



Labor Competency Certifications in Commercial Occupations: A Literature Review



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CONTENTS

ABBREVIATIONS.....	4
INTRODUCTION.....	5
1. FEATURES OF CERTIFICATIONS AND CERTIFICATION SYSTEMS.....	1
Definition of labor competency certification and labor competency certification systems	2
Fit of labor competency certification systems into broad national qualifications frameworks.....	2
Common institutional arrangements of labor competency certification systems	3
2. ADVANTAGES AND DISADVANTAGES OF LABOR COMPETENCY CERTIFICATIONS SYSTEMS	8
Advantages of labor competency certification systems	8
Disadvantages of labor competency certification systems	11
3. IMPACT OF LABOR COMPETENCY CERTIFICATION SYSTEMS	12
Impact of on the job training.....	14
4. EVIDENCE OF CERTIFICATION BENEFITS IN THE INFORMATION TECHNOLOGY SECTOR	15
Overview of the IT certification system	16
Wage premiums associated with IT certification.....	17
5. CONCLUSION.....	20
Direction of future research	20
6. REFERENCES	22

ABBREVIATIONS

CCIE	Cisco Certified Internetwork Engineer
CCNP	Cisco Certified Network Professional
CCSP	Cisco Certified Security Professional
CISSP	Certified Information Systems Security Professional
DB	Database
IT	information technology
Java2	Sun Certified Programmer for the Java2 Platform
ILO	International Labour Organization
MCDBA	Microsoft Certified Database Administrator
MCSE-S	Microsoft Certified System Engineer-Security
MIS	management information system
NQF	national qualifications framework
OCF	Oracle9i DBA Certified Professional
OTJ	on-the-job training
PMP	Project Management Professional
RHCE	Red Hat Certified Engineer

INTRODUCTION

Firms generally seek to acquire a competent and stable workforce, as well as to maintain and upgrade the aggregate knowledge and skills of their workers at the lowest possible cost. In doing so, they routinely face imperfect and asymmetrical information, together with recruiting, turnover, and other transaction costs. When they hire individuals whose skills are not a good match for the needs of a given firm, local labor regulations may make it very expensive to change or release these workers.

Certifications of labor competencies are thought to decrease asymmetries of information for firms. By making the quality and quantity of individuals' skills observable by current or potential employers, certification in theory may lead to higher overall employment, greater labor market mobility, and optimal job placement in a "free-agent" economy. For firms, certification should decrease the transaction costs of selecting and placing workers, improve the ability of managers to match skills to tasks, and increase the effectiveness of outsourcing by making it possible to identify competent external suppliers. Certification may thus enhance organizational performance, promote continuous improvement of efficiency, and increase productivity and profits.

Individuals, meanwhile, generally seek employment that most fully utilizes their skills and provides commensurate compensation. They endeavor to communicate the quality, depth, and breadth of their skills to potential employers quickly and inexpensively. Failure to convey their potential may lead to lower salaries, lack of promotion, inability to transfer to better positions within a firm, and/or inability to move to better opportunities at other firms. Given the asymmetries of information that typically exist between firms and individuals in labor markets—and their associated cost—public intervention to mitigate this problem can optimize outcomes. Systems for the certification of labor competencies are designed to provide this desired mitigation. For individuals, certification promises to boost pay, enhance self-esteem, improve job satisfaction, and augment psychological well-being.

This paper reviews the published literature on certification of labor competencies in commercial occupations. It does not review or address issues related to labor competency certification when its fundamental rationale is public safety or other public purposes. Certifications related to public health and safety typically have been in existence for a long time, are usually mandatory, and tend to be carefully regulated by governments. This type of certification tends to document the competency of nurses, doctors, lawyers, accountants, architects, engineers, and many other public workers (Bailey and Merritt, 1995, 28). The certification of teachers is a more recent idea that has not been readily accepted.

As noted above, the basic rationale for certification of individuals in commercial occupations is the mitigation of information asymmetries. Such certifications have proliferated more recently,

are usually voluntary and often not centrally regulated. Examples include certifications of information technology specialists, auto mechanics, hospitality employees, specialized agricultural workers, transport and logistics workers, and human resource professionals, among others. Of course, some workers in commercial occupations undertake tasks that have public safety implications and concomitant certifications, such as sanitation certification of food service employees. For the purposes of this literature review, those labor competency certifications whose principal purpose is economic will be the focus; such certifications are neither social nor necessarily related to a public purpose.

This distinction is important: certifications whose rationale is economic are often voluntary. Their voluntary nature implies self-selection, meaning that some individuals choose to certify and others do not. Moreover, it implies choices, actions, and costs for firms that certify the labor competencies of their employees, sectors that encourage this behavior among their firms, and governments that adopt labor competency certification systems. This paper thus reviews the literature that seeks to explain the rationale behind these decisions and the impacts that they have, especially on productivity and income.

This review has five sections. The first section describes the different features of certification and certification systems. It provides a short taxonomy, defines labor competency certification and the systems associated with it, explains how these systems fit into broader national qualifications frameworks, and discusses their common institutional arrangements. The second section examines the advantages and disadvantages of these systems, while the third explores what is known about their impact. In general, the empirical evidence currently available for answering key questions is mostly insufficient or tempered by endogeneity concerns. This paper therefore calls for more, and more carefully designed, future research. An exception to the current knowledge gap comes from the information technology (IT) sector, and in the fourth section, a study linking certifications to wage premiums is highlighted. The fifth and final section offers some conclusions and suggests possible avenues of future research.

1. FEATURES OF CERTIFICATIONS AND CERTIFICATION SYSTEMS

The universe of certifications is large and growing: individuals, sectors, firms, products, processes and practices, among others, are being certified.¹

For individuals, the certification of labor competencies usually involves verification of their ability to accomplish an identified task at a particular level of proficiency. A certification may be broad (such as ensuring the problem-free performance of a local area network of linked computers) or narrow (such as demonstrating a consistent ability to successfully prune wine-growing grape vines). The distinction between certification of specific, task-oriented competencies and broad, professional competencies proceeds along a continuum. This review focuses on the narrow end of this continuum.

Similarly, certifications are associated to varying degrees with the completion of formal (often academic) training, with success contingent on standardized licensing and other examinations, as well as practical tests of abilities to be used on the job (the focus of this review). In practice, it is often difficult to distinguish between *aptitude* (the potential to acquire a skill or certain knowledge); *possession of knowledge* (the mastery of information and related content), and *competency* (the ability to regularly perform a given physical or cognitive task at an acceptable level of quality). This difficulty will be discussed further below, but in general this review concerns itself with the third (and narrowest) alternative.

Definitions

Vargas (2002, 112) argues that labor competency certification is a public, formal, and official recognition of an individual's occupational skills. He argues that certification can stand for "the termination of a training process; a person's capacity for the practice of certain occupations; and/or the possession of the competencies defined by a standard, regardless of where or when they were acquired." Irigoien and Vargas (2002, 44–45) describe certification as necessarily embedded in a larger system—a formally established institutional arrangement wherein a cycle is undertaken to identify, standardize, update, and evaluate the qualifications of workers. Boudier and others (2001, 172), on the other hand, see certification as both "a process and an outcome: a process that involves implementing standards and defining the criteria by which these standards

¹ Certifications exist for firms and products as well as for individuals. For firms, there are certifications regarding the way business is conducted and processes are run. Some of these certifications are conferred through widely accepted standardized evaluations (e.g., ISO 9000, ISO 14000), while others are conferred on the basis of more subjective criteria by a variety of organizations that grant fair trade, organic, green, animal-friendly, cruelty-free, and geographic-origin certifications, among others. Firms that voluntarily engage in certification are typically at the cutting-edge of workplace and product practices. They look closely at skills and processes to ensure quality and often engage in certification to signal product features sought by more affluent consumers. Corbett, Montes-Sancho, and Kirsch (2005) found that firms that seek process certifications are more productive and more likely to export; their research also found that the decision to seek initial ISO 9000 certification was followed by significant abnormal improvements in financial performance, though the exact timing and magnitude of the effect varied.

are assessed, and an outcome resulting from these assessment procedures, whether or not they lead to the award of a qualification.” Table 1 gives examples of available certifications.

Table 1. Sample of Available Certifications

<i>Purpose</i>	<i>Type of certification and or provider</i>	<i>Example</i>
Public safety protection	Government-mandated professional licensing	Doctors, nurses, architects, civil engineers, electricians, pharmacists, therapists
Quality assurance for widely used services with high technical requirements	Industry or professional association-provided certification	Lawyers, accountants
Compliance with technical standards	Industry or professional association-provided certification	Institute of Electrical and Electronics Engineers
Labor competency	Industry- and/or job-specific certification of labor competencies	Certifications by companies such as Microsoft and Cisco; automotive repair certifications

The place of certification systems in national qualifications frameworks

Labor competency certifications systems may be part of national qualifications frameworks (NQF). In these cases, the certifications given are typically seen as a type of qualification. The International Labour Organization’s Recommendation on Human Resources Development, 2004 (no. 195) describes NQFs as a means to promote recognition and certification of skills within a holistic strategy that seeks, *inter alia*, to develop labor market information and improve the quality, relevance, and accessibility of education, pre-employment training, and development of competencies (Allais 2010). Tuck (2007, v) agrees with the efficacy of this approach, defining a qualifications framework as:

“an instrument for the development, classification, and recognition of skills, knowledge, and competencies along a continuum of agreed levels. It is a way of structuring existing and new qualifications, which are defined by learning outcomes, i.e., clear statements of what the student must know or be able to do, whether learned in a classroom, on the job, or less formally. A qualifications framework indicates the comparability of different qualifications and how one can progress from one level to another within and across occupations or industrial sectors and even across vocational and academic fields.”

Although the comprehensiveness of qualifications frameworks vary widely, many NQFs serve as overall quality assurance mechanisms for their country’s education and training systems; they may also be the foundation upon which other quality assurance arrangements are built (Allais 2010). Some NQFs are designed on the premise that different educational subsectors (i.e., basic

education, vocational education and training, tertiary education, lifelong and adult education) serve different segments of the labor market and have different institutional imperatives and linkages. Successfully designed NQFs connect these subsectors in a single coherent framework (AQF 2009).

A recent draft report on the implementation and impact of NQFs across 16 countries (Allais 2010, 2) for the ILO asserts, “[T]here is some evidence of increased numbers of certificates which recognize existing skills, knowledge, and abilities of workers and potential workers being awarded, although this is on a small scale in most of the countries in the study.” Among the 16 countries studied, 5 (South Africa, Mauritius, Australia, New Zealand, and Scotland) have attempted or are attempting to implement comprehensive NQFs that include a subframework for skills and/or workplace learning certificates. Two (Chile, Mexico) have attempted to implement frameworks for occupational standards related to workplace learning, with some attempts to apply these frameworks to the vocational education and training sector (Allais 2010, 9).

More generally speaking and to varying degrees, NQFs may also:

- describe the nomenclature and key characteristics of each and all nationally recognized and accredited educational qualifications;
- provide guideline information on the linkages between different qualification types;
- specify the authority for accrediting qualifications and the requirements for issuing qualifications in order to protect the reputation and authenticity of both the qualifications and the issuing institutions;
- describe potential cross-sector qualification linkages, pathways, and recognition of prior learning;
- provide levels or equivalencies of qualifications within the framework itself; and
- facilitate international recognition and comparability of qualifications (Allais 2010).

These features may enhance the effectiveness of certifications, although this conjecture remains to be verified empirically.

Common institutional arrangements of labor competency certifications

The institutional arrangements of labor competency certification systems vary widely and are not comprehensively reviewed in this paper. Rather, the paper describes the typical set-up and common stakeholders of various systems, as well as commonalities and differences among existing systems and frequent pitfalls with their implementation.

It is important to remember that labor competency certification systems as they exist today are not new and have evolved continuously over time. For example, in Germany and England certification of apprentices developed along with training standards in the late nineteenth and

early twentieth centuries. Both France and Spain had systems for certification of labor competencies prior to 1930 (Bouder et al. 2000).

Typical set-up of a labor competency certification system

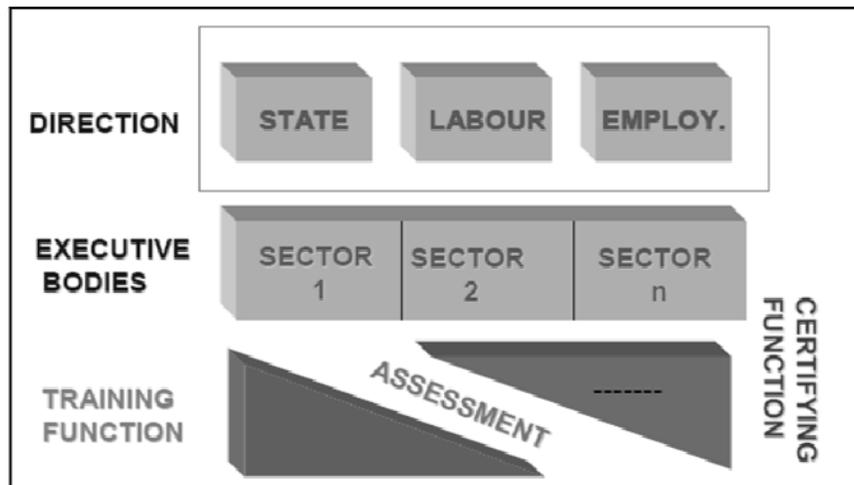
Vargas (2002, 109) describes a typical set up (and illustrates it, as per Figure 1) as follows:

A training and certification system comprises three levels: direction, executive, and operational levels. The Direction level is usually a participative area in which workers, employers, and the government sector set up the “rules of the game” that are usually sanctioned by legal norms. The Direction establishes the structure of the system and appoints those in charge of the functions of training, evaluating, and certifying. Participation by the State is highly desirable because it provides an excellent opportunity to regulate aspects such as access, equity, quality, and transparency.

At executive level, the organization is nearly always sectoral and in most cases made up by the workers and employers of a specific occupational sector (for instance, forestry, automotive industry, leather and footwear manufacture, etc.). Methodologies are applied at this level for the identification of competencies and development of performance standards.

An essential function of the sectoral level is to check on the quality and relevance of the operational level implementing the training, evaluation, and certification, which is fundamental to ensure that it meets the needs detected and that the certificates are reliable, i.e., that they effectively attest to what they purport to certify.

Figure 1. Outline of a Training and Certification System



Source: Vargas 2002, 109.

Training, evaluation, and certification take place at the operational level. A substantive point of discussion is whether such functions should be carried out by the same or different institutions.

Common stakeholders

The stakeholders of labor competency certification systems are the individuals or groups who have a vested interest in ensuring that certification standards, or results, are appropriate. They are often key decision makers: persons who determine whether or not a program gets implemented and is successful. The literature describes four major categories of stakeholders: governments, firms, individuals, and “other.” This last category includes a variety of players:

- Consumers who depend on the competency of certified workers.
- Providers of educational and training programs, who offer the education and training required to achieve the credential and may even administer and manage the program. Universities, community colleges, private schools, vendors of training programs, professional and trade associations, and internal training departments fit in this category.
- Union leaders who can use certification as a tool for affiliate advancement and training. Vargas (2002) suggests that because worker representatives participate in the establishment of the skills profiles that serve as the basis for certification, it has been included among collective bargaining issues.

Within firms, some authors further divide the category into a variety of substakeholders. Hale (2000) mentions four:

- Supervisors with a vested interest in the competency of the workforce that they oversee.
- Senior management, which must ensure that a certification program is a good investment of firm resources and employee time.
- Human resources staff, legal personnel, and internal auditors who want a voice in the design and implementation of any internal certification program, since they are responsible for dealing with employee relations, lawsuits, and compliance issues.
- Internal or contracted support staff, such as administrative and information technology staff, who design and manage a program's database.

Commonalities and differences among systems

Morra (1993), then Director of Education and Employment Issues in the Human Resource Division of the U.S. General Accounting Office, reviewed eight standards and certification systems for occupations that required less than a bachelor's degree for entry-level employment. Her study found several common elements in certification systems, including industry ownership and control, recertification requirements to keep certificateholders' skills current, national portability of credentials, and integration of industry standards and education providers through some sort of accreditation program. Among these elements, she argued that industry ownership and control was most important for the development of a successful certification system.

Despite the aforementioned commonalities, research by Boudier and others (2001) on the European Union illustrates a variety of differences regarding the main characteristics and institutional implementation arrangements of the national certification models of Germany, France, Spain, and England. The evolution of vocational training and labor competency

certification standards has been intertwined in these countries; this back-and-forth relationship is reflected in table 2.

Table 2. Certain Features of Certification Systems in Countries of the European Union

<i>Feature</i>	<i>Germany</i>	<i>France</i>	<i>Spain</i>	<i>England</i>
Main characteristics	Enterprise-centre alternating training (dual system). Enterprise responsible for training	Education and VT regulated by Ministry of Education. Recognition of previous adult learning. Various certification programmes in enterprises	Three training subsystems: <i>Regulated training</i> in educational cycle; <i>Occupational training</i> for the unemployed; <i>Ongoing training</i> for workers	National framework of competency levels governed by a National Authority in educational and occupational aspects
Governing body	Federal VT Institute (BIBB)	Ministry of Education	National Qualifications Institute (INCUAL)	Qualifications and Curricular Authority (QCA) ^a
Standards	National standards set by BIBB	National benchmarks set by the Ministry of Education	Occupational profiles established by Royal Decree	Standards established under the leadership of corporate members
Strengths	Occupational practice. Enterprise-led training. Single national standards	Highly reliable governance (public and national in scoped). Integrated education and VT	National benchmarks focalized on different customers. VT incorporated into educational system	Comprehensive, integrating national framework. Education and VT merged together
Critical aspects	The efficiency of the dual system is questioned due to its narrow focus on a single practice	Employers are critical of diplomas, which they think have low applicability due to a prevalence of academic contents	Need for greater coordination among initial, ongoing, and occupational training systems	Excess of qualifications and descriptions in an effort to be too objective
Historical background	First regulations for industrial training, 1925. Dual training, 1964.	First School of Arts and Crafts, 1803. Establishment of CAP, 1919	Technical Institutes first established in 1925. First certificates issued in mid-70s. General Educational Law passed in late 80s	Private training initiatives 1878 (City and Guild). Competency standards, late 80s

Sources: Vargas 2002, based this table on QCA (2001); Boudier et al. (2001); Fretwell 2001. *Note:* a. QCA is now known as the Qualifications and Curriculum Development Agency; it is scheduled to be closed in March 2011 (see QCDA Web site, <http://www.qcda.gov.uk/about/96.aspx>, accessed December 2010).

There are also a wide range of certification applications in Latin America; table 3 compares their intent and principal actors.

Table 3. Features of Certain Certification Experiences in Latin America

<i>Identification</i>	<i>Programme of occupational quality certification in the tourism sector, Brazil</i>	<i>Pilot programme of occupational competencies' certification, Chile Califica</i>	<i>Standardization and certification of occupational competencies, Mexico</i>	<i>Vocational training institutions^a (several countries)</i>
Leadership	Private sector: Hospitality Institute	Public and private sectors: National Training and Employment Service (SENCE) Fundación Chile	Public sector: Labour Secretariat	Public sector: INA, INTECAP, INSAFORP, INFOP, SENA, INFOTEP Private sector: SENAI, SENAC
Coverage	Hotel trades and tourism	Tourism, construction, mining —national level	National; occupations according to demand	Sectoral, by areas of attention
Standards	Based on Institute's own functional analysis	Based on functional analysis	Based on functional analysis	Based on functional analysis and DACUM
Critical aspects	Transferability. Greater trade union participation. Accessibility for the unemployed.	Great coordination efforts of public-private sectors	Wide offer of standards, low demand for certifications. Integration with VTY	Becoming integrated with public employment and training policies
Strengths	High credibility among employers. Tripartite National Certification Council	Credibility deriving from actors involved. Lifelong educational approach	Credibility. High transferability. Private sector participation	Credibility. Technical proficiency of VTIS Association with the VT progress
Historical	Interest in competitiveness supported by international development banking. Start up: 1999	Interest in competitiveness and efficiency of training. Support provided by development banking and national resources. Start up: 2000	National competitiveness diagnosis. NAFTA perspective. Total support by government and development banks. Start up: 1996	Interest in raising VT supply, quality, and coverage. At the request of employers' sector. Start up: 1967

Source: Vargas 2002, based on institutional documentation and his personal concepts.

Note: a. This column is not intended to include all cases; it shows only several countries where VTIs implement certification programs based on competency profiles.

Frequent pitfalls of implementation

Building a labor competency certification system is a challenging task that has high start-up and maintenance costs, significant uncertainty regarding impact, and substantial incentives for stakeholders to free ride.

In the literature, Morra (1993) warns of the long time periods required for a certification system to become established and accepted, noting a range of 2 to 7 years in her survey. She stresses the high cost of development and maintenance of labor competency certification systems, particularly in terms of in-kind contributions of staff time and materials. Morra then enumerates two major coordination difficulties: the inability to bring all stakeholders together in developing a certification system and the difficulty of forming industry coalitions and reaching agreements on standards. In her view, the former is compounded by the lack of uniform occupational definitions across employers, particularly in terms of specificity. Morra also highlights the typically insufficient structure for disseminating information and promoting certifications across industries.

Herschbach and Campbell (2000) maintain that certification can only be as good as the standards used. They agree with Morra that identifying and maintaining current job tasks and standards of proficient performance is labor intensive and costly, and that both require time and expertise. They add that unless job task standards are kept current, a certification system quickly grows outdated and dysfunctional. “An outdated certification system can hinder economic development and individual advancement because it locks VET into outdated skills. The scope of an initial certification system should thus not exceed the ability to maintain up-to-date standards through available human and financial resources” (Herschbach and Campbell 2000, 55).

2. ADVANTAGES AND DISADVANTAGES OF LABOR COMPETENCY CERTIFICATION SYSTEMS

Advantages

The advantages of labor competency certification systems are best understood when considered from the perspective of different stakeholders.

Márquez (2001) maintains that for governments, certification solves an information problem by making the quality and quantity of individuals’ skills observable by potential employers. Removing this asymmetry of information is thought to lead to higher overall employment, greater transparency in labor markets, and greater equity for employees (i.e., their wages can both more quickly and accurately reflect their true skill levels). Vargas (2002) argues that certification advances equity because it facilitates the access of a greater number of workers to better jobs. By vouching for the capability of workers—particularly those who either did not have or complete formal education, certifications increase workers’ chances of recognition and

acceptance in the labor market. Bouder and others (2001) agree, noting that certification has made it possible for the middle and working classes in Europe to fill occupational and social positions from which they had up to then been excluded. Even today, certification programs in several European countries favor the inclusion of low-skilled workers as a method of incorporating them into training cycles.

Among the other advantages of certification, Barbagelata (1979) notes that it may also improve statistical information regarding a country's employment and occupation structure. Araneda (2006, 16) adds that certification can help "achieve greater alignment between the human resource demands of the private sector, the supply of work-oriented training, and the formal mechanisms that recognize learning attained through formal, non-formal and informal settings." Finally, because governments often provide or subsidize training, they have a vested interest in seeing how well certifications signal the information and tasks that individuals are expected to respectively know and do in given occupations.

For firms, Fertig, Zeitz, and Blau (2009) argue that certifications decrease the transaction costs of selecting and placing workers and increase the effectiveness of outsourcing by making it possible to identify competent external suppliers. This in turn typically enhances organizational performance, promotes continuous firm improvement, and increases productivity. Fertig, Zeitz, and Blau add that the rationale for certification can also be external, as firms may need to comply with local and/or international regulations, improve their public perception, or impress customers and other external stakeholders.

Hale (2000) sees the advantages of the certification of firms in a slightly different way. She argues that certification: helps firms establish uniform performance standards in order to rapidly deploy workers; applies a multidisciplinary approach to solving complex problems; integrates products, supply chains, and processes; and fosters employee development by updating and augmenting employee skills and knowledge. The latter, she says, raises the level of core competencies across an organization and helps retain and attract competent staff.

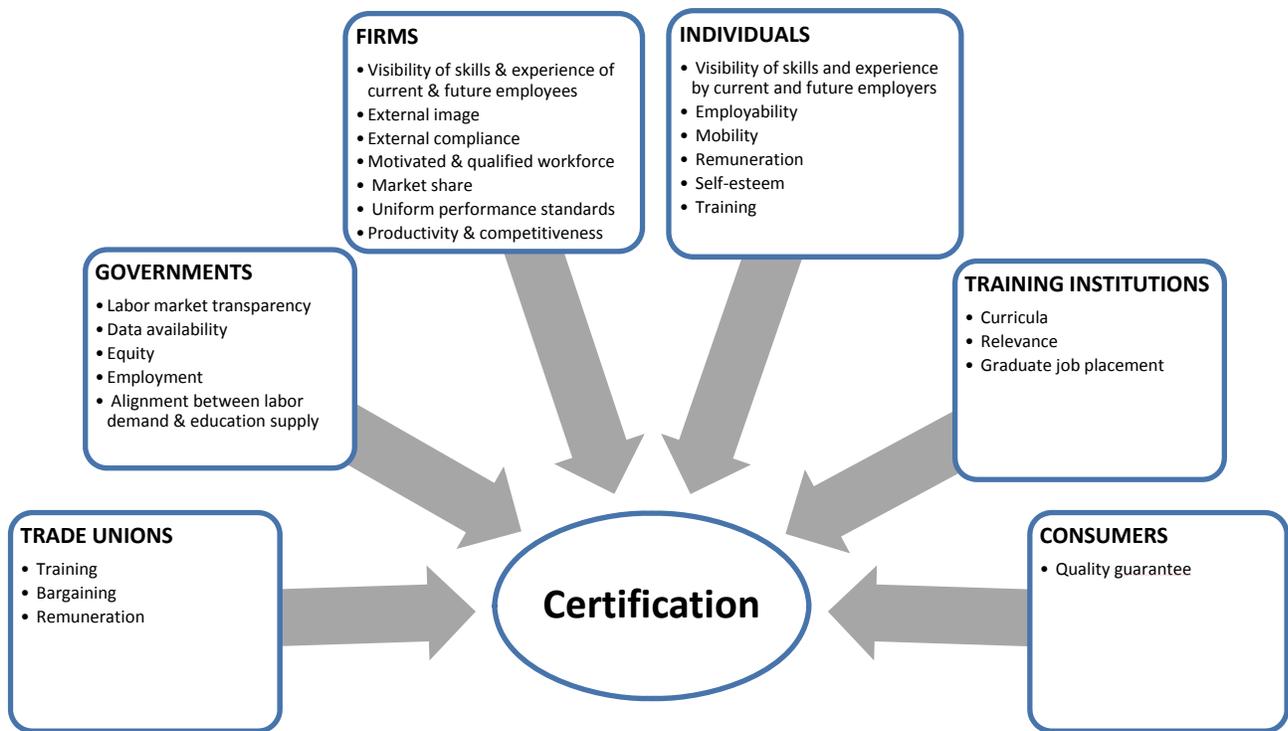
Acemoglu and Pischke (1999) argue that a firms' motivation for certification is greater when it comes at the end of training, contending that certification encourages firm-sponsored training. When employees know that a certificate will increase their value in the labor market, they are likely to work harder in training programs that result in certification than in those that do not. Consequently, firms will invest more in training programs that result in certification because these programs increase employee training motivation and effort. In this sense, certification better aligns employer and employee incentives.

Finally, Rada (1999) argues that firms use certification as a tool to increase their market share. This happens frequently in the IT sector, where companies who teach about their products and

certify that learning simultaneously encourage the use of those products. This process is further explained later in this paper in the section on information technology certification.

For individuals, the motivation to seek labor competency certifications is also rooted in the benefits of fewer information asymmetries. Vargas (2002) highlights the role of certification in publicly recognizing the knowledge that individuals have and apply over and above their academic merits, giving practical experience its due. Bailey and Merritt (1995) argue that by making skills more transparent, certification gives access to a national labor market, thus promoting geographic and occupational mobility and appropriate job placement in a “free agent” economy. Along the same lines, Fertig, Zeitz, and Blau (2009) add that certification may also result in a possible boost in pay, enhanced personal self-esteem, and heightened psychological well-being made possible by a person’s increased sense of professionalism and employability.

Figure 2. Different Expectations Regarding the Advantages of Certification



Source: Based on Vargas (2002).

For other stakeholders, the likely advantages of certification are equally significant. Herschbach and Campbell (2000) say that for education and training programs, certification systems are an effective means of incorporating changing labor market requirements into program content, as well as developing and delivering high-quality instruction. Through a certification system, they argue, detailed information on knowledge and skills requirements, together with graduates' test results, can be fed back into the instructional development and revision process, providing an important check on both internal and external program effectiveness. From the results of certification tests, it is then possible to ascertain whether courses and programs deliver the right content and whether learning is occurring. Herschbach and Campbell also argue that certification encourages the development of a workforce framework that links different forms and levels of education and training into a coherent whole that is responsive to labor market requirements. As Bailey and Merritt (1995) suggest, the latter framework is useful for both prospective and current students because it indicates what they must learn and provides them motivation to acquire the particular skills that they will use in the workplace.

With respect to trade unions, Vargas (2002) says that certification may facilitate their participation in the establishment of the skills profiles that will serve as the basis for training, evaluation, and certification.

Disadvantages

The literature outlines three disadvantages of labor competency certification systems: the risk of promoting “credentialism,” the risk of excluding certain groups, and the difficulty of separating knowledge from competencies.

Fertig, Zeitz, and Blau (2009) outline the first of these disadvantages. They maintain that certifications are double-edged, as they can be used as “*credentials*” in order to gain prestige, rewards, or influence. The authors argue that certifications can be used for extrinsic reasons that have little or nothing to do with improved work performance or competence. Reviewing the literature on “impression management,” they note that this literature provides ample evidence that people are prone to use impression management tactics to bolster their position in work organizations, even if these tactics have little or nothing to do with genuine performance.

Barbagelata (1979) of the ILO expresses a similar fear: with certification, employers may pay differently for equal work, thus violating a fundamental tenant of worker rights.

An aggravating factor associated with credentialism is the potential for labor competency certifications to be *exclusionary*. According to Fertig, Zeitz, and Blau (2009), labor market economists have argued that one of the functions of certification is to provide a barrier to entering a labor market, thus increasing the wages of those possessing the certification. This

result is exactly what detractors of certification systems predict and find unfairly exclusionary. Authors differ on the matter. Boudier and others (2001, 33) assert:

Traditional certification systems are more likely to make social stratifications more rigid than to enable individuals to have the socially and economically useful skills that they possess endorsed. The European Commission . . . seems to reflect this point of view when it writes that: "...society 'locks out' in this way much talent which is frequently unconventional but innovatory and that it therefore produces an elite which is not truly representative of the available human resource potential."

Boudier and others highlight the difficulty of *separating knowledge from competencies*. Citing Bellier (1997), they note that certifications which reference academic knowledge often strengthen and increase social segmentation. On the other hand, certifications intended to highlight and identify individuals' aptitudes, thereby helping them to achieve recognition from which they are currently excluded and promote their integration by enabling a fairer and more efficient use of human resources.

This tension between academic and occupational knowledge was discussed by Barbagelata (1979). He maintained that the two disadvantages of certification were that it could: (i) equalize differences between those who had pursued higher education and those who had not, thus unfairly impacting the former, and (ii) undermine the importance and prestige of occupational qualifications and certifications (i.e., accountant, dentist, etc.), presumably by substituting experience for academically acquired certification or its equivalent.

The next section endeavors to gauge the extent to which the advantages and disadvantages of certification considered here have manifested in experience.

3. IMPACT OF LABOR COMPETENCY CERTIFICATION SYSTEMS

Grounding a discussion of the advantages and disadvantages of labor competency certification systems in solid evidence is not easy. The literature regarding impact is scarce; what does exist is often poorly referenced, more anecdotal than empirical, excessively narrow in focus, or based on findings from public safety-related professions. Moreover, much of the evidence of the positive impact of certification relates to certificates associated with training, rather those associated with recognition of on-the-job competencies.

Vargas (1979, 114) of the ILO asserts, "[T]here is plentiful evidence in Latin America that unemployment is higher among those with fewer years of certified education or who lack specific training (and consequently have no certificates)," but does not cite references to support this claim.

Morra (1993) maintains that organizations who sponsor certification systems believe that certifications garner higher wages for the certified. Although most evidence is anecdotal, she cites evidence from the International Association of Bridge, Structural, and Ornamental Ironworkers, which represents many ironworkers employed as welders. The latter estimates that certified welders in the USA earn \$10,000 to \$12,000 more per year than noncertified welders.

Quan, Dattero, and Galup (2007) concur that wage premia exist for IT certifications, but take the analysis one step further by quantifying these premia and demonstrating that their size is job- and industry-specific. They use survey data from various sources to build a comprehensive model that estimates the increment to wages of various IT certifications. Their findings are discussed in the IT case study presented in the following section.

A 2004 Information Technology Association of America (ITAA) Workforce Development Survey of hiring managers indicated that the best methods for internal advancement among IT employees included both participation in formal on-the-job training (56 percent) and certification programs (55 percent). Some 71 percent of survey respondents said that certification or continuing education was either important or very important for advancement (ITAA 2004). Surveys rarely tell the whole story, however. In an article in *ComputerWorld*, journalist Pratt (2005) quoted many IT executives as saying that certifications had become "watered-down and diluted" as the number of IT certifications and third-party teaching centers had grown and certification exams became less stringent.

In the domain of public safety–related professions, literature on the impact of certifications is likewise scarce. For certifications associated with written tests of knowledge, Fertig, Zeitz, and Blau (2009) reports that few studies have directly examined the relationship between certification test scores and future job performance. Studies that have done so sometimes find little relationship between the two. Kleiner (2006) reviews studies on occupational licensing and reports that they have positive effects on service quality in some cases, but have little or none in others. Fertig, Zeitz, and Blau (2009, 203) note:

Indeed, researchers have concluded that certification tests cannot be held to the standard of predictive validity—that the test predicts effective future job performance (Kane 1982, 2004; Shimberg 1981). Instead, only content validity is seen as relevant (La Duca 1994; Raymond 2001)—whether the test taps into the knowledge and skills judged necessary for good practice.”

He concludes that existing empirical research on certifications lends minimal support to the positive rationale behind their existence.

Research is currently being conducted in Chile that will help decrease the existing knowledge gap. A few selected sectors participated in an innovative program to certify labor competencies

in 2002. This program grew to include 30,000 individuals in 500 firms and 13 sectors and gave rise to the recently created National System of Labor Competency Certifications. Fundación Chile, the not-for-profit corporation that managed the certification program, the National Council of Innovation for Competitiveness in Chile, and the World Bank are currently conducting a detailed study to measure the impact of this certification on firm productivity in tradable sectors of the economy. Results are expected towards the end of 2010.

Impact of on-the-job training

When certifications are given at the end of training, Acemoglu and Pischke (1999) argue it that increases their impact because employees have more incentive to invest their time in such training. Almeida and Cho (2010, 69) find that regardless of the certification, there is a strong and positive correlation between higher productivity and the incidence of job training at the worker or firm level:

On-the-job training is an important channel through which workers upgrade skills and remain competitive in the labor market and firms adopt technology and innovation . In modern economies with constant technological change and increased competition, firms worldwide struggle to find workers with the right set of skills. The investment in job training allows workers to adopt and implement new technologies, eventually leading to increased firm productivity. Studies mostly in developed countries show that this training is positively associated with increases in individual workers’ wage growth and firms’ productivity and innovation.”

Table 4 summarizes some of the findings outlined in Almeida and Cho 2010.

Table 4. Effects of On-the-Job Training on Wages and Productivity

<i>Study</i>	<i>Effects on wages</i>	<i>Methodology</i>	<i>Note</i>
Developed countries			
Lynch (1992)	On-the-job training: 0.2–0.36% wage increase per week of training Apprenticeship: 0.1–0.26% wage increase per week of training Off-the-job training: -0.02– 0.2% wage increase per week of training	Panel analysis (USA, NLSY)	Current training matters, while previous training has little impact Wage premium is large
Developing countries			
Middleton et al. (1993)	About 20% increase in earnings	Survey on previous studies	
Rosholm et al. (JDE 2007)	Kenya and Zambia Formal training: 20% wage	Matching estimation	Larger returns for larger firms

increase

<i>Study</i>	<i>Effects on productivity</i>	<i>Methodology</i>	<i>Note</i>
Developed countries			
Black and Lynch (2001)	Not significant (likely underestimated, because of no information on stock of training)	Both cross-sectional and panel in the USA (manufacturing business survey)	
Barron et al. (1989)	10% increase in hours of training results in 3% increase in productivity	A survey collecting detailed information on training and wages (USA)	Productivity increase is larger than wage increase, suggesting that firms extract rent
Almeida and Carneiro (2009)	Rate of returns: 6.7%–8.6%	Panel data for firms (Portugal, <i>Balanço Social</i>)	Takes into consideration the cost of training and estimates rates of returns
Developing countries			
Acevedo and Tan (2010)	Mexico: 5–6% Chile: 7–9% Peru: 21–26% Colombia: 5%	Quasi-experimental approach using panel data and policy changes	Measures the effect of SME program participation, including training on wages and productivity
Biggs et al. (1995)	Kenya, Zimbabwe, and Ghana 50–127% increase in output after training	OLS and 2SLS	Estimates may be upward-biased due to selectivity
Tan, Savchenko, and Peri (2003)	India: 27% Pakistan: 66% Bangladesh: Not significant Morocco: 48% China: 32% Bolivia: 34%	OLS estimation from investment climate surveys	

Source: Almeida and Cho, 2010.

Note: NSLY = National Longitudinal Survey of Youth 1979, OLS = Ordinary least squares, 2SLS = Two Stage Least Squares (2SLS)

4. EVIDENCE OF CERTIFICATION BENEFITS IN THE IT SECTOR

The dearth of high-quality impact evaluations or cost-effectiveness studies of certification systems means that only partial conclusions can be drawn from existing data. This section draws on research from the IT sector to further ground the debate on labor competency certification systems, particularly those associated with training.

Quan, Dattero, and Galup (2007) provide evidence to support the rationale behind labor competency certification systems. They investigated the contribution of different generic and vendor-specific certifications to the overall wages of IT professionals across multiple job functions and industries and concluded that certifications: (i) could partially substitute for formal education and experience and (ii) were associated with job- and industry-specific wage premia. They defined a *wage premium* as the salary effect of possessing a certain certification.

Overview of IT certification systems

In the IT sector, rapidly evolving technology creates a need for highly skilled individuals to apply, support, configure, and adapt new IT products and services. Industry participants use certification systems to encourage and ensure that industry members keep up with these changes. Although certifications have become widespread throughout the sector, they have no single standard and are not uniformly recognized among employers (Quan, Dattero, and Galup 2007).

IT certifications can generally be classified into two types: vendor neutral and vendor specific. The former are developed by a wide range of experts in a particular field, focus on foundational concepts relative to underlying technology, cover many products, and encompass a broad range of skills and abilities. Some notable generic certification bodies based in the United States include the National Association of Communication Systems Engineers (NACSE), the Computing Technology Industry Association (CompTIA), and the Institute for Certification of Computing Professionals (ICCP). Vendor-specific certifications come from companies such as Microsoft, Red Hat, and Cisco, which provide certifications focused on their specific products. Acquiring one of their certifications ensures vendor-specific knowledge and skills (Quan, Dattero, and Galup 2007).

Currently there are hundreds of certifications on the market. For example, on a Microsoft-run Web site that claims to have a complete list of certifications offered, 112 types are listed, most of which include more than one certification.² According to GoCertify.com, as of December 2007, over 3 million people across the world had been awarded IT certifications. The most common of these was the Microsoft Certified Professional (MCP), which alone boasted over 2 million awardees.³

It is important to note that the level of complexity of certifications varies widely. Some, like the Certified Information System Security Professionals (CISSP), require over five years of professional experience, passing a six-hour test that costs \$450, and must be renewed every three years. Other certifications are less demanding. The Sun Certified Java Associate (SCJA), for instance, is targeted at newcomers to Java who are not necessarily working in technical positions, such as project managers, students, or developers for whom Java is not a primary requirement. In both cases, the amount of training that an individual must have before taking a certification test depends on their level of expertise. There is typically a fast-track route for those who are well-versed in the systems in which they are seeking certification. The Red Hat Certified Engineer (RHCE), for instance, is a performance-based test that measures competency on live systems. If a person is already an expert in Linux, they can take the exam directly or complete a single five-day overview course that costs \$3,000.

² See Web site of MC MCSE, <http://www.mcmce.com/othercerts.shtml>, accessed August 5, 2010.

³ See Web site of Go Certify, <http://www.gocertify.com/article/certification-counts.shtml>, accessed August 4, 2010.

Evidence suggests that nearly all stakeholders in the IT sector benefit from certification systems. Companies who use IT are interested in certified technicians because these workers have been trained and tested to manage specific systems and/or products. Individuals are interested in certifications because they communicate third-party verification of their skills to the labor market, and according to Quan, Dattero, and Galup (2007), because they are rewarded for it. Software manufacturers are interested in teaching technicians how to use their products because it encourages use of these products and disseminates them throughout the sector. They are interested in certifying those they train because it means they can guarantee a minimum level of competency and ensure that their products are adequately used. A paragraph on Novell Corporation's Web site best illustrates a firm's motivation for technician certification:

Novell Education's mission is to drive global pervasive computing through quality education programs and products; its purpose is to increase literacy on Novell products and technologies and thereby foster Novell's success worldwide. Novell Education plays a critical role in providing true pervasive computing by building the infrastructure of support and literacy that is necessary to drive and sustain that vision.⁴

For IT vendors who offer their own certifications, certifications have become a tool to disseminate products, penetrate the market, and gain market share.

Wage premiums associated with IT certification

Quan, Dattero and Galup (2007) built a comprehensive model to estimate wage premia associated with IT certifications for 10,630 IT workers in the United States. Their calculations focused on 9 job functions (representing 81 percent of respondents), 10 industries (representing 69 percent of respondents), and 10 popular IT certifications. These certifications can be classified as outlined in table 5:

Table 5. IT Certifications in the Survey Sample of Quan, Dattero and Galup (2007)

<i>Category</i>	<i>Certification</i>	<i># of respondents</i>	<i>% of respondents^a</i>
Security	• [ISC]2 Certified Information Systems Security Professional [CISSP]	452	4%
	• Microsoft Certified System Engineer-Security [MCSE-S]	122	1%
	• Cisco Certified Security Professional [CCSP]	114	1%
Database	• Oracle9i DBA Certified Professional [OCP]	900	8%
	• Microsoft Certified Database	256	2%

⁴ See Web site of Novell Corporation, <http://www.thefreelibrary.com/NOVELL'S+SECOND+ANNUAL+EDGE+CONFERENCE+KICKS+OFF-a016953257>, accessed on December 20, 2010.

	Administrator [MCDBA]		
Networking	• Cisco Certified Internetwork Engineer [CCIE]	156	1%
	• Red Hat Certified Engineer	540	5%
	• Cisco Certified Network Professional [CCNP]	1,077	9%
Programming	• Sun Certified Programmer for the Java2 Platform [Java2]	409	5%
Project Management	• Project Management Professional [PMP]	80	1%

Source: Quan, Dattero, and Galup 2007.

Note: a. About 4% of respondents had earned multiple certifications.

The results of Quan, Dattero, and Galup (2007) suggest that the magnitude of the wage premia associated with certifications vary by type of certification, job function, industry, and number of certifications held. Table 6 is an example of the wage premia associated with CISSP in different job functions.

Table 6. Wage Premia Associated with CISSP

<i>Job function</i>	<i>Premia</i>
Data communications/ telecommunications	46%
Computer-related consulting	30%
Systems analyst	30%
Computer systems/ operations/ networking	27%
LAN/network systems	22%
IS/ MIS/ DP	18%
Systems engineering/ integration/ technical services	14%

Source: Quan, Dattero, and Galup 2007.

Note: CISSP – [ISC]2 Certified Information Systems Security Professional. IS= information systems, MIS= management information systems, DP= data processing.

Tables 7 and 8 show the wage premia of different certifications by job function and industry, with the acronyms associated with each certification heading each column.

Table 7. Wage Premia of Different Certifications by Job Function

<i>Job function</i>	<i>CCSP</i>	<i>OCP</i>	<i>CCIE</i>	<i>CCNP</i>	<i>RHCE</i>
Computer systems/ operations/ networking			56%		21%
Systems engineering/ integration/ technical services		17%	23%	18%	10%
LAN/network systems	31%		37%	16%	26%
Support		47%		22%	32%
Software application development					22%
Computer-related consulting		28%			
IS/ MIS/ DP		41%			
Systems analyst		20%			
Data communications/ telecommunications					

Source: Quan, Dattero, and Galup 2007.

Note: See tables 5 and 6 for explanations of acronyms.

Table 8. Wage Premia of Different Certifications by Industry

<i>Industry</i>	<i>CISSP</i>	<i>OCP</i>	<i>MCDBA</i>	<i>CCIE</i>	<i>CCNP</i>	<i>RHCE</i>	<i>Java2</i>
Computer / network consulting	33%	27%		45%			38%
Government	14%	19%			23%		
Education		14%				27%	
Consulting		20%		73%			27%
Finance/ banking/ accounting		19%			16%	19%	
Software development							
Telecommunications				46%			
Health/ medical services		39%	27%				
Manufacturing	35%	22%					
Computer-related distributor		44%					

Source: Quan, Dattero, and Galup 2007.

Note: See table 5 for explanations of acronyms.

The results of Quan, Dattero, and Galup (2007) support the conclusions of individual surveys conducted before them. In a 2004 survey conducted by *Certification Magazine*, an IT industry publication, a large percentage of certified respondents said that they had higher average salaries compared to those who were not certified, and reported receiving a raise of up to 15 percent in the first year after receiving their primary certification. According to this article, almost half of the respondents believed that their primary certification played a significant role in earning the salary increase (Sosbe 2004). Many of the other surveys used in paper by Quan, Dattero and Galup came to similar directional conclusions, with actual percentages varying from survey to survey.

It is important to note that the samples of certified workers are representative of all IT workers, as individuals self-select to seek and gain certification. It is not presently possible to know whether the wage premia result from the certification process itself, or from intrinsic characteristics such as high motivation that are associated with both good job performance and participation in certification programs. This caveat applies to research on certification generally; future research using experimental design or natural experiments could overcome this methodological obstacle in order to better understand certification effects.

5. CONCLUSION

This literature review has focused on the certification of specific, task-oriented labor competencies evaluated via practical tests of acquired abilities that will be used on the job. It took a systemic view that embedded certification in larger systems: “a formally established institutional arrangement wherein a cycle is undertaken to identify, standardize, update, and evaluate the qualifications of workers” (Irigoin and Vargas 2002, 44–45).

The certification of labor competency in commercial occupations is meant to overcome inherent asymmetries of information between individuals and employers. When successful, it may promote lower transaction costs for firms, better matching of workers to tasks, and greater organizational efficiency and, hence, productivity. For workers, certification may overcome information obstacles, leading to wages that reflect actual rather than perceived skills, greater job mobility, and higher job satisfaction and professional self-esteem. Governments have an interest in promoting certification when it is effective in overcoming the information asymmetries that decrease the efficiency of markets.

The rationale for certification of labor competencies for commercial occupations differs from certifications conducted for a public safety goal or other public purpose, although sometimes the two categories may overlap. Certification systems for labor competencies for commercial occupations may be promulgated by a wider range of actors and are usually more decentralized than safety-related certifications.

Certification systems may be nested within national qualifications frameworks, whose comprehensive categorization of skills and competencies may help bridge gaps in labor markets caused by the different foci of credentials conferred by formal education. Certification systems are not new; they appeared in their modern form in Europe more than a century ago. Potential stakeholders in or beneficiaries of certification systems include firms, individuals, governments, consumers, training institutions, and unions. The advantages vary by stakeholder, but are generally the result of improved information. The disadvantages are seen to derive from imperfect implementation of certification systems when “credentialism” and exclusion are increased. Review of the empirical data finds tentative support for the positive impact of certification systems, especially with respect to wages in the information technology sector, where the best current data can be found. The magnitude of the wage premia, however, varies substantially by subsector. In other examples, it is difficult to disaggregate the effects of certification from the better-studied effects of on-the-job training.

Direction of future research

Labor competency certification must be further studied in order to fully understand the size, direction, and consequences of its impact. Moreover, since the start-up and ongoing maintenance

costs of labor competency certification systems are high, cost-benefit analyses are desirable to determine whether the impact is worth the cost. To analyze the benefits of such systems, research is needed on three levels:

- at the micro level, to gauge the impact on individuals;
- at the firm level, to measure impact on productivity; and
- at the macro level, to evaluate potential effects on employment, equity, and labor mobility, among others.

The self-selection inherent in the certification of labor competencies for commercial occupations poses methodological challenges for researchers, but these challenges are superable through careful research design. As high-quality worker and firm-level data become increasingly available throughout the world, new avenues of fertile and innovative research become possible. This is certainly one of them.

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This paper reviews published literature on certification of labor competencies in commercial occupations. The basic rationale for certification of individuals in commercial occupations is the mitigation of information asymmetries. In recent years, certifications have proliferated; they are usually voluntary and often not centrally regulated. Examples include certifications of information technology specialists, auto mechanics, hospitality employees, specialized agricultural workers, and transport and logistics workers, among others. The paper describes the different features of certification and certification systems, examines the advantages and disadvantages of these systems, explores what is known about the impact of certifications, highlights a study linking certifications to wage premiums, offers some conclusions, and suggests possible avenues of future research.

The findings, interpretations and conclusions expressed in this paper are entirely those of the authors and should not be attributed in any manner to the World Bank, its affiliated organizations or to the members of its board of executive directors or the countries they represent.

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