on individual quarterly earnings from the Unemployment Insurance system, which can be broken down by industry. As a result, state analysts can identify trends in employment in higher- v. lower-earning sectors, and the educational preparation needed to attain it. Variance in these trends across regions within a state can be analyzed. Though the data have some limitations – such as the absence of workers who have moved out of state for education and/or work – the benefits of the data are still enormous.²⁰

In addition, real-time data on job vacancies are now becoming more available and more complete from sources that scrape the internet for such information, both public and private.²¹ Though these are shorter-term in nature, they give us a sense over time of the set of jobs which employers have had some greater difficulty filling. Finally, these data can be merged with O*NET data on occupational tasks from the Department of Labor to give researchers and state

²⁰ The National Student Clearinghouse data can track students who went to college out of state and often enable researchers using state-specific administrative data to get some handle on the problem of student outmigration for higher education. But these data do not cover subsequent earnings. The Longitudinal Employer Household Dynamics (LEHD) program at the US Census Bureau can track worker movements across states but access to the microdata are very restricted.

²¹ Private data on real-time job vacancies based on internet coverage are held by the National Association of State Workforce Agencies (NASWA) and Burning Glass.

analysts some sense of the tasks that need to be performed on the jobs in high demand, which in turn give us some sense of the skills that need to be provided in these sectors.

While encouraging, the data also have their limitations. It is far more difficult to identify “labor shortages,” even in the short run, than one might think (Barnow et al., 2013). The existence of vacancies alone does not do so, as some vacant jobs always exist (along with unemployed workers). A rise in the job vacancy rate, relative to unemployed workers, also does not prove that a shortage or “mismatch” between workers and jobs exists, as the recent debate about rising aggregate job vacancy rates suggests.²²

On the other hand, combining data on employment trends over time and current vacancies with evidence on the flow of trained workers in an occupation or industry, coupled with conversations with employers in any industry, can likely give us a good sense of the tightness of a labor market today and for the next few years. This can also help state and local determine whether and what kind of a flow of trained workers might be sufficient to meet a given level of demand without creating a glut of these workers.

But it takes years to set up a partnership between employers, training providers and intermediaries, and even more years to establish the pathways needed for training and to work out glitches in that process. By time all of this is accomplished, the industry (and particular occupations) might no longer be high in demand (especially relative to the supply of skilled workers now being generated). New technologies and their applications often change the product and labor market environments in which companies operate; they need to be nimble in response to these changes. Yet the partnerships set up so painstakingly over time usually lack this characteristic.

Of course, demand fluctuations are an economic fact of life in modern capitalist economies, as so many Americans painfully learned in the Great Recession. In the weak labor markets that accompanied our recovery from the recession, there were often fears that jobs would not be available to those who had taken time and resources to train for new work (Watson, 2014). As the labor market continues to recover and to tighten up, these particular fears should be less worrisome to workers who seek training.

But how can we deal with the possibility (or likelihood) that high-demand sectors and occupations today may not be so tomorrow (or in a few years)? Structural changes in product and labor markets will continue to occur, and may even pick up speed. Some computer scientists, such as Eric Brynjolffson and Andrew McAfee of MIT, argue that the pace of such structural change in the labor market will quicken over time, as new applications of “artificial intelligence” and other digital capabilities will grow. For instance, driverless cars and trucks might mean much

²² Analysis of movements in the job vacancy rate over time, relative to the unemployment rate, suggest some possible increase in the “natural rate” of unemployment (Daly et al., 2012), but further analysis suggests that vacancy durations have gotten longer as employer pressure to fill them has declined (Davis et al., 2013).

less demand for transportation workers; or digital implants might generate much more data on individual health that might reduce the demand for health care workers who currently help generate such data and diagnose illnesses.

Labor economists are often skeptical of fears that technological change will render huge numbers of workers unemployed, and note that the employment fears of Luddites and others regarding automation has existed for decades or even centuries, as have almost always been proven wrong (Autor, 2015).²³ Economies and labor markets adjust to these dislocations. For instance, the new technologies make production cheaper, so lower prices result in higher real income among consumers that generates more demand for products and labor either in the industry or outside it. Many kinds of employment are complementary with the new technologies – and not just those requiring technical skills. For instance, those who can master web design skills can prosper in the new environment, as do many in the arts communities facing new demand from newly prosperous citizens.

Yet the fears remain, and some might be reasonable. The pace and scope of technological changes might simply be larger and faster than anything in the past, perhaps overwhelming the traditional adjustment mechanisms. And the adjustments themselves might leave more “middle-skill” workers facing reduced demand. In recent years, employers have begun demanding BAs or higher for many jobs that historically have required “middle-skill” credentials like certificates and AAs – often without the corresponding increases in earnings that the BAs should attract (Modestino et al., 2015; Hershbein and Kahn, 2015). Whether this is primarily a temporary result of the Great Recession, or something more structural (and thus more permanent) remains unclear at the moment.

One additional source of uncertainty exists with regards to future demand. We often think of labor demand as being something determined “exogenously,” by technological and market forces that occur separately from decisions taken by policymakers and practitioners. Indeed, this assumption is very strongly implicit in future employment projections by occupation or industry, whether these are generated by the Bureau of Labor Statistics or private sources (like the Georgetown Center on Education and the Workforce).²⁴

But, over the long term, labor demand decisions by employers are likely very endogenous to our workforce system and its (in)ability to meet their skill needs. In many European countries, where high school graduates often have strong technical skills which are further honed by apprenticeships, employers can create middle-skilled and middle-wage jobs and have them filled by such high school graduates and apprentices; in the U.S., where high-quality CTE has never been widely available and most high school graduates have little in the way of analytical or

²³ While most economists do not expect a large increase in unemployment over time associated with rapid technological change, there is now a broad consensus that digital technologies have contributed to higher inequality through “skill-biased technical change” (e.g., Goldin and Katz, 2008; Autor, 2015).

²⁴ See Carnevale et al. (2013).

communication skills that employers value – much less specific occupational skills – employers create fewer of these jobs.²⁵ As another example, when German manufacturers began relocating their advanced manufacturing facilities to the US – often drawn by lower energy costs and less regulation – they are frequently shocked at the very weak nature of our occupational training systems, and will hesitate to build plants here until they generate a reliable flow of trained technicians and engineers.²⁶

If the quantity and quality of US jobs at the sub-BA level depends on the quality and flow of skilled workers to employers, then it is possible that generating such supply will lead to more demand. Public policies that help or incentivize firms to improve job quality might be rendered more effective by strong sectoral skills-building systems. Indeed, there have been sectoral training effort whose explicit goal has also been to upgrade job quality and skill needs on the demand side of the labor market.²⁷

But, overall, sufficient uncertainty may exist on the future directions of skill demands in any particular sector to undermine our confidence in the ability of greater supplies of skills to generate them.

III. Addressing the Challenges of Building Demand-Driven Training Systems

Given the widespread interest in developing more and better demand-drive training systems for workers, and also given the strong impacts of such programs in evaluation evidence, it is inevitable that we should, and will, continue to do so in the U.S. How, then, can we respond to the challenges listed in the previous section, when doing so?

For each of these challenges, the specific policies and programs needed to address them have been discussed above. Regarding the access of very unskilled workers to sectoral training at community colleges, we need reforms in “developmental education” (Long, 2014) and also in accreditation processes, to make sure that less-demanding certificate programs with labor market value are accessible to Pell grant recipients. Effective “bridge” programs for students can also help them prepare before they arrive on campus, thus mitigating the need for developmental education.

²⁵ In the framework of labor economists, improving the supply of skills in high-demand sectors would reduce the cost to employers of generating them, which in turn could raise employer demand and job creation. In other words, such outward supply shifts would move employers along their demand functions.

²⁶ See Nelson Schwartz’ article (2013) on how German manufacturers in the US have adapted their apprenticeship models to generate more skilled workers here. The well-known example of the gas turbine engine plant built by Siemens in North Carolina – and their decision to build it only after making arrangements with local community and four-year colleges for a steady stream of technicians and engineers - highlights the extent to which labor demand decisions can depend on the supply of skills.

²⁷ ECCLI and PHI (both described above) are examples of sectoral programs in health care which explicitly worked to improve job quality decisions by employers. The Restaurant Opportunities Center (ROC) has tried to improve job quality and worker skills in the restaurant industry (Jayaraman, 2014).

Improving academic preparation and its links to the job market in the K-12 years are also very important in this regard. Providing more high-quality CTE is critical. The best of these options do not “track” students away from higher education; instead, they provide a range of “pathways” to college and/or careers for all students (Symonds et al., 2011). Indeed, perhaps some career exploration should be universal, and should start earlier – to inform students about the usefulness of various kinds of skill development and better motivate them in the process. Making CTE universal would reduce the stigma currently associated with CTE. Contextualized instruction through work-based or project-based learning might also make skill acquisition more effective for students who have not performed as well academically in the traditional classroom setting.

To better prepare workforce trainees for long-term and general labor market skill needs we should expand apprenticeships and other forms of work-based learning, while also making sure that they provide a broad mix of general and sector-specific skills. Encouraging them to be combined with certificate and AA or AS programs in community colleges would help. Making better sense of and rationalizing the many forms of postsecondary credentials in the US, from private industry as well as the full range of educational institutions, would also be helpful, so both employers and workers would better understand the supply of and demand for credentials and which skills they signal to each other. And creating more and better opportunities for individuals to obtain “lifelong learning” when their specific skills become obsolete or need upgrading could be extremely important in a dynamic labor market with lots of technological change and restructuring.

Replicating and scaling the best job-driven models requires that we encourage reforms in community colleges, perhaps along the lines suggested by Tom Bailey and his colleagues that would encourage more structured and “guided” pathways to credentials and the labor market. But more likely needs to be done to encourage this process, and to make sure colleges build sufficient instructional capacity in the pathways they create in high-demand fields.

This likely requires a combination of carefully targeted resources to community colleges – to be spent only on expanding high-demand instruction and supports for disadvantaged students (like better career and academic counseling) while strengthening the incentives and accountability that these colleges face to improve both academic and employment outcomes of students (Holzer, 2014).²⁸ Specifically, more states should engage in performance-based funding for higher education, with both academic and subsequent employment outcomes defining such performance.

Care must be taken to structure the incentives in ways that do not simply award the colleges for “cream-skimming” the best applicants while avoiding disadvantaged ones. While for-profit colleges already face market incentives to respond, they need further regulation to improve the

²⁸ For instance, career counseling at community colleges could likely be improved by collocating more American Jobs Center (One Stop) sites on their campuses.

outcomes they provide to students in return for the high tuition levels they charge and the debts student incur in the process (Cellini and Chaudhury, 2014).

And governments at the federal, state and local levels should do more to engage employers in training partnerships, and perhaps to more frequently take the “high road” to competition by investing more in upgrading their workers’ skills (Holzer, 2015b). A range of methods, using both financial incentives (like grants and tax credits as well as preferences in receiving government procurement contracts) and technical assistance might help them do so. South Carolina, among other states, provides tax credits to employers for every apprenticeship created, and they market the apprenticeships to employers quite effectively. In a few short years they have convinced 700 employers to create apprenticeships (Lerman, 2014).

Some states have been exploring how to achieve scale in their partnerships, by encouraging participation in various consortia or networks of employers through various incentives. This moves them towards systemic efforts rather than individualized programs. For instance, Minnesota now allocates its Perkins funds only to such consortia of schools and employers. Kentucky’s Federation for Advanced Manufacturing Education (FAME) is a systemic model for advanced manufacturing training that might be replicable for other industries. But, given how little we know about what works or doesn’t work cost-effectively in this area, a great deal of experimentation and evaluation needs to be done to learn that.

Broadly speaking, all of the specific ideas above could be categorized into the following broader recommendations for moving forward:

- A wide range of public efforts should be made to incentivize and assist community colleges and employers – on both the supply and demand sides of the market – to create both better-paying jobs and the workers with the skills to fill them;
- Efforts to scale these approaches and make them systemic, by encouraging participation in a range of partnerships and consortia, remain high priorities;
- We should experiment with and rigorously evaluate a range of such efforts at the state and local levels, while continuously providing feedback to both on “best practices” based on these evaluations;
- All such efforts should work to create a mix of general and specific skills and credentials that the labor market rewards over the short-term and long-term;
- Workforce preparation efforts should begin earlier, with high-quality and universal career and technical education in middle schools and high schools, while also providing much better opportunities for adults to update their skills later in their lives through “lifelong learning” options; and
- Innovative efforts of states to forecast the demand for and supply of skills in fast-changing economic environments, and to adjust their partnerships accordingly, should be encouraged and evaluated as well.

REFERENCES

- Administration for Children and Families. <http://www.acf.hhs.gov/programs/ofa/programs/hpog>. US Department of Health and Human Services.
- Andersson, Fredrik et al. 2013. "Does Federally Funded Job Training Work? Nonexperimental Impact Estimates Using Longitudinal Data on Workers and Firms." NBER Working Paper.
- Appelbaum, Eileen et al. 2003. *Low-Wage America*. New York: Russell Sage Foundation.
- Autor, David. 2010. "The Polarization of Job Opportunities in the US Labor Market." The Hamilton Project, Brookings Institution and Center for American Progress.
- Autor, David. (2014). "Skills, Education and the Rise in Earnings Inequality among the Other 99 Percent." *Science*. 344: 6186, 843-851.
- Autor, David. 2015. "Why Are There Still So Many Jobs? The History and Future of Workplace Automation." *Journal of Economic Perspectives*. Vol. 29, No. 3.
- Autor, David and Michael Handel. 2009. "Putting Tasks to the Test: Human Capital, Job Tasks and Wages." NBER Working Paper.
- Backes, Benjamin et al. 2015. "Is It Worth It? Postsecondary Education and Labor Market Outcomes for the Disadvantaged." *IZA Journal of Labor Policy*. 4:1.
- Bailey, Thomas et al. 2015. *Redesigning Community Colleges*. Cambridge MA: Harvard University Press.
- Barnow, Burt et al. 2013. *Occupational Labor Shortages: Concepts, Causes, Consequences and Cures*. Kalamazoo MI: W.E. Upjohn Institute of Employment Research.
- Bartik, Timothy. 2012. "The Future of State and Local Economic Development Policy: What Research is Needed." *Economic Growth and Cultural Change*, Vol. 43, No. 4
- Beaudry, Paul and David Sand. 2013. "The Great Reversal in the Labor Market for Education and Cognitive Skills." NBER Working Paper.
- Becker, Gary. 1996. *Human Capital*. Second Edition. Chicago: University of Chicago Press.
- Bettinger, Eric et al. 2013. "Student Supports: Developmental Education and Other Academic Programs." *The Future of Children*, Vol. 23, No. 1.
- Blanchard, Olivier and Lawrence Katz. 1992. "Regional Evolutions." *Brookings Papers on Economic Activity*.
- Brynjolfsson, Eric and Andrew McAfee. 2014. *The Second Machine Age*.
- Cappelli, Peter. 2014. "Skill Gaps, Skill Shortages and Skill Mismatches." NBER Working Paper.

Carnevale, Anthony et al. 2014. *Recovery: Job Growth and Educational Requirements Through 2020*. Washington DC: Georgetown Center on Education and the Workforce.

Cascio, Elizabeth and Diane Schanzenbach. 2014. "Expanding Pre-School Access for Disadvantaged Children." In M. Kearney and B. Harris eds. *Policies to Address Poverty in America*. The Hamilton Project, Brookings Institution, Washington DC.

Cellini, Stephanie Riegg and Latika Chaudhary. 2014. "The Labor Market Returns to a For-Profit College Education." *Economics of Education Review*, Vol. 43: 125.

College Board. 2013. *Rethinking Pell Grants*. Washington DC.

Conway, Maureen and Robert Giloth. 2014. "Introduction." In M. Conway and R. Giloth eds. *Connecting People to Work: Workforce Intermediaries and Sector Strategies*. Washington DC: Aspen Institute.

Daly, Mary et al. 2012. "A Search and Matching Approach to Labor Markets: Did the Natural Rate of Unemployment Rise?" *Journal of Economic Perspectives*.

Davis, Steven et al. 2013. "The Establishment Level Behavior of Vacancies and Hiring." *Quarterly Journal of Economics*.

Dyer, Barbara et al. 2014. "Philanthropic Innovations for Workforce Impact: The National Fund for Workforce Solutions, 2003-2013." In M. Conway and R. Giloth eds. *Connecting People to Work: Workforce Intermediaries and Sector Strategies*. Washington DC: Aspen Institute.

Elliott, Mark and Anne Roder. 2015. "Workforce Development and Random Control Trial Evaluations." Unpublished memo, Economic Mobility Corporation, New York City.

Fairchild, Denise. 2014. "Emerald Cities Collaborative: Case Study of a High Road Sector Initiative." In M. Conway and R. Giloth eds. *Connecting People to Work: Workforce Intermediaries and Sector Strategies*. Washington DC: Aspen Institute.

Fein, David. 2012. *Career Pathways as a Framework for Program Design and Evaluation*. Office of Planning and Research Evaluation, Administration of Children and Families, US Department of Health and Human Services.

Geel, Regula and Uschi Backes-Gellner. 2011. "Occupational Mobility Within and Between Skills Clusters: An Empirical Analysis Based on the Skills-Weights Approach." *Empirical Research in Vocational and Employment Training*. Vol. 3, No. 1.

Goldin, Claudia and Lawrence Katz. 2008. *The Race Between Education and Technology*. Cambridge MA: Harvard University Press.

Goldrick-Rab, Sara. (2010). "Challenges and Opportunities for Improving Community College Student Success." *Review of Educational Research*, 80:3, 437-469.

Haskins, Ron. 2014. *Show Me the Evidence*. Washington DC: Brookings.

- Heckman, James. 2008. "Schools, Skills, and Synapses." NBER Working Paper.
- Heckman, James et al. 1999. "The Economics and Econometrics of Active Labor Market Programs." In O. Ashenfelter and D. Card eds. *Handbook of Labor Economics, Vol. 3A*. Amsterdam: North Holland.
- Heinrich, Carolyn et al. 2011. "A Non-Experimental Evaluation of WIA Programs." In D. Besharov and P. Cottingham eds. *The Workforce Investment Act: Implementation Experiences and Evaluation Findings*. Kalamazoo MI: W.E. Upjohn Institute for Employment Research.
- Hershbein, Brad and Lisa Kahn. 2015. "Is College the New High School? Evidence from Vacancy Postings."
- Holzer, Harry. 2014. "Improving Employment Outcomes for Disadvantaged Students." In M. Kearney and B. Harris eds. *Policies to Address Poverty in America*. The Hamilton Project, Brookings Institution.
- Holzer, Harry. 2015a. *Job Market Polarization and Worker Skills: A Tale of Two Middles*. Policy Brief, Economic Studies, Brookings Institution, Washington DC.
- Holzer, Harry. 2015b. *Higher Education and Workforce Policy: Creating More Skilled Workers (and Jobs for Them to Fill)*. Policy Brief, Economic Studies, Brookings Institution, Washington DC.
- Holzer, Harry and Erin Dunlop. 2013. "Just the Facts Ma'am: Postsecondary Education and Labor Market Outcomes in the US." CALDER Working Paper, American Institutes for Research, Washington DC.
- Jayuraman, Saru. 2014. "Restaurant Opportunities Centers United: Service the Service Sector." In M. Conway and R. Giloth eds. *Connecting People to Work: Workforce Intermediaries and Sector Strategies*. Washington DC: Aspen Institute.
- Kemple, James. 2008. *Career Academies: Long-Term Impacts on Work, Education and Transitions to Adulthood*. New York: MDRC.
- Lerman, Robert. 2015. "Do Employers Train Enough? Theory, Evidence and Implications for Policy." Commissioned Paper, Study on the Supply Chain for Middle-Skill Jobs. National Academies of Science, Washington DC.
- Lerman, Robert. 2014. "Expanding Apprenticeship Opportunities in the United States." In M. Kearney and B. Harris eds.
- Leung, Loh-Sze. 2014. "A Brief History of SkillWorks: Partners for a Productive Workforce." In M. Conway and R. Giloth eds. *Connecting People to Work: Workforce Intermediaries and Sector Strategies*. Washington DC: Aspen Institute.
- Long, Bridget Terry. 2014. "Addressing the Academic Barriers to Higher Education." In M. Kearney and B. Harris eds. *Policies to Address Poverty in America*. The Hamilton Project, Brookings Institution.

Loprest, Pamela and Sheila Zedlewski. 2001. "Will TANF Work for the Most Disadvantaged Families?" In R. Blank and R. Haskins eds. *The New World of Welfare*. Brookings Institution Press, Washington DC.

Lumina Foundation. 2015. *Making the Case for Reforming the US Credential System*. Washington DC.

Maguire, Sheila et al. 2010. *Tuning Into Local Labor Markets*. Philadelphia: PPV>

Martin, Vanessa and Joseph Broadus 2013. Enhancing GED Instruction to Prepare Students for College and Careers: Early Success in LaGuardia Community College's Bridge to Health and Business Program. New York: MDRC.

Manufacturing Institute. 2014. *Manufacturing Skills and Training Study*. Washington DC.

McCarthy, Mary Alice. 2014. *Beyond the Skills Gap: Making Education Work for Students, Employers and Communities*. Washington DC: New America Foundation.

Melendez, Edwin. 1996. *Working on Jobs*. Boston: University of Massachusetts.

Michaelides, Marios et al. 2015. *Evidence on the Effectiveness of Three Workforce Partnership Programs in Ohio*. IMPAQ, Washington DC.

Modestino, Alicia et al. 2015. "Upskilling: Do Employers Demand More Skills When Workers are Plentiful?" Unpublished, Northeastern University.

Naimovich, Nir and Henry Siu. 2012. "The Trend is the Cycle: Job Polarization and Jobless Recoveries." NBER Working Paper.

National Governors Association. 2013. *Sector Strategies Come Of Age*. Center for Best Practices, Washington DC.

National Research Council. 2015. *Study on the Supply Chain for Middle Skills Jobs*. National Academies Press, Washington DC.

OECD. 2013. *Skills Outlook 2013: First Results from the Survey of Adult Skills*. Paris.

Osterman, Paul and Andrew Weaver. 2014. "Why Claims of Skills Shortages in Manufacturing are Overblown." Economic Policy Institute, Washington DC.

Popovich, Mark. "Journeys and Destinations: The National Fund for Workforce Solutions." In M. Conway and R. Giloth eds. *Connecting People to Work: Workforce Intermediaries and Sector Strategies*. Washington DC: Aspen Institute.

Reamer, Andrew. 2013. "Using Real time Labor Market Information on a Nationwide Scale," policy brief, Credentials That Work Initiative, Jobs for the Future.

Roder, Anne and Mark Elliott. 2011. "A Promising Start: Year Up's Initial Impacts on Low-Income Young Adults' Careers." New York: Economic Mobility Corporation.

- Ross, Martha. 2015. *Unemployment Among Young Adults: Exploring Employer-Led Solutions*. Washington DC: Brookings Institution.
- Rothstein, Jesse. 2012. "The Labor Market Four Years Into the Crisis: Assessing Structural Explanations." *Industrial and Labor Relations Review*. Vol. 65, No. 3.
- Schwartz, Nelson. 2013. "Where Factory Apprenticeship is Latest Model from Germany." *The New York Times*. November 30.
- Shemkus, Sarah. 2015. "Growing Skills Gap: 80% of Small Businesses Can't Find Qualified Staff." *The Guardian*. June 22.
- Stevens, Ann et al. 2015. "Career and Technical Education and Labor Market Outcomes: Evidence from California Community Colleges." NBER Working Paper.
- Symonds, William et al. 2011. *Pathways to Prosperity*. Cambridge MA: Graduate School of Education, Harvard University.
- Ton, Zeynep. 2014. *The Good Jobs Strategy*. MIT Press.
- Uchitelle, Louis. 2009. "Despite Recession, High Demand for Skilled Labor." *The New York Times*. June 23.
- Watson, Orson. 2014. "Workforce Intermediaries in a Slack Labor Market: Who Pays and for What?" In M. Conway and R. Giloth eds. *Connecting People to Work: Workforce Intermediaries and Sector Strategies*. Washington DC: Aspen Institute.
- White House. 2014. *Job-Driven Training and American Opportunity*. Washington DC.
- Zeidenberg, Matthew et al. 2010. "Washington State's I-BEST Program: New Evidence of Effectiveness." Community College Research Center, Columbia University.
- Zinn, Rachel and Andy Van Kluenen. 2014. *Making Workforce Data Work*. Washington DC: National Skills Coalition