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An analysis of apprentices in the US construction trades

An overview of their training and development with recommendations for policy makers

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Abstract

Purpose – The purpose of this research is to provide an in-depth analysis of the labor market for apprentice training in the US construction industry. Also, the paper analyzes the learning process of apprentices and discusses the role of apprenticeships as a pathway to higher education.

Design/methodology/approach – The interdisciplinary approach of this research integrates both the economic, institutional and educational aspects of apprenticeship training to show the process of developing the construction labor force in the USA.

Findings – The major finding of this research is to highlight the importance of apprenticeship programs in the US construction industry and how these programs can be used as a way to help rebalance the labor market. By increasing the number of workers with intermediate skills, we can insure the distribution of skills more closely matches the distribution of available jobs.

Research limitations/implications – Because of space constraints, the research limitations are that little is said about the factors that affect apprenticeship program completion rates.

Practical implications – The practical implications of this research are to provide policy makers some recommendations that can be used to foster the growth and development of apprenticeship programs in the US construction industry.

Social implications – The major social implications are that apprenticeship programs should viewed as an alternative pathway to higher education. They can ultimately improve career mobility and earnings. This can lead to a more equal distribution of income while expanding the tax base.

Originality/value – This paper provides a unique analysis of an important segment of the US labor force by focusing on the economics and learning process of apprentices in the US construction industry. Understanding the learning styles of many apprentices helps explain the importance of the dual nature of their training.

Keywords Training design, Registered apprenticeship, Labor market failure, Learning style, Learning pathways, Life long learning, Construction industry, Education, Apprenticeships, United States of America, Training

Paper type Research paper

Introduction

Maintaining a healthy construction industry is vitally important for statewide, regional, national and international economic development[1]. The construction and maintenance of public buildings and infrastructure, including commercial and residential real estate, depend heavily on firms experienced in project management coupled with a highly trained workforce. As of 2009, the amount of US gross domestic product (GDP) devoted to the construction industry was $537,460,000,000. This represents about 4 percent of US GDP[2]. Total employment in US construction

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during 2009 was 6,244,000 workers representing about 4.6 percent of the total US labor force[3].

Given the size of the US construction industry in terms of its share of GDP and employment, the purpose of this research is to describe and highlight the growing importance of the recruitment, training and development of the US construction workforce with particular emphasis on registered apprenticeship programs.

Section 1 will define a registered apprenticeship program and how it is structured in the US construction trades. The economics of training will be discussed in Section 2. The problem of "poaching" resulting from labor market failure is contrasted with a competing hypothesis involving labor market transaction costs. Section 3 addresses the importance of institutions as a response to external labor market failure. The learning process and the design of apprenticeship programs will be developed in Section 4. Section 5 explores the role of apprenticeship as a pathway to lifelong learning. Section 6 offers some recommendations for policy makers.

1. Registered apprenticeship in the US construction trades[4]

Apprenticeship training combines on-the-job work experience with formal classroom instruction. It is widely believed that craft skills can be acquired most effectively by performing trade-specific tasks under the direct supervision of experienced journeyworkers[5]. The classroom portion of an apprenticeship focuses on general training that complements craft-specific skill development (Cappelli, 1996). The construction industry requires a broad-based set of skills used by craft workers that cannot be acquired from full-time schooling alone. These occupations require apprentices to be able to connect the academic, vocational and practical elements of their training in order to have an integrated understanding of their trade (Gray and Morgan, 1998).

Using the state of California as a representative example, the structure of apprenticeship training is a partnership between industry, labor, education and government. A Joint Apprenticeship Committee (JAC) or Unilateral Apprenticeship Committee (UAC) supervises the actual training. A JAC is composed of representatives from construction firms and craft labor unions while a UAC is made up of a multi-employer group or an individual employer. A person applying for a registered apprenticeship (RA) program must be at least 16 years old and preferably hold a high-school diploma or GED certificate. Most construction trades require four years of on-the-job training (OJT) (8,000 hours) and a recommended 144 hours a year of formal classroom instruction[6].

Upon successful completion of an entrance exam, a contract of employment and training is signed by the candidate and training sponsor, outlining the responsibilities of each party to the agreement. Once the agreement is signed, it is filed with the Division of Apprenticeship Standards (DAS) in the California Department of Industrial Relations (DIR). The role of the DAS is to serve as the government entity that provides consultation and developmental services to labor and management groups undertaking apprenticeship programs. The DAS is also the registration and certification agency for apprentices in California and issues a "Certificate of Completion" to trainees who successfully complete their apprenticeship program. Finally, the California Apprenticeship Council provides policy advice on apprenticeship matters to the DIR, issues rules and regulations on specific apprenticeship subjects, and conducts appeals hearings.

2. The economics of training

In the context of apprenticeship, skill formation is the process of combining two distinct components of training. Becker (1993) refers to these components as general vs specific training. General training can be applied in similar firms within the same industry or in firms across different industries. For example, the theoretical classroom knowledge (general training) an apprentice electrician receives can be applied in the construction of residential and commercial buildings as well as in the manufacturing industry. Further, softer skills such as self-discipline, reliability, attention to detail and respect for peers and teachers have general applicability (Streeck, 1989). Therefore, general training is not unique and increases the productivity of an apprentice within and across industries. On the other hand, specific training increases the productivity of an apprentice in a firm that is providing the training. The theoretical distinction between general and firm-specific skills often blurs in practice (Cappelli, 1996). Becker (1993) has emphasized that OJT actually contains elements of both general and firm-specific training. The ability to achieve high productivity gains from specific training increases the productivity of a worker's general training through the acquisition of complementary knowledge. For example, firm-specific training is often guided by principles learned in the classroom. Also, occupational skills often transcend the specific-general dichotomy. These skills are general in the sense of having value to more than one industry but may be more specific to firms in a particular industry, such as construction where a journeyworker has spent most of his career (Lerman *et al.*, 2009; Lerman, 2010). As a matter of degree, since OJT increases the productivity of an apprentice more in the firm that is providing the training, it more closely approximates specific training. Classroom instruction increases understanding (and therefore productivity) by at least as much in all firms and can be viewed as general training.

Since general training is more transferable to other employers compared to firm-specific training, firms are less apt to finance the general component of apprenticeship training and more willing to share the cost of specific training. For example, apprentices in the construction trades are required to attend formal classes regularly without direct monetary compensation. However, during a typical OJT period of four years, apprentices begin earning 35 to 50 percent of a journeyworker's hourly wage when their productivity is relatively low. As apprentices begin to learn and their productivity increases, they receive periodic pay increases (usually every six months) until they reach the productivity and compensation level of the journeyworker.

In reality, firms do fund a small portion of apprentices' general training by contributing regularly to a training fund. These resources help with the cost of instructors and training materials. Also, at the beginning of the training period, employers absorb relatively more of the cost of OJT when apprentices' hourly wage rate exceeds their hourly contribution to output (productivity). However, during the latter stages of training, employers enjoy relatively more of the benefit of OJT. In this stage, apprentices begin to pay back their employers when their hourly contribution to output (productivity) begins to exceed their hourly wage rate. Apprentices' hourly wage rate remains below that of journeyworkers until they graduate from their training program.

The labor market must supply an adequate number of highly trained construction workers. The replacement of retiring workers coupled with natural occupational expansion associated with economic growth will create job openings in the construction sector (Lerman, 2009). If construction workers retire at a faster rate than new workers can be trained, skill shortages will result. This can cause

imperfections in the market for training where the socially desired amount of training is less than optimal. Further, as Finegold (1993) indicates, firms may not be willing to invest in training new workers because the US has a highly mobile workforce. Labor market imperfections resulting from less than optimal amounts of training and trainee mobility may lead to the problem of "poaching." For example, construction firms may perceive that it is risky hiring new apprentices if they could be hired away "poached" by competitors before the hiring firms recoup their investment in training toward the end of an apprentice's training period. If all construction firms in a particular labor market also fear that their trainees have a high probability of being poached, then skill formation in the corresponding construction industry would decline. In this case, when the labor market fails to produce a socially optimal amount of training, it generates a negative externality spilling over into the construction industry's product market[7]. Less productive construction workers with inadequate training would produce lower quality construction projects at higher prices since it would take them more time to complete a given task compared to more highly trained workers. At higher prices, society would then purchase a lower quantity and quality of construction output than desired.

An alternative view to the poaching problem is that employers have an incentive to fund general training. Acemoglu and Pischke (1999) suggest that because there are transaction costs in the labor market, it may be difficult for workers to quit and costly for employers to replace them. For example, it takes time and resources for apprentices to seek alternative employers and creates the uncertainty of working for a different firm. As long as the transaction costs and uncertainty exceed the expected benefit from being poached, apprentices are more likely to remain with their current employer.

It also takes time and resources to recruit new apprentices if poaching becomes a problem for employers. As long as the transaction (turnover) costs associated with poaching exceed the costs of general training, a greater provision of general training will be funded by employers. Also, firms providing the training know the value and content of the training better than their competitors. Further, training providers have a better grasp of how well individual workers absorb knowledge than a prospective employer.

In a survey of apprentice sponsors conducted by Lerman *et al.* (2009), they found that only 25 percent of survey respondents said poaching was a significant problem. Overall, employers did not view poaching as a deterrent to sponsoring apprenticeship programs. This evidence lends some indirect support for the transaction cost hypothesis proposed by Acemoglu and Pischke (1999). In general, employer transaction (turnover) costs associated with poaching appear to be greater than the cost of funding the general training of apprentices.

3. Labor market institutions

If labor markets fail to allocate enough training to the construction industry and if labor market transaction costs for some apprentices and employers are sufficiently low, are there ways to minimize this failure? Institutional economics suggests that if inadequate amounts of training are being generated in the competition for workers, good employers may be pulled down to the level of bad employers (Parker, 1997). For example, in response to the problem of poaching, an otherwise good employer may reduce the breadth of apprentice training by designing programs that focus more on firm-specific tasks that are less transferable (Gospel and Foreman, 2002). In other words, as long as employers have an incentive not to adequately train because of labor

mobility and apprentices have no incentive to complete their training program because of lack of transferable skills, a low-skills equilibrium will persist in the construction labor market (Gray and Morgan, 1998). This type of labor market failure suggests that individual contractors may need institutional support in order to take on apprentices.

In many cases, coordinated multi-employer training can help to minimize any potential problem of poaching and correct for some of the labor market failure. If more construction firms in a region or labor market share the costs of training, this would reduce the likelihood that any one firm would be at a competitive disadvantage. Therefore, construction firms would be more likely to train the breadth of skills that enhance the value of their apprentices (Gospel and Foreman, 2002).

Institutional support in the construction trades is already an integral part of apprenticeship training in many states. For example, JAC and UAC programs in California are assisted by the DAS to help distribute the costs, risks and benefits of apprentice training among the key stakeholders, including construction firms, craft labor unions and trainees. Many trade unions and employer associations favor extensive training opportunities for qualified apprentices because high levels of training create mutual benefits (Ryan, 2001). Labor unions can justify higher wages more easily if the workers they represent have above-average productivity resulting from their training. Construction firms can be more competitive because of a more productive labor force. Also, since industry "ownership" is a key feature of apprenticeships in the construction trades, the industry is in the best position to update training curricula in response to its changing needs (Fuller, 1996). Interestingly, the Construction Cost Effectiveness Task Force (1997) supports apprenticeship training as provided by groups such as JAC's[8]. Single employers that lack institutional support are likely to experience more poaching and therefore provide less training. These firms may simply not recognize the need or appreciate the productivity and safety benefits that can result from apprenticeship training.

When the key stakeholders of apprenticeship training are brought together in a regional labor market, it is much easier to set uniform training standards and monitor the progress of apprenticeship programs. In the USA, skill standards are organized around industries (Cappelli, 1996). Benchmarking industry standards to advanced training practices and insuring that all parties understand training incentives are essential for industry compliance[9]. For example, construction firms will provide training if they are assured apprentices will accept a training wage. Apprentices will accept a training wage if they are assured of learning a valuable trade that will increase their future income. Moreover, employers will provide ongoing training only if they have assurance that their peers would do the same. The only way to move to a high-skills equilibrium and achieve a critical mass of productive construction firms in the regional labor market is for them to pool their resources and agree to high standards. Beyond understanding the incentive to train, Parker (1997) emphasizes that only the institutional enforcement of broad training standards will lead to a uniform quality of industry training.

Because smaller construction firms have fewer resources for training and may lack the institutional support and incentives needed for apprenticeship programs, this part of the construction industry may remain in a low-skills equilibrium. Smaller construction firms may be able to adjust to a low-skills equilibrium by producing products with mass-production techniques that simply require fewer skills (Cappelli, 1996). For example, residential housing contractors may be able to use more prefabricated construction materials reducing their need for highly skilled carpenters.

According to the Tavistock Institute (1998), if small firms can achieve desired profit levels by producing lower-cost, lower-quality, high volume goods that require minimal skill levels, there is little reason for them to provide high levels of training if skill development is not part of their overall business strategy. Unfortunately, what may be true for part of an industry may not be true for the industry as a whole. Product markets can change because of local or foreign competition. Moving to a high-skills equilibrium increases worker flexibility and transferability of skills resulting in a lower probability of unemployment.

If individual construction firms lack institutional support and are unwilling to organize in order to share the cost of training, what type of incentive could encourage them to provide more training? One possibility is to provide small construction firms tax subsidies to finance apprenticeship programs. The subsidies should be tied to completion rates aligning the interests of construction firms, trainees and the government agencies offering the subsidies[10] (Cappelli, 1996).

Increasing the average skill level of the construction workforce would also lead to greater earnings, reducing income inequality while increasing the tax base.

4. The learning process and the design of apprenticeship training

Apprenticeship programs have three interrelated dimensionscontractual framework, cultural and social aspects of the workplace, and formal and informal off-the-job and OJT.

The contractual framework formalizes the commitment to learn on the part of the apprentice and the responsibilities of the training sponsor. The cultural and social aspects of the workplace should provide an environment conducive to learning. Additionally, the overall training should be designed to maximize student learning, providing trainees a set of skills that are transferable within and across industries, resulting in credentials that are nationally recognized (Fuller and Unwin, 1998). The transferability of journeyworkers' qualifications both within the USA and across borders improves the flexibility of the job market through greater worker mobility (Rauner and Smith, 2010a).

The overall goal of an apprenticeship program should be to increase the pool of workers with intermediate skills (Gallacher *et al.*, 2004). The focus should be skills acquisition rather than employment (Karmel and Mlotkowski, 2010).

Classroom learning is more passive, conceptual and reflective. It tends to focus on "why" and helps develop knowledge that may not be immediately useful but can be accessed over time when needed. It tends to be industry-wide and useful "just-in-case." On the other hand, OJT is more active, practical and experiential. The short-run objective is to learn "how" and it is task oriented. This type of learning is often firm specific and "just-in-time" (Harris *et al.*, 2001b). For example, traditional OJT follows the three-step method:

(1) observation of the work of the journeyworker (trainer);

(2) completion of a similar task by the apprentice; and

(3) coaching and feedback to the apprentice by the journeyworker (D'Agostino *et al.*, 2010).

The OJT activities provide the "experiential hooks" to which to "attach" the formal knowledge gained in the classroom. The juxtaposition of on-the-job experience with formal classroom training deepens learning by improving understanding

(Gendron, 2010). While theoretical knowledge is important, it does not lead to practical competence.

Perhaps the most powerful apprentice learning results from performing new, unknown or unexpected tasks with more expert journeyworkers (Onstenk, 1997; Blokhuis, 2006). A shock or something unexpected can be a strong source of learning. Onstenk (2010) indicates that learning at the workplace is neither always predictable or guided only by explicitly formulated learning objectives.

Recent research indicates that awareness of differences in the "learning style" of apprentices is key to ensuring their success in a training program (Smith, 2000). This is relevant to the professional development of apprentices as they must link their practical OJT to their academic classroom instruction to successfully complete their training program. Bradley *et al.* (1992) define learning style as the characteristic and preferred way a person absorbs and interacts with information, including how the individual responds to the learning environment. Understanding an apprentice's learning style is based on three key assumptions:

(1) there are individual differences in the learning style of apprentices;

(2) apprentices vary in their preferred learning approach; and

(3) apprentices using their preferred way of learning deepen and accelerate their learning (Jonassen and Grabowski, 1993).

Four important examples of student learning styles are:

- Active experimentation – engaging in projects, experiments and homework. These students tend to be extroverted and prefer small group discussion over passive learning situations, such as lectures. They learn by doing.
- Concrete experience – preferring experienced-based learning to memorizing theories. These students dislike theory because they prefer to treat every situation as a unique case. They gain more from working with their peers rather than authority figures.
- Abstract conceptualization – practicing logical thinking and rational evaluation. Students prefer to learn in authority-directed and impersonal learning environments. They tend to learn best when theory and systematic analysis are emphasized. Students find unstructured learning approaches frustrating because of the lack of focus.
- Reflective observation – making tentative judgments based upon careful investigation. These students tend to be introverted and prefer traditional learning such as lectures where they are allowed to be impartial, objective observers in a learning situation (Bradley *et al.*, 1992).

Students who prefer abstract conceptualization and reflective observation tend to learn deductively. They acquire knowledge the easiest when concepts are based on laws, rules or widely accepted principles. Deductive reasoning refers to the process of concluding that something must be true because it is a special case of a general principle that is known to be true. On the other hand, apprentices who prefer active experimentation and concrete experience tend to learn inductively. Inductive reasoning is part of the discovery process whereby the observation of special cases leads one to suspect very strongly that some principle is true. In essence, a deductive argument is supported by reference to a law, rule or

theory while an inductive argument is supported by previous observations or experience[11].

Gardner (1983) emphasizes that the workplace provides a motivating "active learning" environment for young people who possess a more practical form of intelligence that is different from, but not inferior to, a classical academic intelligence. Unfortunately, some apprentices are mislabeled as being low achievers when they simply have a learning style that is not as conducive to abstract conceptualization. These students are often much more motivated to learn when learning takes place in a workplace environment (Organization for Economic Cooperation and Development (OECD), 2000).

Interestingly, Smith's (2002) sample of trainees in her research tended to initially favor OJT over classroom instruction at the beginning of their training program. However, during their first year of training, their attitudes shifted somewhat, as they began to understand how off-the-job training could broaden their learning and make up for deficiencies in their workplace. Indeed, Benke (2010) argues that classroom training should nurture basic competences that are not concrete-occupational, functional or firm specific. This is crucial for developing innovative thinking. Teaching innovations such as project-based learning puts the apprentice in the role of the active producer of knowledge. By dealing with complex and unpredictable work situations, innovation and flexibility are fostered (Halfpap, 2000).

Students are more motivated to learn when they can begin to connect formal classroom instruction with their OJT. This connection can be fostered by providing classroom staff periodic opportunities to observe or work with journeyworkers, helping to insure what is being taught is relevant and up to date (Huddleston, 1998). Student motivation can also be triggered when apprentices recognize the gap between their knowledge and that of practicing journeyworkers. Awareness of this gap motivates student learning when they see that skill acquisition is associated with occupational status and higher future income (Fuller and Unwin, 1998). Some journeyworkers may find it difficult to share their knowledge with apprentices because much of it becomes automatic over time and can be difficult to articulate to novices (Brooker and Butler, 1997). Therefore, training the trainers is essential. For example, journeyworkers assigned to training need to know when to "fade," allowing the apprentice to progressively develop self-confidence empowering her to tackle tasks in a self-directed manner (Billett, 1993).

In order to maximize the application of classroom knowledge, it is important to design OJT so that it gives the apprentice a variety of practical experiences. Both the depth and breadth of skills must be developed in order to insure skill transferability within the construction industry. Since skill standards in the USA are organized around industries rather than occupations, this structure tends to make skill acquisition less general, thereby reducing transferability between industries (Cappelli, 1996). Given this current structure, training opportunities must at least increase the employability of apprentices within the construction industry. Lerman (2009) however, has observed that jobs in the construction industry have become less secure. One way to improve skill transferability between industries is to require the completion of an associate's degree. This can improve the portability of skills across industries and labor market flexibility. In fact, economists judge the quality of education and training based upon labor market flexibility, which can lead to higher pay and less unemployment (Ryan, 1998).

Given the diversity of training in the industry, it is important to expose apprentices to a wide range of skills within and across construction firms. There are three basic

approaches to training design. These include job enlargement, job enrichment and job rotation (Hackman and Oldham, 1980). During the initial stages of training, apprentices will be learning a few basic tasks within their particular trade. Once mastery of those tasks has been achieved, the journeyworker (trainer) will enlarge the training experience by adding more tasks at the same level of responsibility. Job enlargement increases task variety by horizontally expanding the number of tasks within a particular job. While this may reduce the monotony of a job, it does not motivate the apprentice to perform at a higher level. Higher-level performance will occur later during the training period as a result of job enrichment. If an apprentice were performing, say, five different tasks as a result of an enlarged job, job enrichment would add more responsibility to each of the five different tasks. Job enrichment emphasizes skill depth and greater achievement, which increase self-confidence.

If a given job involves an increasing number of tasks that are eventually enriched, once the apprentice has mastered the tasks, he will be ready to move on to a different job involving a new set of tasks that can be enlarged and ultimately enriched. Job rotation may occur in the same firm or may require the apprentice to move to a different firm. Larger construction firms are more likely to have multiple jobs available for trainee rotation. Job rotation is especially important in small firms that may have jobs that do not require enough skills to keep trainees occupied (Cappelli, 1996).

Without job rotation across construction firms, single-employer training may create high-skilled islands within a low-skilled sea and fail to have a positive effect on the construction industry (Gospel and Foreman, 2002).

One way JAC's have minimized the potential for narrow skill development is the use of union-sponsored training facilities[12]. These facilities provide simulated work experiences complementing and adding to OJT at worksite locations. When it is not possible to rotate apprentices across a sufficient number of worksites to acquire the range of skills needed to become a certified journeyworker, training centers help expand skill breadth (Westerhuis, 2007). Periodically, a portion of the training may be conducted off the jobsite in "vestibules" located in the training center. Vestibule training is a type of instruction using a small area away from the actual worksite. It consists of training equipment and materials that duplicate what is used on the actual jobsite without affecting production (Aamodt, 2007). Job rotation encompassing vestibule training ultimately increases skill transferability, thereby improving the flexibility of the construction labor market.

How the OJT curriculum is structured will be influenced in part by the size distribution of construction firms in a particular district or labor market. In practice, even well-designed OJT can be disrupted by short-term production goals. Journeyworkers' time is limited, often requiring apprentices to show greater initiative (Hodkinson *et al.*, 2000). If firms treat apprentices as low-cost labor, focusing only on production goals, apprentice completion rates are likely to decline. According to Kilpatrick's *et al.* (2001) study, apprentices would at times prefer classroom instruction over OJT because student learning is less affected by time constraints and profit making, allowing more quality time with trainers.

Beyond classroom instruction and OJT, quality learning depends on the relationships among trainees, employers, trainers, and their shared culture and workplace values regarding training and learning. Opportunities for informal learning that take place through personal interactions, experience and reflection are not deliberately structured in a formal way and are essential for quality apprenticeship

training (Kilpatrick *et al.*, 2001). Clearly, high involvement among all actors in apprenticeship programs is a key factor to their success (OECD, 2000).

5. Apprenticeship training as a pathway to lifelong learning

In the nineteenth and twentieth centuries, apprenticeships did not evolve as a dominant form of occupational training in the USA. During this time period, the US economy and its labor markets were very dynamic (Smart, 2001). Apprenticeship was not well suited to a settler society where land availability continually drained the labor supply (Elbaum and Singh, 1995). More recently, other factors have hindered the growth of apprenticeship training in the USA Gospel (1994) suggests that many firms have been able to seek skilled immigrant labor from countries with strong apprenticeship programs. Countries such as Australia, Canada, Germany and the UK have historically relied relatively more on apprenticeship as an important source of occupational training. As the USA became more industrialized, mass production techniques increased labor specialization, allowing equipment to be operated with semi-skilled and unskilled production workers. Also, a decline in unionization in the USA led to less multi-employer bargaining, weakening the institutional support for training. If apprenticeship training has grown more slowly in the USA, why the renewed interest in this type of vocational education? With a forecasted labor shortage in the USA during the next 20 years, policy makers are looking for ways to increase the size and quality of the labor force (see Kodrzycki, 2002). Unless workers can be attracted and retained, skill shortages will persist causing costs to escalate, delays to increase and construction to decline in quality (Bilginsoy, 1998). This shortage of workers, coupled with demographic and technological change, has caused increased interest in school-to-work programs and lifelong learning. Policy makers want to increase learning opportunities for the widest cross-section of workers improving labor productivity and making the distribution of income more equal.

Apprenticeship training as a form of vocational education prepares students for work in a number of occupations[13]. While construction trades are vocational in nature, they are closely linked to academic disciplines (West and Steedman, 2003). For example, if the objective is to move the construction industry to a higher-skills equilibrium, a range of career opportunities must exist for a cross-section of apprentices and ultimately throughout a journeyworker's career. A broad range of skills can be built upon during a career and transferred within and beyond an occupational labor market (Gospel, 1994). Since classroom training is worth college credit in many states, an apprentice can obtain dual credentials including a journeyworker certificate issued by the US Department of Labor and an associate degree in Construction Technology. This would be important training for a foreman or superintendent's position on a construction site. The highly motivated individual may continue his academic coursework and, say, earn a bachelor's degree in Business Administration. This would enable the journeyworker to eventually become a project manager or start his own construction company. According to Goldin (2002), an apprenticeship allows an individual to receive job training in preparation for an occupation. Formal schooling, however, enables a person to change occupations over a lifetime. Since periods of rapid economic and technological change require continuous training, one should conceptualize qualifications as platforms for transfer to further learning and educational attainment rather than as a termination point (Fuller and Unwin, 1998).

It is not uncommon for young people in the USA to experience extensive "churning," "milling," and "floundering" when making the transition from school to work (Osterman, 1980). As evidence of this difficult transition period, apprentices in the USA typically begin their training in their mid-20s rather than directly after high school (Ryan, 1998; Lerman, 2009). Part of the problem stems from the fact that youth employment options have deteriorated, especially for students classified as low achievers (Ryan, 2001). As mentioned in Section 4, many students are misclassified as low achievers because their learning style is not conducive to purely academic learning environments. Unfortunately, the American College Testing (ACT) educational service reports that for 2010 the mean completion rate for community colleges in the USA was only 27 percent. These results suggest that many students might initially be better served in an apprenticeship program. School-to-work programs are driven by the belief that academic material can best be taught in the context of real applications, especially to students who tend to learn more inductively (Cappelli, 1996). Apprentices who see a close connection between their course work and future career are more likely to graduate (Lerman, 2009).

If apprenticeship programs are designed as an alternative route to higher education, they must motivate young people by offering a path to increasingly rewarding work if they are going to serve as a true pathway to lifelong learning. Increasing the amount of choices toward the end of an apprenticeship program should benefit students across the motivational spectrum. Those who continue to accumulate credits toward a college degree would clearly benefit from their prior craft training while those who choose work would need less work experience improving their employability (West and Steedman, 2003).

Apprenticeship opportunities in the US construction trades must be expanded to cover the complete spectrum of workers. This includes upper secondary students, unskilled and semi-skilled workers, veterans, part-time workers as well as college graduates. Improving the alignment of educational and training markets with the actual needs of the labor market is essential to help reduce labor market churning and spells of unemployment. Because career aspirations may change over the life cycle, more pathways to higher education need to be opened allowing a more diverse pool of workers to participate in a dynamic economy. By broadening advanced general studies within the vocational stream, greater integration between vocational and academic education can be achieved. Developing double-qualifying pathways that provide work qualifications and a college education can increase the attractiveness of apprentice programs in the construction trades (OECD, 2000).

6. Conclusions and recommendations for policy makers

Policy makers in the USA constantly remind the electorate that the "knowledge society" will require every worker to obtain a college degree. This view, unfortunately, has little to do with the reality of economic development. Long-term projections suggest that the demand for all types of labor will remain high in the USA and most developed and developing countries. However, one of the fastest growing segments of the labor market will require workers with intermediate skills (Holzer and Lerman, 2009). These workers (including construction workers) account for well over half the available jobs (Rauner and Smith, 2010b).

When looking at the distribution of skills compared to the distribution of available jobs, there is often a mismatch. Many jobs in the USA require a college degree to qualify for employment but not to actually perform the job, often leading to

underemployment. Also, many college graduates have difficulty finding jobs that coincide with their academic training. In many cases, jobs requiring little skill are declining whereas jobs requiring intermediate skills are rising. These skills are delivered by vocational and technical training available in the apprenticeship system (Rauner and Smith, 2010b).

Fundamentally, apprenticeship programs must be viewed as a labor market instrument to improve employability, ensure a smoother transition from school to working life, and recalibrate career paths to reduce structural unemployment (D'Agostino *et al.*, 2010).

For those workers who have completed their college education in fields where there are no job opportunities, the transition into an apprenticeship program can be looked upon as a reorientation of or even correction to the individual career path (Schlögl, 2010). Alternatively, graduating from an apprenticeship program and transitioning into higher education that is relevant to the job market, i.e. construction industry, increases the future opportunities available to a newly minted journeyworker. In attempting to transition workers into higher education, Schlögl (2010) observes that apprenticeship programs can serve the role of "wooer" into the pathway of learning. Workplace learning can eventually motivate students for theory, but theory alone may not initially be viewed as a way to better make sense of work experiences (Onstenk, 2010).

Given the current state of apprenticeship programs in the US construction industry, wholesale reforms are not needed. However, reforms at the margin will insure that existing practice is more effective and spread across the apprenticeship and educational system (Hogarth *et al.*, 2010).

Students, parents, as well as high school and community college career counselors must be educated about how apprenticeship programs can provide students with an alternative path to higher education and greater earning's capacity. This would also raise the prestige of apprenticeship programs by linking them to higher education. This information can be used to persuade high schools and community colleges to reallocate resources for the purpose of supporting the development of intermediate skills. By creating new career ladders that focus on the needs of the labor market, the educational system can help reduce structural unemployment.

In addition to providing more transparent career information, including well-designed orientation and mentoring programs, the construction industry must provide meaningful learning experiences in order to improve apprenticeship program completion rates. According to Benke (2010), teaching and learning are becoming the most important task of construction firms as they attempt to respond to increased competition and technological change in an era of globalization.

The proper evaluation of skills acquired by apprentices during their training is also essential in order to insure their readiness as future journeyworkers. Trade certification must be competency based rather than strictly based on time served (Rauner and Smith, 2010a). This can be determined by evaluating trade skills and competence in a real work context. Professional knowledge can be assessed with written exams (Rauner *et al.*, 2010).

Researchers need improved access to existing data so they can be used to conduct studies designed to improve the effectiveness of apprenticeship programs (Benke, 2010). Also, new data collection efforts should be vetted with the research community while insuring the data are consistent with the goals of apprenticeship programs (Gallacher *et al.*, 2004). Data collection is necessary to enable researchers to conduct

cost/benefit studies of apprenticeship programs and earnings studies of journeyworkers[14]. This is necessary in order to provide evidence-based research to policy makers, showing the economic value of intermediate skills acquired in apprenticeship programs.

To elevate the importance of issues dealing with intermediate skill development and apprenticeship programs, educational forums should be organized by leaders in the construction industry, educational sector and policy-making communities. These forums would help facilitate communication between labor economists, educational and construction industry experts, economic development practitioners and policy makers.

While the above recommendations are not exhaustive, they will lead to apprenticeship program reviews in the US construction industry providing input into their growth and development. Current apprenticeship programs must continue to evolve in response to the changing demands of apprentices, employers and the knowledge-based economy (Menard *et al.*, 2008). Clearly, the demand for intermediate-skilled construction workers is expected to remain quite strong relative to supply over the next decade (Holzer and Lerman, 2009). Apprenticeship programs in the construction trades that can attract disadvantaged and low-income workers as well as individuals who have acquired academic credentials for which no jobs are available, is essential for improving the distribution of income (Holzer and Lerman, 2009). Policy makers must expand the pathways to higher education through apprenticeship programs and provide more transparent career planning. This would help to rebalance the labor market and insure that the distribution of skills more closely matches the distribution of available jobs.

Notes

1. For example, see Woods (2007) for a recent study of economic growth and income distribution in the state of California, USA.
2. Data Source: US Department of Commerce, Bureau of Economic Analysis.
3. Data Source: US Department of Labor, Bureau of Labor Statistics. Note that construction employment fell by 1.5 million workers in the USA during the Great Recession from December 2007 to June 2009. This represents approximately a 19.8 percent decline in employment compared to pre-recession levels. The annualized unemployment rate in the construction sector in December 2007 was 7.4 percent and increased to 17.4 percent by June 2009.
4. According to the US Department of Labor, the major skilled construction trades typically include bricklayer, carpenter, electrician, operating engineer, painter, pipe fitter, plumber, roofer, sheet metal and structural steel worker.
5. The term "journeyworker" is used generically to include both males and females who have completed a registered apprenticeship program.
6. See the California Labor Code for additional details, available at www.dir.ca.gov/DLSR/, accessed June 12, 2011.
7. In this case, a negative externality occurs in the labor market for training when a residual cost (a lower quality and quantity of construction projects) spills over to a third party (society) that is not directly involved in the market for training.
8. The Business Roundtable is an association of chief executive officers committed to improving public policy.

9. In this context, benchmarking is the continuous process of assessing training quality in one firm against its competitors or recognized industry leaders.

10. An analysis of apprenticeship completion rates is beyond the scope of this research. Excellent studies are available. For example, see Harris *et al.* (2001a), Bilginsoy (2003), Gallacher *et al.* (2004), Glover and Bilginsoy (2005), Karmel and Mlotkowski (2010), Hogarth *et al.* (2010) and Karmel and Oliver (2011).

11. University of Toronto Mathematics Network, available at www.math.toronto.edu/mathnet/questionCorner/deductive.html, accessed June 15, 2011.

12. I am grateful for discussions with Chill Elmore concerning union-sponsored training facilities. Also, I benefited from a tour of the state-of-the-art training center for carpenters, floor coverers and millwrights associated with the Indiana/Kentucky Regional Council of Carpenters, Joint Apprenticeship and Training Fund, Greenwood, IN (USA).

13. For example, there are currently over 200 occupations in California that have active registered apprenticeship programs.

14. For a comprehensive study of cost/benefit methodology using Canadian data see O'Grady (2005) andalso Rauner *et al.* (2010). For earnings study of apprentices see Hollenbeck's (2008).

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