

INFORMATION OCCUPATIONS AND THE SOCIOECONOMIC
ENVIRONMENTS IN U.S. METROPOLITAN AREAS

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INFORMATION OCCUPATIONS AND THE SOCIOECONOMIC
ENVIRONMENTS IN U.S. METROPOLITAN AREAS

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Throughout this dissertation, I focus on “information occupations,” which deliver knowledge and information-intensive input to economic activities, and which are high-end jobs requiring a high level of education and skills. The main questions are fourfold: What are information occupations?; How can we define information occupations and their geographic profiles?; Why are information occupations important in metropolitan economies?; What metropolitan characteristics affect the specialization in information occupations?

Regarding these questions, I suggest a new analytical framework to define “information occupations” and explore their geographic profiles using two databases: Occupational Network Information (O*NET) and Occupational Employment Statistics (OES). Information Occupations are becoming important in regional studies in two aspects: the growing employment in information occupations in the new economies, compared to non-information occupations, and their importance to metropolitan economies. Information occupations prefer cultural environments with innovation capacity and high density of the younger workforce, rather than diversity. In terms of economic functions, metropolitan size is more closely related to urban hierarchies than to Internet infrastructure. Policy makers are able to enhance the competitiveness of

medium sized metropolitan areas if they target “regular” information occupations for regional development. Industry specialization is still important to location choice of information occupations.

BIOGRAPHICAL SKETCH

Eun-Nan Kim attained her Bachelor's degree in Housing and Interior Design from Yonsei University, South Korea, in 1994. She began her Master's degree program in City and Regional Planning at Seoul National University, South Korea, in 1995. During her study, she published *Paradigm Shift of New Industry Districts* in a periodical (Volume 53) of the Korean Association of Space and Environment Research. She received her Master's degree in 1997. Her Master's thesis was published by Seoul National University: *The Role of Housebuilders in the Provision of Housing*. Since then, she worked as a researcher in the Seoul Development Institute. There, she was joint author of three publications: *Development of Welfare Housing Standard; A Study on the Cultural Animation of Public Community Facilities; and A Study on Vitalizing Rental Housing Construction*.

In 1999, she started to study at Cornell in the field of Regional Science in the Department of City and Regional Planning. She achieved her Special Master's degree in Regional Science at Cornell University in 2004. Finally, she gained her PhD degree in Regional Science here in 2006.

To my parents

사랑하는 부모님께 바칩니다.

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I. INTRODUCTION

The new economy is represented as one of information technology, professional and highly skilled workers, high value-added industries, and knowledge-based industries. Since the new economy must be sensitive and flexible with regard to information and economic changes, its ability to generate, manage, control, and regenerate information become critical functions of economic activities. Who handles these core functions in the new economy? It is the members of the “information occupations” who deliver, generate, and manipulate information, knowledge, and creativity. At the same time, these jobs require workers to have a high degree of education and relatively long-term work experience and training; the competitive edge of firms or regions relies on their wealth of highly educated and productive workers. In brief, unlike the old economy, the new economy needs more knowledge and information-based workers who generate, control, and manage information and who have a high degree of education and high-end skills.

In this study, I focus on “information or knowledge occupations,” which generate and manipulate information, knowledge, and creativity. The goals of this study are threefold: to define the “information occupations” in order to apply the concept to diverse regional studies, to investigate the relationship between the concentrations of “information occupations” and metropolitan economies, and to explore the locational determinants of “information occupations” in metropolitan areas

1. Why Focus on Occupations?

In regional studies, industries and firms have been investigated as major factors for regional development. Recently, however, several scholars have suggested a new approach to rethink our regional economic policy in light of the new economy (Florida 2002; Markusen and Schrock 2001; Markusen 2002). The key to this new approach involves the significant role of human capital in the regional economy. Florida (2002) argues that the human capital theory is a potentially powerful theory for city and regional growth. The basic premise of the human capital theory is that people are the engine behind regional growth and that economic growth occurs in the locations where educated people are concentrated. The key to regional growth lies in assets of highly educated and productive people (Florida 2002). Markusen and Schrock (2001) also explore the increasingly significant role of human capital in regional development. They argue that economic development specialists would do well to put greater efforts into two areas: investigating the generation and locational determinants of worker choice, and enhancing the attractiveness of regions to select occupations (Markusen and Schrock 2001).

Over the past decade, regional economists and geographers have considered human capital as the major potential for regional development. As a result, in several studies, the occupational mix and the industry composition were investigated as significant regional innovative potentials (Deitz 2004; Markusen and Schrock 2001; Markusen 2002; Deitz 2003; Clark 2004; Pendall and Christopherson 2004). Some studies investigate a region's occupational mix separately from its industry composition (Deitz 2003).¹ Other studies investigate the occupational mix and its shift within a

¹ Deitz (2003) assesses the occupational composition of the Upstate New York workforce using the 2000 Census, analyzes how it has changed since the 1990 Census, and compares the evolving mix of occupations in Upstate New York with those of the nation as a whole.

certain industry (Hepworth 1990; Deitz 2004; Clark 2004).² Sometimes, human capital is more highlighted than firms (Florida 2002). Among studies that investigate a region's occupational composition and its shift, some studies explored the occupational characteristics in Upstate New York (Deitz 2003; Pendall and Christopherson 2004).

The common idea between the new approach and related studies is that the major focus of regional studies should not be on industry alone; instead, scholars and specialists should pay more attention to workers who generate and manipulate information, knowledge, and creativity. In regional studies, why must occupations come into such sharp focus?

First, industry clusters cannot tell the whole story of regional economic status.³ Even if specific industries, known as the "information sector," are located in a region, their presence does not guarantee the region's economic prosperity. If a region supports only the peripheral functions of the industries, they will provide low-end and low-wage jobs and forecast a less prosperous future in the region. Therefore, the bottom line has to do with what functions of the industries are located in a region. How can we determine the level of economic functions in a region, regardless of what kind of industries are located there? We can recognize the level of regional economic functions by focusing on the occupational structure of a region. In particular, the concentration of high-end jobs implies that core economic functions are performed in such a region. In addition,

² Hepworth (1990) analyzes occupational trends in information industries. Deitz (2004) also analyzes the restructuring of the manufacturing workforce over the past two decades by investigating how the occupational distribution of workers has changed. Clark (2004) examines regional sector specialization and firm labor market strategies through industry and occupation analysis of the optic and imaging industry in Rochester, NY.

³ Markusen (2002) introduces why and how economic and community development planners might target occupations as well as industries in shaping an economic development strategy. A region's occupational mix cannot be mapped simply from its industrial mix – most occupations are quite diversified across industrial sectors and have shifted over the past decade from a concentration in manufacturing toward services.

for the most part, high-end and high-skill workers are usually well-paid. As the proportion of the high-end jobs is bigger, the regional economic income might be better.

Second, more importantly, “information occupations” not only serve well-known high-tech industries (that is, the “information sector”); they also serve across industries. For example, unlike high-tech industries, manufacturing is usually considered as the old economy; it is not classified as part of the information sector in many studies. However, in the new economy, most industries are becoming informationalized, and they need greater information-intensive input. Therefore, information occupations are not exclusively employed by the information sector. These occupations can serve across all industries in the new economy that needs information and knowledge-intensive economic activities. Therefore, it is efficient to focus on the occupational mix in order to determine the level of economic activities and prosperity in a region. This is why we focus on the occupational structure as well as the industrial composition in a region.

Third, an additional advantage of focusing on the occupational structure in regional studies is that occupations can be classified by education levels and skills. Information occupations deliver information and knowledge-intensive input, the core of the new economy. These jobs require workers to have high-end skills and information that usually necessitates higher education, relatively long-term work experience, and training. Using criteria such as education, experience, and training, we can classify occupations into information and non-information groups.

2. Study Framework

Here, I will discuss three major issues to be investigated in my study. The first issue is to introduce a new analytical framework to define information occupations and

analyze regional occupational profiles using the definitions. The second issue is to verify the growing importance of information occupations in metropolitan economies. The third issue is to explore metropolitan characteristics to affect specialization in information occupations.

With regard to these three issues, I will begin with a three-part literature review of these issues in chapter 2. First, the literature review will cover the known origin of the term “information occupations,” including the conceptual definition of the term. Second, I introduce the major works of literature that have highlighted the importance of information occupation in regional economies. Third, I explore the previous studies related to locational determinants of worker choice (i.e., regional factors to lure information occupations into specific places). Additionally, I review the studies that have investigated New York State’s economy and its occupational profile.

In this study, the first major issue is to introduce a new analytical framework to define information occupations and analyze regional occupational profiles in applied research. The definition of information occupations has two parts: conceptual definition and practical approach. In the first part, I address the following questions: What are information occupations? and What are information occupations’ characteristics? Information occupations are not a new concept in regional studies. There exist many previous studies about this concept. I will investigate the conceptual definition of information occupations in the literature review in chapter 2. More importantly, my research focuses on how to apply the conceptual definition of information occupations to applied research. In this regard, I consider the following question: How should we define information occupations in practical research? I will devise and introduce a reasonable and practical approach to satisfy the conceptual definition of information occupations. I will deal with these in chapter 3.

The second issue is to answer why researchers should focus on information occupations in regional studies. It is because these occupations are growing in the new economy and because their impact on regional economies is increasing. In chapter 4, I address these issues at the metropolitan level: the growing trends of information occupations in the new economy and their importance in metropolitan economies.

The third issue involves the locational determinants of information occupations. What factors attract the information occupations to specific regions? I focus on major factors related to the concentration of information occupations such as size, innovation, information infrastructure, diversity, industry specialization, and so on. Using econometrics, I will analyze the extent to which these factors are related to the concentration of information occupations. This issue will be addressed in chapter 5.

In chapter 6, I will recap the study outcomes about these three issues. In addition, I will examine implications that can be deduced from this study and discuss what issues should be addressed in future studies.

3. Study Area

The geographic units of this study are the metropolitan areas in the United States. The metropolitan areas are based on the Metropolitan Statistical Area (MSA) and Primary Metropolitan Statistical Area (PMSA), defined by the Office of Management and Budget (OMB) in the Bureau of Economic Analysis (BEA). According to OMB's general concept, a metropolitan area is a geographic area consisting of a large population nucleus, together with adjacent communities having a high degree of economic and social integration with the nucleus. The metropolitan area definitions are the county-based definitions issued by OMB. With the exception of the New England region, the geographic limits of a metropolitan area are defined by county boundaries.

In the New England region, cities and towns have a high degree of administrative importance and these are typically used to define the boundaries of a metropolitan area. The federal government releases detailed metropolitan economic information, and so the data availability problem is less serious at the metropolitan level than at smaller geographic levels such as counties. The occupational data are in the same situation. Based on the Occupational Employment Statistic (OES) data used in this study, a metropolitan area is the best geographic unit available; it includes both occupational employment and wage estimates.

In addition to all U.S. metropolitan areas, this study focuses upon parts of New York State (NYS) in chapter 3. Upstate New York (Upstate) and Downstate New York (Downstate) show opposing economic patterns because Upstate and Downstate represent a lagging regional economy and a pivot point of the global economy, respectively. An investigation of the occupational structures of two areas will be helpful to suggest policies for regional development of the two areas. This occupational study will allow us to get a better understanding of their economic problems and potential.

Table I-1 shows the NYS geographic composition. NYS includes 62 counties. Thirty of these are parts of metropolitan areas. There are three Primary Metropolitan Statistic Areas (PMSAs) and ten Metropolitan Statistic Areas (MSAs). Newburgh NY-PA PMSA is the only PMSA in Upstate, and it includes counties in two states: Orange County, New York, and Pike County, Pennsylvania. Since it is difficult, at the metropolitan level, to obtain separate data for the two counties in the Newburgh PMSA, this study will include all of the Newburgh metropolitan area.

Table I-1. Composition of Metropolitan and Non-Metropolitan Areas, New York State

	Metropolitan Areas		Non-Metropolitan Areas
Upstate	11 MSAs	28 Counties	24 Counties
	Albany-Schenectady-Troy MSA	Albany	Broome
		Montgomery	Cattaraugus
		Rensselaer	Chenango
		Saratoga	Clinton
		Schenectady	Columbia
		Schoharie	Cortland
	Binghamton MSA	Broome	Delaware
		Tioga	Essex
	Buffalo-Niagara Falls MSA	Erie	Franklin
		Niagara	Fulton
	Dutchess County, NY MSA	Dutchess	Greene
	Elmira, NY MSA	Chemung	Hamilton
	Glens Falls MSA	Warren	Jefferson
		Washington	Lewis
	Jamestown MSA	Chautauqua	Madison
	Newburgh, NY-PA PMSA ¹	Orange	Montgomery
	Rochester MSA	Genesee	Otsego
		Livingston	St. Lawrence
		Monroe	Schuyler
		Ontario	Seneca
		Orleans	Steuben
		Wayne	Sullivan
	Syracuse MSA	Cayuga	Tompkins
		Madison	Ulster
		Onondaga	Wyoming
		Oswego	Yates
	Utica-Rome MSA	Herkimer	
		Oneida	
Downstate	2 MSAs	10 Counties	
	New York PMSA	Bronx ²	
		New York ²	
		Kings ²	
		Queens ²	
		Richmond ²	
		Putnam	
		Rockland	
		Westchester	
	Nassau-Suffolk PMSA (Long Island)	Nassau	
		Suffolk	

1. Originally, Newburgh NY-PA PMSA is composed of Orange County, NY and Pike County, PA. Here, Pike County is included for this study.

2. Denotes counties in New York City.

II. LITERATURE REVIEW

In this chapter, I review literature on information occupations. The first part is to investigate the conceptual definition of information occupations. The second part is to introduce the major works of literature that have highlighted the importance of information occupations to regional economies. The third part is to explore the previous studies that have investigated the locational determinants of worker choice and the ability of regions to attract information occupations. Finally, I review the studies that have investigated the New York State (NYS) economy and occupational profiles.

1. Information Occupations

In regional studies, the definitions of information occupations varies from broad concepts (i.e., information workers or knowledge workers) to narrow concepts (i.e., information technology occupations or information processing occupations). I begin with the broad concepts.

1) Broad Concepts

The terms “knowledge worker” and “information worker” were coined by Machlup (1962) and Porat (1977), respectively. The terms “knowledge-producing workers” and “knowledge-producing occupations” were first used by Princeton University economist Fritz Machlup in his book, *The Production and Distribution of Knowledge in the United States* (1962). Later, in his book, *The Information Economy* (1977), Porat defines an “information worker” for his historical analysis of occupational trends in the U.S. labor force. Porat develops an inventory of 422 informational occupations from the U.S. Census. He then classifies these occupations into four broad

groupings – information producers, processors, distributors, and infrastructure workers. Porat’s concept of information occupations has been employed with little revision by several scholars (Hepworth, Green, and Gillespie 1987; Hepworth 1990; Castells and Aoyama 1994; Aoyama and Castells 2002).

In his book, *The Work of Nations* (1992), Robert Reich uses “symbolic analysts” as the term defining the problem-solving, -identifying, and brokering of many people: research scientists, design engineers, software engineers, civil engineers, biotechnology engineers, sound engineers, public relations executives, investment bankers, lawyers, real estate developers, and even a few creative accountants.⁴

According to Graham and Marvin (1996), in the information-switching centers of the global economy, the bulk of the high-quality jobs created in cities currently are for highly skilled information workers in so-called quaternary or high-order, decision-making functions. These jobs involve the skilled manipulation, processing, value enhancement, and dissemination of information, knowledge, and symbols.

Today’s economy is fundamentally a creative economy (Florida 2002). Florida argues that knowledge and information are the tools and materials of “creativity” because he sees creativity as the creation of new useful forms out of knowledge, with innovation as its product. Florida classifies the major occupational categories in the definitions of four major classes such as the creative class, working class, service class, and agriculture occupations.⁵ Florida introduces the “creative class” as people in work

⁴ According to Reich (1992), symbolic analysts solve, identify, and broker problems by manipulating symbols. The manipulations are done with analytical tools, honed by experience. These tools may be mathematical algorithms, legal arguments, scientific principles, or psychological insights about how to persuade or to amuse.

⁵ In his book, *The Rise of the Creative Class*, Florida defined four occupational categories: The “creative class” has two major sub-components: a super-creative core and creative professionals. The “working class” engages in construction and extraction occupations, installation, maintenance, and repair occupations, production occupations, and transportation and material moving occupations. The “service class” is composed of the following occupational categories: health care support occupations, food preparation and food service-related occupations, building and grounds cleaning and maintenance

whose function is to “create meaningful forms.” The creative class consists of two components: the “super-creative core” and “creative professionals.” The super-creative core of this new class includes scientists and engineers, university professors, poets and novelists, artists, entertainers, actors, designers, and architects, as well as the thought leadership of modern society: nonfiction writers, editors, cultural figures, think-tank researchers, analysts, and other opinion-makers. Florida defines the highest order of creativity work as producing new forms or designs that are readily transferable and widely useful. Creative professionals work in a wide range of knowledge-intensive industries such high-tech sectors, financial services, the legal and health care professions, and business management. They require a high degree of formal education and thus a high level of human capital. What they are required to do regularly is to think on their own (Florida 2002).

2) Narrow Concepts

In another line of studies, information jobs are defined as relatively narrow concepts. In a high-tech and information technology specialization study by Markusen et al. (2001), a set of information technology occupational titles are composed of five computer scientist occupations: systems analysts, database administrators, computer programmers, numerical tool and process control programmers, and other computer scientists.⁶ Even though they bring information technology and high-tech occupations

occupations, personal care and service occupations, low-end sales and related occupations, office and administrative support occupations, community and social service occupations, and protective service occupations. The agriculture occupations are farming, fishing, and forestry occupations (see Florida 2002).

⁶ Using a criterion of science, engineering, and computer professionals in the workforce, Markusen and her collaborators identify a broader set of manufacturing and service industries with high innovative content. These include pharmaceuticals, medical instruments, engineering and architectural services, management and public relations, and research, development and testing services, all of which are large and fast-growing employers, faster even than electronics and computing over the period 1991-2001. They also include a separate set of industries as information technology-intensive, so-called “I-tech” (Markusen et al. 2001).

into focus as regional innovative potential,⁷ the definition of information technology occupations remain as a relatively narrow concept, compared to the concept of information occupations, which is referred to in the previous section. Zook (2003) also defines information processing jobs as information job. Atkinson defines both knowledge jobs (broad) and information technology jobs (narrow) separately (Atkinson 2002, 2001).

3) New Definitions of Information Occupations

Thus the definitions of information jobs or information occupations have a great deal of variation in the literature. It depends on the purpose of each study. In my research, I will focus on the occupations, which require high-end skills and high education levels, mostly following the broad concepts of information occupations. The productivity and competitiveness of agents in the new economy depends on their capacity to generate, process, and apply efficiently knowledge-based information (Castells 2000). If the information jobs are restricted as information technology jobs, they cannot represent the occupational structure in the new economy. Therefore the broad concepts of information occupations are more reasonable.

How can we define the information occupations to represent the new economy? Most recently, Feser (2003) lays out a conceptual framework and an empirical approach to identifying knowledge-based occupation clusters (i.e. groups of occupations that share the same broad knowledge characteristics). Feser uses a database, the

⁷ Markusen and her collaborators argue that cities and regions would do well to rethink their working definitions of high technology and the economic development initiatives that promote it. Abandoning narrow notions of high tech restricted to maturing technologies in computers, electronics, and telecommunications, and using science and technology (S&T) occupations as a marker for high tech, it may be possible to tag the innovative potential of emerging sectors, including high-tech services. Cities and regions could then search the set for matches with their existing occupational, financial, and locational strengths. Strategies developed with this broader set of industries in mind could improve regions' chances of creating comparative advantage and ensuring longer-term dynamism in their economies (Markusen et al. 2001).

Occupational Information Network (O*NET),⁸ which characterizes the required basic skills, knowledge, and worker attributes of thousands of occupations. Feser's conceptual framework can be used to extract information occupations from myriad occupations, based on the required skills, education levels, and characteristics of information jobs (Feser 2003).

2. Information Occupations and Regional Economies

1) Targeting Occupations for Regional Development

The theoretical and practical case for an occupational approach is built on growing recognition that human skill is an essential ingredient in local economies and may be less expensive to attract, nurture, and retain than physical capital, which has consumed the lion's share of economic development incentives in recent decades with disappointing results (Markusen, Schrock, and Elisa 2004).

Markusen and Schrock (2001) explore the increasingly significant role of human capital in regional development by presenting a number of hypotheses about the nature and extent of regional occupational specialization and exploring these with data analysis on national trends and on the Minneapolis/St. Paul metropolitan area. Nationally, a region's occupational mix cannot be mapped simply from its industrial mix – most occupations are quite diversified across industrial sectors and have shifted over the past decade from concentrations in manufacturing towards services, a pattern particularly strong for the high-tech occupations. Markusen and Schrock conclude that

⁸ In the mid 1990s, the Department of Labor's Employment and Training Administration commissioned a project to characterize the basic skill, knowledge, and worker attributes of thousands of occupations. The database is called the Occupational Information Network (O*NET). The National O*NET Consortium manages the development of O*NET and its related products for the U.S. Department of Labor, Employment and Training Administration (ETA).

economic development specialists would do well to spend greater efforts on investigating the generation and locational determinants of worker choice and on enhancing the attractiveness of regions to select occupations. They also suggest a methodology, similar to industrial targeting in some ways but unique in others, for targeting occupations at the regional level (Markusen and Schrock 2001).

Markusen (2002) also analyzes why and how economic and community development planners might target occupations as well as industries in shaping an economic development strategy. Key occupations are identified on the basis of capturability, high relative employment growth rates, connectivity across industries, fit with underemployed workforce groups, and potential for self-employment and entrepreneurship. She demonstrates the potential for an occupational approach with quantitative and qualitative evidence on art occupations for a set of medium-sized metropolitan areas and makes the case for occupational location and development theories analogous to those for industry. She closes by outlining steps planners can follow to incorporate occupational targeting into their work (Markusen 2002).

Why are information occupations important in regional economies? Florida (2002) argues that firms are following talented people. If talented people are gathering into specific places, firms are following them (Florida 2002). Bee (2003) also argued that talent pools are the resources that make urban centers attractive to technology companies. Universities and strong research centers become assets for technology development when they offer a large and reliable talent pool of technical workers (Bee 2003).

2) Human Capital and Economic Growth

In his widely read 2002 book, *The Rise of the Creative Class*, Richard Florida argues that, over the past few decades, human capital theory has emerged as a

potentially powerful theory for explaining city and regional growth. The basic idea is that “people are the motor force behind regional growth” (Florida 2002, p. 221). Human capital theory says that economic growth will occur in places that have educated people. The key to regional growth lies in endowments of highly educated and productive people. Florida (2002) argues that the clustering of human capital is even more important to economic growth than the clustering of firms. The concentrations of talented people power innovation and economic growth in the regions. The ability to rapidly mobilize talent from such concentrations is a tremendous source of competitive advantage for firms or regions in the creative economy (Florida 2002).

In his book, Florida (2002) also reviews regional studies of the United States, finding a clear connection between the economic success of regions and their human capital, as measured by the levels of education.

In a series of studies, Harvard University economist Edward Glaeser and his collaborators found considerable empirical evidence that human capital is the central factor in regional growth. According to Glaeser, such clustering of human capital is the ultimate cause of regional agglomerations of firms: Firms concentrate to reap the advantages that stem from common labor pools -- not merely...to tap the advantages from linked networks of customers and suppliers as is more typically argued....Places with greater numbers of highly educated people grew faster and were better able to attract more talent. Patricia Beeson, an urban economist at the University of Pittsburgh, supports this view.... She finds that investments in higher education infrastructure predict subsequent growth far better than investments in physical infrastructure like canals, railroads or highways (Florida 2002, p.222).

3) Information Occupations and Regional Advantages

Florida (2002) shows that the statistical correlations comparing creative-class locations to rates of patenting and high-tech industry are uniformly positive and statistically significant. The correlations between working-class concentrations and these factors are uniformly negative and statistically significant (Florida 2002).

3. Factors to Attract Information Jobs

Many scholars in regional studies have observed a “spatial division of occupations.” Graham and Marvin (1996) argued that “telemetric” and footloose information movement affects the social and spatial polarization of urban economies. According to them, a major shift from manufacturing towards producer services, consumer services, and knowledge-based industries is remaking the economic construction of cities. That is, in general, the jobs which surrounded the old manufacturing centers are being swept away and they are observed at offshore locations in newly industrialized or less developed countries. In their place, the bulk of the high-quality jobs created in cities are for highly skilled information workers in high-order, decision-making functions (Graham and Marvin 1996, 125). Hepworth et al. (1987) identified the spatial division of information labor in Great Britain. There is clear evidence of Greater London’s dominance of the information economy, particularly in higher-order information occupations related to management and control functions and specialized producer-services activities (Hepworth, Green, and Gillespie 1987). Florida (2002) also showed that the major creative class centers and those of the working class do not overlap. The correlations between creative-class and working-class regions, and also between creative-class and service-class regions, are consistently negative and significant (Florida 2002).

Over the past decade, scholars started to have an interest in factors to attract information occupations into specific regions. Markusen and Schrock (2001) argued that economic development specialists would do well to spend greater efforts on investigating the generation and locational determinants of worker choice and on enhancing the attractiveness of regions to select occupations. Florida (2002) argued that, since the members of creative class are highly mobile and not bound to any particular place, they can move for greater job quality and improved quality of life.

“What they look for in communities are high-quality amenities and experiences,⁹ an openness to diversity of all kinds, and above all else the opportunity to validate their identities as creative people” (Florida 2002).

In this section, I review studies answering the following questions. Where do information workers want to live and work? What really matters to them in making this kind of life decision? Why do they choose to live in and concentrate in some cities over others?

1) Size

The first factor to affect specialization in information occupations is related to city size. In many studies it has been argued that high-quality jobs and information workers concentrate in the global cities and the other low-skilled jobs are located in peripheral areas of global cities or other foreign countries (Graham and Marvin 1996; Hepworth, Green, and Gillespie 1987; Hepworth 1990).

According to Bee (2003), technology workers in a volatile labor market do not want to remain in a small labor market in which alternative job opportunities are few. “A larger pool of workers in an area makes it easier for firms to find workers with the characteristics they need. Conversely, workers are more likely to find a job suited to their skills in a large labor market. In short, labor pooling improves the matching between firms and workers” (Combes and Duranton 2001, p.1).

⁹ Florida (2002) argues that cultural amenities are one of significant factors to attract creative people in a region. 1) “The Geography of Cool,” centers of culture and fashion from New York to Berlin, had also emerged as leading centers for attracting talented people and generating certain new technology-intensive industries. 2) The Bohemian Index: the number of writers, designers, musicians, actors and directors, painters and sculptors, photographers, and dancers. Florida (2002) argues that this is a strong predictor of everything from a region's high-technology base to its overall population and employment growth. A region's Bohemian concentration in 1990 predicts both its high-tech industry concentration and its employment and population growth between 1990 and 2000.

The size of the urban area is tied to the agglomeration economies of urbanization (i.e., external economies such as the quality of airline services, cultural amenities, and health and education services) (Drennan 2002).

2) Innovation Capacity

The second factor is innovation capacity. Many regional innovation studies have considered university research and development (R&D), patents, and venture capital as measures of regional innovation capacity, together or separately. One of most popular measures of innovation capacity in a region is university R&D. There are two related hypotheses explaining the development of high-tech clusters in the vicinity of major university R&D activity (Acs, Fitzroy, and Smith 1999). First, university research is a source of significant innovation-generating knowledge.¹⁰ Second, the university-based explanation of clustering highlights the provision of a pool of trained and highly qualified science and engineering graduates.¹¹ Bania and collaborators, using cross-section data, find a significant effect of university research expenditure on new firm formation (Bania, Eberts, and Fogarty 1993). Acs, Fitzroy, and Smith (1999) analyze the effects of R&D spillover on high-technology employment and wages.¹²

¹⁰ Since both basic and applied university research may benefit private enterprise, it induces firms to be located nearby. Presumably, the chief benefits of geographical proximity to the spillover source consists of a reduction in both the transaction costs of knowledge transfer and in the cost of commercial research and product development (Acs, Fitzroy, and Smith 1999).

¹¹ The high level of human capital is another mechanism by which knowledge is transmitted. Even if university research is either negligible or irrelevant to industry, university training of new industrial scientists alone may be sufficient to generate local labor market spillovers (Acs, Fitzroy, and Smith 1999).

¹² Using four years of data from 36 American cities and six high-technology groupings, they present the first estimates of University R&D spillover on employment at this level of disaggregation, while controlling for wages, prior innovations, state fixed effects, and sample selectivity bias. They find robust evidence that lagged and disaggregated university R&D is a significant determinant of city high-technology employment and some evidence for employment effects of innovation (Acs, Fitzroy, and Smith 1999).

In several research studies, patents are considered as the measure of a region's capacity to turn science into commercial products. The creation of commercially viable knowledge from existing scientific capabilities is most commonly measured by patents (Zook 2003). Bee (2003) argues that patents are the best measure of a region's potential to turn science into commercial inventions.¹³ Some researchers argue that patent data are a better measure of regional technology innovation capacity than university R&D. Patent data are far more predictive of technological production than academic research (Furman, Porter, and Stern 2002; Stern, Poeter, and Furman 2000). Jaffe (1989) confirmed, in his research, that patents are a better measure of technological innovation than university research citation.

Venture capitalists act as innovation catalysts who facilitate direct innovation in regions with strong social structures of innovations (i.e., concentration of human capital, university and public research and development) (Florida and Kenney 1998). Florida and Smith (1992) analyzed the essential role of venture capital in simulating the development of high technology. Zook (2003), using a combination of interviews and regression methodologies, argued that the regional distribution of venture capital investing played a central role in determining the location of new Internet startups.

In several studies, the correlation or mixed effects of university R&D, patents, and venture capital in regional economies are often addressed at the same time. Spillovers from university R&D to patent activity in the same state have been identified econometrically by Jaffe (1989). Bee (2003) examined university blockbuster patents in the semiconductor area to determine whether new innovations cluster near

¹³ He shows that the distribution of patent across metropolitan areas in the United States can be depicted by the Pareto distribution. Therefore, innovation across America's metropolitan areas also follows Pareto's distribution (Bee 2003).

universities.¹⁴ Zook (2003) used patent and venture capital in order to analyze the geographic factors shaping the location of the Internet industry. Atkinson (2001; 2002) used mixed and correlated indicators for accessing the transformation of regional economies to the new economic order at the state and metropolitan levels. He measured the technological innovation capacity in a region using multi-indicators such as high-tech employment, the number of scientists and engineers, patents, R&D, and venture capital.

Thus, in regional innovation studies, the major focus has been on the role of innovation capacity such as university R&D, patents, venture capital in new firm formation or industry clustering, while the studies on the effect of innovation potential on regional high-quality employment have not been highlighted. However, the increasing significance of human capital needs to bring this issue into sharp focus: the relationship between information occupations and regional innovation capacity.

3) Internet Infrastructure

Many previous studies consider innovations in information technology (computer communications networks) or “telemetrics” as a prime mover to reinforce integration of global cities into the global information economy (Hepworth, Green, and Gillespie 1987) and affect the spatial polarization of occupation location (Graham and Marvin 1996).

¹⁴ Universities are considered as seedbeds of regional technology clusters. Cluster theory suggests that businesses near research universities are better networked with professors and are therefore among the first to adopt cutting-edge science. However, according to Bee, proximity to universities with leading-edge research does not appear to bestow geographic advantages to local companies, at least in the case of semiconductors. World-class universities like MIT and Stanford have worldwide networks. Companies on the other side of the world are as likely to access their cutting-edge research as local companies. However, linkages between university science and commerce are clearly strong in other knowledge networks. In case of pharmaceutical companies to form collaboration with biotech faculty, town-and-gown-links are much stronger in the medical network than in semiconductors. Commercial licensing and development of university patents in chemistry is common (Bee 2003).

Even if it is difficult to find studies about the direct relationship between agglomeration of information occupations and the level of regional Internet infrastructure, that is, networks of footloose information movement, we can find some studies to measure the degree of regional transformation to the digital economy (Atkinson 2001, 2002). At state and metropolitan levels, Atkinson measures several digital economy indicators: the percentage of the population online, broadband telecommunications availability and use, commercial (".com") Internet domain names, deployment and use of information technology in K-12 public schools, the use of digital technologies to deliver state government services, percentage of farmers online and using computers, and use of the Internet by manufacturers.

4) Openness to Diversity

Florida (2002) argues that creative-class people seek environments open to the new and different, but the presence of creative-class people has still failed to put an end to long-standing divisions of race and gender. Florida (2002) shows a negative statistical correlation between concentrations of high-tech firms in a region and non-whites as a percentage of the population, which is particularly disturbing in light of his other findings on the positive relationship between high-tech firms and other kinds of diversity – from foreign-born people to gays. Florida (2002) introduces two types of diversity indices which examine correlations between creative-class employment and regional economies: the new outsiders and the gay index, which are somehow disputable.

1) The New Outsiders: Even though many studies point to the role of immigrants in economic development (Saxenian, Motoyama, and Quan 2002; Saxenian 2002, 1999; Florida 2002), it is disputable whether immigration is the powerful source of innovation on regions and the significant index of the concentration of creative and

talented people. Florida (2002) argues that openness to entrepreneurial individuals from around the globe has long been a hallmark of the United States. Immigrants have also spurred a good deal of recent growth in U.S. cities and regions. “The 2000 Census makes it abundantly clear that a large share of regional growth over the 1990s was driven by immigration. Immigrants have fueled the rebound of older established regions like New York and Chicago, as well as powering growth in younger cities from Atlanta to Phoenix” (Florida 2002, p.253). Florida (2002) argues that immigrants have also been a powerful source of innovation and entrepreneurship. Cities across the United States have stepped up their efforts to attract immigrants. Entire inland regions in the United States are actively encouraging immigration to build their economies.

Florida and his collaborators examined the relationship between immigration, or percentage of foreign-born, and the presence of high-tech industry.¹⁵ The outcome contradicted Florida’s own argument. Clearly, immigration is associated with the high-tech industry, but immigration is not strongly associated with innovation, measured as rates of patenting. While it is positively associated with population growth, it is not correlated with job growth. Furthermore, places that are open to immigration do not necessarily number among the leading creative-class centers (Florida 2002).

2) The Gay Index:¹⁶ According to Florida (2002), the Gay Index represents a leading indicator of a place that is open and tolerant (has a low entry barrier) and a very strong predictor of a region's high-tech industry concentration. Florida argues,

There are several reasons why the Gay Index is a good measure for diversity. As a group, gays have been subject to a particularly high level of discrimination.

¹⁵ According to Florida (2002), a 2000 study by the Milken Institute identified immigration as one of the two most powerful demographic trends reshaping the nation’s cities and regions. Its list of “Melting Pot Metros” ranks the most diverse regions in the country. Inspired by the Milken Institute study, Florida and his collaborators dubbed the Melting Pot Index. Four of the top ten regions on the Melting Pot Index are also among the nation’s top ten high-technology regions.

¹⁶ In the 1990 and 2000 Census, gay couples can be identified as unmarried partners with the same sex. The Gay Index, created by Gates, a doctoral student at Carnegie Mellon University, ranks regions by their concentration of gay people (Florida 2002).

Attempts by gays to integrate into the mainstream of society have met substantial opposition. To some extent, homosexuality represents the last frontier of diversity in our society, and thus a place that welcomes the gay community welcomes all kinds of people....For these reasons, openness to the gay community is a good indicator of the low entry barriers to human capital that are so important to spurring creativity and generating high-tech growth. (Florida 2000, pp. 255-256)

According to Florida, six of the top ten 1990 and five of the top ten 2000 Gay Index regions also rank among the nation's top ten high-tech regions. Also, the Gay Index was positively associated with the creative class in both periods; but it was negatively associated with the working class (Florida 2002).

5) Industry Specialization

Who attracts whom? Is human capital the power source to attract firms in a region? Or do specific industries attract highly educated people? The causality of two factors is still disputable in regional studies. However, we can still observe the geographic overlap between educated people and certain industries. Some studies investigated the relationship between industry specialization and the concentration of information occupations (i.e., workers with a high degree of human capital). According to Florida (2002), places with large concentrations of the creative class also rank highly as centers of high-tech industry and the correlation between the location of creative people and the location of high-tech industry is positive and statistically significant.¹⁷

Some industries need more highly educated workers than other industries do. As a result, the specialization of information-intensive industries, which need greater numbers of more educated workers, increases the relative share of information occupations in a region's occupational composition.

¹⁷ According to Florida, the correlation between the creative class and the high-tech industry is 0.38 (Florida 2002).

In his book, *The Information Economy and American Cities* (2002), Drennan introduced three components of industries as members of the information sector: financial producer services, other producer services, and advanced consumer services.¹⁸ Drennan examined the occupational structure of the information sector. According to Drennan, the information sector is quite different in its occupational composition than the other sectors shown. The difference arises from its high share of professional workers (highly educated and higher-paid), clerical workers, and service workers (low-paid).¹⁹ Thus, the information sector not only has high proportions of jobs for college graduates but also has large proportions of jobs for workers with high school or less education. Additionally, he showed that three parts of the information sector differ a good deal among themselves in their occupation composition (Drennan 2002).

4. New York State Economy and Occupations

1) New York State Economy

Drennan (1998) analyzes the economic change of two metropolitan areas, Rochester and Buffalo, in Upstate New York. Drennan explains the economic differences of the two areas, relative to industry specialization, and forecasts the future growth patterns of the two areas. Pendall et al. (2004) show the economic change of Upstate New York over 20 years. Economic measures of 52 counties in Upstate New York are discussed in detail in order to explain the economic changes and trends of

¹⁸ See Appendix C5 for the detailed industries comprising the three components of the information sector.

¹⁹ For the national distribution in 1997, the share of managerial and professional jobs, the occupational classes heavily dominated by people with college degrees or higher education (the so-called high degree of human capital occupational classes), ranged from 31% to 56% in the information sector. The share of managerial and professional jobs ranged from only 14% to 18% in the other parts of the economy in 1997. The sum of clerical plus service job shares ranged from 37% in advanced consumer services to 53% in financial producer services (Drennan 2002).

Upstate New York, including the changes of industrial structures in 11 metropolitan areas of Upstate New York. Using econometrics, they examine the positive and negative factors on the level and growth of per capita personal income (PCPI) and wages at the county level. In this paper, they use Drennan's taxonomy, which is used at his recent book (Drennan 2002). This study's results raise several questions about the occupational distribution of the information sector. One of them is that, in Upstate New York, the higher the share of the information sector in total earnings, the lower the wage. That is, the information sector in Upstate New York may have a higher proportion of low-wage and clerical jobs than in Downstate New York or the United States (Pendall, Drennan, and Christopherson 2004).

2) New York State Occupational Profile

One study has investigated the occupational mix and its shift in New York State, in comparison with the national occupational mix (Deitz 2004), while other studies investigated the occupational profile of Upstate New York (Deitz 2003; Clark 2004; Pendall and Christopherson 2004).

Deitz (2003) uses newly available data from the 2000 Census to assess the occupational composition of the Upstate New York workforce and to analyze how it has changed since the 1990 Census. He also compares the evolving mix of occupations in Upstate New York with that of the nation as a whole. The largest occupation in Upstate New York is office and administrative support, retail and sales, management, and production. Compared with the nation, Upstate New York has particularly high concentrations of workers in production, education, healthcare, and community and social services. Regional workers in the narrower occupations of management, construction, community and social services, protection, and farming tend to earn higher wages than workers in those occupations on a national level, while regional

wages in retail and sales, and in computer and mathematical occupations (broader occupations) tend to be lower than the nation's (Deitz 2003).

According to Deitz (2004), within manufacturing, the composition of the workforce has been changing dramatically. High-skilled manufacturing jobs are growing, even in many areas where manufacturing job loss has been particularly severe. And even in the few areas where high-skilled manufacturing jobs are not growing — such as New York State — intensive loss in low-skilled jobs is causing the makeup of the remaining manufacturing workforce to shift toward high-skilled employment. He analyzes the restructuring of the manufacturing workforce over the past two decades by investigating how the occupational distribution of workers has changed (Deitz 2004).

Pendall and Christopherson (2004) grouped occupations at the national level into five wage-based quintiles, each of which had equal numbers of workers; the lowest quintile represented those occupations that included the 20% of workers who earned the lowest average hourly wage. This procedure was conducted separately for men and women to account for the gendering of occupations. The top tier consists mostly of managerial and professional occupations; the bottom tier consists mostly of production, food-service, and transportation occupations. According to them, Upstate New York has a wage disadvantage within the occupational quintiles, particularly in the uppermost quintiles. Upstate New York men in the top occupational quintile earn only 91% of the national average hourly wage, and women only 93%. The “pure” impact of comparatively low wages on Upstate New York's aggregate wages is substantial. If Upstate New York's white, college-educated workers whose hourly wages in 1999 were below the national average were raised to the national average for those of similar ages and educational levels, this occupational quintile would be worth nearly \$5.6 billion, a 5.5% increase in Upstate New York's total wages, assuming no changes in the age

structure, educational attainment level, and occupational structure of Upstate New York's workers (Pendall and Christopherson 2004).

Throughout her dissertation research of Rochester, New York's optic and imaging industry, Clark (2004) examines regional sector specialization and firm labor market strategies deployed to retain corporate competitiveness. Throughout industry and occupational analysis, she argues that there is a contradiction between the need for firm-specific skills and the desire for a flexible employment relationship that creates an increased dependence on the skills and capacity of the regional labor market (Clark 2004).

III. INFORMATION OCCUPATIONS AND REGIONAL PROFILES

In this study, the conceptual definition of “information occupations” follows broad concepts such as “information workers” (Porat 1997), “knowledge workers” (Machlup 1962), “symbolic analysts” (Reich 1992), and “the creative class” (Florida 2002). The common idea of those concepts is the significance of human capital such as high-end skills and a high level of education. Hence we can define information occupations using the common criteria which high-end jobs require: a high level of education, experience, and job training. In this chapter, the study focus is on defining information occupations by these criteria and on capturing the regional profiles of information occupations.

1. Methodology and Data

In order to satisfy these goals, we need a particular database to explain the characteristics and worker requirements of each occupation in order to define the information occupations by conceptual criteria and, at the same time, provide geographic employment and wage data for each occupation. However, there is no database to satisfy both conditions. Instead, I will introduce two databases which are used to satisfy each goal: the Occupational Information Network (O*NET) and the Occupational Employment Statistics (OES). I will show how the two databases are used to define information occupations and to provide the regional employment and wage mix of information occupations (see Figure III-1).

Analysis Framework: Two databases are respectively used to define information occupations and to analyze their spatial mix and wage: the Occupational

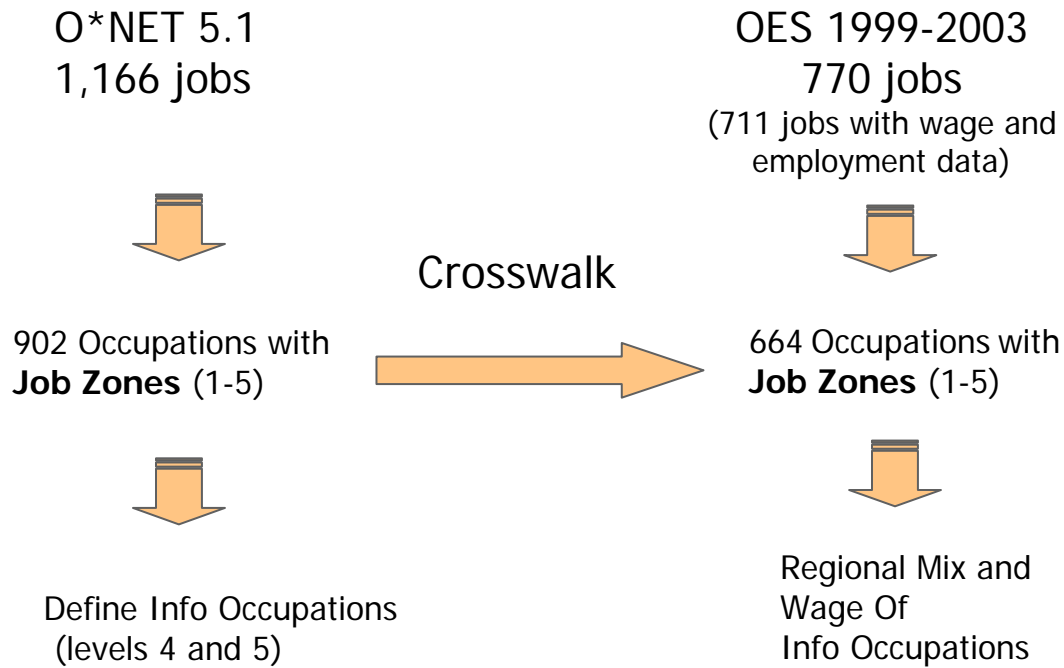


Figure III-1. Analysis Framework for the Definition and Regional Mix of Information Occupations

Note: O*NET 5.1 is the database version used for this study. The database version continues to be updated. OES defines 770 jobs but it provides wages and employment of 711 jobs at the national level.

Information Network (O*NET) for defining information occupations and the Occupational Employment Statistics (OES) for analyzing their spatial mix and wage. The O*NET is a useful database to characterize the basic skills, knowledge, and worker attributes of thousands of occupations. The O*NET does not include the information about occupational employment and wage, but the OES does.

First, I defined information occupations using the five job zones in the O*NET database. The O*NET job zone is the measure of experience, education, and job training, required by occupation. Job zones consist of five groups ranging from job zone 1 to job zone 5. Generally, a higher level of job zone means that the occupation needs

more experience, higher education, and longer job training. Job zones 4 and 5 are used as the indicators to select information occupations from all occupations. The O*NET database has 902 occupations classified by job zone, while the O*NET database has 1,166 occupations.

Second, in order to analyze the regional mix of information occupations, I converted 902 occupations with a job zone in the O*NET database to 664 jobs of the OES, by using two crosswalk files released by the National Crosswalk Service Center (NCSC).

Third, I analyze the spatial mix of employment and wage of information occupations using the OES data, in which occupations are converted from the O*NET occupations according to job zone.

1) Definitions of Information Occupations: O*NET and Job Zones

In the mid 1990s, the Department of Labor's Employment and Training Administration commissioned a project to characterize the basic skills, knowledge, and worker attributes of thousands of occupations. The database is called the Occupational Information Network (O*NET).²⁰ The O*NET is an electronic replacement for the Dictionary of Occupational Titles (DOT).

Five Job Zones: Five job zones were developed to help transition DOT's measures of specific vocational preparation (SVP) to O*NET's measure of experience, education, and job training. The SVP is the amount of time required by a typical worker

²⁰ The O*NET database is organized into a conceptual model of six dimensions: 1) worker characteristics (abilities, interests, and work styles); 2) worker requirements (basic and cross-functional skills, general knowledge, and education); 3) experience requirements (training, experience, and licensing); 4) occupation requirements (work activities and context, and organizational context); 5) occupation-specific information (knowledge, skills, tasks, and machinery/equipment); and 6) occupational characteristics (such as wages and the labor market outlook).

Table III-1. O*NET Job Zone Reference

Job Zone	Experience	Education	Job Training	Examples
Job Zone 1: Little or No Preparation Needed	No previous work-related skill, knowledge, or experience is needed	May require a high school diploma or GED certificate. May require a formal training course to obtain a license.	A few days to a few months of training. Usually, an experienced worker could show a new worker how to do the job.	Bus drivers, forest and conservation workers, general office clerks, home health aides, and waiters/waitresses.
Job Zone 2: Some Preparation Needed	Some previous work-related skill, knowledge, or experience may be helpful, but usually is not needed.	Usually a high school diploma, some vocational training or job-related course work. In some cases, an Associate's or Bachelor's degree.	A few months to one year of working with experienced employees.	Drywall installers, fire inspectors, flight attendants, pharmacy technicians, salespersons (retail), and bank tellers.
Job Zone 3: Medium Preparation Needed	Previous work-related skill, knowledge, or experience is needed.	Most require training in vocational schools, related on-the-job experience, or an Associate's degree. Some may require a Bachelor's degree.	Usually one or two years of training involving both on-the-job experience and informal training with experienced workers.	Dental assistants, electricians, fish and game wardens, legal secretaries, personnel recruiters, and recreation workers.
Job Zone 4: Considerable Preparation Needed	A minimum of two to four years of work-related skill, knowledge, or experience is needed.	Most require a Bachelor's degree, but some do not.	Usually several years of work-related experience, on-the-job training, and/or vocational training.	Accountants, chefs and head cooks, computer programmers, historians, pharmacists, and police detectives.
Job Zone 5: Extensive Preparation Needed	Extensive skill, knowledge, and experience are needed. Many require more than five years of experience.	A Bachelor's degree is required. However, many also require graduate school: Master's degree, PhD, MD, or JD.	Most assume that the person will already have the required skills, knowledge, work-related experience, and/or training.	Athletic trainers, lawyers, managing editors, physicists, social psychologists, and surgeons.

Source: O*NET 5.1 database

to learn the techniques, acquire the information, and develop the abilities needed for average performance in a specific work situation. Table III-1 shows the worker requirement of experience, education, and job training for occupations in each job zone. Usually, occupations in higher job zones, especially job zones 4 and 5, require workers to have longer experience, higher education, and longer job training. For these occupations with higher job zones, workers need longer preparation time, that is, higher human capital investment.

Thus, if an occupation requires a higher level of human capital, the job zone level is also higher. Since job zones are the occupational groups which are classified by human capital such as education, experience, training, I use job zones to classify diverse occupations into “information occupations” and “non-information occupations.” Figure III-2 shows how I assign each job zone to three occupational groups: non-information

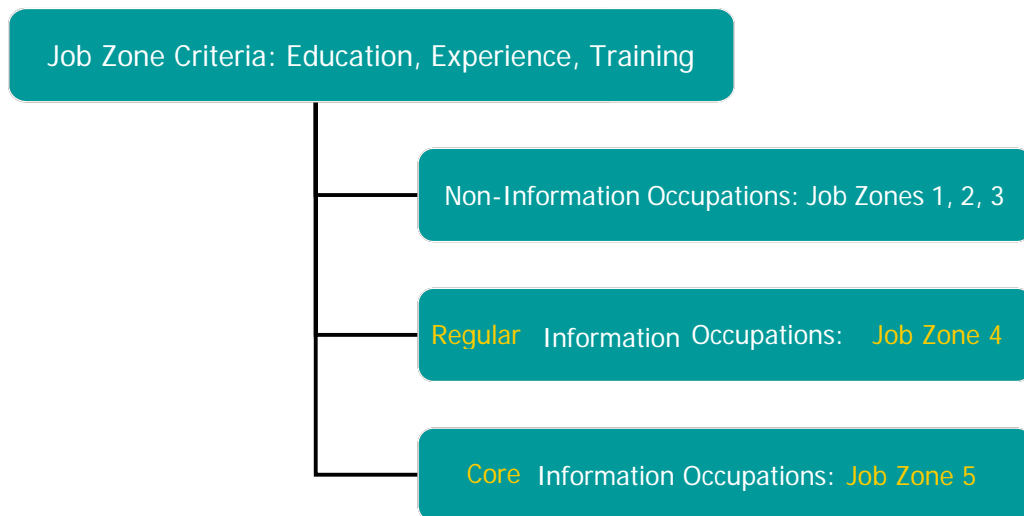


Figure III-2. Types of Information Occupations Classified by Job Zone

occupations, regular information occupations, and core information occupations. Occupations in job zones 1, 2, and 3 are defined as “non-information occupations.” Occupations in job zone 4 are defined as “regular information occupations” and occupations in job zone 5 are defined as “core information occupations.” “Total information occupations” are occupations in job zones 4 and 5 (i.e., the sum of “core information occupations” and “regular information occupations”).

By using job zones, I defined total information occupations and two types of information occupations: 1) core information occupations with the highest level of education, experience, and training; and 2) regular information occupations with a relatively high level of education, experience, and training, but with a lower level than that of core information occupations. Those two together represent total information occupations (i.e., the sum of core and regular information occupations).

2) Regional Profile of Information Occupations: OES

The Occupational Employment Statistics (OES) program collects data on wage and salary workers in nonfarm establishments in order to produce employment and wage estimates for over 700 occupations.²¹ The OES program produces these occupational estimates by geographic area and by industry. Table III-2 shows availability and sources of occupational employment and wage estimates by geographic area and by industry from 1999 to 2003. Estimates based on geographic areas are available at the National, State, and Metropolitan Area levels. The OES Survey began

²¹ The Occupational Employment Statistics (OES) program conducts a yearly mail survey designed to produce estimates of employment and wages for specific occupations. The OES survey is a Federal-State cooperative program between the Bureau of Labor Statistics (BLS) and State Workforce Agencies (SWAs). BLS provides the procedures and technical support, draws the sample, and produces the survey materials, while the SWAs collect the data. SWAs from all 50 States, plus the District of Columbia, Puerto Rico, Guam, and the Virgin Islands participate in the survey. The BLS, using data from the 50 States and the District of Columbia, produces occupational employment and wage rate estimates at the national level.

Table III-2. 1999-2003 Occupational Employment and Wage Data and Sources by Geography Area and by Industry

Geography	Cross-Industry 1999-2003 data	Industry-Specific SIC ¹ 1999-2001 data NAICS ² 2002, 2003 data
National Total	BLS ³	BLS ³
By Metropolitan	BLS ³	SWAs ⁴

1. SIC = Standard Industrial Classification.

2. NAICS = North American Industry Classification System.

3. BLS = Bureau of Labor Statistic.

4. SWAs = State Workforce Agencies.

using the North American Industrial Classification System (NAICS) in 2002. Data prior to 2002 are based on the Standard Industrial Classification (SIC) system.

In 1999, the OES survey began using the new Standard Occupation Classification (SOC) system. Due to the OES survey's transition to the new SOC system, data prior to 1999 are not compatible with data since 1999. The 1999, 2000, 2001, and 2002 wage data have been adjusted to the May 2003 reference period by using the over-the-year wage changes in the most applicable national Employment Cost Index series.²² The OES program provides occupational employment and wage estimates at the major group and detailed occupation levels. The OES survey defines employment as the number of full-time or part-time employees²³ in nonfarm industries. Data from self-employed persons are not collected and are not included in the

²² The Employment Cost Index, an index to monitor inflation, measures the relative changes in wages, benefits, and bonuses for a specific group of occupations.

²³ The OES survey covers all full- and part-time wage and salary workers, including workers on paid vacations or other types of leave; workers on unpaid short-term absences; salaried officers, executives, and staff members of incorporated firms; employees temporarily assigned to other units; and employees for whom the reporting unit is their permanent duty station.

estimates.²⁴ Annual wage estimates are calculated by multiplying an hourly wage by a “year-round, full-time” figure of 2,080 hours (52 weeks × 40 hours). Many employees are paid at an hourly rate by their employers and may work more than or less than 40 hours per week.²⁵ Thus, annual wage estimates may not represent the actual annual pay received by the employee.

3) Crosswalks: O*NET-SOC, SOC, and OES

The O*NET and OES databases have different occupational classification systems, but both of them are based on the Standard Occupational Classification (SOC) system. Figure III-3 shows the linkage between O*NET and SOC, and between OES and SOC.

The Office of Management and Budget (OMB) Standard Occupational Classification (SOC) system is used by all federal statistical agencies for reporting occupational data. The final version of the 1998 SOC was released on September 20, 1999. Some minor changes were made to the classifications in 2000. The new SOC system consists of 821 detailed occupations, grouped into 449 broad occupations, 96 minor groups, and 23 major groups. Appendix Table A1 shows the 23 major groups of the SOC system.

The Occupational Information Network (O*NET) is a comprehensive data system for collecting, organizing, describing, and disseminating information on occupational characteristics and worker attributes. The O*NET-SOC classification was developed and incorporated into the O*NET database in response to the Office of Management and Budget (OMB)’s mandate that federal agencies that collect

²⁴ The survey does not include the self-employed owners and partners in unincorporated firms, household workers, or unpaid family workers.

²⁵ Occupations that typically have a work year of less than 2,080 hours include musical and entertainment occupations, pilots and flight attendants, and teachers.

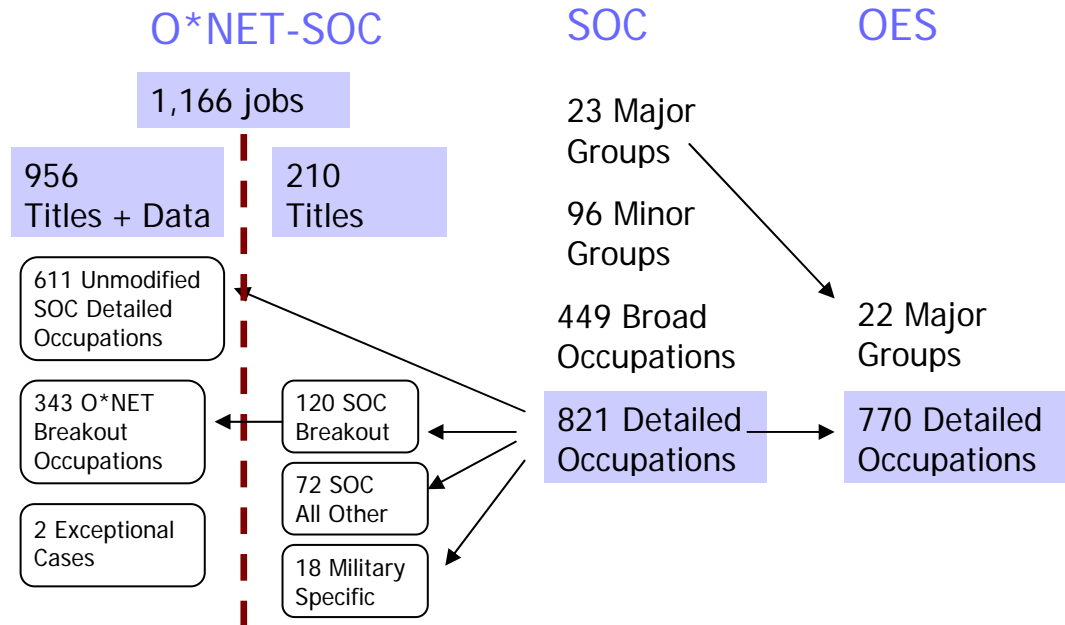


Figure III-3. Occupational Classification Comparisons: O*NET-SOC, SOC, and OES

Source: O*NET-SOC and SOC Classification Comparison is rearranged on the base of National O*NET Consortium, 2001, "O*NET™ Occupational Listings, database 3.1," Figure 1, p.10.

occupational data make use of a common set of occupations. O*NET-SOC builds upon the 2000 SOC framework, adding an additional level of detailed occupations.

O*NET-SOC includes 1,166 occupational titles, of which 956 will include O*NET data. The majority (701 occupations) of the SOC 821 detailed occupations are adapted without modification into the O*NET-SOC system. O*NET breaks out 120 SOC occupations into more detailed O*NET occupations (343 occupations).

In 1999, the OES survey began using the new SOC system. Due to the OES survey's transition to the new SOC system, data prior to 1999 are not compatible with data since 1999. The OES survey categorizes workers in one of the 770 detailed occupations. Together, these detailed occupations comprise 22 major occupational

Table III-3. Crosswalks Between O*NET and OES: Availability and Source Agency

Linkages	Availability	Crosswalk file	Source Agency
O*NET ↔ OES	(Under development)	Estimable	O*NET
O*NET ↔ SOC	Available	O*NET ↔ 2000 SOC ¹	O*NET/NCSC
SOC ↔ OES	Available	2000 SOC ↔ 1999 OES ²	BLS

Source: National Crosswalk Service Center, Career OneStop Official Crosswalk Tables (http://www.state.ia.us/ncdc/xw_ackx.html)

Note: 1. O*NET - 2000 SOC linkages are part of the O*NET 3.1 database. But the occupational listings are consistent with the current O*NET database (ONET 4.1/5.0/5.1 databases).

2. The spreadsheet file linking the 1998 SOC and 1999 OES was furnished by BLS. The 1998 SOC in that file were converted to 2000 SOC occupations by NCSC.

groups. One of 23 major groups of the SOC, “Military Specific Occupations,” is not included in the OES survey.

In order to convert O*NET occupations to OES, we need two crosswalk files. A crosswalk links two or more different classification systems. Crosswalk files are produced by the National Crosswalk Service Center (NCSC) and various federal agencies. The NCSC specializes in products based on the educational and occupational classifications used by the federal government. The Employment and Training Administration (ETA) has identified a number of standardized crosswalk files and made those resources available through the National Crosswalk Service Center (NCSC).

Table III-3 shows availability and source agency of crosswalk files between O*NET and OES. A crosswalk file between O*NET and OES is under development by O*NET, but, as of the date of my research, it is not yet available. Therefore, in order to convert O*NET occupations into OES, I made a cross-table combining two crosswalk files: a crosswalk file between O*NET and SOC and a crosswalk file between SOC and

OES (see Appendix Table A2). This crosswalk table shows the linkage among 1,166 O*NET-SOC occupations including 902 occupations defined by job zone, 2 minor groups and 821 detailed occupations of the SOC system, and 770 detailed occupations of the OES system.

Before combining two original tables, the crosswalk table of SOC to OES has been modified by the author 1) in order to reflect the recent modifications of the SOC system, and 2) in order to make three classifications convertible. First, for reflecting the SOC modifications, the following three codes have been changed on both SOC and OES codes. The code for “Mathematical Technicians” has been changed from 15-3011 to 15-2091. “Farm Laborer Contractors” moved from 45-2031 to 45-1012. “Farming, Fishing, and Forestry Workers, All Others,” 45-9099, has been deleted. Second, for combining two tables, I have changed one linkage of SOC to OES. SOC code 49-3011, “Aircraft Mechanics and Service Technicians,” has been converted to OES code 49-3011, “Aircraft Mechanics and Service Technicians,” although the SOC code was assigned to two OES codes on the original table of SOC to OES.

2. Information Occupations

Eight hundred ninety-eight out of 902 O*NET occupations, defined by job zone, are matched with 664 OES occupations (86% of 770 OES occupations total). The OES released 2003 national occupation employment and wage estimates of 711 occupations²⁶ and 661 occupations (93%) out of those classified by job zone (see Figure III-4). Because of the differences in occupation numbers between the two databases, every OES occupation is not matched with a unique O*NET occupation, but it is

²⁶ OES does not release the occupational employment and wage estimates of all 770 OES occupations. Estimates for residual, “All Other,” occupations are not available. Some confidential data are not released in cases where the sample size is not big enough.

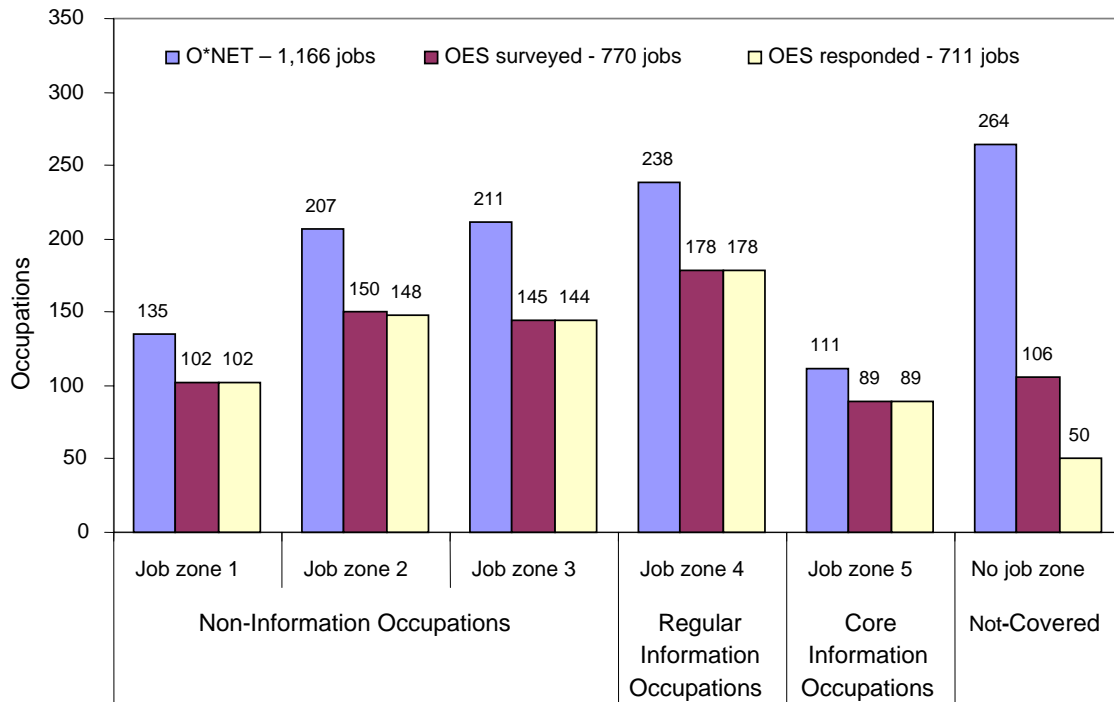


Figure III-4. 2003 Information Occupations Defined by O*NET Job Zone: The Results of a Crosswalk between O*NET and OES via SOC

assigned to plural O*NET occupations. The job zone of each OES occupation, therefore, is determined by the average of job zones of the corresponding O*NET occupations.

Table III-4 shows how I determine the job zone level of each occupation in OES data. In the 2003 national occupational data of OES, 102, 150, 145, 178, and 89 occupations are classified as job zone 1, job zone 2, job zone 3, job zone 4, and job zone 5, respectively – from low-end jobs to high-end jobs. In this study, 267 (40.2%) occupations under job zones 4 and 5 are defined as information occupations and 397 under job zones 1, 2, and 3 are defined as non-information occupations. Also, job zones 4 and 5 are classified as regular information occupations and core information

occupations, respectively. Appendix Table A3 shows the list of the OES occupations classified by O*NET job zone.

Table III-4. Information Occupations Defined by O*NET Job Zone: The Results of a Crosswalk Between O*NET and OES via SOC

	O*NET Classification		OES Classification			
			Surveyed		Released (2003 National)	
	No.	Share	No.	Share	No.	Share
Occupation Compatibility						
Occupations with a job zone	902	77.4%				
Compatible occupations with a job zone	898	77.0%	664	86.2%	661	93.0%
Total occupations	1166	100.0%	770	100.0%	711	100.0%
Job Zone Level*						
Job zone 1: 1 <= job zone average < 1.5	135	15.0%	102	15.4%	102	15.4%
Job zone 2: 1.5 <= job zone average < 2.5	207	22.9%	150	22.6%	148	22.4%
Job zone 3: 2.5 <= job zone average < 3.5	211	23.4%	145	21.8%	144	21.8%
Job zone 4: 3.5 <= job zone average < 4.5	238	26.4%	178	26.8%	178	26.9%
Job zone 5: 4.5 <= job zone average <= 5	111	12.3%	89	13.4%	89	13.5%
Covered by job zone	902	100.0%	664	100.0%	661	100.0%
Information Occupations						
Regular information occupations	Job zone 4		178	26.8%	178	26.9%
Core information occupations	Job zone 5		89	13.4%	89	13.5%
Total information occupations	Job zones 4 & 5		267	40.2%	267	40.4%

Note: OES occupations are matched with several O*NET occupations. Therefore, the job zone of each OES occupation was determined by the average of job zones of the corresponding O*NET occupations.

The occupation number by job zone may show how various occupations exist in information occupations or non-information occupations, but it does not show how big and important these information occupations are in a geographic unit. In order to show this, we need to know the employment distribution by job zone.

In the data released by the OES, not all occupational employment and wage estimates are available because of confidentiality. Therefore, employment estimates for detailed occupations do not sum to the area totals because the totals include occupations which are not shown in the detailed occupations. Figure III-5 shows two kinds of outcomes: employment disclosure rates of detailed occupations and shares of

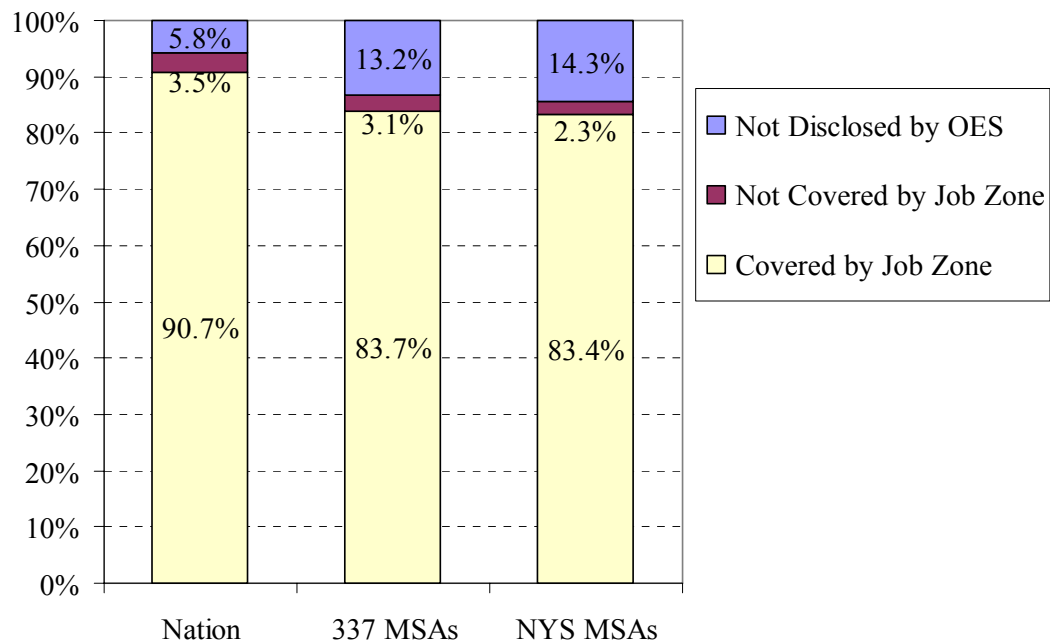


Figure III-5. 2003 Employment Share for OES Detailed Occupations Covered by Job Zone in Total Regional Employment.

Note: Estimates for residual, "All Other," occupations are not available. (1) Estimates for detailed occupations do not sum to the totals because the totals include occupations not shown separately. Estimates do not include self-employed workers. (2) Some employment data are not released because of confidentiality.

occupational employment with job zone to total employment in a nation, total 337 Metropolitan Statistic Areas (MSAs) and New York State (NYS) MSAs in 2003. In 2003, available employment estimates by occupation are 94.2% of the national employment total and 86.8% of the MSA employment total. The NYS MSA total shows a similar rate (85.7%) of employment disclosure of the 337 MSA total. The covered rates of occupational employment by job zone are 90.7% of the national total, 83.7% of the 337 MSA total, and 83.7% of the NYS total. As the sample size gets smaller (i.e., as the geographic area gets smaller), the share of available occupational employment estimates decreases. As a result, in this analysis, employment shares for missing occupations not disclosed by OES range from 5.8% to 14.3% of total occupational employment, and employment shares for occupations not covered by job zone are only in the range of 2.3% to 3.1% of total employment.

What are the characteristics of occupations which are not disclosed by OES or not covered by job zone? Figure III-6 shows that, at the national level, 337 MSAs, and NYS MSAs, annual wages for total OES occupations are higher than those for detailed occupations disclosed by OES and detailed occupations with a job zone.²⁷ This means that a substantial portion of detailed occupations not disclosed by OES or not covered by job zone is a high-wage occupation. Usually, high-end occupations are composed of small groups of workers because these jobs need specialized knowledge and high-end skills. In small areas, therefore, these occupations might not be disclosed by OES because of confidentiality concerns. In addition, among detailed occupations for which OES released employment and wage estimates in 2003, occupations not covered by job zone also seem to include a high portion of high-end jobs. Therefore, in this analysis,

²⁷ In the OES original data, annual wages are \$36,210 at the national level and \$37,363 at the metropolitan level. However, in the case of the occupations classified by job zone, annual wages are \$34,800 and \$35,394, respectively.

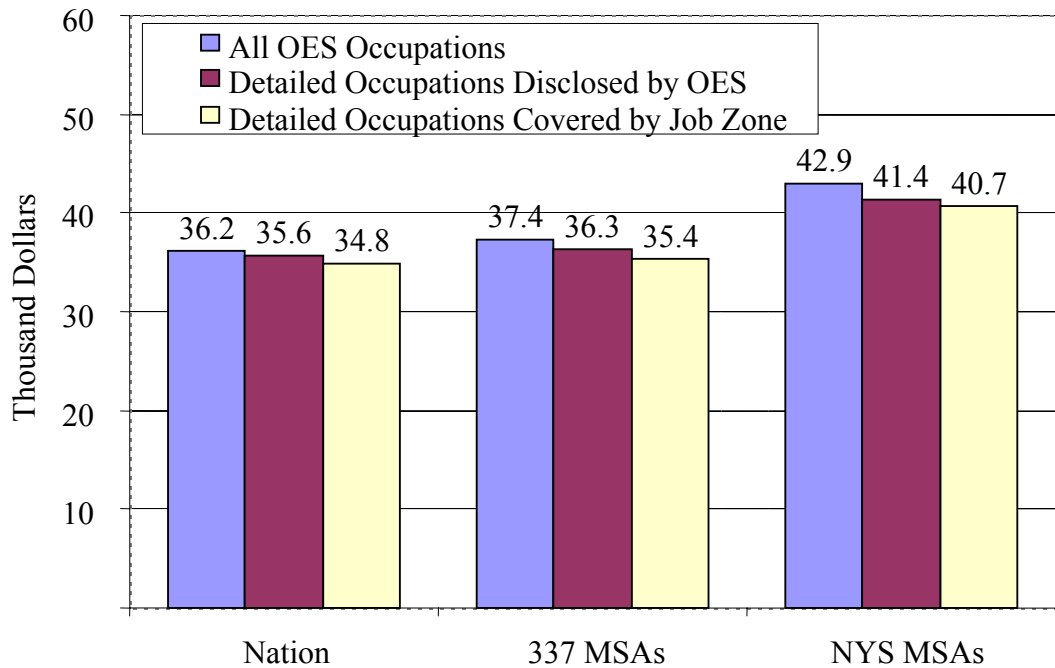


Figure III-6. 2003 Average Annual Wage Estimates for OES Detailed Occupations Covered by Job Zone.

occupational wage distribution might be biased to the lower level, compared to the original occupational wage distribution.

In my analysis, I omit detailed occupations not disclosed by OES or not covered by job zone from regional employment totals. Employment shares for missing occupations not disclosed by OES are different by geographic size. Because of confidential concerns, small areas have large portions of missing occupations, while big areas have small portions of missing occupations. In a region a large portion of missing occupations reduces the employment share of job zone occupations in total regional employment. In contrast, employment shares of job zone occupations might be exaggerated in big areas. Therefore I control the variations of occupational employment distribution according to geographic size, by omitting occupations not disclosed by

OES from total regional employment. In addition, since occupations without a job zone have a small portion in total regional employment, the omission of those occupations from total regional employment does not affect regional occupational distribution analysis significantly.

In diverse geographic units, the occupational profile was analyzed based on the employment and wage estimates for occupations with a job zone (see Figures III-7 and III-8). In 2003, total information occupations are 25.6% of the national employment total and they are composed of two categories of information occupations: 20.7% regular information occupations and 4.9% core information occupations (see Figure III-7). In 2003, metropolitan areas show almost the same pattern as the national employment distribution by job zone. This is because 77.4% of total employment is located in metropolitan areas.²⁸ The 22.6% employment located in non-metropolitan areas seems to have little impact on the national occupational distribution, compared to the metropolitan employment.

However, unlike the employment patterns, in 337 metropolitan areas, the average annual wage by job zone is higher than the annual wage nationally (see Figure III-8). Nationally, the annual wage of regular information occupations is \$51,341 and the annual wage of core information occupations is \$80,973. In metropolitan areas, regular information occupations earn approximately \$52,666 per year and core information occupations earn around \$84,256.

²⁸ According to the 2003 OES data, 106,978,190 (83.9%) out of 127,567,910 workers were located in metropolitan areas. The employment covered by job zones was 115,698,120 nationwide and 89,572,870 in metropolitan areas (77.4% of the national total).

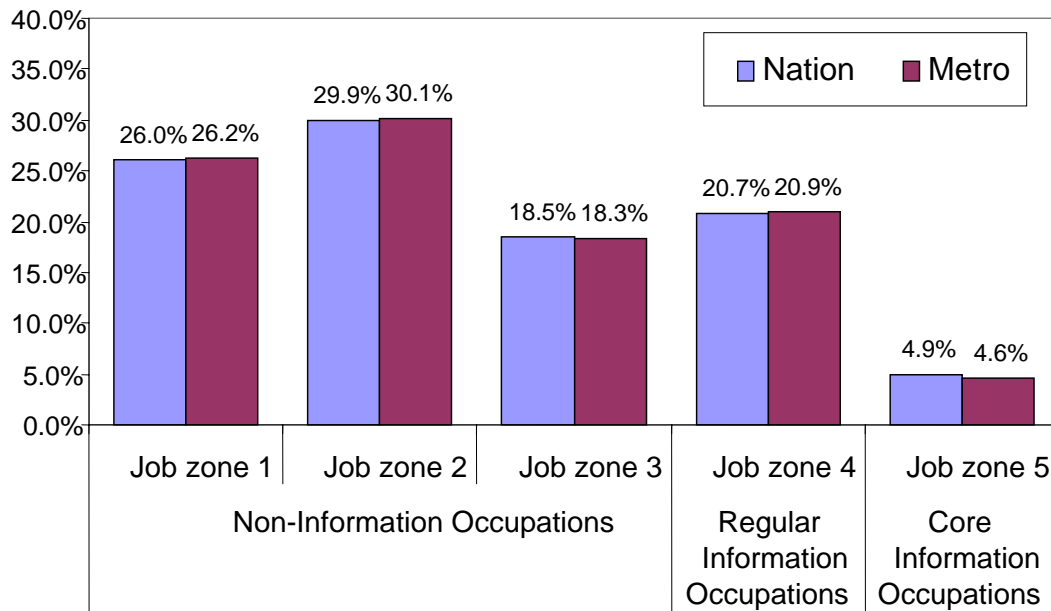


Figure III-7. 2003 Employment Share of Information Occupations: Nation vs. Metro

Source: Occupational Employment -2003 OES and Job Zone – O*NET 5.1 database

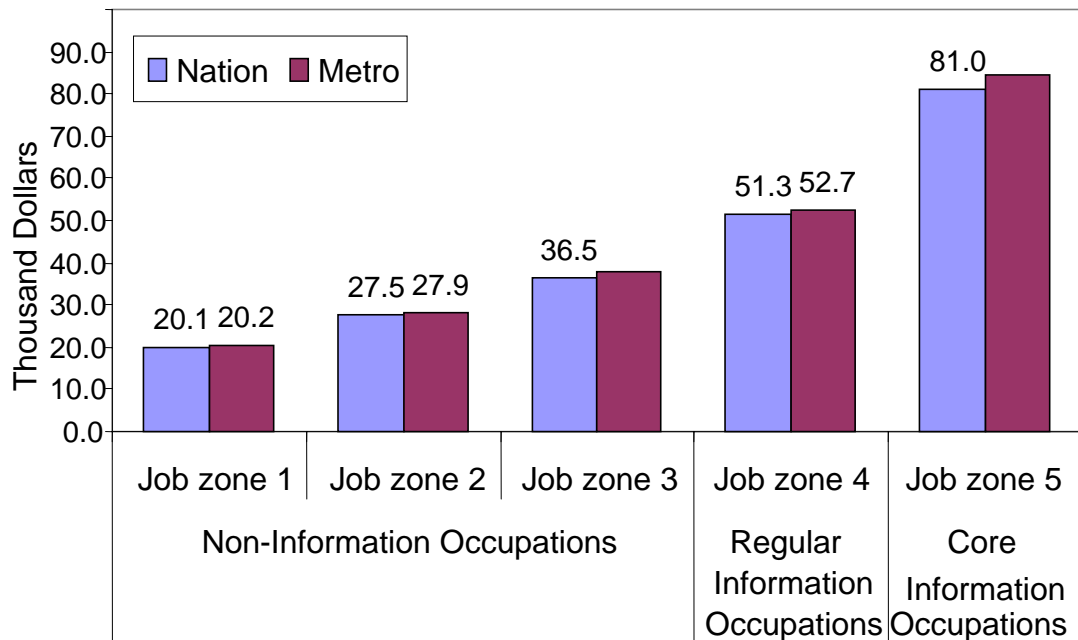


Figure III-8. 2003 Annual Wage of Information Occupations: Nation vs. Metro

Source: Occupational Employment -2003 OES and Job Zone – O*NET 5.1 database

3. Regional Profile: Upstate vs. Downstate New York

1) Upstate vs. Downstate

Upstate metropolitan areas are composed of 11 Metropolitan Statistical Areas (MSAs)²⁹ and Downstate is composed of two Primary Metropolitan Statistical Areas (PMSAs). Figure III-9 shows the employment share by job zone in Upstate and Downstate New York, compared to the average employment share of 337 MSAs. In 2003, Upstate New York had a smaller share (3.8%) of core information occupations than the average share (4.6%) of 337 MSAs, while its share of regular information occupations was similar to the MSA average. Unlike Upstate New York, Downstate New York shows a slightly higher share of information occupations than the MSA average. In particular, core information occupations are 1.4% larger than the average of 337 MSAs.

Occupational wages are proportional to the level of job zone, but Upstate and Downstate New York show opposite patterns, in comparison with average wages of 337 MSAs (see Figure III-10). In 11 Upstate MSAs, at every level of job zone, occupational wages are lower than the MSA average, and wages of information occupations (job zones 4 and 5) are much lower than the MSA average. On the other hand, in Downstate New York, at every level of job zone, occupational wages are higher than the MSA average and wages of information occupations are much higher than the MSA average. Hence, the wage gap between Upstate and Downstate New York increases as the level of job zone is raised. In job zone 1, the wage gap is just \$3,491 (17.7% of the Upstate average), but the gap in job zone 5 is \$29,103 (38% of the Upstate average).

²⁹ The metropolitan composition of Upstate and Downstate New York was explained in the chapter 1.

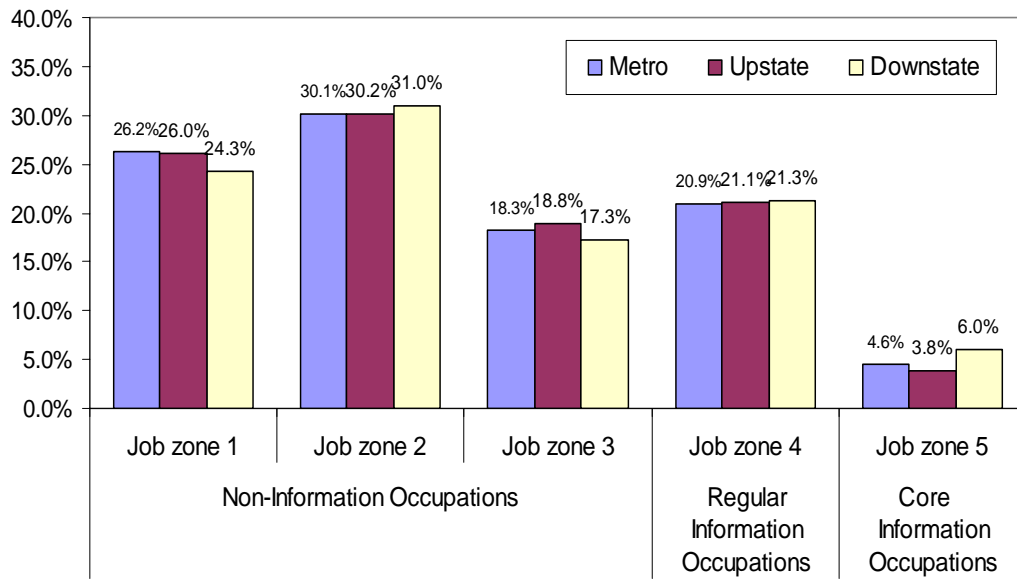


Figure III-9. 2003 New York State Metropolitan Employment Share of Information Occupations: Upstate vs. Downstate New York

Source: Occupational Employment-2003 OES and Job Zone –O*NET 5.1 database

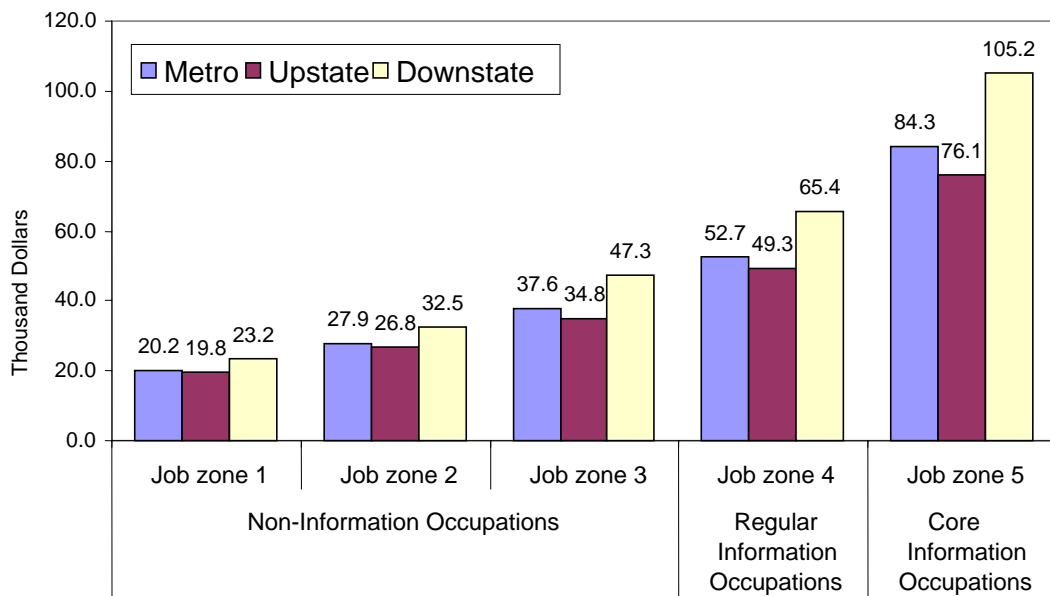


Figure III-10. 2003 New York State Metropolitan Area Annual Wage of Information Occupations: Upstate vs. Downstate New York

Source: Occupational Employment-2003 OES and Job Zone –O*NET 5.1 database

2) 11 Upstate Metropolitan Areas

Table III-5 shows the ranks of 13 metropolitan areas in New York State (NYS) in terms of employment and wage for the two kinds of information occupations: core and regular, and their sum, labeled “total” information occupations. In terms of employment, Albany-Schenectady-Troy Metropolitan Statistical Area (MSA) has the highest employment share of information occupations. New York, Rochester, Syracuse, and Binghamton, and Nassau-Suffolk follow sequentially. Only three out of 13 metropolitan areas — Albany-Schenectady-Troy (28.3%), New York (28.2), and Rochester (26.7%) — have a higher employment share of information occupations than the national MSA average (25.5%).

In the case of wages, only two Downstate metropolitan areas — New York (\$76,811) and Nassau Suffolk (\$65,060) — show a higher wage than the national MSA average (\$58,317). Albany-Schenectady-Troy, Newburgh, and Dutchess are ranked third, fourth, and fifth, and their high ranks are probably related to their proximity to the New York Primary Metropolitan Statistical Area (PMSA). However, no Upstate MSA provides a higher wage for information occupations than the U.S. MSA average.

The 2003 occupational profiles in two specialized areas, which have a higher share of information occupations than the national average, are as follows. First, Albany-Schenectady-Troy has higher portions of both core and regular information occupations (5.2% and 23.1%, respectively) than the national MSA averages (4.6% and 20.9%, respectively). On the other hand, Albany-Schenectady-Troy provides lower wages for both core and regular information occupations (\$78,932 and \$50,577, respectively), compared to the national metropolitan averages (\$84,256 and \$52,666, respectively). The higher employment shares of information occupations in

Table III-5. New York State Metropolitan Area Rank by Employment and Wage for Information Occupations in 2003.

Metropolitan Areas	Employment Share			Rank by Employment		
	Total	Core	Regular	Total	Core	Regular
Albany-Schenectady-Troy	28.3%	5.2%	23.1%	1	2	1
New York*	28.2%	6.7%	21.5%	2	1	3
Rochester	26.7%	4.1%	22.7%	3	3	2
Syracuse	24.6%	3.6%	20.9%	4	5	5
Binghamton	24.6%	3.4%	21.1%	5	7	4
Nassau-Suffolk*	24.5%	4.0%	20.6%	6	4	6
Buffalo-Niagara Falls	23.9%	3.5%	20.4%	7	6	7
Utica-Rome	23.2%	3.3%	19.9%	8	9	8
Dutchess County	22.7%	3.4%	19.3%	9	8	9
Newburgh	21.9%	2.7%	19.2%	10	10	10
Elmira	20.0%	2.5%	17.5%	11	11	11
Jamestown	18.6%	1.6%	17.0%	12	12	12
Glens Falls	15.4%	1.3%	14.2%	13	13	13
Upstate average	24.9%	3.8%	21.1%			
Downstate average	27.3%	6.0%	21.3%			
NYS metro average	26.5%	5.3%	21.2%			
US metro average	25.5%	4.6%	20.9%			
	Annual Wage			Rank by Wage		
	Total	Core	Regular	Total	Core	Regular
New York*	76,811	107,303	67,291	1	1	1
Nassau-Suffolk*	65,060	94,141	59,433	2	2	2
Albany-Schenectady-Troy	55,796	78,932	50,577	3	4	5
Newburgh	55,668	79,689	52,255	4	3	3
Dutchess County	55,157	73,318	51,932	5	11	4
Rochester	53,872	74,529	50,160	6	9	6
Buffalo-Niagara Falls	52,439	75,058	48,575	7	7	8
Binghamton	52,273	75,029	48,588	8	8	7
Syracuse	51,787	77,080	47,391	9	5	10
Glens Falls	50,475	73,720	48,401	10	10	9
Utica-Rome	50,209	71,526	46,683	11	12	11
Jamestown	46,557	75,398	43,847	12	6	12
Elmira	46,510	66,379	43,644	13	13	13
Upstate average	53,357	76,099	49,261			
Downstate average	74,195	105,204	65,401			
NYS metro average	67,947	98,520	60,271			
US metro average	58,317	84,256	52,666			

* Downstate Metropolitan Areas

Albany-Schenectady-Troy have long been highly dependent on the state government, even though the wages for information occupations are lower than the national MSA averages.³⁰

In order of the employment share of total information occupations, Rochester was ranked third among 13 NYS metropolitan areas. Figure III-11 shows that Rochester retains a higher employment share of regular information occupations (22.7%) than those of national and upstate metropolitan areas (20.9% and 21.1%, respectively). Its employment share of core information occupations (4.1%) is higher than the Upstate average (3.8%), but it is lower than the national metropolitan average (4.6%); this might be because Rochester continues its comparative strength in high-tech instrument manufacturing such as optics and imaging technology.

Unlike the employment share, Rochester does not provide better compensation for both core and regular information occupations than the national average.³¹ For regular information occupations, its wage (\$50,160) is higher than the Upstate average (\$49,261) but lower than the national metropolitan average (\$52,666). For core information occupations, Rochester provides a lower wage (\$74,529) than even the Upstate average (\$76,099), and a much lower wage than the national metropolitan average (\$84,256). The annual wage of core information occupations is about \$1,500 less than the Upstate MSA average. In particular, it is about \$10,000 less than the MSA

³⁰ Pendall, Drennan, and Christopherson (2004a) say that it is because of the “captive” nature of labor for state government in Albany.

³¹ Rochester provides the fifth highest annual wage for all information jobs among 13 NYS metropolitan areas, and it provides the third highest annual wage among 11 Upstate metropolitan areas. Rochester is ranked sixth for overall information occupation and regular information occupations, but it is ranked ninth for core information occupations. Except for job zone 5, that is, core information occupations, Rochester wages for the other four job zones are similar to or better than the Upstate average. According to Pendall, Drennan, and Christopherson, in the 1990s, the average wage per job in the region slipped by 3.8%. They explained that it occurred in part because unions are comparatively weak in Rochester. In 1999, only 13% of manufacturing workers in Rochester were covered by union contracts, compared with 35% of those in Buffalo (Pendall, Drennan, and Christopherson, 2004).

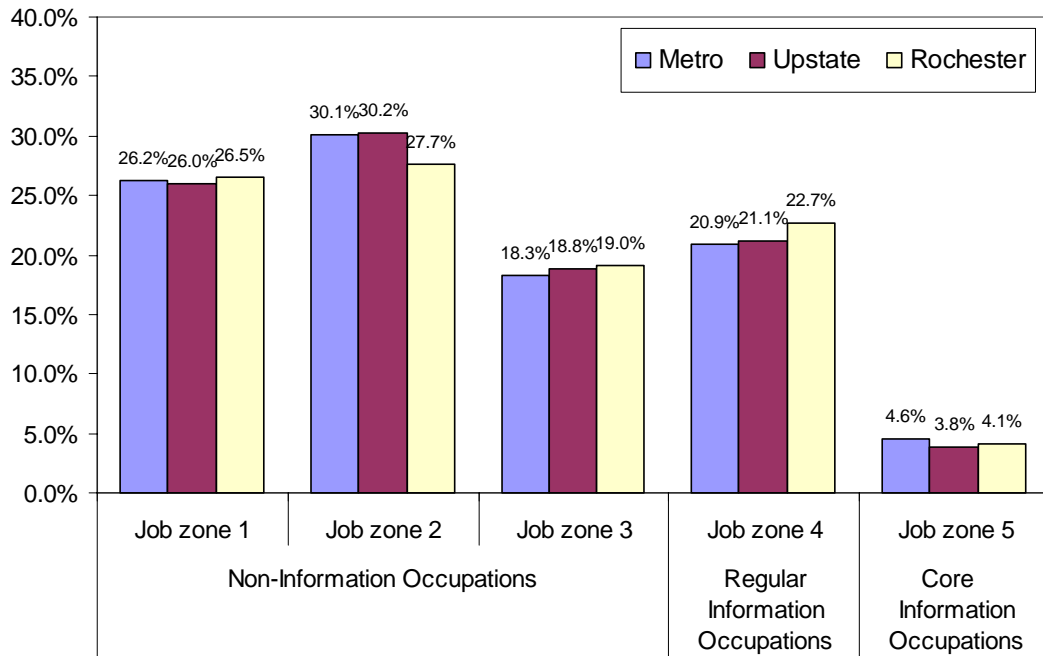


Figure III-11. 2003 Rochester Employment Share of Information Occupations

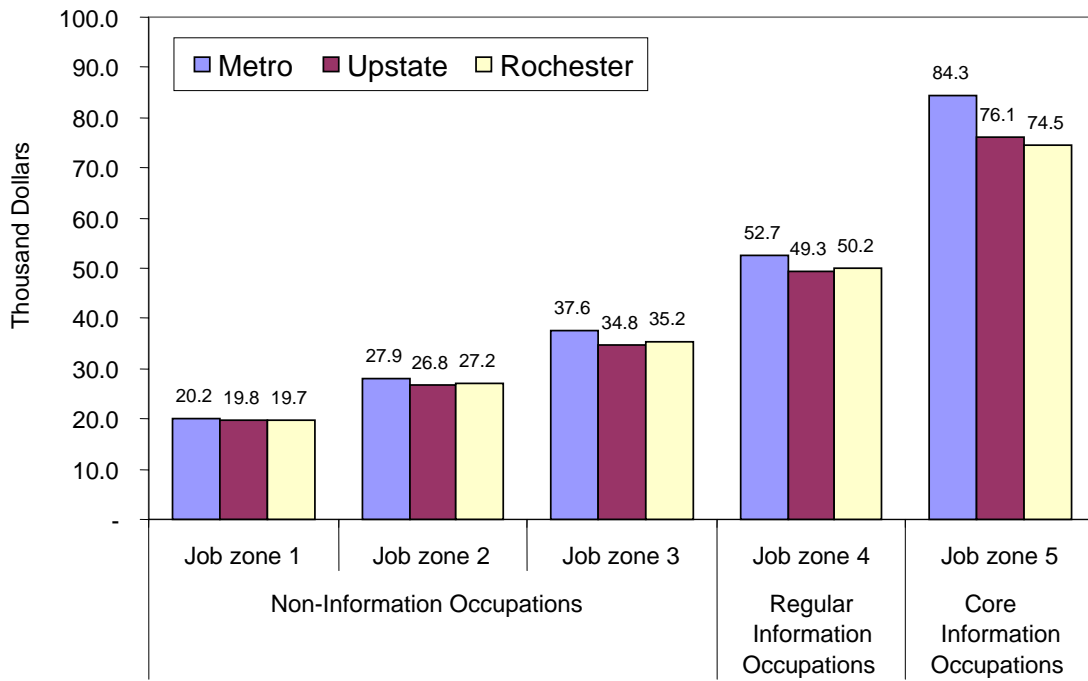


Figure III-12. 2003 Rochester Annual Wage of Information Occupations

average. The annual wage gap between Rochester and 337 MSAs is serious for core information occupations, compared to the gap for the other four job zone occupations (see Figure III-12).

3) Summary

In brief, the 2003 characteristics of information occupations in NYS are as follows. First, for regular information occupations, both Upstate and Downstate are specialized in those jobs. However, for core information occupations, only Downstate is specialized in those jobs. Downstate shows a much higher portion of core information occupations than the MSA average but Upstate does not. Second, in the case of occupational wage, Upstate and Downstate show opposite patterns. At every level of job zone, the wage in Upstate is lower than the MSA average, but in Downstate, it is higher than the MSA average. The wage gap between Upstate and Downstate increases as the level of job zone is raised. In Upstate, the annual wage per information occupation (job zones 4 and 5) is much lower than the MSA average, but in Downstate, it is much higher than the MSA average. Third, information occupations are specialized in three out of 13 NYS metropolitan areas — Albany-Schenectady-Troy, New York, and Rochester — which have higher employment shares of information occupations than the national MSA average.

IV. INFORMATION OCCUPATIONS AND METROPOLITAN ECONOMIES

Why should we focus on information occupations in regional studies? It is because, in the new economy, information occupations grow faster than non-information occupations and because, in metropolitan economies, they become more important. In this chapter, I investigate these two issues: the growing patterns of information occupations in the new economy and their importance in metropolitan economies. In this regard, I focus on two analyses: 1) past trends and future projections of information occupations, and 2) the impact of their concentration on regional income at the metropolitan level.

1. Growing Occupations

In order to show the growth patterns of information occupations in the new economy, I examine the employment trends of information occupations over two periods (1994-2004 and 2002-2012), using two data sources. First, I analyze the historic employment trends of information workers over the past decade (January 1994- January 2004), using the Current Population Survey (CPS) data, which include employment by education level. Second, I forecast the future trends of information occupations, using the occupational projections from 2002 to 2012, released by the Bureau of Labor Statistics (BLS), which includes occupational employment by the required education and training levels of employees aged 25 to 44 years.

1) Past Trends

In order to show the past trends of information occupations, it would be ideal to analyze the historic data of the Occupational Employment Statistics (OES) by job zone: occupational groups by the required education, experience, and training. The occupation classification used by OES, however, has been changed dramatically since 1998. Therefore, the OES data before 1998 are difficult to compare to the 1998 and later data. Instead, I estimate the employment trends of information occupations by culling workers with a high level of education among the myriad employed persons, after classifying employees by education attainment. For this reason, I use a new concept (i.e., “information workers”) and an alternative database (i.e., the Current Population Survey (CPS)).

In this study, “information workers” or “total information workers” are defined as employed persons with more than a Bachelor’s degree without regard to their occupations. The detailed classifications are as follows. Employed persons with Doctorate degrees, Master’s degrees, and professional degrees (e.g., MD, DDS, DVM) are considered as “core information workers,” and employed persons with Bachelor’s degrees are considered as “regular information workers.” On the other hand, employed persons with less than a Bachelor’s degree are considered as “non-information workers.”

The CPS database includes employment and employee’s highest level of education completed at the national level. The highest education level of school completed is composed of seven categories: Doctorate degree, Master’s degree, professional school degree, Bachelor’s degree, some college or Associate’s degree, high school graduation diploma or GED, and less than a high school diploma. Using the CPS data, I classified information and non-information workers by grouping the employed

persons by the highest level of school completed, and then I analyzed the 1994-2004 employment growth of information workers (see Appendix Table B1).

Figure IV-1 shows the growth rate of information and non-information workers over the past decade, based on January 1994. The number of information workers (employees with a Bachelor's degree and higher) has been growing faster than that of non-information workers (employees with less than a Bachelor's degree). Over this period, the numbers of core information workers (employees with a Doctorate, Master's, or professional degree) and regular information workers (employees with a Bachelor's degree) have increased by 37.4% and 32.7%, respectively, while the number of non-information workers has increased by only 7.5% over the same period. It implies that, over this period, information occupations (jobs requiring a high level of human capital) have grown faster than non-information occupations.

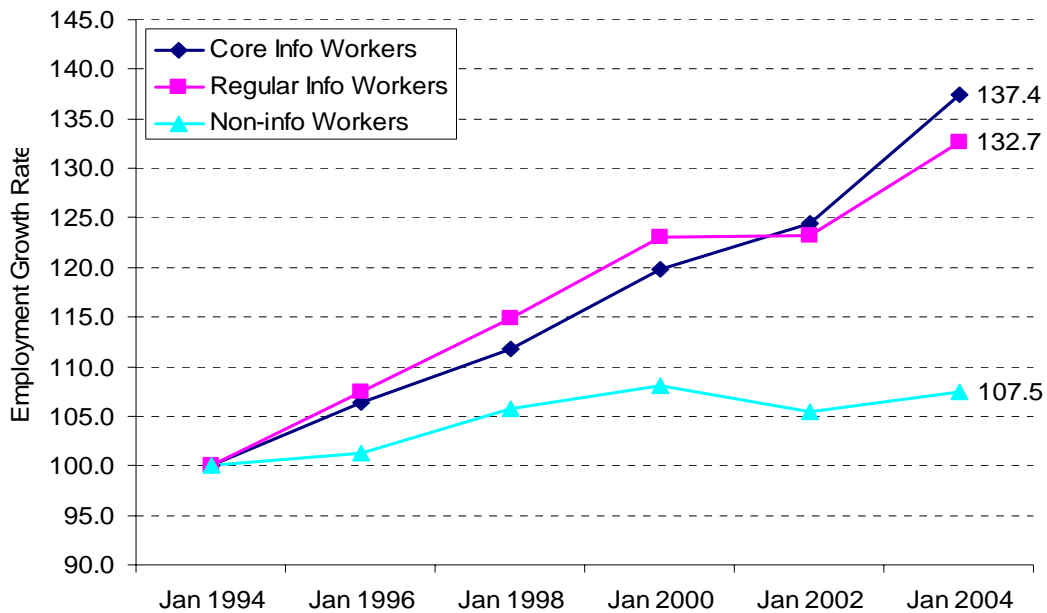


Figure IV-1. 1994-2004 Employment Growth Rate: Core, Regular, and Non-Information Workers

Source: BLS, Current Population Survey, 1994-2004. Data were extracted with DataFerrett and calculated by Author

In both 1994 and 2004, the biggest segment of employment was occupied by employed workers with a high school diploma: 40,615,700 (33.8%) workers in 1994 and 41,619,982 (30.3%) workers in 2004. However, the employment share of those workers has decreased by 3.5 percentage points (from 25.5% to 29.5%) over this time period. In contrast, the employment shares of core and regular information workers has increased 1.7 percentage points (from 8.4% to 10.1%) and 2.7 percentage points (from 16.9% to 19.6%), respectively, over the same period (see Figure IV-2). During this period, the employment growth of information workers consists of 61% (about 11.3 million jobs) of national employment growth (17.2 million) (see Figure IV-3). These results indicate that, over this period, the number of information occupations, which require workers with higher education and longer training time, has increased more than the number of non-information occupations.

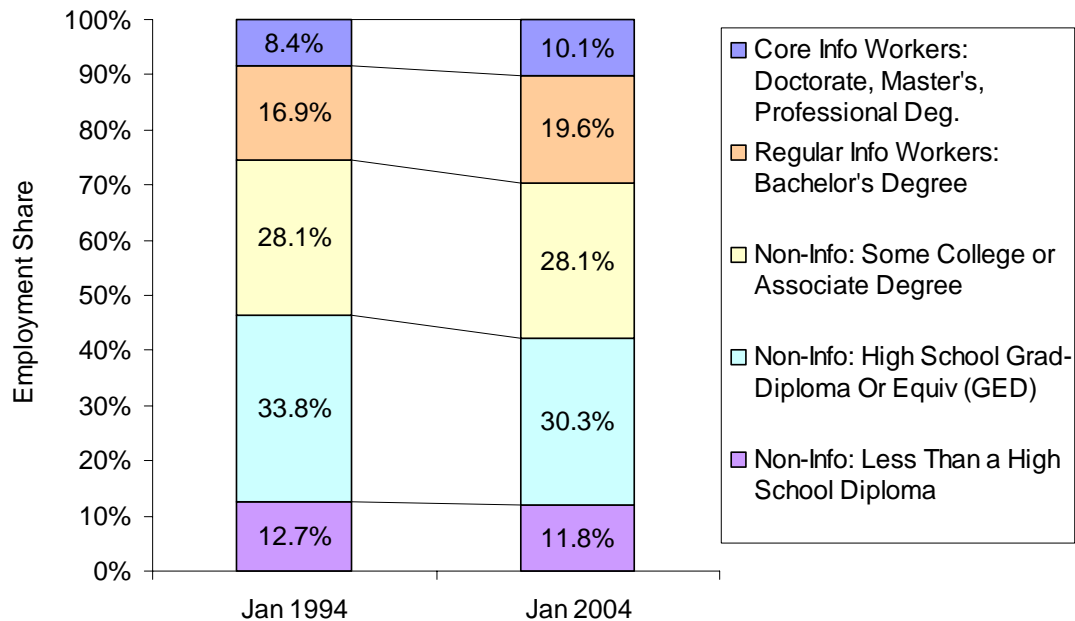


Figure IV-2. 1994 and 2004 National Employment Shares of Core, Regular, and Non-Information Workers

Source: BLS, Current Population Survey, 1994-2004. Data were extracted with DataFerrett and calculated by Author

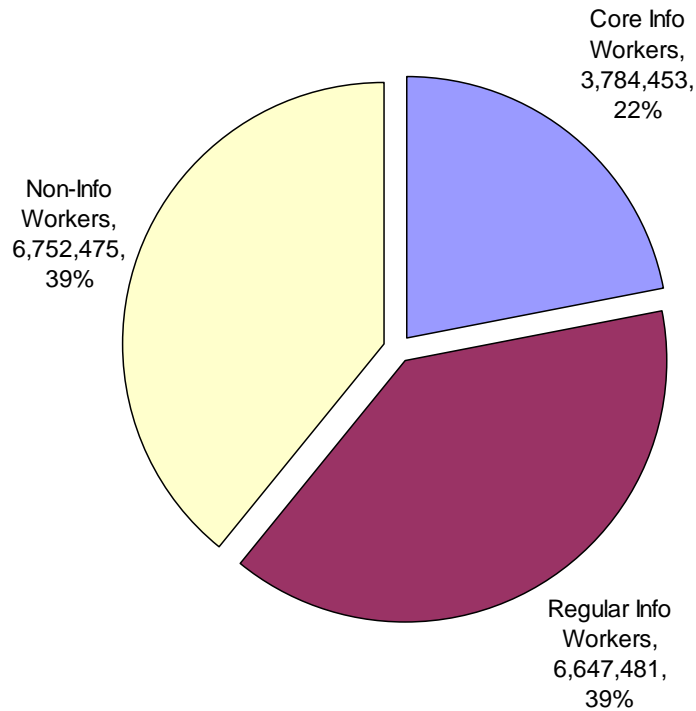


Figure IV-3. Shares of Core, Regular, and Non-Information Workers in National Employment Growth from January 1994 to January 2004

Source, BLS, Current Population Survey, 1994-2004. Data were extracted with DataFerrett and calculated by Author

2) Future Projections

The 2004-2005 Occupational Projections and Training Data, released by the Bureau of Labor Statistics (BLS), introduce educational attainment clusters of occupations and provide the 2002-2012 projected employment change by occupation.³² The BLS identifies 11 education and training categories³³ that describe, for each

³² The 2004-05 Occupational Projections and Training Data introduce a new analytical method to identify 11 occupational education clusters that are determined by educational attainment distribution of employees aged 25 to 44 years (United States. Bureau of Labor Statistics. 2004-05).

³³ These 11 education and training categories are Doctoral degree, Master's degree, first professional degree, Bachelor's or higher degree, plus work experience, Bachelor degree's, Associate's degree,

occupation, the most significant postsecondary education or training pathway to employment in that occupation. I classified occupations into information and non-information occupations by grouping these 11 categories by job zone, and then I analyzed the growth of information and non-information occupations (see Appendix Table B2).

Figure IV-4 shows the 2002-2012 projected employment growth of information and non-information occupations, based on 2002 rates. During the projected ten years, the core information occupations (25%) and regular information occupations (20.7%) are expected to grow faster than non-information occupations (13.0%). Figure IV-5 shows the projected change of the employment share by job zone from 2002 to 2012.

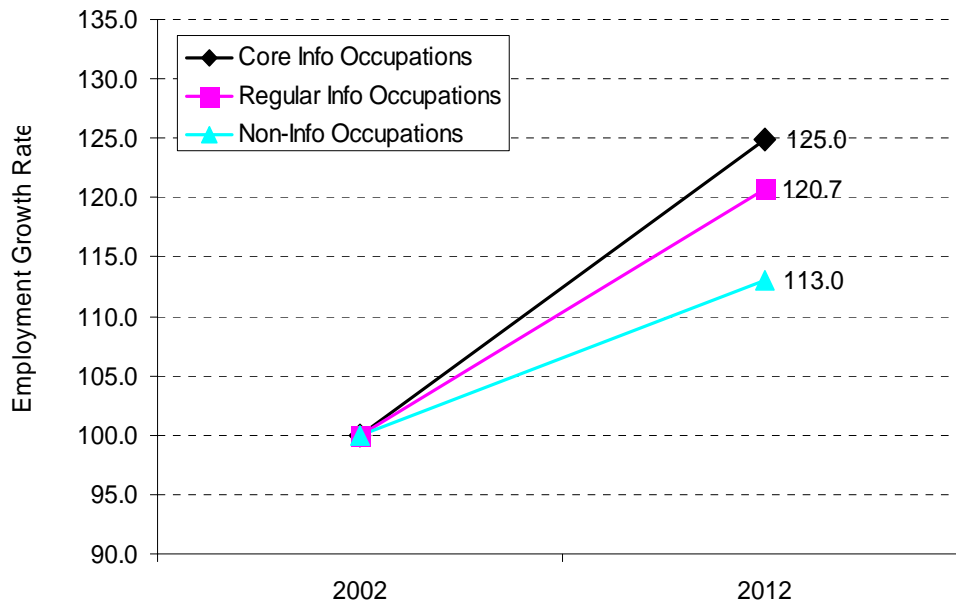


Figure IV-4. 2002-2012 Projected Employment Growth Rate: Core, Regular, and Non-Information Occupations

Source: BLS, Occupational Projections and Training Data 2004-05 Edition

postsecondary vocational award, work experience in a related occupation, long-term on-the-job training, moderate-term on-the-job training, and short-term training.

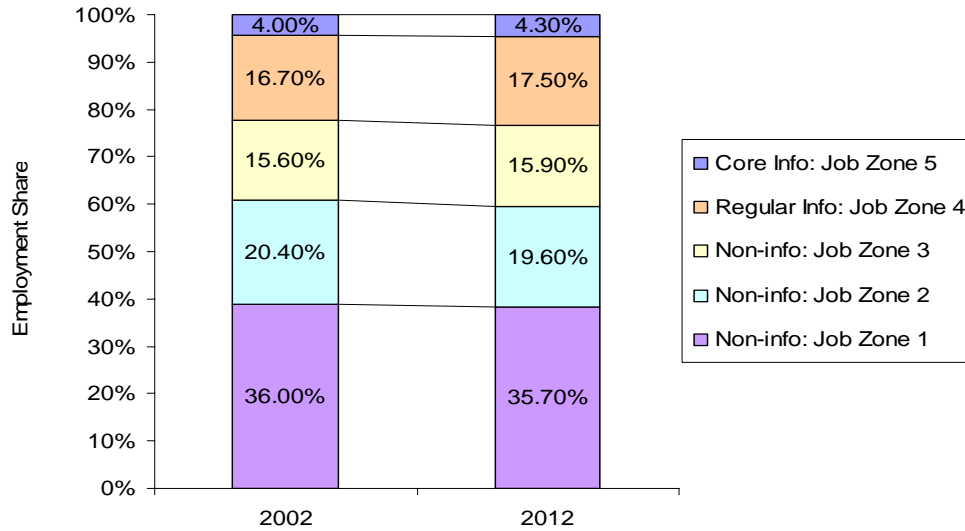


Figure IV-5. 2002 and 2012 Projected Employment Shares of Core, Regular, and Non-Information Occupations

Source: BLS, Occupational Projections and Training Data, 2004-05 Edition.

The share of total information occupations, relative to national employment, is expected to grow from 20.7% to 21.8%, while the share of non-information occupations is expected to decrease from 79.3% to 78.1%. The shares of core and regular information occupations are expected to increase from 4.0% to 4.3% and from 16.7% to 17.5%, respectively. Both figures indicate that, in the future, human capital will be more important and the new economy will need more information occupation workers who will have already acquired the required higher education and training.

3) Summary and Limitations

The past trends and future projections for information occupations verify the increasing demand for highly educated and highly skilled people in the new economy. During both periods, the numbers of information occupations (or workers) grow faster

than non-information occupations (or workers). During the past decade, from 1994 to 2004, the share of information workers, relative to total employment, has grown, while the share of non-information occupations has decreased. Similarly, for the projected period, 2002 to 2012, the share of information occupations is expected to continue to rise.

These analyses have a minor limitation when it comes to analyzing the growth trends of information occupations over the two periods: lack of available data for historic occupational employment. For the future trend analysis, the 2002-2012 occupational projections by education cluster are available. However, the available data for the past trend analysis are the annual employment by educational attainment from 1994 to 2004. These data do not include occupational employment. Therefore, separately from “information occupations,” I defined a term, “information workers,” to include those employees with a Bachelor’s degree or higher without regard to their occupations. Then, I analyzed growth of “information workers” for the 1994-2004 period and projected that of “information occupations” for the 2002-2012 period. Nonetheless, the analytical results are still meaningful. The outcomes provide enough evidence that, for the two periods, the demand for highly educated people has increased in the new economy.

2. Importance of Information Occupations in Metropolitan Economies

In order to examine the importance of information occupations in metropolitan economies, I focused on analyzing the relationship between the share of information occupations and regional income at the metropolitan level by controlling size and industry specialization.

1) Data: OES and REIS

At the metropolitan level, by controlling size and industry specialization, I analyze whether information occupation specialization influences the level of metropolitan income, proxied by per capita personal income (PCPI)³⁴ in 2001. Here, I use two data sets: the Occupational Employment Statistics (OES) data and the Regional Economic Information System (REIS)³⁵ data. The shares of information occupations (the employment share of occupations in job zones 4 and 5) are extracted from the OES data, and PCPI and metropolitan population are extracted from the REIS data.

The OES data provide employment of information occupations defined by job zone³⁶ from 1999 to 2003, while the REIS data provides personal annual income for the US metropolitan areas back to 1969. The two databases have compatibility problems with regard to metropolitan definitions. The REIS definitions of metropolitan statistical areas have changed since the 2002 REIS data.³⁷ The metropolitan definitions of the two datasets have not been compatible since 2002. Additionally, on the 1969-2001 REIS data disc, industry earnings by North American Industry Classification System (NAICS) are available only in 2001. Therefore, I used 2001 data from both databases to analyze the impact of information occupation specialization on PCPI at the metropolitan level.

³⁴ PCPI is the best measure of living standards available annually.

³⁵ The Regional Economic Information System (REIS) is released by the Bureau of Economic Analysis, U.S. Department of Commerce. The REIS data include population, personal income and its components, employment by broad sectors, and earnings by detailed (two-digit North American Industry Classification System, that is, NAICS) industries for all counties and metropolitan areas of the United States annually, back to 1969.

³⁶ The occupation classification used by OES has been changed dramatically since 1998. Therefore, the OES data before 1998 are difficult to compare with the 1998 and later data.

³⁷ The MSA definition was changed in 2003. The OES data use the 1999 definition of MSA, but the 1969-2001 REIS data have used the new definition from a version including 2002 (the 1969-2002 or 1969-2003 REIS data).

There is one data problem that imposes a geographic limitation to this analysis: omission of metropolitan areas in the New England region. The two databases use different metropolitan area definitions in the New England region.³⁸ The metropolitan definitions of the two databases are based on the 1999 Metropolitan Statistical Area (MSA) definitions of the Office of Management and Budget (OMB).³⁹ However, the OMB recognizes two sets of metropolitan areas in the New England region.⁴⁰ The first set is defined in terms of cities and towns; the second set is defined by county boundaries and it consists of 12 New England county metropolitan statistical areas (NECMAs). The OES data use the first set and the REIS data use the second set. As a result, with the omission of metropolitan areas in the New England region, 306 out of total 337 OES metropolitan areas are matched with the REIS metropolitan areas: 248 Metropolitan Statistical Areas (MSAs) and 58 Primary Metropolitan Statistical Areas (PMSAs).⁴¹

2) Model Specification

In this section, my analysis goal is to explore the impacts of specialization in core, regular, and total information occupations on metropolitan income, by controlling feasible impacts on regional income, according to metropolitan size and industry

³⁸ Massachusetts, Maine, New Hampshire, Connecticut, Vermont, and Rhode Island.

³⁹ OMB's general concept of a metropolitan area is that of a geographic area consisting of a large population nucleus together with adjacent communities having a high degree of economic and social integration with the nucleus.

⁴⁰ The metropolitan area definitions used by BEA are the county-based definitions issued by the Office of Management and Budget (OMB). With the exception of the New England region, the geographic limits of a metropolitan area are defined by county boundaries. In the New England region, cities and towns have a high degree of administrative importance and these are typically used to define the boundaries of a metropolitan area.

⁴¹ The OES MSAs are composed of 261 MSAs and 76 PMSAs: 248 MSAs and 58 PMSAs outside of the New England region, 10 MSAs and 15 PMSAs in the New England region, and 3 MSAs and 3 PMSAs in Puerto Rico. The REIS MSAs are composed of 248 MSAs, 58 PMSAs, and 12 NECMAs. The unmatched MSAs between both data sets are composed of MSAs in Puerto Rico (not included in the REIS data), and MSAs in the New England region.

specialization. Table IV-1 shows the descriptions and sources of variables used in this analysis.

Here, I specify the regression models to analyze the impacts of size, industry specialization, and information occupation specialization on metropolitan income in 306 metropolitan areas in 2001. The dependent variable, the level of metropolitan income in 2001, is measured by the log of per capita personal income (PCPI) in 2001, which is extracted from Regional Economic Information System (REIS) data.

Independent variables are composed of three major factors: size, industry specialization, and information occupation specialization. In this analysis, as well as information occupation specialization, I control two additional factors to affect metropolitan income: size and industry specialization. Metropolitan size is measured by the log of population in 2000. The data source is the U.S. Census Bureau's Census 2000.

In order to measure industry specialization, I included six detailed industry groups and two major industry groups in my models, separated according to Drennan (2002)'s traded goods and services taxonomy. Using the concept of traded and non-traded goods and services employed from international trade economics, Drennan (2002) grouped all industries with traded versus non-traded goods and services. The idea of traded versus non-traded goods and services comes from the economic theory of international trade. The industries that produce goods and services that can be traded beyond a region's borders are the drivers of the region's economy. The goods and service industries would be agriculture, manufacturing, distribution, financial, business and professional services, and health care services. The non-traded goods and services industries would be construction, electric and gas utilities, retail trade, personal services, and local government, because the outputs of these industries are usually consumed within a region's borders.

Table IV-1. Variable Description of Cross-Sectional Data in Models

Variable	Description	Source
Geographic Unit: Metropolitan Area in the United States (306 MSAs/PMSAs)		
Dependent Variable: Level of Metropolitan Income		
[LPCPI]	Log of per capita personal income in 2001	REIS ¹
Independent Variables		
Metropolitan Size		REIS ¹
[LPOP]	Log of population in 2001	
Traded Goods and Services Specializations		REIS ¹ , NAICS ²
% of industry earnings in following groups in 2001		
6 Detailed Groups		
[PRM]	Primary production	
[MFG]	Manufacturing	
[DIST]	Distribution	
[PSFIN]	Financial producer services	
[PSOTH]	Other producer services	
[ACS]	Advanced consumer services	
2 Major Groups		
[GPD]	Goods production and distribution sector	
[INFO]	Information sector	
Information Occupation Specialization		OES ³ 2001
% of employment in the following occupations in 2001		
Disaggregated		
[REGULAR]	Regular information occupations	
[CORE]	Core information occupations	
Aggregated		
[TOTAL]	Total information occupations	

[] variable title.

1. REIS = Regional Economic Information System. Data are extracted from the REIS 1969-2001 disc.

2. NAICS = North America Industry Classification System.

3. OES = Occupational Employment Statistics.

In my study, I focus on traded goods and services as the drivers of the regional economy. Drennan (2002) divides traded goods and services into six industry groups. Within these six groups, three groups (financial producer services, other producer services, and advanced consumer services) are labeled information sector (INFO), because the groups' inputs and outputs are information and the occupational composition has a higher proportion of high-wage, professional jobs than other graded goods and services. The other three groups (primary production, manufacturing, and distribution) are labeled goods production and distribution (GP&D). I classified the industry groups using North America Industry Classification System (NAICS) (for industry composition details, see Appendix Table C2). Two major groups and six detailed groups are included in separate equations.

In addition to controlling two major factors, size and industry specialization, I specified two separate models to explore the impacts of the aggregate information occupations, total information occupations, and the two disaggregated information occupations in regional income.

As a result, I specified four ordinary least squares (OLS) models. The first equation is composed of nine independent variables: size, specialization in six detailed industry groups, and specialization in two disaggregated information occupations (i.e., core and regular information occupations). The second equation is composed of eight independent variables: size, specialization in six detailed industry groups, and specialization in total information occupations. The third equation is composed of five variables: size, two major industry sectors specialization, and two disaggregated information occupation specialization. The fourth equation is composed of four variables: size, two major industry sectors specialization, and total information occupations specialization. These four equations are specified as follows:

$$LPCPI_i = a_o + a_1LPOP_i + a_2PRM_i + a_3MFG_i + a_4DIST_i + a_5PSFIN_i + a_6PSOTH_i + a_7ACS_i + a_8CORE_i + a_9REGULAR_i \quad (1.1)$$

$$LPCPI_i = b_o + b_1LPOP_i + b_2PRM_i + b_3MFG_i + b_4DIST_i + b_5PSFIN_i + b_6PSOTH_i + b_7ACS_i + b_8TOTAL_i \quad (1.2)$$

$$LPCPI_i = c_o + c_1LPOP_i + c_2GP \& D_i + c_3INFO_i + c_4CORE_i + c_5REGULAR_i \quad (1.3)$$

$$LPCPI_i = d_o + d_1LPOP_i + d_2GP \& D_i + d_3INFO + d_4TOTAL_i \quad (1.4)$$

where $LPCPI_i$ is the log of 2001 per capita personal income in metropolitan area i ($i = 0, 1, 2, \dots, 306$). $LPOP_i$ is the log of 2000 population in metropolitan area i . PRM_i , MFG_i , $DIST_i$, $PSFIN_i$, $PSOTH_i$, and ACS_i are the industry specialization in six detailed industry groups in metropolitan area i : primary production, manufacturing, distribution, financial producer services, and other producer services, and advanced consumer services, and they are proxied by the industry earnings in each industry group. $GP \& D_i$ and $INFO_i$ are industry specializations in two major groups in metropolitan area i : the goods production and distribution sector and the information sector, and they are proxied the industry earnings in each sector. $INFO_i$ is industry specialization in metropolitan area i , proxied by the industry earnings in that sector. $CORE_i$ and $REGULAR_i$ are specializations in two disaggregated information occupations: core and regular information occupations, and they are proxied by the employment share in each occupation type. $TOTAL_i$ is specialization in the aggregate information occupations (i.e., total information occupations), proxied by employment share in those occupations.

3) Characteristics of 306 Metropolitan Areas in 2001

Table IV-2 shows the variable descriptive statistics which explain the economic characteristics of 306 metropolitan areas in the models specified above: metropolitan

Table IV-2. Variable Descriptive Statistics: Characteristics of 306 Metropolitan Areas in the United States in 2001

Variable	Mean	Std. Dev.	Min	Max	Metro with the lowest value	Metro with the highest value
Dependent Variable						
Level of Metropolitan Income						
log of per capita personal income in 2001 [LPCPI]	10.217	0.186	9.532	10.963	McAllen-Edinburg-Mission, TX (MSA)	San Francisco, CA (PMSA)
Independent Variables						
Level of Metropolitan Size						
log of population in 2001 [LPOP]	12.797	1.061	10.957	16.085	Enid, OK (MSA)	Los Angeles-Long Beach, CA (PMSA)
Industry Specialization (industry earnings share in following groups in 2001)						
Six Detailed Groups						
Primary production [PRM]	1.02%	2.70%	0.00%	28.12%	*	Odessa-Midland, TX (MSA)
Manufacturing [MFG]	14.93%	8.85%	0.00%	56.94%	*	Kokomo, IN (MSA)
Distribution [DIST]	6.63%	3.33%	0.00%	19.94%	*	Laredo, TX (MSA)
Financial producer services [PSFIN]	6.09%	3.25%	0.00%	29.32%	Dover, DE (MSA)	New York, NY (PMSA)
Other producer services [PSOTH]	9.22%	5.72%	0.00%	32.92%	Clarksville-Hopkinsville, TN-KY (MSA)	Boulder-Longmont, CO (PMSA)
Advanced consumer services [ACS]	9.12%	3.46%	1.10%	30.10%	Goldsboro, NC (MSA)	Rochester, MN (MSA)
Two Major groups						
Goods production and distribution sector [GPD]	22.58%	9.27%	0.00%	59.69%	Washington, DC-MD-VA-WV (PMSA)	Kokomo, IN (MSA)
Information sector [INFO]	24.42%	8.82%	4.85%	61.68%	Dover, DE (MSA)	New York, NY (PMSA)
Information Occupation Specialization (employment share in the following occupations in 2001)						
Disaggregated						
Core information occupations [CORE]	3.43%	1.25%	1.16%	8.06%	Jacksonville, NC (MSA)	Washington, DC-MD-VA-WV (PMSA)
Regular information occupations [REGULAR]	18.26%	3.51%	7.90%	29.95%	St. Joseph, MO (MSA)	San Jose, CA (PMSA)
Aggregated						
Total information occupations [TOTAL]	21.69%	4.47%	10.15%	37.09%	St. Joseph, MO (MSA)	San Jose, CA (PMSA)

* denotes that there are several metropolitan areas with the same minimum share (0%) in the industry groups.

income, metropolitan size, traded goods and services specialization, and information occupation specialization in 2001.

Metropolitan Income: The average per capita personal income of 306 metropolitan areas is \$27,857. Out of these 306 metropolitan areas in 2001, the one with the highest per capita personal income, \$57,714, was the San Francisco, California, Primary Metropolitan Statistic Area (PMSA). The metropolitan area with the lowest income, \$13,788, was the McAllen-Edinburg-Mission, Texas, Metropolitan Statistic Area (MSA).

Size: The mean population of 306 metropolitan areas in 2001 was 711,743. The Los Angeles-Long Beach, California, PMSA, with a population of 9,677,220 was the largest metropolitan area in 2001. On the other hand, in 2001, Enid, Oklahoma, with a population of 57,339, was the smallest metropolitan area.

Industry Specialization: In 2001, the average earnings share of total traded goods and services in 306 metropolitan areas was 47%, which means that about 53% earnings in metropolitan areas came from non-traded goods and services in 2001.⁴² The San Jose, California, metropolitan area had the highest earnings share (75.11%) in traded goods and services in 2001. Meanwhile, Jacksonville, North Carolina, was the one with the lowest earnings share (8.97%) in these industries. The average earnings share (47%) of traded goods and services in the 306 metropolitan areas was composed of each earnings share of two major industry groups: the goods production and

⁴² It is interesting that the earnings share of non-traded goods and services was larger than that of traded goods and services in 2001. It implies that metropolitan earnings rely heavily on the non-traded goods and services such as construction, electric and gas utilities, retail trade, personal services, and local government, the outputs of which are usually consumed within a region's borders. Even though non-traded goods and services occupy a large portion of metropolitan earnings, these industries do not trade beyond a region's borders. Therefore, they are not considered as drivers of the regional economy. For this reason, this study includes only traded goods and services as one of metropolitan environments to affect regional income. However, it would be interesting to investigate whether some industries among non-traded goods and services have a pivotal role on the metropolitan economy, and, if so, what industries these might be. For now, I set this matter aside for future studies by other researchers.

distribution and the information sector. In 2001, out of the earning share (47%) of traded goods and services, metropolitan areas created 22.58% of earnings in the goods production and distribution sector (that is, primary production, manufacturing, and distribution) and 24.52% in the information sector (that is, financial producer services, other producer services, and advanced consumer services), respectively. It implies that, today, metropolitan earnings are created more from the information sector than from the goods production and distribution sector. However, the goods production and distribution sector, as well as the information sector, is still a major source of metropolitan earnings.

The earnings shares of these two major industry groups were, respectively, the sums of earning shares of three detailed industry groups. The earnings share (22.58%) of the goods production and distribution sector was the sum of earnings shares of manufacturing (14.93%), distribution (6.63%), and primary production (1.02%); the earnings share (24.52%) of the information sector was the sum of earnings shares of other producer services (9.22%), advanced consumer services (9.12%), and financial producer services (6.09%). In the goods production and distribution sector, manufacturing contributed dominantly to metropolitan earnings creation, compared to earnings creation of distribution and primary production.⁴³ In 2001, manufacturing was the biggest metropolitan earnings source in traded goods and services, as well as in the goods production and distribution sector. It implies that, in spite of deindustrialization at the national level, manufacturing still contributed considerably to creation of metropolitan earnings. In the information sector, other producer services and advanced consumer services were also relatively large earnings sources in metropolitan areas, compared to financial producer services with relatively small average earnings share in

⁴³ It is not surprising that primary production was the smallest part (1.02%) of metropolitan earnings in 2001.

metropolitan areas in 2001.⁴⁴ Total producer services, which usually include financial and other producer services, created 15.31% of metropolitan earnings, which was larger than the earning share of manufacturing in 2001. It shows that producer services are the largest earning source in the contemporary cities. Whether the absolute share of metropolitan earnings in each industry group is large or small, its impact on metropolitan income is another story. I will explain the details in the next section on the regression analysis about the impact of metropolitan size, industry specialization, and information occupation specialization on metropolitan income.

In 2001, the following metropolitan areas created the highest shares of earnings in each of six detailed industry groups: Odessa-Midland, Texas, produced 28.12% of earnings in primary production; Kokomo, Indiana, created 56.94% in manufacturing; Laredo, Texas, created 19.94% in distribution; New York PMSA created 29.32% in financial producer services; Boulder-Longmont, Colorado, created 32.92% in other producer services; and Rochester, Minnesota, created 30.10% in advanced consumer services. These metropolitan areas were the most specialized areas in each of six industry groups in traded goods and services in 2001. Out of 306 metropolitan areas, Kokomo, Indiana, which was most specialized in manufacturing, was also the metropolitan area with the highest share (59.69%) of earnings in the goods production and distribution sector (in detail, primary production, manufacturing and distribution), while the Washington PMSA was the one with the lowest share (0%). The New York PMSA, which was most specialized in financial producer services, was also the metropolitan area with the highest share (61.68%) of earnings in the information sector

⁴⁴ The small portion of metropolitan earnings attributable to financial producer services may be because the industries are usually highly concentrated in global cities such as New York, London, and Tokyo, and their earnings creations are also concentrated to the small number of these global cities. However, although the absolute earnings portion of financial producer services proved to be smaller than what we usually expect, their impact on metropolitan income is different from the absolute number of earnings share. The impact of each industry groups on regional income will be explained in the next section.

(in detail, financial producer services, other producer services, and advanced producer services), while Dover, Delaware, was the one with the lowest share (4.85%).

Information Occupations: In 2001, average total information occupations (i.e., the sum of core and regular information occupations) were 21.69% of metropolitan employment in 306 metropolitan areas; core information occupations and regular information occupations were 3.43% and 18.26%, respectively. Since regular information occupations occupied a major part of total information occupations in 2001, total information occupations and regular information occupations showed similar patterns in their presence: the biggest shares (37.09% and 29.9%) were in San Jose, California, and the smallest shares (10.1% and 7.90%) were in St. Joseph, Missouri. On the other hand, core information occupations showed the highest share (8.06%) in the Washington PMSA, but the lowest share (1.16%) in Jacksonville, North Carolina. It is also notable that Jacksonville, North Carolina, with the lowest share of core information occupations, also showed the lowest earnings share of traded goods and services, and that San Jose, California, with the highest employment share of regular information occupations, also showed the highest earnings share in traded goods and services.

4) What Affects Metropolitan Income?

In order to show the importance of information occupations in metropolitan economies, I analyzed four ordinary least square (OLS) models to explore the impact of specialization in information occupations on and regional income at 306 metropolitan areas in 2001, by controlling two major additional factors: size and industry specialization. Models I and II include specialization in six detailed industry groups, and Models III and IV include specialization in two major industry groups. Models I and III include specialization in two disaggregated occupation specializations, and

Models II and IV include specialization in aggregate information occupation specializations. Table IV-3 shows the approximated results.

Size and Metropolitan Income: In four models, size is not significant at all. Although I do not include the results here, for 306 metropolitan areas from 1999 to 2001, I analyzed additional pooled regression models including only two factors: size and specialization in information occupations.⁴⁵ Those models show all significant variables: size and specialization in core, regular, and total information occupations. However, in models including industry specialization, size is not a significant factor to affect metropolitan income.

Industry specialization and Metropolitan Income: Models I and II, which include six detailed industry groups, represent a better explanation than Model III and IV, which include two major industry groups (adjusted R^2 values are approximately 0.58 in Models I and II, but approximately 0.53 in Models III and IV). It suggests that six detailed industry specializations explain the level of metropolitan income better than specialization in two major groups. In Models I and II, three industry groups are positive and strongly significant: manufacturing, financial producer services, and other producer services. However, each 1% increase of earnings in financial producer services and in other producer services increases metropolitan income four times and five times more, respectively, than a 1% increase of earnings in manufacturing does.

In Models III and IV, both of the two major groups (i.e., the goods production and distribution sector and the information sector) are positive and significant. It is not surprising that the information sector (in detail, producer services, and other producer services) has a positive impact on the level of metropolitan income. It seems meaningful

⁴⁵ I analyzed two pooled regression models. One is composed of three variables: size and specialization in two disaggregated information occupations (CORE and REGULAR). The other is composed of two variables: size and specialization in aggregate information occupations (TOTAL).

Table IV-3. Estimated Results: Logarithms of Per Capita Personal Income in 306 Metropolitan Areas, 2001

Description	Variable	Model I		Model II		Model III		Model IV	
		Parameter Estimate	Pr > t	Parameter Estimate	Pr > t	Parameter Estimate	Pr > t	Parameter Estimate	Pr > t
Size	LPOP	-0.00477	0.6124	-0.00393	0.6761	0.00427	0.658	0.00684	0.4784
Industry Specialization									
Six detailed groups	PRM	0.00383	0.1533	0.00373	0.1645				
	MFG	0.00296	0.0009 **	0.0027	0.0018 **				
	DIST	-0.00188	0.3981	-0.00199	0.3731				
	PSFIN	0.0128	<.0001 **	0.01272	<.0001 **				
	PSOTH	0.01587	<.0001 **	0.01622	<.0001 **				
	ACS	-0.00062	0.7619	-0.00096	0.6362				
Two major groups	GP&D					0.00216	0.011 *	0.00172	0.038 *
	INFO					0.00917	<.0001 **	0.00925	<.0001 **
Information Occupation Specialization									
Disaggregated	REGULAR	0.77935	0.0109 *			1.01065	0.0015 **		
	CORE	2.14955	0.0138 *			3.47516	0.0001 **		
Aggregated	TOTAL			1.05312	<.0001 **			1.52539	<.0001 **
Adjusted R-Sq		0.5888		0.5878		0.5332		0.5268	
F Value		49.53		55.37		70.67		85.9	
No. of Observations		306		306		306		306	

Note: * denotes significant at the 5% level, and ** denotes significant at the 1% level.

that the goods production and distribution sector (manufacturing) still has an impact on the level of metropolitan income in the new economy. However, each 1% increase of earnings in the information sector increases the level of metropolitan income four times more than does a 1% increase of earnings in the goods production and distribution sector. It might be because of the characteristics of producer services. Products of producer services are usually highly specialized services that are usually used as intermediate inputs for other industries or firms, which then produce highly value-added products using highly specialized services. Therefore, producer services may have a larger derivative effect on the metropolitan economy than does manufacturing.

In the previous section, we examined that manufacturing has a larger portion of metropolitan earnings, compared to financial producer services and other producer services, and that the goods production and distribution sector has a similar portion of metropolitan earnings, compared to the information sector. However, the regression results show that the impact of each industry or sector on metropolitan income is not related to its absolute share of earnings. For example, financial services produced only 6.09% of metropolitan earnings, but a 1% earnings increase in this industry could increase the level of metropolitan income four times more than a 1% earnings increase in manufacturing, which produced 14.93% of metropolitan earnings in 2001. That is why we need more sophisticated analyses than the simple statistics for sound policy implications or recommendations.

Information Occupations and Metropolitan Income: In all models, all information occupations are positive and significant. It suggests that high shares of core, regular, and total information occupations have positive impacts on level of metropolitan income, even though size and industry specialization are controlled. In Models I and III, the slope coefficients of core information occupations are about three times larger than those of regular information occupations. It means that a 1% increase

of core information occupations increases metropolitan income more than that of regular information occupations does. As I showed in chapter 3, it might be because core information occupations receive higher compensation than regular information occupations. Models I and III include two disaggregated information occupations and Models II and IV include aggregate information occupations. However, there are no great differences of adjusted R^2 values between Models I and II (approximately 0.58) and between Models III and IV (approximately 0.53). That is, two disaggregated parts of information occupations and their sum have similar explanation power about the level of metropolitan income.

These outcomes show that the level of metropolitan income is more related to the kinds of industries in which a metropolitan area is specialized and how much information occupations are concentrated in that metropolitan area, rather than how big that metropolitan area is. As a result, it provides evidence that the high shares of information occupations, as well as industry specialization, are important in metropolitan economies. That is why we should bring information occupations into sharp focus in regional studies.

3. Summary and Recommendations

In order to verify the importance of information occupations in regional studies, I investigated two issues in chapter 3: the growing employment of information occupations in the new economy and their importance in metropolitan economies. The outcomes of two analyses provide evidence to support the importance of information occupations in regional studies: employment growth of information occupations and a positive impact of their concentration on metropolitan income.

First, I examined the national employment trends of information occupations during two periods: 1994-2004 and 2002-2012. During these two periods, information occupations have been growing faster than non-information occupations. The share of information occupations has increased, while the share of non-information occupations has decreased.

Second, I analyzed the impact of information occupation specialization on per capita personal income (PCPI) in 306 metropolitan areas in 2001 by controlling impacts of two additional factors: size and industry specializations. Metropolitan concentrations of all information occupations (that is, core, regular, and total information occupations) have positive impacts on metropolitan income, even though size and industry specialization are controlled.

Even though there are several limitations related to data, the above outcomes suggest the importance of information occupations in regional studies by providing two pieces of evidence: the growing employment of information occupations in the new economy, compared to non-information occupations, and their contemporary importance in metropolitan economies.

However, there are several remaining issues related to the relationship between information occupations and metropolitan economies. I will refer to two kinds of issues for the future study: the impact of information occupations on metropolitan income inequality and the development of compatible occupational data.

1) Information Occupations and Inequality

Another challenging issue related to the important role of information occupations on metropolitan economy is the relationship between the concentration of information occupations and income inequality at the metropolitan level. It is an important issue for policy implications to examine whether metropolitan specialization

in information occupations leads to more inequality, or whether the benefits have a broader distribution impact. Although there have been few studies to conduct statistically sophisticated analyses on the impact of the concentration of high-level professionals on metropolitan income inequality, today we have a large number of detailed studies about trends in earnings and household income inequality in major cities. However, the issue regarding income inequality and social polarization in major cities is controversial.

In her widely read 2001 book, *The Global City: New York, London, Tokyo* (2nd edition), Sassen argued that the growing numbers of high-level professionals and high-profit specialized service firms have the effect of raising the degree of spatial and socioeconomic inequality evident in global cities such as New York, London, and Tokyo. A dynamic, high-growth manufacturing sector in highly developed countries raised wages, reduced inequality, and contributed to the formation of a middle class. However, new forms of growth have a different impact on the social order of the global city. Major growth industries show a greater incidence of jobs at the high and low ends of the pay scale than do the older industries now in decline, particularly manufacturing. Two other developments in global cities have also contributed to economic polarization. One is the vast supply of low-wage jobs required by high-income gentrification in both its residential and commercial settings: expensive restaurants, luxury housing, gourmet shops, boutiques, and so on. A second development is the downgrading of the manufacturing sector: the decrease of jobs within existing industries and the job supply patterns of some new industries, notably electronics assembly.

On the other hand, there are several studies showing outcomes that refute Sassen's argument. In a major study on cities and inequality, based on 1990 Census data, Drennan et al (1996) find that cities with high growth resulting from dynamic economies, particularly producer services growth, had increases in the average income

of low-income people. This positive effect also held for blacks, including blacks in New York whose median income rose. In contrast, cities focused on manufacturing had declining median incomes and stagnant economies. Cities such as Detroit and Cleveland saw a decrease in the income levels of its lowest deciles generally, and decreases in the median income of blacks.

In her 2000 book, *Changes in Income Inequality within U.S. Metropolitan Areas*, Madden introduced the sophisticated analysis of income inequality and poverty at the metropolitan level. Madden (2000) explored how changes in demographics (the age and ethnic composition of the population), the labor market (the supply of workers, the demand for workers, and the way that wages and salaries are determined in the labor market), and the geographic structure of a metropolitan area (income segmentation and racial segregation of neighborhoods and communities) are related to changes in income inequality. At the metropolitan level, changes in these metropolitan characteristics were regressed on the change in Gini coefficients of household income and the change in the share of each segment of income distribution that account for the tendencies of the distribution to converge or diverge. Among factors which Madden (2000) included in the analysis models, skill composition (that is, mean education and Gini coefficients for the distribution of educational attainment among adults) and local labor market (that is, Gini coefficients of earnings distribution and employment-to-population ratios) can explain the effects of overall characteristics of local labor market on income inequality. Madden (2000)'s analysis results showed that household income inequality is substantially reduced by tightening of labor markets, but it is not affected by the skill composition of metropolitan population. According to Madden (2000), policies which create more jobs, regardless of wage level, reduce household income inequality and metropolitan poverty rates. Therefore, the creation of low-wage jobs may increase earnings inequality, but reduce income inequality. These outcomes are contrary to

Sassen (2002)'s argument that the increase of low-wages jobs that support increasingly higher levels of high-level professionals (that is, a new high-income class) influences the social inequality and polarization in global cities.

However, these factors, which Madden (2002) included as skill composition, earnings distribution, and tightness of metropolitan labor market, are still insufficient to explain whether the concentration of highly educated professionals has a positive or negative impact on income inequality in metropolitan areas. In particular, the change in mean education of the metropolitan population and the convergence or divergence in the distribution of educational attainment among adults cannot interpret perfectly the growth of specific groups as the new driver in the metropolitan economy and their impact on metropolitan social inequality, because these two variables may not explain the metropolitan variations of growth patterns of detailed targeting groups, those groups with high levels of human capital. According to Madden (2000), another reason these two factors were not as likely as metropolitan characteristics to have impacts on income inequality in the 1980s is that they had much smaller variations in cross-sectional data at the metropolitan level than in longitudinal data at the national level. Therefore, in order to conduct more meaningful analyses in future studies, we need to focus on the impact of targeting groups with high levels of education or skill on metropolitan inequality than that of overall skill composition of the metropolitan population.

There are both policy and academic implications with regard to examination of whether metropolitan specialization in information occupations leads to more inequality. We can recognize the clear targeting group for policy making and can conclude the controversial academic debates related to the relationship between inequality and the increasing new class: that is, the creative class, information occupations, or high-level professionals. It would be challenging, in future studies, to

explore the impact of the concentration of information occupations on metropolitan income inequality.

2) Compatibility of Occupational Data

For the future studies, in order to provide clearer evidence that information occupations are becoming important in metropolitan economies, researchers have to examine the long-term trends and measure the impact of information occupations on metropolitan income or inequality. In this regard, researchers need to analyze the consistent long-term occupational employment data at the metropolitan level. In my research, I used the OES data, which provide occupational employment at the metropolitan level. However, the OES data before 1998 and from that year forward are not compatible because of the dramatic change in occupation classification that took place in 1998. The long-term analysis using OES data calls into question the reliability of the analysis outcomes because of the lack of data compatibility.⁴⁶

In the occupational analyses using OES data, there are two limitations related to data compatibility: the lack of historical compatibility of the OES data and the lack of geographical compatibility between the OES data and the REIS data. The lack of compatibility of the historical OES data causes the lack of definition consistency of information occupations in the growth trend analysis of information occupations. The different definitions of metropolitan areas used in the OES data and the REIS data

⁴⁶ To explore the long-term change of information occupations using the OES data, researchers might reclassify information occupations as major occupational groups with a high portion of highly educated workers: management, business and financial operations, and so on. Then, they might analyze the similar occupational groups in historical and recent OES data. However, this might not be possible, given the problem of definition inconsistencies for information occupations. Setting this problem aside, another problem still remains: over time, definitions of metropolitan areas also change. The REIS data, which include metropolitan income data, provide consistent metropolitan area definitions over time; all previous years' data are adjusted by updated metropolitan area definitions when a new version of REIS data is released. In contrast, the historical OES data are not adjusted by new metropolitan area definitions. Therefore, researchers will still confront the compatibility problem between the historic OES data and the REIS data.

relative to the New England region cause another problem: the omission from the correlation analysis of metropolitan areas in the New England region.

Therefore, for future studies, it would be more reasonable to find other existing databases or devise new databases to provide consistent long-term occupational employment data at the metropolitan level. However, like the OES data, other existing occupational databases have similar compatibility problems or they do not include employment data at the metropolitan level. The institutions that provide occupational data should consider researchers' critical requests: needs of occupational data with historical and geographical compatibility. If these institutions could improve the historical compatibility in existing occupational databases or the compatibility of geographic definition between occupational databases and other metropolitan economic databases, researchers could use these databases to create more useful and powerful research outcomes.

V. FACTORS TO ATTRACT INFORMATION OCCUPATIONS

In this chapter, the study goal is to investigate which factors impact on specialization in information occupations at the metropolitan level. I estimate econometric models to analyze locational determinants of metropolitan specialization in information occupations. In these models, the dependent variables are dichotomous: $Y=1$ if a metropolitan area is specialized in information occupations, and $Y=0$ if it is not. Therefore, in order to deal with the binary dependent variables, logit models and probit models are employed. I use three dependent variables to deal with metropolitan specialization in core, regular, and total information occupations. The models include several locational characteristics to affect metropolitan specialization in information occupations: size, innovation capacity, Internet infrastructure, diversity, young generation, and industry specialization. Those variables are considered to have an important role in the concentration of information occupations in metropolitan areas. In these models, cross-sectional data are used. The geographic units for analysis are Metropolitan Statistic Areas (MSAs) and Primary Metropolitan Statistic Areas (PMSAs) in the United States, with total 220 observations.

This chapter is composed of four parts: 1) theoretical background of the logit and probit models and model specification, 2) the data sources and variable descriptions, 3) the estimation results analyzed using the two models, and 4) the summary of analysis outcomes and discussion for future studies.

1. Model Specification

1) Binary Dependent Variable: Specialization in Information Occupations

Since each metropolitan area is either specialized in information occupations or is not, the response variable can have only two values, $Y=1$ if a metropolitan area is specialized in information occupations, and $Y=0$ if it is not. In other words, the dependent variable is a binary, or dichotomous, variable.

In order to measure metropolitan specialization in information occupations, the location quotient (LQ) is employed. The location quotient is the traditional measure of urban specialization. In this study, the location quotient is measured as the ratio of a metropolitan area's employment share of information occupations, compared to their national presence. That is,

$$LQ = \frac{\text{employment share of information occupations in a metropolitan area}}{\text{employment share of information occupations in a nation}}$$

where LQ is the location quotient of information occupations in a metropolitan area. If the location quotient is larger than 1, it indicates that a metropolitan area is specialized in information occupations. Therefore, we can put the dependent variable as $Y=1$ if $LQ \geq 1$, and $Y=0$ if $LQ < 1$.

In this study, two types of information occupations and their sum are considered as dependent variables: core, regular, and total information occupations. As discussed earlier, core and regular information occupations are two disaggregate parts of information occupations, and total information occupations equal to the sum of core and regular information occupations (see Table V-1). The number of specialized metropolitan areas is different by type of information occupations. Core information occupations are much more concentrated in a few areas than other types of information

Table V-1. Dependent Variables: Specialization in Two Types of Information Occupations and Total Information Occupations

Dependent Variable	Metro Specialization in Information Occupations		Type of Information Occupations		
			Core	Regular	Total*
Y=1	$LQ \geq 1$	Specialized	35	66	51
Y=0	$LQ < 1$	Not specialized	185	154	169
		No. of Observation	220	220	220

* Total = Core and Regular Information Occupations

occupations. Table V-1 shows that the geographic presence of information occupations is different according to their level of skills and education. Therefore, it might be interesting to separately analyze the locational determinants by each type of information occupations in which a metropolitan area is specialized.

2) Binary Response Models: Probability Models

In a model where Y is quantitative, its objective is to estimate expected or mean value, given the values of independent variables. However, in a model where Y is qualitative, its objective is to find the probability of something happening, such as the probability of a metropolitan area being specialized in information occupations: this is the information occupation specialization rate in a metropolitan area. Hence, qualitative response regression models are often known as probability models. Here, I review three approaches to developing a probability model for a binary response variable: the linear probability model, the logit model, and the probit model.

Linear Probability Model: To fix ideas, consider the following regression model: $Y_i = \beta_o + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_k X_{ki} + u_i$ (1.1)

where $Y_i=1$ if metropolitan area i is specialized in information occupations and $Y_i=0$ if it is not, and $X_{1i}, X_{2i}, X_{3i}, \dots, X_{ki}$ are determinants of Y such as innovation capacity, Internet use, diversity, industry specialization, and so on.

Model (1.1) looks like a typical linear regression model. However, because the dependent variable is binary, or dichotomous, the conditional expectation of Y_i given $X_{1i}, X_{2i}, X_{3i}, \dots, X_{ki}$, $E(Y_i | X_{1i}, X_{2i}, X_{3i}, \dots, X_{ki})$, gives $\Pr(Y_i=1 | X_{1i}, X_{2i}, X_{3i}, \dots, X_{ki})$, the probability of a metropolitan area being specialized in information occupations whose determinants ($X_{1i}, X_{2i}, X_{3i}, \dots, X_{ki}$) are given. Therefore, it is called a linear probability model (LPM).

Assuming $E(u_i)=0$, as usual, we obtain:

$$E(Y_i | X_{1i}, X_{2i}, X_{3i}, \dots, X_{ki}) = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_k X_{ki} \quad (1.2)$$

Now, if P_i is the probability that $Y_i=1$ (that is, metropolitan area i is specialized in information occupations), and $(1 - P_i)$ is the probability that $Y_i=0$ (that is, it is not specialized), the variable Y_i follows the Bernoulli probability distribution (see Table V-2). Now, we obtain:

$$E(Y_i) = 1 \cdot \Pr(Y_i = 1) + 0 \cdot \Pr(Y_i = 0) = 1 \cdot P_i + 0 \cdot (1 - P_i) = P_i = \Pr(\text{specialized}) \quad (1.3)$$

Comparing (1.2) with (1.3), we can equate:

Table V-2. Dependent Variable and Probability in Binary Response Model

Y_i	Metro Specialization in Information Occupations	Location Quotient	Probability
1	Specialized	≥ 1	P_i
0	Not Specialized	< 1	$1 - P_i$
Total			1

$$E(Y_i) = P_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_k X_{ki} \quad (1.4)$$

That is, the conditional expectation of the model (1.1) can, in fact, be interpreted as the conditional probability of Y_i . Since the probability P_i must lie between 0 and 1, we have the restriction, $0 \leq E(Y_i | X_i) \leq 1$, that is, the conditional expectation (or conditional probability) must lie between 0 and 1.

The LPM is plagued by several problems: 1) non-normality of u_i , 2) heteroscedasticity of u_i , 3) possibility of Y lying outside the 0-1 range, and 4) the generally lower R2 values. But these problems are surmountable. We can use weighted least squares (WLS) to resolve the heteroscedasticity problem⁴⁷ or increase the sample size to minimize the non-normality problem. By mathematical programming technique, we can even make the estimated probability lie in the 0-1 interval.

Nonetheless, the LPM is not logically a very attractive model because it assumes that P_i increases linearly with X_i . For practical purposes, a probability model needs two features. First, as X_i increases, P_i increases but never steps outside the 0-1 interval. Second, the relationship between P_i and X_i is a nonlinear and S-shaped curve. As X_i gets extremely large or small, P_i approaches 1 or 0 at slower and slower rates. Geometrically, the model should resemble the cumulative distribution function (CDF) of a random variable (see Figure V-1). The CDFs commonly chosen to represent the 0-1 response models are the logistic and the normal. The former gives rise to the logit model and the latter to the probit (or normit) model.

⁴⁷ We can weight both sides of the model:

$$\frac{Y_i}{\sqrt{w_i}} = \frac{\beta_0}{\sqrt{w_i}} + \frac{\beta_1 X_{1i}}{\sqrt{w_i}} + \frac{\beta_2 X_{2i}}{\sqrt{w_i}} + \dots + \frac{u_i}{\sqrt{w_i}}$$

where, $\sqrt{w_i} = \sqrt{P_i(1 - P_i)}$

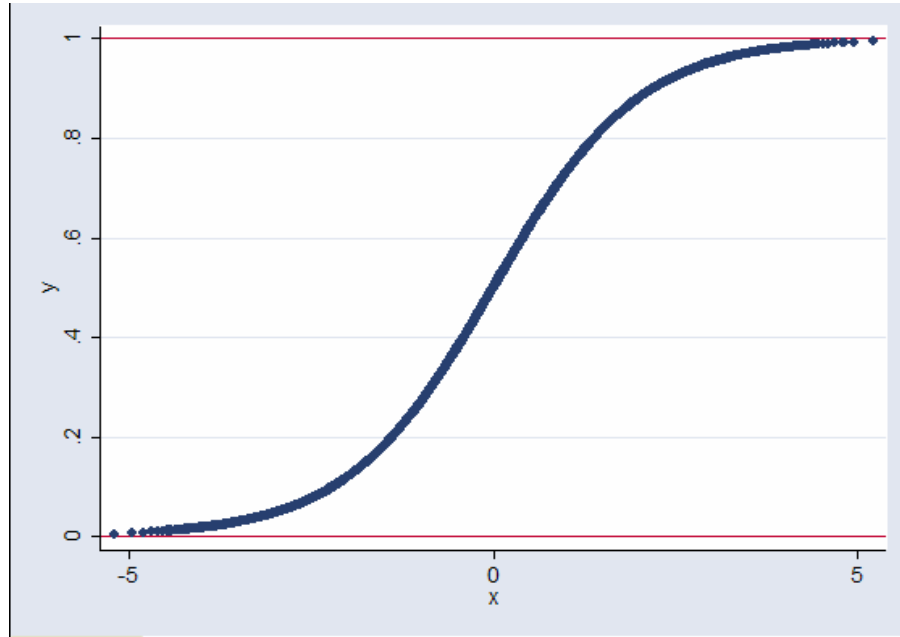


Figure V-1. Cumulative Distribution Functions

Logit Model: The following equation of the logit model represents the logistic distribution function.

$$E(Y_i = 1 | X_i) = P_i = \frac{1}{1 + e^{-(b_0 + b_1 X_{1i} + b_2 X_{2i} + \dots + b_k X_{ki})}} = \frac{1}{1 + e^{-Z_i}} = \frac{e^{Z_i}}{1 + e^{Z_i}} \quad (2.1)$$

where $Y_i = 1$ means that metropolitan area i is specialized in information occupations, and $X_{1i}, X_{2i}, X_{3i}, \dots, X_{ki}$ are determinants of Y . And:

$Z_i = b_0 + b_1 X_{1i} + b_2 X_{2i} + \dots + b_k X_{ki}$. As X ranges from $-\infty$ to $+\infty$, P_i ranges between 0 and 1, P_i is nonlinearly related to X .

We can linearize the model with a few steps. If P_i , the probability of metropolitan area i being specialized in information occupations, then $(1 - P_i)$, its probability of not being specialized, is:

$$(1 - P_i) = 1 - \frac{e^{Z_i}}{1 + e^{Z_i}} = \frac{1}{1 + e^{Z_i}} \quad (2.2)$$

Therefore, we can obtain:

$$\left(\frac{P_i}{1 - P_i} \right) = e^{Z_i} \quad (2.3)$$

where $P_i/(1 - P_i)$ is the odds ratio in favor of information occupation specialization in metropolitan area i , that is, the ratio of the probability of specialization to the probability of non-specialization. If we take the natural log of equation (2.3), we obtain

$$L_i = \log\left(\frac{P_i}{1 - P_i}\right) = Z_i = b_o + b_1 X_{1i} + b_2 X_{2i} + \dots + b_k X_{ki} \quad (2.4)$$

where L_i , the log of the odds ratio, is linear in X s. L is called the logit.

Probit Model: In addition to the logistic function, the normal CDF, known as probit model or normit model, has been found useful to explain a dichotomous dependent variable. Here, I will explain the probit model based on utility theory or rational choice perspective on behavior, as developed by McFadden (1973).

Assume that whether a metropolitan area is specialized in information occupations depends on an unobservable utility index, U_i (also known as a latent variable), that is determined by one or more explanatory variables such as innovation capacity, Internet infrastructure, diversity, industry specialization and so on. The larger the value of the index U_i is, the greater the probability of a metropolitan area being specialized in information occupations is. We express the index U_i as

$$U_i = \beta_o + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_k X_{ki} + \varepsilon_i \quad (3.1)$$

where $\varepsilon_i \sim N(0, \sigma^2)$, that is, $U_i \sim N(\beta_o + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_k X_{ki}, \sigma^2)$, and X s are determinants of U_i .

Now, assume that there is a critical or threshold level of the index, C . If U_i exceeds C , the metropolitan area will be specialized in information occupations, otherwise it will not. The threshold C , like U_i , is not observable, but if we assume that it is normally distributed with the same mean and variance, it is possible not only to estimate the parameters of the index given in (3.1) but also to get some information about the unobservable index itself.

We observe the specialization in information occupations for individual metropolitan area i , if $U_i \geq C$ where C is a threshold value. Given the assumption of

normality, the probability that $U_i \geq C$ can be computed from the standardized normal CDF as:

$$\begin{aligned} P_i &= P(Y = 1 | Xs) = P(C \leq U_i) = P(Z_i \leq U_i) \\ &= \Phi(U_i) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{U_i} e^{-z^2/2} dz = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_k X_{ki}} e^{-z^2/2} dz \end{aligned} \quad (3.2)$$

where $P(Y=1|Xs)$ means the probability of the specialization in information occupations for individual metropolitan area i , given the values of the Xs , and where Z_i is the standard normal variable (i.e., $Z \sim N(0, \sigma^2)$). Φ (Φ) is the standard normal CDF.

Now in order to obtain U_i (i.e., the utility index) as well as parameters, we take the inverse of $\Phi(U_i)$ as:

$$\Phi^{-1}(P_i) = U_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_k X_{ki} \quad (3.3)$$

where $\Phi^{-1}(P_i)$ is the inverse of $\Phi(P_i)$ and it is linearly related to Xs .

Between logit and probit, which model is preferable? In most applications, the models are quite similar. The main difference is that the logistic distribution has slightly fatter tails. The conditional probability P_i approaches 0 or 1 at a slower rate in logit than in probit. Therefore, there is no compelling reason to choose one over the other. In practice, many researchers choose the logit model because of its comparative mathematical simplicity (Gujarati 2003). In this study, I will use both models to analyze the determinants for information occupations concentrated in metropolitan areas.

3) Specified Logit and Probit Models

I specify both logit and probit models for analyzing metropolitan characteristics to affect specialization in two types of information occupations: core and regular information occupations, and also their sum, total information occupations. In both models, I consider as independent variables six conceptual metropolitan characteristics to affect their specialization: size, innovation capacity, Internet infrastructure, diversity,

young generation, and industry specialization. Metropolitan size is composed of two dummies: metropolitan areas with a population of 4 million and more, and metropolitan areas with a population of less than 4 million but at least 1.8 million. Industry specialization also consists of two parts of industry sectors: goods production and distribution sectors (GP&D) and information sectors (INFO). Therefore, eight independent variables are used for analyzing metropolitan characteristics to affect specialization in total information occupations and two types of information occupations.

Here, I specify logit and probit models by type of information occupations for exploring determinants to affect their specialization rate in 220 metropolitan areas in 2003. As a result, six equations are specified for analyzing metropolitan factors for specialization in two types of information occupations, for a total of three logit models and three probit models. The equations are as follows:

$$\begin{aligned}
 L_{core,i} &= \log\left(\frac{P_{core,i}}{1 - P_{core,i}}\right) \\
 &= b_o + b_1LARGE18_i + b_2LARGE40_i + b_3INNOV_i + b_4INTERNET_i \\
 &\quad + b_5DIVERSITY_i + b_6YOUNG_i + b_7GP \& D_i + b_8INFO_i
 \end{aligned} \tag{4.1}$$

$$\begin{aligned}
 L_{reg,i} &= \log\left(\frac{P_{reg,i}}{1 - P_{reg,i}}\right) \\
 &= b_o + b_1LARGE18_i + b_2LARGE40_i + b_3INNOV_i + b_4INTERNET_i \\
 &\quad + b_5DIVERSITY_i + b_6YOUNG_i + b_7GP \& D_i + b_8INFO_i
 \end{aligned} \tag{4.2}$$

$$\begin{aligned}
 L_{total,i} &= \log\left(\frac{P_{total,i}}{1 - P_{total,i}}\right) \\
 &= b_o + b_1LARGE18_i + b_2LARGE40_i + b_3INNOV_i + b_4INTERNET_i \\
 &\quad + b_5DIVERSITY_i + b_6YOUNG_i + b_7GP \& D_i + b_8INFO_i
 \end{aligned} \tag{4.3}$$

$$\begin{aligned}\Phi^{-1}(P_{core,i}) = & b_o + b_1LARGE18_i + b_2LARGE40_i + b_3INNOV_i + b_4INTERNET_i \\ & + b_5DIVERSITY_i + b_6YOUNG_i + b_7GP \& D_i + b_8INFO_i\end{aligned}\quad (4.4)$$

$$\begin{aligned}\Phi^{-1}(P_{reg,i}) = & b_o + b_1LARGE18_i + b_2LARGE40_i + b_3INNOV_i + b_4INTERNET_i \\ & + b_5DIVERSITY_i + b_6YOUNG_i + b_7GP \& D_i + b_8INFO_i\end{aligned}\quad (4.5)$$

$$\begin{aligned}\Phi^{-1}(P_{total,i}) = & b_o + b_1LARGE18_i + b_2LARGE40_i + b_3INNOV_i + b_4INTERNET_i \\ & + b_5DIVERSITY_i + b_6YOUNG_i + b_7GP \& D_i + b_8INFO_i\end{aligned}\quad (4.6)$$

where $L_{core,i}$, $L_{reg,i}$, $L_{total,i}$, $\Phi^{-1}(P_{core,i})$, $\Phi^{-1}(P_{reg,i})$, and $\Phi^{-1}(P_{total,i})$ are the logits and probits of specialization rates of core, regular, and total information occupations in metropolitan area i ($i = 0, 1, 2, \dots, 220$). $LARGE40_i$ and $LARGE18_i$ are size dummies: metropolitan area i with a population of 4 million and more, and metropolitan area i with a population of less than 4 million and 1.8 million or more. $INNOV_i$ is innovation capacity in metropolitan area i , proxied by number of 1990-99 patents per 1,000 employees in that metropolitan area. $INTERNET_i$ is Internet use rate in metropolitan area i . $DIVERSITY_i$ is the openness to diversity or the tolerance towards differences in metropolitan area i , proxied by the gay index, the percentage of same-sex partner households compared to total households. $YOUNG_i$ is the young generation share in metropolitan area i . $GP \& D_i$ is industry specialization in the goods production and distribution sector in metropolitan area i , proxied by the industry earnings in that sector. $INFO_i$ is industry specialization in the information sector in metropolitan area i , proxied by the industry earnings in that sector.

4) Maximum Likelihood Estimation and Interpretation

The estimation method of the logit model depends on the type of data we have for analysis. We distinguish two types of data: individual data and grouped data, where P_i is represented as the ratio of events (or success) to trials.

The logit model with grouped data may use ordinary least squares (OLS) to estimate parameters, although some remedies such as weighted least squares (WLS) should be applied to solve heteroscedasticity problems. However, in the case of individual data, the OLS estimation of the logit model is infeasible. For data at the individual level, we have to resort to the maximum likelihood (ML) method to estimate the parameters. For individual data, the results of the probit model are comparable with those obtained from the logit model.

In this study, each metropolitan area has just one observation, which is $Y=1$ if the metropolitan areas are specialized in information occupations, otherwise $Y=0$. Each metropolitan area has individual output, and hence the estimation of parameters follows the ML method.

Most modern statistical packages have routines to estimate logit and probit models on the basis of ungrouped data. I used SAS in this analysis. Before interpreting these results, some information about SAS outputs is warranted.

1. Since the method of maximum likelihood generally requires a large sample, the estimated standard errors are asymptotic.
2. Wald Chi-squares statistic: Instead of using the t statistic, SAS provides this measure to evaluate statistical significance of a coefficient.
3. Max-Rescaled R^2 : Measures similar to R^2 , called pseudo R^2 , are available. However, the conventional measure of goodness of fit, R^2 , is not particularly meaningful in binary dependent models. In binary regression models, goodness

of fit is of secondary importance. What matters is the expected signs of the regression coefficients and their statistical significances.

4. Likelihood ratio (LR) statistic: The equivalent of the F test in the linear regression model, to test the null hypothesis that all the slope coefficients are simultaneously equal to 0. The LR statistic follows the χ^2 distribution with df equal to the number of explanatory variables.
5. Marginal effect of a unit change in the value of a predictor: In the linear regression model, the slope coefficient measures the change in the average value of the regression for a unit change in the value of a regressor, with all other variables held constant. However, in the logit and probit models, the rate of change in the probability of an event happening for a unit change in the value of a predictor is not simply measured as the slope coefficient of the predictor, but all the regressors included in the analysis are involved in computing the changes in probability. In the following section, I address this issue in detail.

5) Marginal Effect of a Unit Change in the Value of a Predictor

In the logit model, the slope coefficient of a variable gives the change in the log of the odds associated with a unit change in that variable, again holding all other variables constant. But the rate of change in the probability of an event happening is given by $\beta_j P_i (1 - P_i)$, where β_j is the coefficient of the j^{th} regressor. But in evaluating P_i , all the variables included in the analysis are involved. Differentiating (2.1), the marginal effect of a unit change of the j^{th} regressor in the logit function is:

$$\begin{aligned} \frac{dP_i}{dX_{ji}} &= \frac{dP_i}{dZ_i} \cdot \frac{dZ_i}{dX_{ji}} = -(1 + e^{-z})^{-2} e^{-z} (-) \beta_j = \left(\frac{1}{1 + e^{-z}} \right)^2 e^{-z} \beta_j \\ &= P_i^2 \left(\frac{1 - P_i}{P_i} \right) \beta_j = P_i (1 - P_i) \beta_j \end{aligned} \quad (5.1)$$

In the probit model, the rate of change in the probability is complicated and is given by $\beta_j f(u_i)$, where $f(u_i)$ is the density function of the standard normal variable and $U_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_k X_{ki}$, that is, the regression model used in the analysis. Differentiating (3.2), the marginal effect of a unit change in the value of the j^{th} regressor in the probit function, is:

$$\frac{dP_i}{dX_{ji}} = \frac{dF(u)}{du} \cdot \frac{du}{dX_{ji}} = f(u) \cdot \beta_j = \beta_j \cdot f(\beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \dots + \beta_k X_{ki}) \quad (5.2)$$

In both logit and probit models, all the regressors are involved in computing the changes in probability, whereas in the linear probability model (LPM), only the j^{th} regressor is involved.

2. Data and Variable Descriptions

For this study, the estimated models use cross-sectional data with 220 metropolitan areas in the United States: Metropolitan Statistical Areas (MSAs) or Primary Metropolitan Statistical Areas (PMSAs). The dependent variables are specialization rates of core, regular, and total information occupations. The independent variables are composed of six conceptual determinants to affect their specialization: size, innovation capacity, Internet infrastructure, diversity, young generation, and industry specialization. Table V-3 provides information of variables used in these models such as variable description, proxies, and data sources. Additionally, Table V-4 provides descriptive statistics of these variables.

1) Metropolitan Statistical Areas

There is a compatibility problem with regard to metropolitan definitions among data sources, because the variables in the models have different data sources: the

Table V-3. Variable Description of Cross-Sectional Data in the Models

Variables	Proxies/Description	Source
Geographic unit:		
Metropolitan area in the United States (220 MSAs/PMSAs)		
Binary Dependent Variables: Specialization in Information Occupations in 2003		
3 Variables: Specialization in Core, Regular, and Total Information Occupations		OES ¹
[CORE, REGULAR, TOTAL]	1, if specialized (LQ \geq 1) 0, if not specialized (LQ < 1)	2003
Independent Variables		
Size	Large Metros - 2 Dummies	Census 2000
[METRO40]	1 if population \geq 4,000,000, otherwise 0	
[METRO18]	1 if 1,800,000 \leq population < 4,000,000, otherwise 0	
Innovation Capacity	1990-99 Patents per 1,000 Employees: (total patents \div average annual employment)*1000	USPTO ² REIS ³ 1969-2001
[INNOV]		
Internet Infrastructure	Online Population: people aged 3+ using Internet anywhere in 2001 Per 1,000	ICU ⁴ 2001
[INTERNET]		
Openness to Diversity	Gay Index: % of unmarried-partner household– same sex in 2000	Census 2000
[DIVERSITY]		
Young Generation	% of people aged 25-44 in 2000	Census 2000
[YOUNG]		
Industry Specialization	% of industry earnings in following sectors in 2001	REIS ³ 1969-2001
[GP&D]	Goods Production and Distribution Sectors: primary production, manufacturing, and distribution	NAICS ⁵
[INFO]	Information Sectors: finance, producer, and advanced consumer services	

[] variable title

1. OES = Occupational Employment Statistics.

2. USPTO = United States Patent and Trademark Office.

3. REIS = Regional Economic Information System. Data are extracted from the REIS 1969-2001 disc.

4. ICU = Internet and Computer Use, that is one of Current Population Survey Supplements.

5. NAICS = North America Industry Classification System.

Table V-4. Descriptive Statistics: Specialization in Information Occupations and Socioeconomic Characteristics of 220 Metropolitan Areas

Variable	Mean	Std Dev	Sum	Min	Max	Metro with the Highest Value
Specialization in Information Occupations in 2003						
Specialization Rates: Binary Dependent Variables (1 if specialized, otherwise 0)						
CORE	0.16	0.37	35	0	1	
REGULAR	0.30	0.46	66	0	1	
TOTAL	0.23	0.42	51	0	1	
Location Quotient						
CORE	0.76	0.25		0.25	1.65	
REGULAR	0.92	0.15		0.47	1.44	
TOTAL	0.89	0.16		0.46	1.45	
Occupation Share (%)						
CORE	3.72	1.24		1.22	8.06	Washington, DC-MD-VA-WV*
REGULAR	19.14	3.19		9.84	29.95	San Jose, CA*
TOTAL	22.86	4.22		11.88	37.09	San Jose, CA*
Independent Variables						
Metropolitan Size in 2000						
LARGE40	0.04	0.19	8	0	1	
LARGE18	0.08	0.27	18	0	1	
Population (thousand)	920	1321	-	112	9,519	Los Angeles-Long Beach, CA*
Innovation Capacity: 1990-1999						
INNOV	3.87	3.57		0.20	25.32	San Jose, CA*
Internet Infrastructure in 2001						
INTERNET (%)	54.85	9.38		17.84	79.45	Olympia, WA*
Openness to Diversity in 2000						
DIVERSITY (%)	5.87	1.82		2.92	17.74	San Francisco, CA*
Young Generation in 2000						
YOUNG (%)	29.73	2.46		18.78	36.56	San Francisco, CA*
Industry Specialization in 2001						
GP&D (%)	22.00	8.62		0.00	43.79	Odessa-Midland, TX
INFO (%)	26.48	8.82		4.85	61.68	New York, NY*

CORE = core information occupations.

REGULAR = regular information occupations.

TOTAL = total information occupations.

LARGE40 = dummy; 1 if a metropolitan population in 2000 is over 4 million, otherwise 0.

LARGE18 = dummy; 1 if 1.8 million \leq a metropolitan population in 2000 < 4 million, otherwise 0.

INNOV = 1990-99 patents per 1,000 employees.

INTERNET = % of people aged 3 and older using Internet anywhere in 2001.

DIVERSITY = % of unmarried-partner household (same sex) in 2000.

YOUNG = % of people aged 25-44 in 2000.

GP&D = % of earnings in the goods and production sector in 2001.

INFO = % of earnings in the information sector in 2001.

Occupational Employment Statistic (OES) survey, the U.S. Patent and Trademark Office (USPTO),⁴⁸ Census 2000, the Regional Economic Information System (REIS) and the Internet and Computer Use (ICU) survey as one supplement of the Current Population Survey (CPS).

Most sources, except for the ICU survey, use the 1999 Metropolitan Statistical Area (MSA) definitions of the Office of Management and Business (OMB). However, each source has a slightly different metropolitan definition than the others. Mostly, the differences among data sources are due to different MSA definitions in the New England regions.⁴⁹ The OES survey uses the city- and town-based MSA definitions, but the REIS and the USPTO use the county-based MSA definitions. Census 2000 uses both definitions. After metropolitan areas in the New England region are omitted, 306 metropolitan areas are matched among those sources except for the ICU survey.

The biggest difference of metropolitan definitions, however, is from the ICU data in the CPS. The ICU survey uses the 1993 definition of metropolitan areas, while other data sources use the 1999 definitions.⁵⁰ The ICU data contain 241 metropolitan areas. The number of metropolitan areas is much less than the number of metropolitan areas released by the OMB in 1999. And 21 of 241 metropolitan areas are in the New England region. As a result, just 220 MSAs are analyzed in these models.

⁴⁸ Metropolitan areas, used in patent data, are based on definitions effective July 1, 1999. The patent data are matched with 306 MSAs out of 318 MSAs. The unmatched MSAs are 12 NECMAs.

⁴⁹ I explained two sets of metropolitan definitions in the New England region in chapter 4.

⁵⁰ The specific metropolitan identifiers on the ICU data are based on the Office of Management and Budget's June 30, 1993 definitions. MSAs and PMSAs can be identified by using the FIPS MSA/PMSA code. Many of the smaller metropolitan areas in the sample are coded "not identifiable" in the household metropolitan statistical area residence status code (GEMSAST). The GE in each variable name refers to Household Geographic.

2) Specialization in Information Occupations

In these models, the dependent variables are dichotomous. Since each metropolitan area is either specialized in information occupations or it is not, the response variable can take only two values: $Y=1$ if a metropolitan area are specialized in information occupations, and $Y=0$ if it is not. In this study, I analyze metropolitan specialization in two types of information occupations and the sum of the two.⁵¹ Core and regular information occupations are two disaggregate parts of information occupations, and total information occupations equal to the sum of core and regular information occupations. Therefore, I analyze three binary dependent variables: *CORE*, *REGULAR*, and *TOTAL*. *CORE*=1 if a metropolitan area specialized in core information occupations, and *CORE*=0 if it is not. The other two variables, *REG* and *TOTAL*, follow the same process.

In order to measure metropolitan specialization in information occupations, the location quotient (LQ) is employed. The location quotient is measured as the ratio of a metropolitan area's employment share in information occupations to their national presence. If LQ is larger than 1, it indicates that a metropolitan area is specialized in information occupations. Therefore, dependent variables for two types of information occupations and total information occupations take two values:

$$CORE=1 \text{ if } LQ_{core} \geq 1, \text{ and } CORE=0 \text{ if } LQ_{core} < 1$$

$$REGULAR=1 \text{ if } LQ_{reg} \geq 1, \text{ and } REGULAR=0 \text{ if } LQ_{reg} < 1$$

$$TOTAL=1 \text{ if } LQ_{total} \geq 1, \text{ and } TOTAL=0 \text{ if } LQ_{total} < 1$$

⁵¹ In chapter 2, I defined information occupations using the O*NET job zones. Core information occupations are defined as those in job zone 5, while regular information occupations are those in job zone 4. Total information occupations are those in job zones 4 and 5 (i.e., the sum of core and regular information occupations).

where LQ_{core} , LQ_{reg} , and LQ_{total} are the location quotients for core, regular, and total information occupations, respectively. The source of employment of information occupations is the 2003 OES data.

According to Table V-4, in 2003, 220 metropolitan areas had on average 3.72% core information occupations, 19.14% regular information occupations, and 22.86% total information occupations (i.e., the sum of core and regular information occupations). Average location quotients of core, regular, and total information occupations are 0.76, 0.92, and 0.89 respectively. All of them are smaller than 1. IN particular, core information occupations showed a smaller average location quotient and a larger standard deviation than regular and total information occupations did. It means that specializations in all types of information occupations were concentrated in a small number of metropolitan areas, and core information occupations were most concentrated in a few metropolitan areas. In reality, 35, 66, and 51 out of 220 metropolitan areas were specialized, respectively, in core, regular, and total information occupations in 2003. Therefore, probabilities of a metropolitan being specialized in core, regular, and total information occupations (i.e., average specialization rates) were 0.16, 0.30, and 0.23, respectively, in 2003. In 2003, the metropolitan area that was most specialized in core information occupations was the Washington PMSA. On the other hand, San Jose, CA was most specialized in both regular and total information occupations.

3) Six Conceptual Determinants

I consider six conceptual factors to affect metropolitan concentration of information occupations: size, innovation capacity, Internet infrastructure, diversity, young generation, and industry specialization. These factors are composed of eight variables (see Table V-3).

Size: In regional studies, it has long been argued that economic core functions controlled or managed by high-quality and high-end occupations converge on global cities with a large population (Graham and Marvin 1996; Hepworth, Green, and Gillespie 1987; Hepworth 1990), and technology workers in a volatile labor market do not want to remain in a small labor market in which alternative job opportunities are few, because they lack job alternatives in the smaller nodes of the network (Bee 2003). In order to explore the effect of “labor pooling” on metropolitan specialization in information occupations, I use two dummy variables in the models: LARGE40 and LARGE18. I get metropolitan population data from Census 2000 as a measure of metropolitan size.

After plotting location quotients of core, regular, and total information occupations against metropolitan size, the critical points categorizing the size of metropolitan areas were decided (see the Appendix Figure C1-3). According to figures plotting location quotients against a population in each metropolitan area, there is a clear phenomenon that information occupation specialization patterns are different by metropolitan size.

Table V-5 summarizes the observed outcomes from figures plotting location quotients against metropolitan size. Core information occupations showed big changes of specialization rates by metropolitan size; specialization rates of core information occupations were 0.75 in metropolitan areas with a population of 4 million and more, 0.39 in those with a population of less than 4 million and 1.8 million, and 0.11 in those with a population of less than 1.8 million. Specialization rates of regular and total information occupations showed moderate changes between biggest metropolitan areas and relatively large metropolitan areas, but radical changes between relatively large metropolitan areas and smaller metropolitan areas; specialization rates of regular and

Table V-5. Number of Metropolitan Areas Specialized in Information Occupations by Metropolitan Size

Metro Size (Number of Metros)	Specialization (LQ \geq 1)	Information Occupations		
		CORE	REGULAR	TOTAL
4 million and more (8 metros)	Specialized	6	7	6
	Not specialized	2	1	2
	Specialization rate	0.75	0.875	0.75
1.8-4.0 million (18 metros)	Specialized	7	14	12
	Not specialized	11	4	6
	Specialization rate	0.39	0.78	0.67
Less than 1.8 million (194 metros)	Specialized	22	45	33
	Not specialized	174	149	161
	Specialization rate	0.11	0.23	0.17
Total metros (220 metros)	Specialized	35	66	51
	not specialized	187	154	169
	Specialization rate	0.16	0.30	0.23

total information occupations were 0.875 and 0.75 in metropolitan areas with a population of 4 million and more, 0.78 and 0.67 in those with a population of less than 4 million and 1.8 million and more, and 0.23 and 0.17 in those with a population of less than 1.8 million. Thus, these changes of specialization rates of core, regular, total information occupations by metropolitan size proved the existence of two important population thresholds: 4 million and 1.8 million. Therefore, I categorized metropolitan size into three population groups: 4 million and more, less than 4 million and 1.8 million and more, and less than 1.8 million.

Appendix Table C1 shows the specialized information occupation types of metropolitan areas by size. Six out of eight metropolitan areas with a population of over

4 million (i.e., Atlanta, Chicago, Houston, New York, Philadelphia, and Washington) are specialized in all of the core, regular, and total information occupations. However, Detroit is specialized in only the regular information occupations, and Los Angeles-Long Beach (PMSA) is specialized in none of information occupations.⁵²

Seven out of 18 metropolitan areas with a population of less than 4 million and 1.8 million and more, (i.e., Baltimore, Denver, Minneapolis-St. Paul, Pittsburgh, Portland-Vancouver, St. Louis, and San Diego) were specialized in all of the core, regular, and total information occupations. Five metropolitan areas such as Dallas, Newark, Oakland, Phoenix-Mesa, Seattle-Bellevue-Everett were specialized in regular and total information occupations. Two metropolitan areas (i.e., Cleveland-Lorain-Elyria, and Orange County) are specialized in only regular information occupations. Four metropolitan areas such as Miami, Nassau-Suffolk, Riverside-San Bernardino, and Tampa-St. Petersburg-Clearwater were specialized in none of the information occupations.

In particular, out of metropolitan areas with a population of over 4 million, the Los Angeles-Long Beach PMSA is the outlier, since it is not specialized in any of the information occupations, even though it is the biggest metropolitan area with a population of about 9.5 million in 2000 (see Appendix Figure C1-3). The existence of

⁵² It might be because of the characteristics of population composition such as a large number of uneducated immigrants in the Los Angeles-Long Beach PMSA. The Los Angeles-Long Beach PMSA was the metropolitan area with the biggest population including an increasing immigration population in the United States in 2000. The reason that the Los Angeles-Long Beach PMSA was specialized in none of the information occupations seems to be that, unlike New York, which has proximity to the Canadian border and whose immigration population is composed of relatively educated people, Los Angeles, with proximity to the Mexican border, has a large portion of uneducated immigrants. The outcome that the Los Angeles-Long Beach PMSA has specialization in none of information occupations also gives evidence which refute some scholars' argument that the weather is one of important motivations which attract creative or educated people into specific areas. Los Angeles, with the wonderful weather, is an attractive area to not only educated people, but also uneducated people, especially to legal or illegal immigrants, who usually decide to be located in the biggest metropolitan areas with more employment opportunity. It seems that the weather is a variable to explain the location choice of all kinds of people rather than information occupations.

an outlier such as the Los Angeles-Long Beach PMSA may distort regression models, but they are not removable because, in regional studies, it is an important area showing a meaningful social phenomenon. Therefore, in this study, in order to control such an outlier as well as to represent two population thresholds which influenced specialization rates of information occupations by metropolitan size, I use two dummy variables to distinguish three levels of metropolitan size: *LARGE40* and *LARGE18*. *LARGE40* = 1 if the population in a metropolitan area is 4 million and more, and *LARGE40* = 0 if it is not. *LARGE18* = 1 if the metropolitan population is less than 4 million and 1.8 million and more, and *LARGE18* = 0 if it is not.

Innovation Capacity: In regional innovation studies, the major focus has been on the role of innovation capacity such as university R&D, patents, and venture capital in new firm formation or industry clustering, while the effect of innovation potential on regional high-quality employment have not been highlighted. However, the increasing significance of human capital needs to bring this issue into sharp focus: the relationship between information occupations and regional innovation capacity. There are several indicators to explain regional innovation capacity such as patents, university R&D expenditures, and venture capital activities. In this study, I used patent data as an indicator to measure metropolitan innovation capacity for two reasons: first, patents are the best measure of a region's potential to turn science into commercial inventions (Bee 2003) and a better measure of technology innovation than university research (Jaffe 1989; Furman, Porter, and Stern 2002; Stern, Poeter, and Furman 2000). Second, patent data are available at the metropolitan level.⁵³

⁵³ In the case of university R&D, expenditures are not available at the metropolitan level, but are available only at the state level.

The U.S. Patent and Trademark Office (USPTO) presents the numbers of utility patents⁵⁴ granted to residents of each state, county (or equivalent), and metropolitan area of the United States from 1990 to 1999. The geographic distribution of patents is based on the residence of the first-named inventor. From 1990 to 1999, the percentage of utility patents in MSA, NECMA, or PMSA to Total U.S. Utility Patents was 91.8-93.1% (USPTO 2000). The data source is “Table 1. U.S Utility Patent Grants by Metropolitan Area, 50 States, 1990-1999 Rank Ordered List, Based on 1999 Grants.”⁵⁵

From 1990 to 1999, 220 metropolitan areas received an average 3.87 patents per 1,000 employees. During this period, San Jose, CA, had the highest level of innovation capacity by acquiring the largest number (25.32) of patents per 1,000 employees.

Internet Infrastructure: The third determinant is Internet infrastructure. Many researchers have argued that innovations in information technology (computer communications networks) reinforce integration of global cities into the global information economy (Hepworth 1987) and affect the spatial polarization of occupation locations (Graham and Marvin 1996). Therefore, in my models, I examine the relationship between Internet infrastructure and metropolitan specialization in information occupations.

Two ways are used for measuring Internet infrastructure in a metropolitan area: counting the online population who use Internet anywhere, and counting the number of homes that subscribe to broadband services, either through cable services or digital subscriber lines (DSL) over the telephone. The 2001 Computer and Internet Use (ICU)

⁵⁴ Patent is a property right granted by the Government of the United States of America to an inventor “to exclude others from making, using, offering for sale, or selling the invention throughout the United States or importing the invention into the United States,” for a limited time in exchange for public disclosure of the invention when the patent is granted. Utility patent is a patent to be granted to anyone who invents or discovers any new, useful, and nonobvious process, machine, article of manufacture, or composition of matter, or any new and useful improvement thereof (USPTO website: <http://www.uspto.gov/main/glossary/index.html>).

⁵⁵ <http://www.uspto.gov/web/offices/ac/ido/oeip/taf/county.pdf>.

survey, a supplement of the Current Population Survey (CPS), provides the persons aged 3 and over who use Internet anywhere and the number of homes with broadband services. In the models, I used two variables which are the share of online population and the share of broadband households. It turns out that the share of the online population is a better predictor than the share of broadband households, and its multicollinearity problem is smaller than that of the other. So I include the share of online population and remove the broadband households in the models. Here the variable is called INTERNET.

In 220 metropolitan areas, on average, people using Internet anywhere were 54.85% of metropolitan population aged 3 and more in 2001. In that year, Olympia, WA, was the metropolitan area with the largest share (79.45%) of online population.

Diversity: Diversity is one of this study's determinants. Creative-class people, or highly educated people, are seeking an environment open to difference (Florida 2002). Florida introduced two types of diversity indicators such as the new outsiders (immigrants) and the gay index, and he argued that the gay index represents a leading indicator of a place that is open and tolerant (the low barrier entry). In my study, the measure of the diversity in a metropolitan area is the Gay Index: an indicator of tolerance towards difference in a community (Florida 2002). I refer to the variable as DIVERSITY. I use a percentage of unmarried-same-sex partner households to total households as a measure of diversity in a metropolitan area. The data are available from Census 2000.

In 2000, an average 5.87% of metropolitan households were same-sex partner households. The metropolitan area with the largest gay index (17.74% of households) was San Francisco, CA.

Young Generation: In this study, I include the high presence of young generation as a determinant for metropolitan specialization in information occupations.

I consider the young generation (YOUNG) as the cohort aged 25-44 years. The cohort aged 20-24 includes a large portion of college students. Their locations usually depend on the locations of universities. For the same reason, human capital is usually measured as the portion of people with more than a Bachelor's degree among the population aged 25 and over.⁵⁶ Among the population aged 25 and over, the cohort 25-44 can migrate more freely to other places and can choose the place where to want to live (see Figure

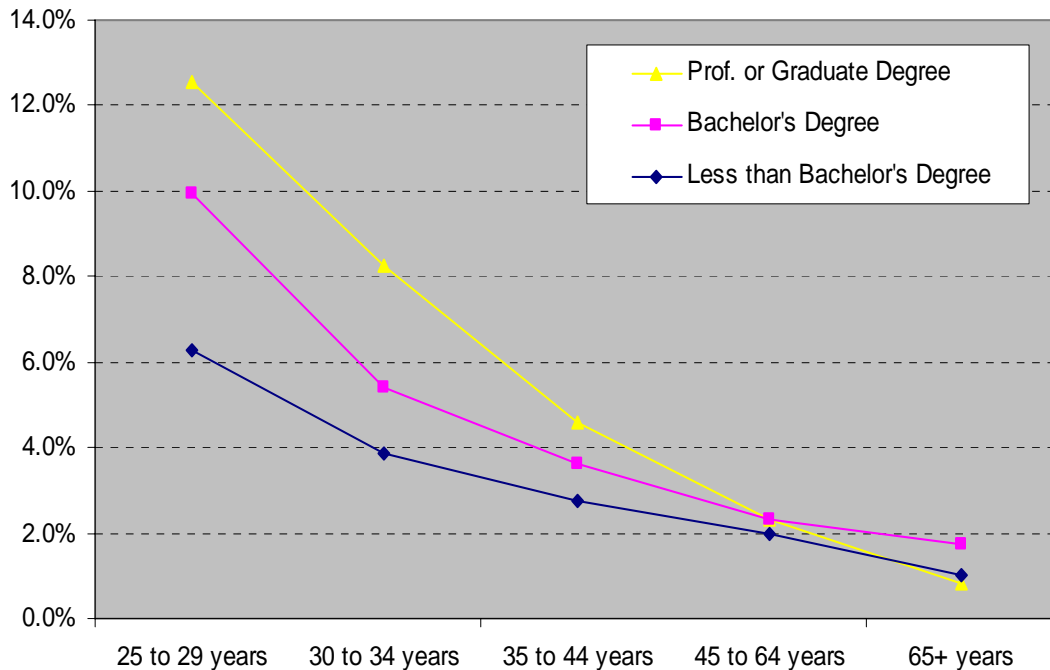


Figure V-2. Probability of Migrating Across State Lines in 2001-2002, by Age and Educational Attainment

Source: U.S. Census Bureau, Geographic Mobility: March 2001 to March 2002, Table 6. General Mobility of Persons 25 Years and Over, by Region, Age, and Educational Attainment: March 2001-2002: Internet Release Date: December 12, 2003, Calculated by the Author

⁵⁶ Information occupations are composed of highly educated workers. The people who graduate from a college are usually aged 21 or 22 or older. In particular, the core information occupations require workers with advanced degrees. Therefore, people who want to work in core information occupations have to spend more time to acquire advanced degrees from professional or graduate school. After attaining their degrees, people can choose where to live and work.

V-2).⁵⁷ If we find a high portion of the cohort aged 25 to 44, it probably means that the place offers better job opportunities and amenities than other places, and hence a young workforce with high mobility chooses the place for working and living.

In the cohort aged 25 to 44, the highly educated people show higher mobility than other people. On the other hand, the older generation over 45 show no different mobility between information and non-information workers. If a place provides a more attractive environment to the people aged 25 to 44 than other places, the place is also attractive to information occupations with higher mobility in this age group. Therefore, the high presence of the cohort aged 25-44 in a metropolitan area might be a factor in favor of information occupations. That is, as a place gets a bigger portion of the cohort 25-44, the specialization possibility of information occupations becomes higher. For this reason, I include this cohort as a determinant for metropolitan specialization in information occupations. The young generation data are also available from Census 2000.

In 2000, 220 metropolitan areas showed the presence of an average 29.73% people aged 25-44. The metropolitan areas in which the young generation was most concentrated in 2000 was San Francisco, CA, where 36.56% of the metropolitan population was people aged 25-44.

Industry Specialization: In the new economy, information occupations cross industries. However, it has been observed that knowledge-intensive industries require more highly educated workers than other industries and a high portion in their

⁵⁷ Demographic characteristics of workers, such as age and education, also play an important role in labor mobility. Migration is common among younger and more educated workers. The relationship between age and labor mobility declines systematically over the working life and mobility is different among workers' education levels. Older workers are less likely to move because migration is a human capital investment. Older workers have a shorter period over which they can collect a return on investment in the migration. The shorter payoff period decreases the net gains to migration and hence lowers the probability of migration. There is also a positive correlation between workers' education attainment and the probability of migration (Borjas 2005).

occupation mix is composed of management and professional occupations. The industry type in which a metropolitan area specializes could be a good predictor of the specialization in information occupations in that area. In order to explore the impact of knowledge-intensive industry specialization on regional occupational structure at a metropolitan level, I include two comparative parts of industries in my models: information sectors (INFO) and goods production and distribution sectors (GP&D).

Here I use Drennan (2002)'s definitions about these industry groups which are classified by the concept of traded and non-traded goods and services employed from international trade economics. Drennan divides the traded goods and services into six industry groups. Among the six groups, three groups (financial producer services, other producer services, and advanced consumer services) are labeled information sector (INFO) because the groups' input and output are both information and the occupational composition has a higher proportion of high-wage, professional jobs than other graded goods and services. The other three groups (primary production, manufacturing, and distribution) are labeled goods production and distribution (GP&D). In my models, I include two major groups (INFO and GP&D), not six detailed groups, in order to avoid multicollinearity problems (for industry composition details, see Appendix Table C2).

In 2001, total traded goods and production (i.e., the sum of the goods production and distribution sector and the information sector) created an average 48.48% of metropolitan earnings: 22.00% earnings in the goods production and distribution sector and 26.48% of earnings in the information sector. In 2001, out of 220 metropolitan areas, the most specialized area in the goods production and distribution sector was Odessa-Midland, TX, which produced the largest share (43.79%) in this sector. On the other hand, the metropolitan area most specialized in the information sector was New York, NY, which created 61.68% earnings in this sector.

3. Econometric Estimation Results

Model Compositions: In the previous section, I specified logit and probit models by type of information occupations for exploring determinants that might affect their specialization rate in 220 metropolitan areas in 2003. As a result, six equations were specified for analyzing metropolitan factors for specialization in total information occupations and two types of information occupations: three logit models and three probit models (see Equation 4.1-4.6). The three logit models are labeled Logit I and the probit models are labeled Probit I. In addition, I analyzed three logit and three probit models excluding one independent variable, *DIVERSITY*, from Logit I and Probit I. These three logit and three probit models are labeled Logit II and Probit II, respectively.

As a result, I analyzed four types of models (12 estimated equations) for determinants of metropolitan specialization in core, regular, and total information occupations: Logit I and II, and Probit I and II. Tables V-6 and V-7 show the estimated results from these four types of models. Each type of model has three dependent variables: *CORE*, *REGULAR*, and *TOTAL*. Logit and probit models have the same variable compositions. Logit I and Probit I are composed of all eight independent variables: *LARGE40*, *LARGE18*, *INNOV*, *INTERNET*, *DIVERSITY*, *YOUNG*, *GP&D*, and *INFO*. On the other hand, Logit II and Probit II are composed of all seven independent variables, excluding *DIVERSITY*. The only difference between Logit I (or Probit I) and Logit II (or Probit II) is the inclusion or exclusion of *DIVERSITY*.

Overall Features: Logit models and probit models show almost similar results. The two models have no big differences of signals and significance of coefficients, and

Table V-6. Regression Estimates: Logit Models of Metropolitan Specialization in Information Occupations

Parameter	LOGIT I			LOGIT II		
	CORE	REGULAR	TOTAL	CORE	REGULAR	TOTAL
<i>Large40</i>	2.7109 (6.69) **	1.4133 (1.40)	1.6079 (2.35)	2.7151 (6.72) **	1.3051 (1.21)	1.6015 (2.34)
<i>Large18</i>	0.8958 (1.72)	1.5317 (4.30) *	1.4663 (4.16) *	0.9161 (1.85)	1.3711 (3.58)	1.4581 (4.19) *
<i>INNOV</i>	0.2208 (11.26) **	0.203 (8.77) **	0.1582 (6.03) *	0.2221 (11.54) **	0.1882 (8.03) **	0.1574 (6.10) *
<i>INTERNET</i>	0.00295 (0.98)	0.00409 (2.61)	0.00895 (8.52) **	0.00294 (0.97)	0.00422 (2.88)	0.00895 (8.52) **
<i>DIVERSITY</i>	0.0271 (0.03)	-0.2239 (2.43)	-0.0117 (0.01)			
<i>YOUNG</i>	0.3694 (7.75) **	0.4476 (14.81) **	0.3677 (9.13) **	0.3773 (9.07) **	0.3942 (12.75) **	0.365 (9.71) **
<i>GP&D</i>	-0.1218 (9.25) **	-0.0536 (3.22)	-0.1001 (7.60) **	-0.1238 (10.28) **	-0.0366 (1.78)	-0.0992 (8.23) **
<i>INFO</i>	-0.00096 (0.00)	0.0717 (5.84) *	0.0663 (3.88) *	0.000115 (0.00)	0.065 (4.86) *	0.066 (3.87) *
Likelihood Ratio	71.2271	104.4218	104.7688	71.1944	101.8488	104.7619
df	8	8	8	7	7	7
Max-Rescaled R ²	0.4738	0.5358	0.5728	0.4737	0.5254	0.5728
N of Observations	220	220	220	220	220	220

* denotes statistically significant at the 5% level, and ** denotes strongly significant at the 1% level.

() is Wald Chi-square statistic.

Table V-7. Regression Estimates: Probit Models of Metropolitan Specialization in Information Occupations

Parameter	PROBIT I			PROBIT II		
	CORE	REGULAR	TOTAL	CORE	REGULAR	TOTAL
<i>Large40</i>	1.5079 (6.31) **	0.8498 (1.65)	0.8919 (2.12)	1.5117 (6.34) *	0.7639 (1.37)	0.8904 (2.13)
<i>Large18</i>	0.5075 (1.72)	0.9089 (4.67) *	0.7874 (3.78)	0.5192 (1.84)	0.8145 (3.81)	0.7859 (3.84) *
<i>INNOV</i>	0.1227 (11.33) **	0.123 (10.17) **	0.0909 (6.08) *	0.1238 (11.69) **	0.115 (9.31) **	0.0908 (6.17) *
<i>INTERNET</i>	0.00148 (0.86)	0.00231 (2.67)	0.00478 (8.29) **	0.00147 (0.84)	0.00234 (2.82) *	0.00478 (8.29) **
<i>DIVERSITY</i>	0.0198 (0.06)	-0.1311 (2.68)	-0.0024 (0.00)			
<i>YOUNG</i>	0.1975 (7.93) **	0.2599 (16.37) **	0.2068 (10.12) **	0.2035 (9.43) **	0.228 (14.18) **	0.2062 (10.95) **
<i>GP&D</i>	-0.0623 (8.76) **	-0.0312 (3.51)	-0.0534 (7.41) **	-0.0639 (10.05) **	-0.0208 (1.84)	-0.0532 (8.12) **
<i>INFO</i>	0.00222 (0.02)	0.0422 (6.32) **	0.0388 (4.48) *	0.00294 (0.03)	0.0386 (5.36) *	0.0388 (4.52) *
Likelihood Ratio	71.194	105.9795	104.8197	71.1358	103.3222	104.8188
df	8	8	8	7	7	7
Max-Rescaled R ²	0.4737	0.542	0.5731	0.4733	0.5314	0.5731
N of Observation	220	220	220	220	220	220

* denotes statistically significant at the 5% level, and ** denotes strongly significant at the 1% level.

() is Wald Chi-square statistic.

of explanation power.⁵⁸ Therefore, I will explain the results estimated from logit models.

Both Logit I and Logit II explain the factors of metropolitan specialization in total information occupations better than those in core or regular information occupations. Logit I and Logit II have higher explanation powers, as measured by Max-Rescaled R^2 , for the metropolitan specialization in total information occupations (about 0.57 for all four models) than those for the metropolitan specialization in core (about 0.47 for all four models) and regular information occupations (about 0.53 to 0.54 for four models).

Logit I shows that *DIVERSITY* is not a significant factor to affect the metropolitan specialization in information occupations. In addition, Logit I (with *DIVERSITY*) and Logit II (without *DIVERSITY*) have almost the same explanation power, as measured by Max-Rescaled R^2 . That is, the metropolitan diversity measured by the gay index cannot explain statistically the metropolitan specialization in any type of information occupations in these models.

The metropolitan specialization in each type of information occupation is determined by different sets of location factors. The following section explains the analysis outcomes about which location factors are significant to explain metropolitan specialization in each of information occupations.

1) Types of Information Occupations and Location Factors

Core Information Occupations: Four independent variables are strongly significant as metropolitan characteristics to affect concentration of core information

⁵⁸ The coefficients of the logit and probit models have the same signals and almost the same significance. Also, the Max-Rescaled R^2 value of both models almost the same, even if, for total and regular information occupations, the probit models have slightly higher explanation power and, for core information occupations, the logit models do so.

occupations: *LARGE40*, *INNOV*, *YOUNG*, and *GP&D* (four variables are significant at the 1% level). It is more likely that specialization in core information occupations is observed in metropolitan areas with biggest size, high innovation capacity, and a high density of young generation. On the other hand, specialization in the goods production and distribution sector leads to lower shares of core information occupations. The explanation power of these models to account for specialization in core information occupations is lower than those for metropolitan specialization in regular and total information occupations (in both Logit I and Logit II, Max-Rescaled R² values are 0.47).

Regular Information Occupations: Four independent variables are significant as location factors of regular information occupations: *LARGE18*, *INNOV*, *YOUNG*, and *INFO*. Two out of four predictors, *INNOV* and *YOUNG*, are strongly significant (at the 1% level). Regular information occupations more likely concentrate in metropolitan areas which have relatively large size, strong innovation capacity, high density of young workforce, and specialization in the information sectors. The explanation power of these logit (or probit) models for specialization in regular information occupations is higher than those for core information occupations, but lower than those for total information occupations (in Logit I and Logit II, Max-Rescaled R² values are 0.54 and 0.53, respectively).

Total Information Occupations: Six independent variables are significant as geographic factors to explain metropolitan specialization in total information occupations: *LARGE18*, *INNOV*, *INTERNET*, *YOUNG*, *GP&D*, and *INFO*. Total information occupations is more likely to flock to metropolitan areas with relatively large size, high innovation capacity, well-established Internet infrastructure, high density of young workforce, and specialization in the information sectors. On the other hand, like core information occupations, total information occupations are less likely to

concentrate in metropolitan areas specialized in the goods production and distribution sector. The explanation power of these models to account for factors to affect specialization in total information occupations is higher than those for two disaggregated groups: core and regular information occupations (in both Logit I and Logit II, Max-Rescaled R^2 values are 0.57).

The above analysis outcomes of locational determinants by type of information occupations shows several features. First, specialization in two types of information occupations is influenced by different metropolitan environments: different size and different type of industry specialization. Core information occupations show the high presence in metropolitan areas with the biggest size (a population of 4 million and over). Their presence has a significant and negative relationship with metropolitan specialization in the production and distribution sector, but no significant relationship with metropolitan specialization in the information sector. In contrast, regular information occupations are observed in metropolitan areas with relatively large size (a population of 1.8 to 4 million). Unlike core information occupations, their presence shows a significant relationship with specialization in the information sector, but no significant relationship with specialization in the goods production and distribution sector. Second, the estimated models explain the factors to affect metropolitan specialization in total information occupations better than those to affect metropolitan specialization in core or regular information occupations. Core and regular information occupations have four significant factors to explain their concentration in particular metropolitan areas, while total information occupations has six significant factors. Additionally the explanation power of the models for total information occupations is higher than those for core and regular information occupations (see Tables V-6 and V-7). Third, among all eight variables, only metropolitan diversity (*DIVERSITY*), measured by the gay index, is not able to affect the metropolitan specialization in any

type of information occupations. Diversity is the only insignificant variable in these models.

2) Six Location Factors

In the previous section, I explained what locational factors affect metropolitan specialization by type of information occupation. Here I will explain in more detail the impacts of six conceptual factors (eight variables) on the specialization rate of total information occupations and two types of information occupations: size, innovation capacity, Internet, young generation, diversity, and industry specialization.

Size: Models show that metropolitan size has a positive impact on a probability of metropolitan specialization in information occupations. All coefficients of two dummies (*METRO18* and *METRO40*) are positive, even though some are not significant.

In particular, metropolitan size has an impact on the type of information occupations which concentrate in metropolitan areas. If a metropolitan area's population is more than 4 millions, there is a high probability that core information occupations will be concentrated in that metropolitan area (the coefficient of *LARGE40* is positive and highly significant but the coefficient of *LARGE18* is not significant). On the other hand, if a metropolitan area's population is between 1.8 and 4.0 million, there is a high probability that regular information occupations will be concentrated in that area (the coefficient of *LARGE18* is positive and significant, but the coefficient of *LARGE40* is not significant).

Like regular information occupations, total information occupations (i.e., the sum of core and regular information occupations) concentrate in the metropolitan areas with a population of 1.8 to 4 million (the coefficients of *LARGE18* are positive and significant). For metropolitan specialization in total information occupations, the

coefficients of *LARGE40* are not a significant factor. However, their Wald Chi-squares are higher than those for metropolitan specialization in regular information occupations. The increase of Wald Chi-squares is because total information occupations include both core and regular information occupations. However, they are not statistically significant. It seems to be because the share of core information occupations is much smaller than the share of regular information occupations in total information occupations.

To sum up, metropolitan size is a significant factor to explain the specialization rate in information occupations. Metropolitan size has an impact on the type of information occupations in which the metropolitan area is specialized. The biggest metropolitan areas show higher specialization rates in core information occupations and relatively big metropolitan areas show higher specialization rates in regular and total information occupations. It provides evidence in favor of the popular argument that the core functions of economic activities concentrate in global cities (Graham and Marvin 1996).

Innovation Capacity: All models show that a region's innovation capacity (the number of patents per 1,000 employees from 1990 to 1999) has a positive and significant impact on the specialization rates of all types of information occupations (at the 1% level for core and regular information occupations, and at the 5% level for total information occupations). It implies that innovation capacity is a very strong predictor of the metropolitan concentration of information occupations. That is, the regional innovation capacity is a very important factor for information occupations to consider as one of locational determinants. It provides a piece of evidence that highly educated and highly skilled people are concentrated in places with high innovation capacity.

Information Infrastructure: Internet infrastructure (persons aged 3 and older using Internet anywhere as a proxy) has a positive and strongly significant impact on the

specialization rates of total information occupations in both Logit I and Logit II models. However, in both models, it has positive but not significant relationships with metropolitan specialization rates of core and regular information occupations. In brief, Internet infrastructure explains metropolitan specialization in aggregated information occupations better than metropolitan specialization in two disaggregated groups of information occupations. It means that overall information occupations prefer the metropolitan infrastructure in which they can use Internet anywhere, but this infrastructure does not have an impact on functional division of economic activities.

Diversity: Unlike Florida (2002)'s argument, the gay index cannot predict the metropolitan concentration of talented people. He argues that creative-class people seek an environment open to difference and the gay index represents a leading indicator of a place that is open and tolerant. However, Florida's analysis for supporting his argument cannot provide statistically sufficient evidence. He merely analyzes an association between the gay index and the creative-class centers. Simply showing the correlation between two variables explains nothing. We need to remember that diversity is one common feature of the biggest metropolitan areas, and the biggest metropolitan areas are usually open to all kind of differences: cultural and demographic diversities.

In my research, after controlling other variables to represent metropolitan environments, diversity (the gay index) cannot explain metropolitan concentration of well-educated people. In all models, there is no significant relationship between metropolitan diversity and the specialization rate of information occupations. Without other variables, *DIVERSITY* by itself has a positive and significant relationship with the specialization rate of information occupations. However, if it is included in these models with diverse variables, it is no longer a powerful predictor. It means that other variables in these models explain metropolitan specialization in information occupations better than *DIVERSITY*, proxied by the gay index. In other words,

metropolitan size, innovation capacity, Internet infrastructure, young generation, and industry specialization seem to affect specialization in information occupations more than diversity.

Young Generation: In all models, the portion of the young generation (i.e., cohorts aged 25 to 44 years) has a positive and highly significant impact on the specialization rate of total information occupations and two types of information occupations. It implies that the share of young people in the metropolitan population is a strong predictor of the concentration of information occupations in metropolitan areas.

Industry Specialization: According to outcomes, the type of industries in which a metropolitan area is specialized affects whether the metropolitan area is specialized in information occupations. Two comparative sectors (GP&D and INFO) show almost opposite impacts on metropolitan specialization in information occupations.

The goods production and distribution sector (GP&D) has a negative and strongly significant impact on specialization in core and total information occupations in both Logit I and Logit II models. In the case of regular information occupations, their occupational specialization rates also have a negative relationship with industry specialization in GP&D, but in both Logit I and Logit II models, the coefficients of GP&D are not significant. The information sector (INFO) has a positive and significant impact on specialization in regular and total information occupations. At the metropolitan level, the probability of being specialized in core information occupations and specialization in the information sector do not show a significant relationship in all models.

In brief, metropolitan specialization in the goods production and distribution sector has a negative and strongly significant impact on specialization in core and total information occupations, but it does not show a significant relationship with specialization of regular information occupations. On the other hand, metropolitan

specialization in the information sector is a positive predictor of metropolitan concentration of regular and total information occupations, but it does not show a significant relationship with specialization of core information occupations.

To sum up, the location factors to affect metropolitan concentrations of total information occupations and two types of information occupations are as follows. First, high innovation capacity and high concentration of young workforce are metropolitan amenities for all kinds of information occupations, but metropolitan diversity does not have an impact on specialization in any kind of information occupations. Second, unlike innovation capacity and young generation, the metropolitan Internet infrastructure is a good predictor of specialization in only total information occupations, not for core and regular information occupations. Third, metropolitan size has an impact on the type of information occupations in which the metropolitan area is specialized. The biggest metropolitan areas show higher specialization rates in core information occupations and relatively big metropolitan areas show higher specialization rates in regular and total information occupations. Fourth, the type of industries in which a metropolitan area is specialized affects whether the metropolitan area is specialized in information occupations. Two comparative sectors show almost opposite impacts on metropolitan specialization in information occupations. Metropolitan specialization in the information sector is a strong and positive predictor of metropolitan concentrations of regular and total information occupations, but not for core information occupations. On the other hand, metropolitan specialization in the goods production and distribution sector has a negative impact on concentration of core and total information occupations, but not for regular information occupations.

3) Implications

Up to this point, I explained significant location determinants by type of information occupations and the detailed analysis outcomes of the impacts of six metropolitan characteristics on metropolitan specialization in information occupations. Here I will explore the following issue: How we can interpret these findings? What implications can we draw from these analytical results about factors to attract the information occupations?

1. Innovation Capacity and Young Generation vs. Diversity — What Matters?: What kinds of cultural and demographic features in metropolitan areas matter in the location decision of information occupations? Innovation capacity (patents) and the presence of young generation are the most powerful predictors of specialization in total information occupations and the two types of them. On the other hand, unlike Florida (2002)'s argument, diversity (proxied by the gay index) cannot explain metropolitan specialization in any type of information occupations.

1) Innovation Capacity: Even if some studies address that metropolitan innovation capacity (patents) has an impact on the high-tech employment (Acs, Fitzroy, and Smith 1999), the main focus in regional innovation studies has been on the relationship between innovation capacity and new firm formation, not between innovation capacity and occupational employment. One of the important implications in this study is to show a strong and positive relationship between innovation capacity and metropolitan concentrations of information occupations, which has not been highlighted in regional studies.

2) Young Generation: In the case of young generation, it is difficult to find previous regional studies about the relationship between the presence of young generation and information occupations. In this study, one important outcome is a strong relationship between the presence of a young workforce and specialization in

information occupations. It means that policy makers should consider regional amenities for the young generation for regional economic development and planning. In this regard, they should determine the locational desired amenities for this generation and the needs of this generation in the cycle of their working life.

3) Diversity: Another interesting finding is that, unlike Florida (2002)'s well-known argument, metropolitan diversity, as measured by the gay index, is not statistically significant as a factor to affect the concentration of information occupations. Even though diversity may be a factor for information occupations to choose their locations, diversity is a common feature of the biggest metropolitan areas. The biggest metropolitan areas are usually open to all kinds of differences such as cultural and demographic diversities. The gay index by itself has a significant and positive correlation with metropolitan specialization in information occupations, while the gay index is insignificant if the variable is included with other variables in the logit and probit models. Unlike other factors such as size, innovation capacity, Internet infrastructure, young generation, and industry specialization, diversity (measured by the gay index) is not a good predictor of information occupation specialization in the estimated logit and probit models used here.

2. Internet Infrastructure and Size — Urban Hierarchies: Many scholars have argued that the innovation of information technology, such as the Internet, has been changing urban hierarchies and functions (i.e., creating digital divides). Information technology causes the shift of urban hierarchies and economies, but such a shift does not go to only one direction. Some scholars have argued that information technology changes urban hierarchies more vertically, that is, core functions are converged into global cities with critical network nodes, and the peripheral functions are located in the hinterlands (Hepworth, Green, and Gillespie 1987; Hepworth 1990; Graham and Marvin 1996). Others have argued that traditional urban hierarchies are breaking down

(Markusen, Schrock, and Elisa 2004)⁵⁹ and technology can enable knowledge and information workers, who perform core economic functions, to be located in any place with diverse amenities that they value (Beyers 2000; Florida 2002).^{60 61} In reality, how do Internet infrastructure and size affect urban hierarchies and economic functions?

1) Internet infrastructure: Unlike innovation capacity and young generation, metropolitan Internet infrastructure is a good predictor of specialization in only total information occupations, not for core and regular information occupations. That is, the metropolitan environment for using Internet anywhere can explain its positive and strong impact on the metropolitan concentration of aggregate information occupations, but not the two disaggregated information occupations.

These analysis outcomes somehow support two controversial arguments at the same time. In reality, how well the Internet infrastructure is established in a metropolitan area influences the possibility of concentrations of overall information occupations in that metropolitan area. Metropolitan areas with a well-established Internet infrastructure serve as critical network nodes to perform the core functions of economic activities requiring highly educated people. However, there is no evidence of spatial division by Internet infrastructure within information occupations (i.e., core and

⁵⁹ Markusen et al. (2004) argue that, over the past two decades, traditional urban hierarchies are breaking down and functional specialization is becoming more important. Second-tier cities are actually more specialized in many of the high-tech occupations than are the three metropolitan areas with population greater than 4 million – New York, Chicago, and Los Angeles.

⁶⁰ Beyers (2000) documents that the geographical pattern of growth in the new economy is different from the conception of scholars who emphasize mega-cities, global cities, and giant cities. We are, in fact, experiencing a more decentralized pattern of job growth and trade in a variety of types of regional economic specialties and capabilities. For examining important reasons for locations, Beyer summarizes the data taken from two samples: 1) the NSF sample, dominated by urban business, and 2) the Economic Research Services (ERS) sample, surveyed in rural areas in 44 states. Based on these data, Bayers argues that many players in the new economy have an ability to choose the location where they want to be, whether they are firm owners, proprietors, or employees. The culmination of these individual decisions of employees and employers is the evolving geographical pattern of employment in the new economy.

⁶¹ Florida (2002) argues that people are moving away from traditional corporate communities to creative centers. He argues that creative-class people look for the following features in communities: 1) amenities and experiences, 2) openness to diversity, and 3) opportunity to validate their identities as creative people.

regular information occupations). Even though a metropolitan area's Internet infrastructure is an important factor to influence metropolitan concentration of overall information occupations, the respective location choices of core and regular information occupations are not much affected by the level of the Internet infrastructure in metropolitan areas. In particular, specialization in core information occupations has much lower Wald Chi-squares of the Internet infrastructure in all models than those for regular and total information occupations. Therefore, core information occupations are not necessarily located in critical network nodes, but their location choice might have impacts based on other factors which they value such as size, innovation, young generation, and industry specialization.

2) Size: Metropolitan size has an impact on the type of information occupations in which the metropolitan area is specialized. The biggest metropolitan areas with a population of 4 million and over show higher specialization rates in core information occupations, and relatively big metropolitan areas with a population between 1.8 and 4 million show higher specialization rates of regular and total information occupations. It implies that metropolitan size has a proportionate relationship with the level of economic functions to be performed by workers. It provides evidence in favor of the popular argument that the core functions of economic activities are concentrated in global cities and the peripheral functions are located in the hinterlands (Graham and Marvin 1996; Hepworth, Green, and Gillespie 1987; Hepworth 1990).

To sum up, overall information occupations are likely to be located in metropolitan areas with well-established Internet infrastructure, but urban hierarchies (functional divisions of urban systems) are not affected by its Internet infrastructure. On the other hand, metropolitan size is closely related to the functional division of economic activities. Core information occupations converge in the largest metropolitan

areas but regular information occupations are observed in relatively large metropolitan areas. Therefore, size is more closely related to urban hierarchies.

3. Competitiveness of Medium Size Metropolitan Areas — Targeting

Occupations: As mentioned earlier, metropolitan size has a proportionate relationship with the level of economic functions to be performed by workers. From this outcome, we can recognize an important policy implication for regional development: finding regular information occupations as target occupations for regional development in medium-sized metropolitan areas.

By metropolitan size, we can recognize potential target occupations for regional development. Core information occupations show high specialization rates in a small number of the biggest metropolitan areas (with a population of 4 million and more). In contrast, regular information occupations show high specialization rates in a relatively large number of medium-sized metropolitan areas (with a population of less than 4 million and 1.8 million and more). Therefore, for more effective regional development, target occupations should be core information occupations in the biggest metropolitan areas and regular information occupations in medium-sized metropolitan areas.

However, the share of core information occupations in total information occupations is much smaller than that of regular information occupations. In particular, medium-sized metropolitan areas need to focus on improving metropolitan amenities to attract regular information occupations for regional development.

4. Industry Specialization is Still Important: The type of industries in which a metropolitan area is specialized affects whether the metropolitan area is specialized in information occupations. Two comparative sectors (GP&D and INFO) show almost opposite impacts on metropolitan specialization in information occupations. Metropolitan specialization in the goods production and distribution sector has a highly significant and negative impact on the concentration of core and total information

occupations. On the other hand, metropolitan specialization in the information sector is a positive predictor of metropolitan concentration of regular and total information occupations.

These outcomes support the following facts. First, even if, in the new economy, information occupations serve industries across the board, knowledge-intensive industries (the information sector) require more highly educated workers than other industries (the goods production and distribution sector). Second, the metropolitan concentration of the information sector is an attractive factor in location choice of core and total information occupations. On the other hand, the metropolitan specialization in the goods production and distribution sector is a negative factor of specialization in regular and total information occupations.⁶²

The implications to be drawn from the analysis outcomes of six conceptual location factors are explained in this section. In the following section, I summarize all findings and discuss what issues might be addressed in future studies.

4. Summary and Discussions

In this study, I estimated the logit and probit models for analyzing six location determinants to affect metropolitan specialization in two types of information occupations and the sum of the two: size, innovation capacity, Internet infrastructure, diversity, young generation, and industry specialization. Logit and probit models show almost similar results. Both models explain the factors of metropolitan specialization in total information occupations better than those in core or regular information

⁶² In other words, specialization in core information occupations has a significant impact on metropolitan specialization in only the goods production and distribution sectors, but specialization in regular information occupations has a significant impact on metropolitan specialization in only the information sector. In contrast, metropolitan concentrations of total information occupations are influenced by specialization in both sectors.

occupations. Metropolitan diversity, measured by the gay index, cannot explain statistically the metropolitan specialization in any type of information occupations in these models.

Two types of information occupations (core and regular) seem to live and work in two common metropolitan environments: those with high innovation capacity and high density of young generation. In terms of size, core information occupations show their high presence in metropolitan areas with the biggest size, but regular information occupations do so in metropolitan areas with relatively large size. In terms of industry type, specialization in the goods production and distribution sector leads to reduced metropolitan shares of core information occupations. Specialization in the information sector has a positive impact on metropolitan shares of regular information occupations. Internet infrastructure does not have an impact on two types of information occupations (i.e., core and regular). Total information occupations, the sum of the two, are likely to be observed more frequently in metropolitan areas with relatively large size, high innovation capacity, well-established Internet infrastructure, high density of young workforce, and specialization in the information sectors. They are observed less frequently in metropolitan areas with specialization in the goods production and distribution sector.

Features and implications of location factors to affect metropolitan concentrations of two types of information occupations and the sum of the two can be recapped as follows. First, what kinds of cultural and demographic features in metropolitan areas matter in the location decision of information occupations? High innovation capacity and a high concentration of young workforce are metropolitan amenities for all kinds of information occupations, but metropolitan diversity does not have an impact on specialization in any kind of information occupations.

Second, which factor affect urban hierarchies and economic functions, Internet infrastructure or size? Overall, information occupations are likely to be located in metropolitan areas with well-established Internet infrastructure, but urban hierarchies — functional divisions of urban systems — are not affected by Internet infrastructure. On the other hand, metropolitan size is closely related to the functional division of economic activities. Core information occupations are likely to concentrate in the largest metropolitan areas, but regular information occupations are likely to be observed in the relatively large metropolitan areas. Therefore, size is more closely related to urban hierarchies.

Third, what occupations enhance the competitiveness of medium-sized metropolitan areas? In medium-sized metropolitan areas, we should consider regular information occupations as target occupations for regional development. Core information occupations concentrate in a small number of the biggest metropolitan areas, but regular information occupations are distributed in a relatively large number of medium-sized metropolitan areas. Therefore, policy makers should not miss the potential of regular information occupation as target occupations to enhance the competitiveness of medium-sized metropolitan areas. Regional planner in medium-sized metropolitan areas need to focus on improving metropolitan amenities to attract regular information occupations for regional development.

Finally, is the type of industry specialization still important for information occupations to choose their locations? The answer is yes. The type of industries in which a metropolitan area is specialized affects whether the metropolitan area is specialized in information occupations. Two comparative sectors show almost opposite impacts on metropolitan specialization in information occupations. Metropolitan specialization in the information sector is a strong and positive predictor of metropolitan concentrations of regular and total information occupations, but not for core

information occupations. On the other hand, metropolitan specialization in the goods production and distribution sector has a negative impact on the concentration of all kinds of information occupations.

Up until this point, I summarize analysis outcomes and implications of six conceptual location determinants to affect metropolitan specialization in information occupations: size, innovation capacity, Internet infrastructure, diversity, young generation, and industry specialization. What would be possible considerations to improve the approach to this issue in future studies? From now on, I will discuss several possibilities for future studies: additional location factors and advanced logit models. We can consider additional factors such as natural amenities and compensation level of information occupations. As well as these additional factors, follow-up research might consider advanced logit models to deal with categorical dependent variables with more than two response values, in order to address factors to affect the level of metropolitan specialization in information occupations.

Additional Location Factors: One of the possible location factors to affect the concentration of information occupations is a place's natural amenities such as coastal setting and mild climate. I did not include these variables in my models, because it has a high possibility that metropolitan areas with natural amenities such as coastal settings and mild climate may be overlapped with large metropolitan areas. In fact, I included coastal dummy (Coastal) in my models. However this coastal dummy caused very significant multicollinearity problem with other variables. It is not surprising because the largest metropolitan areas are located in coastal areas. Therefore I excluded it from the models. Even though I did not try to include the climate variable, I expected that the variable might show similar results to the coastal dummy variable. In addition, there is another reason to exclude the natural amenities in my models. Even though natural amenities had an impact on the location choice of information occupations, it might not

provide significant implications for public policy to lure these occupations into specific metropolitan areas. In my judgment, the inclusion of natural amenities in the models as a factor to affect metropolitan specialization in information occupations might not contribute significantly to public policy, even though it has academic implications. However, the inclusion or exclusion of these variables in parallel studies depends on researchers' goals and judgment. If it is suitable for research goals, it is worth considering the inclusion of these variables in the future studies.

Another variable to be considered is the compensation level of information occupations, measured by wages. I included this variable into my models. However, it also causes serious multicollinearity problems. This is not surprising, because larger metropolitan areas provide better compensation to workers. In the future studies, if the problem of the compensation variable can be controlled, researcher might analyze the impact of this factor on location choices of information occupations. For example, to begin with, we can control the differences of average wage levels among metropolitan areas by considering the differences in living expenses among metropolitan areas. The cost of living can be controlled by metropolitan average wages. We might use the gap between annual wages per information occupation and average annual wages per worker to control the differences among metropolitan areas. In the future studies, this issue should be addressed more carefully.

Ordinal or Multinomial Logit Models: Here I used logit and probit models using dichotomous variables. Since each metropolitan area is either specialized in information occupations or it is not, the response variable can take only two values, $Y=1$ if a metropolitan area is specialized in information occupations, and $Y=0$ if it is not. In other words, the dependent variable is a binary, or dichotomous, variable. The logit model addresses categorical dependent variables whose response values are more than

two, as well as dichotomous dependent variables. There are two types of logit models related to this issue: the ordinal and the multinomial logit model.

In the case of the ordinal logit model, each observation should be classified into only one of several response types, and the response values of a dependent variable usually represent the level of importance or satisfaction. For this study, the possible response values of one observation (a metropolitan area) might be the level of specialization in information occupations: a metropolitan area may be highly specialized, specialized, or not specialized in information occupations. Unlike the ordinal logit model, the response values of multinomial logit models do not include the sequential order or level. For example, as an observation unit of demographic survey, each person can be classified into only one type such as White, Hispanic, Black, Asian, and so on, but a person must not be classified into two or three races at the same time. However, a metropolitan area can be specialized in two or three types of information occupations at the same time. Therefore, the multinomial logit model is not suitable in this case.

To sum up, for the studies about location factors to influence specialization in information occupations, the ordinal logit model is one of the feasible models to deal with this issue, but the multinomial is not. In the future studies, the ordinal logit model might meet the challenge of researchers who have interest in the impacts of location factors on the level of metropolitan specialization in information occupations.

In this chapter, I discussed several possibilities for the future studies such as additional location factors and ordinal logit models. Additional factors such as natural amenities and compensation level of information occupations might improve the explanation power of models used in this study. In regional studies, it might be a challenging issue to address factors to affect the level of metropolitan specialization in information occupations by using the ordinal logit model.

VI. CONCLUSIONS AND IMPLICATIONS

In my dissertation, I set three goals. The first goal was to introduce a new approach in order to define “information occupations” and grasp the occupational profile in metropolitan areas. The second was to inquire into why we should focus on information occupations in regional studies, by examining their growing trends in the new economy and their importance in metropolitan economies. The third was to explore the factors to lure information occupations into particular metropolitan areas.

1. Part I: Definition and Regional Profile of Information Occupations

In my study, the first goal was to define “information occupations” by reasonable criteria and employ the definition to applied research which investigates regional occupational mix and wages. In this regard, I suggested a new approach: I introduced two important databases and an analysis framework to define information occupations and analyze their regional profile using these two databases.

1) Two Databases: O*NET and OES

I used two databases: O*NET (Occupation Information Network) and OES (Occupational Employment Statistics). O*NET allows researchers to classify occupations by education, experience, and job training, and OES allow researchers to analyze regional occupational profiles. Using the O*NET database, I could define “information occupations” as those which require a high level of education and skills. However the O*NET database does not include the regional information on occupational employment and wages, but the OES does. Since O*NET and OES have different definitions of occupations, there is a compatibility problem. I solved this

problem by using two crosswalk files to make them compatible. This allowed me to analyze the occupational employment and wages of the OES database at the national and metropolitan levels.

2) Analysis Framework and Findings

My research process was composed of three steps: 1) the definition of information occupations, 2) the crosswalk between two databases, and 3) the analysis of the regional occupational profile. At each step, I got the following outcomes.

First, I defined information occupations using the O*NET job zones. O*NET is a database that characterizes the basic skills, knowledge, and worker attributes by occupation. This database classifies occupations into 5 job zones (job zones 1-5). These five job zones are occupational groups classified by the required level of experience, education, and job training. The higher the job zone, the higher the level of experience, education, and job training. I defined “total” information occupations as those in the job zones 4 and 5. The “total” information occupations are twofold: “core” information occupations (i.e., those in job zone 5, which generally have the highest level of education, experience, and job training), and “regular” information occupations (i.e., those in job zone 4, which have a relatively high level of education, experience, and job training, but which have a lower level than “core” information occupations).

Second, I made the crosswalk between occupational classifications of two databases by using two crosswalk files. I converted 898 out of 1,166 O*NET occupations classified by job zone to 664 out of 770 OES occupations. OES releases occupational employment and wages estimates every year. In 2003, OES released the national employment and wage estimates for 711 out of 770 occupations. Six hundred sixty-one (93%) out of those 711 occupations were classified by job zone.

Third, using the OES data reclassified by job zone, I analyzed the regional occupational profile at the New York State (NYS) metropolitan level. The OES includes the information of occupational employment and wages in 337 metropolitan areas. Using the 2003 OES data and the new definition of information occupations, I analyzed the occupational mix in Upstate and Downstate New York and compared it with the average occupational mix in 337 metropolitan areas. The findings are as follows.

For regular information occupations, in 2003, both Upstate and Downstate New York showed specialization. However, for core information occupations, only Downstate showed specialization. Downstate showed a much higher share of core information occupations than the metropolitan average, but Upstate showed a lower share than the metropolitan average.

In the case of occupational wage, in 2003, Upstate and Downstate showed opposite patterns. In every job zone, in Upstate New York, the annual wage was lower than the metropolitan average, but in Downstate New York, it was higher. The wage gap between Upstate and Downstate New York increased as the level of job zone increased. In Upstate New York, the annual wage per information occupation (job zones 4 and 5) was much lower than the metropolitan average, but in Downstate New York, it was much higher.

Three out of 13 NYS metropolitan areas — Albany-Schenectady-Troy, New York, and Rochester — showed specialization in information occupations. These areas showed a higher employment share of information occupations than the national metropolitan average.

3) Study Implications

In chapter 3, I suggested a new approach for defining information occupations and grasping the occupational profile in metropolitan areas. In this regard, my study implications are twofold: to introduce two important databases (O*NET and OES) and to devise a reasonable analytical framework to define information occupations and analyze their profiles in regional units using these two databases.

Two Databases (O*NET and OES): O*NET allows researchers to classify occupations by education, experience, and job training, while OES allows researchers to analyze regional occupational profiles.

A New Analytical Framework for Regional Occupation Studies: I have introduced a new analytical framework to define information occupations by reasonable criteria and to apply this definition to occupation studies at the diverse geographic levels using the two databases.

The analytical framework consists of three steps. The first step is to define information occupations using the O*NET job zones: the occupational groups classified by important criteria (i.e., a high level of education, experience, and job training). The second step is to make the two different databases (O*NET and OES) compatible by using crosswalk files and then converting the O*NET occupations, classified by job zone, to OES occupations with regional occupational information such as employment and wage data at the regional level. The final step is to analyze the regional profile of information occupations, using the OES data reclassified by job zone at diverse geographic levels – nation, state, and metropolitan area.

These three steps are applicable to diverse regional studies about information occupations, together or separately. Each step can be revised to suit a researcher's goals. For example, the definition of information occupations can be revised by using criteria different from mine (job zones 4 and 5). It depends on the research goals. Researchers

can use different databases with occupational employment and wage data. The bottom line is to define information occupations by reasonable criteria (i.e., a high level of education, experience, and job training) and then analyze their regional profile using the new definition.

2. Part II: Information Occupations and Metropolitan Economies

In order to verify the importance of information occupations in regional studies, I investigated two issues in chapter 4: the growing employment of information occupations in the new economy, and their importance in metropolitan economies. First, in order to examine the growth patterns of information occupations in the new economy, I analyzed the past trends and future projections of their employment. Second, in order to verify the importance of information occupations in metropolitan economies, I ascertained whether their concentration has a positive and significant impact on metropolitan income.

1) Employment Growth of Information Occupations

At the national level, I compared the employment trends of information and versus non-information occupations (and workers) during two periods: 1994-2004 and 2002-2012. Over these two periods, the number of information occupations (and workers) has been growing faster than the number of non-information occupations. The share of information occupations (and workers) to national employment has increased, while that of non-information occupations (and workers) has decreased. These outcomes imply that, over the two periods, the demand for highly educated people has increased in the new economy.

2) Positive Impact of Information Occupation Concentrations on Metropolitan Income

For three types of information occupations (i.e., core, regular, and total information occupations), I examined the impacts of their employment shares on per capita personal income (PCPI) in 306 metropolitan areas over three years (as of 2001), as well as two additional factors: size and industry specialization. For all information occupations, their metropolitan concentrations have positive and significant impacts on the level of metropolitan income, even though size and industry specialization are controlled.

These outcomes underscore the importance of information occupations in regional studies by providing two pieces of evidence: the growing employment of information occupations in the new economy, compared to non-information occupations, and their contemporary importance in metropolitan economies.

3) Recommendations for Future Studies

There are several remaining issues related to the relationship between information occupations and metropolitan economies. Here I recommend two kinds of issues for future study: the impact of information occupations on metropolitan income inequality and the development of compatible occupational data.

Information Occupations and Income Inequality: Another challenging issue related to the important role of information occupations on metropolitan economy is the relationship between the concentration of information occupations and income inequality at the metropolitan level. It is an important issue, from the policy maker's perspective, to examine whether metropolitan specialization in information occupations leads to more inequality, or whether the benefits have a broader distribution impact. Even though few studies conduct statistically sophisticated analyses on the impact of the concentration of high level professionals on metropolitan income inequality, today

we have a large number of detailed studies about trends in earnings and household income inequality in major cities. However, this issue about income inequality and social polarization in major cities is controversial among scholars in regional studies.⁶³

There are both policy and academic implications to examining whether metropolitan specialization in information occupations leads to more inequality, because we can recognize the clear targeting group for policy making and can conclude the controversial academic debates related to the relationship between income inequality and growth of the new class: that is, the creative class, information occupations, or high-level professionals. In future studies, it would be challenging to explore the impact of the concentration of information occupations on metropolitan income inequality.

Compatibility of Occupational Data: For future studies, in order to provide clearer evidence that information occupations are becoming important in metropolitan economies, researchers need to examine the long-term trends measuring the impact of information occupations on metropolitan income or inequality. In this regard, researchers need to analyze the consistent long-term occupational employment data at the metropolitan level. In the occupational analyses using the OES data, there are two limitations related to data compatibility: the lack of historical compatibility of the OES data and the lack of geographical compatibility between the OES data and the REIS data. Therefore, the institutions which provide occupational data should consider researchers' critical requests: needs of occupational employment data with historical and geographical compatibility. If they will improve the historical compatibility in the

⁶³ Sassen (2001) argued the social inequality and polarization in global cities by new forms of growth, by consumption patterns of new high-level professionals, and by impacts of manufacturing in decline. However, in their sophisticated analyses, Drennan et al. (1997) and Madden (2000) showed opposite outcomes to refute Sassen's argument about social inequality and polarization. Their outcomes support that cities with high growth had increases in the average income of low-income people and experienced the decrease in income inequality.

occupational database and the compatibility of geographic definitions between occupational databases and economic information databases, researchers could use these databases to create more powerful research outcomes.

3. Part III: Factors to Attract Information Occupations

In chapter 5, using logit and probit models, I analyzed the factors to attract information occupations to metropolitan areas. In regard to metropolitan specialization in information occupations, I examined several major factors: size, innovation capacity, information infrastructure, diversity, young generation and industry specialization. For these analyses, I used cross-sectional data composed of 220 Metropolitan Statistical Areas (MSAs). The logit and probit models show almost identical results. The two models have no big differences in signals and significance of coefficients, and in explanation power.

1) Types of Information Occupations and Location Factors

What is the difference among types of information occupations? Here I sum up the factors to affect their specialization by type of information occupations. Core information occupations are likely to be observed in metropolitan areas with the biggest size, high innovation capacity, and a high density of young generation. But the goods production and distribution sector is a negative factor to affect specialization in core information occupations. Regular information occupations are likely to concentrate in metropolitan areas with relatively large size, strong innovation capacity, high density of young workforce, and specialization in the information sectors. The specialization rate of total information occupations, the sum of the two, is high in metropolitan areas of relatively large size, high innovation capacity, well-established Internet infrastructure,

high density of young workforce, and specialization in the information sector. Like core information occupations, total information occupations show the lower specialization rate in metropolitan areas specialized in the goods production and distribution sector.

The relationships between metropolitan environments and specialization rates of core, regular, or total information occupations show the following overall features. First, two information occupations — core and regular — show high specialization rates in metropolitan areas with high innovation and high density of young generation, but there are differences in metropolitan size and industry specialization type to affect specialization rates of the two types. Second, the estimated models explain the factors that affect metropolitan specialization in total information occupations better than those that affect metropolitan specialization in the core or regular information occupations.⁶⁴ Third, among all eight variables, only metropolitan diversity (DIVERSITY), measured by the gay index, is not able to affect the metropolitan specialization in any type of information occupations. Diversity is the only insignificant variable in these models.

2) Roles of Six Location Factors

The detailed impacts which location factors have on the metropolitan concentrations of core, regular, and total information occupations can be recapped as the following features. First, high innovation capacity and high concentration of young workforce are metropolitan amenities for both aggregate and disaggregated information occupations, but metropolitan diversity, measured by the gay index, has no impact on specialization in all information occupations. Second, unlike innovation capacity and young generation, metropolitan Internet infrastructure is a significant predictor of

⁶⁴ Core and regular information occupations have four significant factors to explain their concentration in particular metropolitan areas, while total information occupations have six strongly significant factors. Additionally the explanation power of the models for total information occupations is higher than that for core and regular information occupations.

specialization in only total information occupations, but not core and regular information occupations. Third, metropolitan size has an impact on the type of information occupations in which the metropolitan area is specialized. The biggest metropolitan areas with a population of 4 million and more show higher specialization rates in core information occupations, and relatively big metropolitan areas with a population between 1.8 and 4 million show higher specialization rates in regular and total information occupations. Fourth, the type of industries in which a metropolitan area is specialized affects whether the metropolitan area is specialized in information occupations. Two comparative sectors show almost opposite impacts on metropolitan specialization in information occupations. Metropolitan specialization in the information sector is a strong and positive predictor of metropolitan concentrations of regular and total information occupations, but not core information occupations. On the other hand, metropolitan specialization in the goods production and distribution sector has a negative impact on the concentration of core and total information occupations.

3) Study Implications

How can we interpret these findings? What implications can we draw from these analytical results about factors to attract the information occupations? The features and implications of location factors affecting metropolitan concentrations of core, regular, and total information occupations can be recapped as follows:

1. Innovation Capacity and Young Generation vs. Diversity — What Matters?

What kinds of cultural and demographic features in metropolitan areas matter in the location decision of information occupations? High innovation capacity and a high concentration of young workforce are metropolitan amenities for both aggregate and disaggregated information occupations, but unlike Florida's (2002) well-known argument, metropolitan diversity does not have an impact on specialization in any kind

of information occupation. This is to say that, for regional economic development and planning, policy makers and planners should consider investment in the regional innovation environment, and they should make efforts to improve cultural and economic amenities for the young generation in order to attract information occupations into their areas.

2. *Internet Infrastructure and Size — Impacts on Urban Hierarchies:* Which factor affects urban hierarchies and economic functions more significantly, Internet infrastructure or size? Overall, information occupations are likely to be located in metropolitan areas with well-established Internet infrastructures, but urban hierarchies — the functional divisions of the urban system — are not affected by Internet infrastructure.⁶⁵ According to the estimated results, there is no spatial division by Internet infrastructure within information occupations (i.e., core and regular). On the other hand, metropolitan size is closely related to the functional division of economic activities. Core information occupations converge in the largest metropolitan areas with a population of 4 million and more, but regular information occupations are observed in the relatively large metropolitan areas with a population between 1.8 and 4 million. Therefore, size is more closely related to urban hierarchies in terms of economic functions.

3. *Competitiveness of Medium-Sized Metropolitan Areas — Targeting Occupations:* What occupations enhance the competitiveness of medium-sized metropolitan areas? In medium-sized metropolitan areas, we should consider regular information occupations to target occupations for regional development. Core information occupations concentrate in a small number of the biggest metropolitan

⁶⁵ Specialization in core and regular information occupations has no significant impact from the Internet infrastructure in all models. On the other hand, concentration of total information occupations has a highly significant and positive impact from Internet infrastructure.

areas, but regular information occupations are distributed in a relatively large number of medium-sized metropolitan areas. Therefore, policy makers should not miss the potential of regular information occupation as target occupations to enhance the competitiveness of medium-sized metropolitan areas. Regional planners in medium-sized metropolitan areas need to focus on improving metropolitan amenities to attract regular information occupations for regional development.

4. Industry Specialization — Still Important?: Is the type of industry specialization still important for information occupations to choose their locations? The answer is yes. The type of industries in which a metropolitan area is specialized affects whether the metropolitan area is specialized in information occupations. Two comparative sectors show almost opposite impacts on metropolitan specialization in information occupations. Metropolitan specialization in the information sector is a positive predictor of metropolitan concentrations of regular and total information occupations, but not core information occupations. On the other hand, metropolitan specialization in the goods production and distribution sector has a highly significant and negative impact on the concentration of core and total information occupations. It means that even if, in the new economy, information occupations serve industries across the board, knowledge-intensive industries (the information sector) require more highly educated workers than other industries (the goods production and distribution sector) do.

4) Discussion

Earlier, I summarized the analysis outcomes and implications for six conceptual location determinants to affect metropolitan specialization in information occupations: size, innovation capacity, Internet infrastructure, diversity, young generation, and industry specialization. What would possible considerations be in order to improve the

approach to this issue in future studies? I discussed several possibilities for future studies: additional location factors and advanced logit models. We can consider additional factors such as natural amenities and the compensation level of information occupations. Additional factors such as natural amenities and compensation levels of information occupations might improve the explanation power of models used in this study. As well as such additional factors, in follow-up research, we might consider advanced logit models to deal with categorical dependent variables with more than two response values; this would allow us to address factors to influence the level of metropolitan specialization in information occupations. In regional studies, it might be a challenging issue to address factors that affect the level of metropolitan specialization in information occupations by using the ordinal logit model.

4. Summary

In regional studies, the main focus has typically been on industries, not on occupations. However, since human capital is becoming important in the new economy, in regional studies, researchers have begun to focus on occupations over the last decade. Industry clusters alone cannot tell the whole story of regional economic status. More importantly, in the new economy, information occupations requiring high education and skills serve not only the knowledge-intensive industries, such as the information sector, but also industries across the board. An additional advantage of focusing on the occupational structure in regional studies is that occupations can be easily classified into information and non-information groups by using criteria such as education level and skills.

In this study, I focused on information or knowledge occupations which generate and manipulate information, knowledge, and creativity. The goals of this study

were threefold: to define the information occupations in order to apply the concept to diverse regional studies, to investigate the relationship between the concentrations of information occupations and metropolitan economies, and to explore the locational determinants of information occupations in metropolitan areas.

In chapter 3, I suggested a new approach for defining information occupations and grasping the occupational profile in metropolitan areas. In this regard, my study implications are twofold: to introduce two important databases (O*NET and OES), and to devise a reasonable analytical framework to define information occupations and analyze their profiles in regional units using these two databases.

In chapter 4, in order to verify the importance of information occupations in regional studies, I investigated two issues. First, in order to examine the growth patterns of information occupations in the new economy, I analyzed the past trends and future projections of employment in those occupations. Second, in order to verify the importance of information occupations in metropolitan economies, I ascertained what impact their concentration has on metropolitan income. As a result, analysis outcomes underscore the importance of information occupations in regional studies by providing two pieces of evidence: the growing employment of information occupations in the new economy, compared to non-information occupations, and their importance to metropolitan economies.

In chapter 5, using logit and probit models, I analyzed what factors attract core, regular, and total information occupations in 220 metropolitan areas. The locational factors are composed of six conceptual determinants: size, innovation capacity, information infrastructure, diversity, young generation, and industry specialization. The estimated models explain the factors to affect metropolitan specialization in total information occupations better than in core or regular information occupations. Information occupations prefer cultural and demographic environments with innovation

capacity and high density of young generation rather than diversity. Metropolitan size is more closely related to urban hierarchies in terms of economic functions than Internet infrastructure. Industry specialization is still important for location choice of information occupations.

Throughout this research, I have focused on information or knowledge occupations which generate and manipulate information, knowledge, and creativity. In this study, the overriding goal is to explore regional economic potentials through the occupational approach. In the future, will our regions prosper and be up-and-comers in the new economy? Which regions meet the challenge of the new economy? Since information occupations provide upscale services to regional economies, we can find answers to these questions by focusing on the information occupations. Therefore, for reasonable regional economic development, researchers and policy makers need to pay constant attention to the economic and cultural characteristics of places which information occupations value when deciding to establish their workplaces and living environments.

VII. APPENDIX

Table A1. 23 Major Groups of the Standard Occupational Classification (SOC) System

SOC code	Occupation Title
11-0000	Management occupations
13-0000	Business and financial operations occupations
15-0000	Computer and mathematical occupations
17-0000	Architecture and engineering occupations
19-0000	Life, physical, and social science occupations
21-0000	Community and social services occupations
23-0000	Legal occupations
25-0000	Education, training, and library occupations
27-0000	Arts, design, entertainment, sports, and media occupations
29-0000	Healthcare practitioners and technical occupations
31-0000	Healthcare support occupations
33-0000	Protective service occupations
35-0000	Food preparation and serving related occupations
37-0000	Building and grounds cleaning and maintenance occupations
39-0000	Personal care and service occupations
41-0000	Sales and related occupations
43-0000	Office and administrative support occupations
45-0000	Farming, fishing, and forestry occupations
47-0000	Construction and extraction occupations
49-0000	Installation, maintenance, and repair occupations
51-0000	Production occupations
53-0000	Transportation and material moving occupations
55-0000	Military specific occupations (not surveyed in OES)

Table A2. A Crosswalk Table - OES, SOC, O*NET with Job Zones

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
1	11-1011	Chief Executives	11-1011	Chief Executives	11-1011.00	Chief Executives	
2	11-1011	Chief Executives	11-1011	Chief Executives	11-1011.01	Government Service Executives	4
3	11-1011	Chief Executives	11-1011	Chief Executives	11-1011.02	Private Sector Executives	5
4	11-1021	General and Operations Managers	11-1021	General and Operations Managers	11-1021.00	General and Operations Managers	
5	11-1031	Legislators	11-1031	Legislators	11-1031.00	Legislators	
6	11-2011	Advertising and Promotions Managers	11-2011	Advertising and Promotions Managers	11-2011.00	Advertising and Promotions Managers	4
7	11-2021	Marketing Managers	11-2021	Marketing Managers	11-2021.00	Marketing Managers	4
8	11-2022	Sales Managers	11-2022	Sales Managers	11-2022.00	Sales Managers	4
9	11-2031	Public Relations Managers	11-2031	Public Relations Managers	11-2031.00	Public Relations Managers	
10	11-3011	Administrative Services Managers	11-3011	Administrative Services Managers	11-3011.00	Administrative Services Managers	4
11	11-3021	Computer and Information Systems Managers	11-3021	Computer and Information Systems Managers	11-3021.00	Computer and Information Systems Managers	5
12	11-3031	Financial Managers	11-3031	Financial Managers	11-3031.00	Financial Managers	
13	11-3031	Financial Managers	11-3031	Financial Managers	11-3031.01	Treasurers, Controllers, and Chief Financial Officers	5
14	11-3031	Financial Managers	11-3031	Financial Managers	11-3031.02	Financial Managers, Branch or Department	4
15			11-3040	Human Resources Managers	11-3040.00	Human Resources Managers	4
16	11-3040	Human Resources Managers	11-3041	Compensation and Benefits Managers	11-3041.00	Compensation and Benefits Managers	4
17	11-3040	Human Resources Managers		Training and Development Managers	11-3042.00	Training and Development Managers	4
18	11-3040	Human Resources Managers		Human Resources Managers, All Other	11-3049.99	Human Resources Managers, All Other	
19	11-3051	Industrial Production Managers	11-3051	Industrial Production Managers	11-3051.00	Industrial Production Managers	4
20	11-3061	Purchasing Managers	11-3061	Purchasing Managers	11-3061.00	Purchasing Managers	4

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
21	11-3071	Transportation, Storage, and Distribution Managers	11-3071	Transportation, Storage, and Distribution Managers	11-3071.00	Transportation, Storage, and Distribution Managers	
22	11-3071	Transportation, Storage, and Distribution Managers	11-3071	Transportation, Storage, and Distribution Managers	11-3071.01	Transportation Managers	4
23	11-3071	Transportation, Storage, and Distribution Managers	11-3071	Transportation, Storage, and Distribution Managers	11-3071.02	Storage and Distribution Managers	4
24	11-9011	Farm, Ranch, and Other Agricultural Managers	11-9011	Farm, Ranch, and Other Agricultural Managers	11-9011.00	Farm, Ranch, and Other Agricultural Managers	
25	11-9011	Farm, Ranch, and Other Agricultural Managers	11-9011	Farm, Ranch, and Other Agricultural Managers	11-9011.01	Nursery and Greenhouse Managers	4
26	11-9011	Farm, Ranch, and Other Agricultural Managers	11-9011	Farm, Ranch, and Other Agricultural Managers	11-9011.02	Agricultural Crop Farm Managers	4
27	11-9011	Farm, Ranch, and Other Agricultural Managers	11-9011	Farm, Ranch, and Other Agricultural Managers	11-9011.03	Fish Hatchery Managers	4
28	11-9199	All Other Managers	11-9012	Farmers and Ranchers	11-9012.00	Farmers and Ranchers	3
29	11-9021	Construction Managers	11-9021	Construction Managers	11-9021.00	Construction Managers	4
30	11-9031	Education Administrators, Preschool and Child Care Center/Program	11-9031	Education Administrators, Preschool and Child Care Center/Program	11-9031.00	Education Administrators, Preschool and Child Care Center/Program	4
31	11-9032	Education Administrators, Elementary and Secondary School	11-9032	Education Administrators, Elementary and Secondary School	11-9032.00	Education Administrators, Elementary and Secondary School	4
32	11-9033	Education Administrators, Postsecondary	11-9033	Education Administrators, Postsecondary	11-9033.00	Education Administrators, Postsecondary	5
33	11-9199	All Other Managers	11-9039	Education Administrators, All Other	11-9039.99	Education Administrators, All Other	
34	11-9041	Engineering Managers	11-9041	Engineering Managers	11-9041.00	Engineering Managers	5
35	11-9051	Food Service	11-9051	Food Service	11-9051.00	Food Service	4

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Managers		Managers		Managers	
36	11-9061	Funeral Directors	11-9061	Funeral Directors	11-9061.00	Funeral Directors	4
37	11-9071	Gaming Managers	11-9071	Gaming Managers	11-9071.00	Gaming Managers	3
38	11-9081	Lodging Managers	11-9081	Lodging Managers	11-9081.00	Lodging Managers	3
39	11-9111	Medical and Health Services Managers	11-9111	Medical and Health Services Managers	11-9111.00	Medical and Health Services Managers	5
40	11-9121	Natural Sciences Managers	11-9121	Natural Sciences Managers	11-9121.00	Natural Sciences Managers	5
41	11-9131	Postmasters and Mail Superintendents	11-9131	Postmasters and Mail Superintendents	11-9131.00	Postmasters and Mail Superintendents	4
42	11-9141	Property, Real Estate, and Community Association Managers	11-9141	Property, Real Estate, and Community Association Managers	11-9141.00	Property, Real Estate, and Community Association Managers	4
43	11-9151	Social and Community Service Managers	11-9151	Social and Community Service Managers	11-9151.00	Social and Community Service Managers	4
44	11-9199	Managers, All Other	11-9199	Managers, All Other	11-9199.99	Managers, All Other	
45	13-1011	Agents and Business Managers of Artists, Performers, and Athletes	13-1011	Agents and Business Managers of Artists, Performers, and Athletes	13-1011.00	Agents and Business Managers of Artists, Performers, and Athletes	3
46	13-1021	Purchasing Agents and Buyers, Farm Products	13-1021	Purchasing Agents and Buyers, Farm Products	13-1021.00	Purchasing Agents and Buyers, Farm Products	4
47	13-1022	Wholesale and Retail Buyers, Except Farm Products	13-1022	Wholesale and Retail Buyers, Except Farm Products	13-1022.00	Wholesale and Retail Buyers, Except Farm Products	3
48	13-1023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	13-1023	Purchasing Agents, Except Wholesale, Retail, and Farm Products	13-1023.00	Purchasing Agents, Except Wholesale, Retail, and Farm Products	4
49	13-1031	Claims Adjusters, Examiners, and Investigators	13-1031	Claims Adjusters, Examiners, and Investigators	13-1031.00	Claims Adjusters, Examiners, and Investigators	
50	13-1031	Claims Adjusters, Examiners, and Investigators	13-1031	Claims Adjusters, Examiners, and Investigators	13-1031.01	Claims Examiners, Property and Casualty Insurance	4

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
51	13-1031	Claims Adjusters, Examiners, and Investigators	13-1031	Claims Adjusters, Examiners, and Investigators	13-1031.02	Insurance Adjusters, Examiners, and Investigators	3
52	13-1032	Insurance Appraisers, Auto Damage	13-1032	Insurance Appraisers, Auto Damage	13-1032.00	Insurance Appraisers, Auto Damage	4
53	13-1041	Compliance Officers, Except Agriculture, Construction, Health and Safety, and Transportation	13-1041	Compliance Officers, Except Agriculture, Construction, Health and Safety, and Transportation	13-1041.00	Compliance Officers, Except Agriculture, Construction, Health and Safety, and Transportation	
54	13-1041	Compliance Officers, Except Agriculture, Construction, Health and Safety, and Transportation	13-1041	Compliance Officers, Except Agriculture, Construction, Health and Safety, and Transportation	13-1041.01	Environmental Compliance Inspectors	3
55	13-1041	Compliance Officers, Except Agriculture, Construction, Health and Safety, and Transportation	13-1041	Compliance Officers, Except Agriculture, Construction, Health and Safety, and Transportation	13-1041.02	Licensing Examiners and Inspectors	3
56	13-1041	Compliance Officers, Except Agriculture, Construction, Health and Safety, and Transportation	13-1041	Compliance Officers, Except Agriculture, Construction, Health and Safety, and Transportation	13-1041.03	Equal Opportunity Representatives and Officers	4
57	13-1041	Compliance Officers, Except Agriculture, Construction, Health and Safety, and Transportation	13-1041	Compliance Officers, Except Agriculture, Construction, Health and Safety, and Transportation	13-1041.04	Government Property Inspectors and Investigators	3
58	13-1041	Compliance Officers, Except Agriculture, Construction, Health and Safety, and Transportation	13-1041	Compliance Officers, Except Agriculture, Construction, Health and Safety, and Transportation	13-1041.05	Pressure Vessel Inspectors	4
59	13-1041	Compliance Officers, Except Agriculture, Construction,	13-1041	Compliance Officers, Except Agriculture, Construction, Health and Safety, and	13-1041.06	Coroners	4

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Health and Safety, and Transportation		Transportation			
60	13-1051	Cost Estimators	13-1051	Cost Estimators	13-1051.00	Cost Estimators	4
61	13-1061	Emergency Management Specialists	13-1061	Emergency Management Specialists	13-1061.00	Emergency Management Specialists	
62	13-1071	Employment, Recruitment, and Placement Specialists	13-1071	Employment, Recruitment, and Placement Specialists	13-1071.00	Employment, Recruitment, and Placement Specialists	
63	13-1071	Employment, Recruitment, and Placement Specialists	13-1071	Employment, Recruitment, and Placement Specialists	13-1071.01	Employment Interviewers, Private or Public Employment Service	3
64	13-1071	Employment, Recruitment, and Placement Specialists	13-1071	Employment, Recruitment, and Placement Specialists	13-1071.02	Personnel Recruiters	3
65	13-1072	Compensation, Benefits, and Job Analysis Specialists	13-1072	Compensation, Benefits, and Job Analysis Specialists	13-1072.00	Compensation, Benefits, and Job Analysis Specialists	3
66	13-1073	Training and Development Specialists	13-1073	Training and Development Specialists	13-1073.00	Training and Development Specialists	4
67	13-1199	All Other Business Operations and Human Resources Specialists	13-1079	Human Resources, Training, and Labor Relations Specialists, All Other	13-1079.99	Human Resources, Training, and Labor Relations Specialists, All Other	
68	13-1199	All Other Business Operations and Human Resources Specialists	13-1081	Logisticians	13-1081.00	Logisticians	
69	13-1111	Management Analysts	13-1111	Management Analysts	13-1111.00	Management Analysts	4
70	13-1121	Meeting and Convention Planners	13-1121	Meeting and Convention Planners	13-1121.00	Meeting and Convention Planners	4
71	13-1199	*All Other Business Operations and Human Resources Specialists	13-1199	Business Operations Specialists, All Other	13-1199.99	Business Operations Specialists, All Other	

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
72	13-2011	Accountants and Auditors	13-2011	Accountants and Auditors	13-2011.00	Accountants and Auditors	
73	13-2011	Accountants and Auditors	13-2011	Accountants and Auditors	13-2011.01	Accountants	4
74	13-2011	Accountants and Auditors	13-2011	Accountants and Auditors	13-2011.02	Auditors	4
75	13-2021	Appraisers and Assessors of Real Estate	13-2021	Appraisers and Assessors of Real Estate	13-2021.00	Appraisers and Assessors of Real Estate	
76	13-2021	Appraisers and Assessors of Real Estate	13-2021	Appraisers and Assessors of Real Estate	13-2021.01	Assessors	4
77	13-2021	Appraisers and Assessors of Real Estate	13-2021	Appraisers and Assessors of Real Estate	13-2021.02	Appraisers, Real Estate	4
78	13-2031	Budget Analysts	13-2031	Budget Analysts	13-2031.00	Budget Analysts	4
79	13-2041	Credit Analysts	13-2041	Credit Analysts	13-2041.00	Credit Analysts	4
80	13-2051	Financial Analysts	13-2051	Financial Analysts	13-2051.00	Financial Analysts	5
81	13-2052	Personal Financial Advisors	13-2052	Personal Financial Advisors	13-2052.00	Personal Financial Advisors	3
82	13-2053	Insurance Underwriters	13-2053	Insurance Underwriters	13-2053.00	Insurance Underwriters	4
83	13-2061	Financial Examiners	13-2061	Financial Examiners	13-2061.00	Financial Examiners	4
84	13-2071	Loan Counselors	13-2071	Loan Counselors	13-2071.00	Loan Counselors	4
85	13-2072	Loan Officers	13-2072	Loan Officers	13-2072.00	Loan Officers	4
86	13-2081	Tax Examiners, Collectors, and Revenue Agents	13-2081	Tax Examiners, Collectors, and Revenue Agents	13-2081.00	Tax Examiners, Collectors, and Revenue Agents	4
87	13-2082	Tax Preparers	13-2082	Tax Preparers	13-2082.00	Tax Preparers	2
88	13-2099	Financial Specialists, All Other	13-2099	Financial Specialists, All Other	13-2099.99	Financial Specialists, All Other	
89	15-1011	Computer and Information Scientists, Research	15-1011	Computer and Information Scientists, Research	15-1011.00	Computer and Information Scientists, Research	
90	15-1021	Computer Programmers	15-1021	Computer Programmers	15-1021.00	Computer Programmers	4
91	15-1031	Computer Software Engineers, Applications	15-1031	Computer Software Engineers, Applications	15-1031.00	Computer Software Engineers, Applications	4
92	15-1032	Computer	15-1032	Computer Software	15-1032.00	Computer	4

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Software Engineers, Systems Software		Engineers, Systems Software		Software Engineers, Systems Software	
93	15-1041	Computer Support Specialists	15-1041	Computer Support Specialists	15-1041.00	Computer Support Specialists	4
94	15-1051	Computer Systems Analysts	15-1051	Computer Systems Analysts	15-1051.00	Computer Systems Analysts	3
95	15-1061	Database Administrators	15-1061	Database Administrators	15-1061.00	Database Administrators	4
96	15-1071	Network and Computer Systems Administrators	15-1071	Network and Computer Systems Administrators	15-1071.00	Network and Computer Systems Administrators	
97	15-1071	Network and Computer Systems Administrators	15-1071	Network and Computer Systems Administrators	15-1071.01	Computer Security Specialists	4
98	15-1081	Network Systems and Data Communications Analysts	15-1081	Network Systems and Data Communications Analysts	15-1081.00	Network Systems and Data Communications Analysts	4
99	15-1099	Computer Specialists, All Other	15-1099	Computer Specialists, All Other	15-1099.99	Computer Specialists, All Other	
100	15-2011	Actuaries	15-2011	Actuaries	15-2011.00	Actuaries	5
101	15-2021	Mathematicians	15-2021	Mathematicians	15-2021.00	Mathematicians	5
102	15-2031	Operations Research Analysts	15-2031	Operations Research Analysts	15-2031.00	Operations Research Analysts	4
103	15-2041	Statisticians	15-2041	Statisticians	15-2041.00	Statisticians	4
104	15-9099	All Other Mathematical Occupations	15-2099	Mathematical Science Occupations, All Other	15-2099.99	Mathematical Science Occupations, All Other	
105	15-2091	Mathematical Technicians	15-2091	Mathematical Technicians	15-2091.00	Mathematical Technicians	4
106	17-1011	Architects, Except Landscape and Naval	17-1011	Architects, Except Landscape and Naval	17-1011.00	Architects, Except Landscape and Naval	5
107	17-1012	Landscape Architects	17-1012	Landscape Architects	17-1012.00	Landscape Architects	4
108	17-1021	Cartographers and Photogrammetrists	17-1021	Cartographers and Photogrammetrists	17-1021.00	Cartographers and Photogrammetrists	4
109	17-1022	Surveyors	17-1022	Surveyors	17-1022.00	Surveyors	4
110	17-2011	Aerospace Engineers	17-2011	Aerospace Engineers	17-2011.00	Aerospace Engineers	5
111	17-2021	Agricultural	17-2021	Agricultural	17-2021.00	Agricultural	5

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Engineers		Engineers		Engineers	
112	17-2031	Biomedical Engineers	17-2031	Biomedical Engineers	17-2031.00	Biomedical Engineers	
113	17-2041	Chemical Engineers	17-2041	Chemical Engineers	17-2041.00	Chemical Engineers	5
114	17-2051	Civil Engineers	17-2051	Civil Engineers	17-2051.00	Civil Engineers	4
115	17-2061	Computer Hardware Engineers	17-2061	Computer Hardware Engineers	17-2061.00	Computer Hardware Engineers	4
116	17-2071	Electrical Engineers	17-2071	Electrical Engineers	17-2071.00	Electrical Engineers	5
117	17-2072	Electronics Engineers, Except Computer	17-2072	Electronics Engineers, Except Computer	17-2072.00	Electronics Engineers, Except Computer	5
118	17-2081	Environmental Engineers	17-2081	Environmental Engineers	17-2081.00	Environmental Engineers	
119	17-2111	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors	17-2111	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors	17-2111.00	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors	
120	17-2111	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors	17-2111	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors	17-2111.01	Industrial Safety and Health Engineers	4
121	17-2111	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors	17-2111	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors	17-2111.02	Fire-Prevention and Protection Engineers	4
122	17-2111	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors	17-2111	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors	17-2111.03	Product Safety Engineers	5
123	17-2112	Industrial Engineers	17-2112	Industrial Engineers	17-2112.00	Industrial Engineers	4
124	17-2121	Marine Engineers and Naval Architects	17-2121	Marine Engineers and Naval Architects	17-2121.00	Marine Engineers and Naval Architects	
125	17-2121	Marine Engineers and Naval Architects	17-2121	Marine Engineers and Naval Architects	17-2121.01	Marine Engineers	5
126	17-2121	Marine Engineers and Naval Architects	17-2121	Marine Engineers and Naval Architects	17-2121.02	Marine Architects	5

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Architects					
127	17-2131	Materials Engineers	17-2131	Materials Engineers	17-2131.00	Materials Engineers	5
128	17-2141	Mechanical Engineers	17-2141	Mechanical Engineers	17-2141.00	Mechanical Engineers	4
129	17-2151	Mining and Geological Engineers, Including Mining Safety Engineers	17-2151	Mining and Geological Engineers, Including Mining Safety Engineers	17-2151.00	Mining and Geological Engineers, Including Mining Safety Engineers	4
130	17-2161	Nuclear Engineers	17-2161	Nuclear Engineers	17-2161.00	Nuclear Engineers	5
131	17-2171	Petroleum Engineers	17-2171	Petroleum Engineers	17-2171.00	Petroleum Engineers	5
132	17-2199	Engineers, All Other	17-2199	Engineers, All Other	17-2199.99	Engineers, All Other	
133	17-3011	Architectural and Civil Drafters	17-3011	Architectural and Civil Drafters	17-3011.00	Architectural and Civil Drafters	
134	17-3011	Architectural and Civil Drafters	17-3011	Architectural and Civil Drafters	17-3011.01	Architectural Drafters	3
135	17-3011	Architectural and Civil Drafters	17-3011	Architectural and Civil Drafters	17-3011.02	Civil Drafters	3
136	17-3012	Electrical and Electronics Drafters	17-3012	Electrical and Electronics Drafters	17-3012.00	Electrical and Electronics Drafters	
137	17-3012	Electrical and Electronics Drafters	17-3012	Electrical and Electronics Drafters	17-3012.01	Electronic Drafters	3
138	17-3012	Electrical and Electronics Drafters	17-3012	Electrical and Electronics Drafters	17-3012.02	Electrical Drafters	4
139	17-3013	Mechanical Drafters	17-3013	Mechanical Drafters	17-3013.00	Mechanical Drafters	4
140	17-3099	All Other Drafters, Engineering, and Mapping Technicians	17-3019	Drafters, All Other	17-3019.99	Drafters, All Other	
141	17-3021	Aerospace Engineering and Operations Technicians	17-3021	Aerospace Engineering and Operations Technicians	17-3021.00	Aerospace Engineering and Operations Technicians	4
142	17-3022	Civil Engineering Technicians	17-3022	Civil Engineering Technicians	17-3022.00	Civil Engineering Technicians	4
143	17-3023	Electrical and Electronic Engineering	17-3023	Electrical and Electronic Engineering	17-3023.00	Electrical and Electronic Engineering	

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Technicians		Technicians		Technicians	
144	17-3023	Electrical and Electronic Engineering Technicians	17-3023	Electrical and Electronic Engineering Technicians	17-3023.01	Electronics Engineering Technicians	4
145	17-3023	Electrical and Electronic Engineering Technicians	17-3023	Electrical and Electronic Engineering Technicians	17-3023.02	Calibration and Instrumentation Technicians	4
146	17-3023	Electrical and Electronic Engineering Technicians	17-3023	Electrical and Electronic Engineering Technicians	17-3023.03	Electrical Engineering Technicians	4
147	17-3024	Electro-Mechanical Technicians	17-3024	Electro-Mechanical Technicians	17-3024.00	Electro-Mechanical Technicians	4
148	17-3025	Environmental Engineering Technicians	17-3025	Environmental Engineering Technicians	17-3025.00	Environmental Engineering Technicians	
149	17-3026	Industrial Engineering Technicians	17-3026	Industrial Engineering Technicians	17-3026.00	Industrial Engineering Technicians	3
150	17-3027	Mechanical Engineering Technicians	17-3027	Mechanical Engineering Technicians	17-3027.00	Mechanical Engineering Technicians	4
151	17-3099	All Other Drafters, Engineering, and Mapping Technicians	17-3029	Engineering Technicians, Except Drafters, All Other	17-3029.99	Engineering Technicians, Except Drafters, All Other	
152	17-3031	Surveying and Mapping Technicians	17-3031	Surveying and Mapping Technicians	17-3031.00	Surveying and Mapping Technicians	
153	17-3031	Surveying and Mapping Technicians	17-3031	Surveying and Mapping Technicians	17-3031.01	Surveying Technicians	4
154	17-3031	Surveying and Mapping Technicians	17-3031	Surveying and Mapping Technicians	17-3031.02	Mapping Technicians	3
155	19-1010	Agricultural and Food Scientists	19-1011	Animal Scientists	19-1011.00	Animal Scientists	5
156	19-1010	Agricultural and Food Scientists	19-1012	Food Scientists and Technologists	19-1012.00	Food Scientists and Technologists	4
157	19-1010	Agricultural and Food Scientists	19-1013	Soil and Plant Scientists	19-1013.00	Soil and Plant Scientists	
158	19-1010	Agricultural and Food Scientists	19-1013	Soil and Plant Scientists	19-1013.01	Plant Scientists	5

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
159	19-1010	Agricultural and Food Scientists	19-1013	Soil and Plant Scientists	19-1013.02	Soil Scientists	5
160			19-102	Biological Scientists	19-1020.01	Biologists	5
161	19-1021	Biochemists and Biophysicists	19-1021	Biochemists and Biophysicists	19-1021.00	Biochemists and Biophysicists	
162	19-1021	Biochemists and Biophysicists	19-1021	Biochemists and Biophysicists	19-1021.01	Biochemists	5
163	19-1021	Biochemists and Biophysicists	19-1021	Biochemists and Biophysicists	19-1021.02	Biophysicists	5
164	19-1022	Microbiologists	19-1022	Microbiologists	19-1022.00	Microbiologists	5
165	19-1023	Zoologists and Wildlife Biologists	19-1023	Zoologists and Wildlife Biologists	19-1023.00	Zoologists and Wildlife Biologists	5
166	19-1099	All Other Life Scientists	19-1029	Biological Scientists, All Other	19-1029.99	Biological Scientists, All Other	
167	19-1031	Conservation Scientists	19-1031	Conservation Scientists	19-1031.00	Conservation Scientists	
168	19-1031	Conservation Scientists	19-1031	Conservation Scientists	19-1031.01	Soil Conservationists	4
169	19-1031	Conservation Scientists	19-1031	Conservation Scientists	19-1031.02	Range Managers	5
170	19-1031	Conservation Scientists	19-1031	Conservation Scientists	19-1031.03	Park Naturalists	4
171	19-1032	Foresters	19-1032	Foresters	19-1032.00	Foresters	4
172	19-1041	Epidemiologists	19-1041	Epidemiologists	19-1041.00	Epidemiologists	4
173	19-1042	Medical Scientists, Except Epidemiologists	19-1042	Medical Scientists, Except Epidemiologists	19-1042.00	Medical Scientists, Except Epidemiologists	4
174	19-1099	Life Scientists, All Other	19-1099	Life Scientists, All Other	19-1099.99	Life Scientists, All Other	
175	19-2011	Astronomers	19-2011	Astronomers	19-2011.00	Astronomers	5
176	19-2012	Physicists	19-2012	Physicists	19-2012.00	Physicists	5
177	19-2021	Atmospheric and Space Scientists	19-2021	Atmospheric and Space Scientists	19-2021.00	Atmospheric and Space Scientists	4
178	19-2031	Chemists	19-2031	Chemists	19-2031.00	Chemists	4
179	19-2032	Materials Scientists	19-2032	Materials Scientists	19-2032.00	Materials Scientists	4
180	19-2041	Environmental Scientists and Specialists, Including Health	19-2041	Environmental Scientists and Specialists, Including Health	19-2041.00	Environmental Scientists and Specialists, Including Health	5
181	19-2042	Geoscientists, Except	19-2042	Geoscientists, Except Hydrologists and	19-2042.00	Geoscientists, Except	

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Hydrologists and Geographers		Geographers		Hydrologists and Geographers	
182	19-2042	Geoscientists, Except Hydrologists and Geographers	19-2042	Geoscientists, Except Hydrologists and Geographers	19-2042.01	Geologists	5
183	19-2043	Hydrologists	19-2043	Hydrologists	19-2043.00	Hydrologists	5
184	19-2099	Physical Scientists, All Other	19-2099	Physical Scientists, All Other	19-2099.99	Physical Scientists, All Other	
185	19-3011	Economists	19-3011	Economists	19-3011.00	Economists	5
186	19-3021	Market Research Analysts	19-3021	Market Research Analysts	19-3021.00	Market Research Analysts	4
187	19-3022	Survey Researchers	19-3022	Survey Researchers	19-3022.00	Survey Researchers	
188	19-3031	Clinical, Counseling, and School Psychologists	19-3031	Clinical, Counseling, and School Psychologists	19-3031.00	Clinical, Counseling, and School Psychologists	
189	19-3031	Clinical, Counseling, and School Psychologists	19-3031	Clinical, Counseling, and School Psychologists	19-3031.01	Educational Psychologists	4
190	19-3031	Clinical, Counseling, and School Psychologists	19-3031	Clinical, Counseling, and School Psychologists	19-3031.02	Clinical Psychologists	4
191	19-3031	Clinical, Counseling, and School Psychologists	19-3031	Clinical, Counseling, and School Psychologists	19-3031.03	Counseling Psychologists	5
192	19-3032	Industrial-Organizational Psychologists	19-3032	Industrial-Organizational Psychologists	19-3032.00	Industrial-Organizational Psychologists	5
193	19-3099	All Other Social Scientists and Related Workers	19-3039	Psychologists, All Other	19-3039.99	Psychologists, All Other	
194	19-3041	Sociologists	19-3041	Sociologists	19-3041.00	Sociologists	3
195	19-3051	Urban and Regional Planners	19-3051	Urban and Regional Planners	19-3051.00	Urban and Regional Planners	4
196	19-3091	Anthropologists and Archeologists	19-3091	Anthropologists and Archeologists	19-3091.00	Anthropologists and Archeologists	
197	19-3091	Anthropologists and Archeologists	19-3091	Anthropologists and Archeologists	19-3091.01	Anthropologists	4
198	19-3091	Anthropologists	19-3091	Anthropologists and Archeologists	19-3091.02	Archeologists	4

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		and Archeologists		Archeologists			
199	19-3092	Geographers	19-3092	Geographers	19-3092.00	Geographers	4
200	19-3093	Historians	19-3093	Historians	19-3093.00	Historians	4
201	19-3094	Political Scientists	19-3094	Political Scientists	19-3094.00	Political Scientists	5
202	19-3099	Social Scientists and Related Workers, All Other	19-3099	Social Scientists and Related Workers, All Other	19-3099.99	Social Scientists and Related Workers, All Other	
203	19-4011	Agricultural and Food Science Technicians	19-4011	Agricultural and Food Science Technicians	19-4011.00	Agricultural and Food Science Technicians	
204	19-4011	Agricultural and Food Science Technicians	19-4011	Agricultural and Food Science Technicians	19-4011.01	Agricultural Technicians	2
205	19-4011	Agricultural and Food Science Technicians	19-4011	Agricultural and Food Science Technicians	19-4011.02	Food Science Technicians	2
206	19-4021	Biological Technicians	19-4021	Biological Technicians	19-4021.00	Biological Technicians	2
207	19-4031	Chemical Technicians	19-4031	Chemical Technicians	19-4031.00	Chemical Technicians	3
208	19-4041	Geological and Petroleum Technicians	19-4041	Geological and Petroleum Technicians	19-4041.00	Geological and Petroleum Technicians	
209	19-4041	Geological and Petroleum Technicians	19-4041	Geological and Petroleum Technicians	19-4041.01	Geological Data Technicians	3
210	19-4041	Geological and Petroleum Technicians	19-4041	Geological and Petroleum Technicians	19-4041.02	Geological Sample Test Technicians	3
211	19-4051	Nuclear Technicians	19-4051	Nuclear Technicians	19-4051.00	Nuclear Technicians	
212	19-4051	Nuclear Technicians	19-4051	Nuclear Technicians	19-4051.01	Nuclear Equipment Operation Technicians	3
213	19-4051	Nuclear Technicians	19-4051	Nuclear Technicians	19-4051.02	Nuclear Monitoring Technicians	3
214	19-4099	All Other Life, Physical, and Social Science Technicians	19-4061	Social Science Research Assistants	19-4061.00	Social Science Research Assistants	
215	19-4099	All Other Life, Physical, and	19-4061	Social Science Research Assistants	19-4061.01	City Planning Aides	3

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Social Science Technicians					
216	19-4091	Environmental Science and Protection Technicians, Including Health	19-4091	Environmental Science and Protection Technicians, Including Health	19-4091.00	Environmental Science and Protection Technicians, Including Health	3
217	19-4092	Forensic Science Technicians	19-4092	Forensic Science Technicians	19-4092.00	Forensic Science Technicians	4
218	19-4093	Forest and Conservation Technicians	19-4093	Forest and Conservation Technicians	19-4093.00	Forest and Conservation Technicians	
219	19-4099	Life, Physical, and Social Science Technicians, All Other	19-4099	Life, Physical, and Social Science Technicians, All Other	19-4099.99	Life, Physical, and Social Science Technicians, All Other	
220	21-1011	Substance Abuse and Behavioral Disorder Counselors	21-1011	Substance Abuse and Behavioral Disorder Counselors	21-1011.00	Substance Abuse and Behavioral Disorder Counselors	4
221	21-1012	Educational, Vocational, and School Counselors	21-1012	Educational, Vocational, and School Counselors	21-1012.00	Educational, Vocational, and School Counselors	4
222	21-1013	Marriage and Family Therapists	21-1013	Marriage and Family Therapists	21-1013.00	Marriage and Family Therapists	
223	21-1014	Mental Health Counselors	21-1014	Mental Health Counselors	21-1014.00	Mental Health Counselors	4
224	21-1015	Rehabilitation Counselors	21-1015	Rehabilitation Counselors	21-1015.00	Rehabilitation Counselors	
225	21-9099	All Other Counselors, Social and Religious Workers	21-1019	Counselors, All Other	21-1019.99	Counselors, All Other	
226	21-1021	Child, Family, and School Social Workers	21-1021	Child, Family, and School Social Workers	21-1021.00	Child, Family, and School Social Workers	5
227	21-1022	Medical and Public Health Social Workers	21-1022	Medical and Public Health Social Workers	21-1022.00	Medical and Public Health Social Workers	5
228	21-1023	Mental Health and Substance Abuse Social Workers	21-1023	Mental Health and Substance Abuse Social Workers	21-1023.00	Mental Health and Substance Abuse Social Workers	5
229	21-9099	All Other Counselors, Social and Religious Workers	21-1029	Social Workers, All Other	21-1029.99	Social Workers, All Other	

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
230	21-1091	Health Educators	21-1091	Health Educators	21-1091.00	Health Educators	5
231	21-1092	Probation Officers and Correctional Treatment Specialists	21-1092	Probation Officers and Correctional Treatment Specialists	21-1092.00	Probation Officers and Correctional Treatment Specialists	3
232	21-1093	Social and Human Service Assistants	21-1093	Social and Human Service Assistants	21-1093.00	Social and Human Service Assistants	2
233	21-9099	All Other Counselors, Social and Religious Workers	21-1099	Community and Social Service Specialists, All Other	21-1099.99	Community and Social Service Specialists, All Other	
234	21-2011	Clergy	21-2011	Clergy	21-2011.00	Clergy	5
235	21-2021	Directors, Religious Activities and Education	21-2021	Directors, Religious Activities and Education	21-2021.00	Directors, Religious Activities and Education	5
236	21-9099	All Other Counselors, Social and Religious Workers	21-2099	Religious Workers, All Other	21-2099.99	Religious Workers, All Other	
237	23-1011	Lawyers	23-1011	Lawyers	23-1011.00	Lawyers	5
238	23-1021	Administrative Law Judges, Adjudicators, and Hearing Officers	23-1021	Administrative Law Judges, Adjudicators, and Hearing Officers	23-1021.00	Administrative Law Judges, Adjudicators, and Hearing Officers	5
239	23-1022	Arbitrators, Mediators, and Conciliators	23-1022	Arbitrators, Mediators, and Conciliators	23-1022.00	Arbitrators, Mediators, and Conciliators	5
240	23-1023	Judges, Magistrate Judges, and Magistrates	23-1023	Judges, Magistrate Judges, and Magistrates	23-1023.00	Judges, Magistrate Judges, and Magistrates	5
241	23-2011	Paralegals and Legal Assistants	23-2011	Paralegals and Legal Assistants	23-2011.00	Paralegals and Legal Assistants	4
242	23-2091	Court Reporters	23-2091	Court Reporters	23-2091.00	Court Reporters	
243	23-2092	Law Clerks	23-2092	Law Clerks	23-2092.00	Law Clerks	4
244	23-2093	Title Examiners, Abstractors, and Searchers	23-2093	Title Examiners, Abstractors, and Searchers	23-2093.00	Title Examiners, Abstractors, and Searchers	
245	23-2093	Title Examiners, Abstractors, and Searchers	23-2093	Title Examiners, Abstractors, and Searchers	23-2093.01	Title Searchers	2
246	23-2093	Title Examiners, Abstractors, and Searchers	23-2093	Title Examiners, Abstractors, and Searchers	23-2093.02	Title Examiners and Abstractors	3
247	23-9099	All Other Legal	23-2099	Legal Support	23-2099.99	Legal Support	

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		and Related Workers		Workers, All Other		Workers, All Other	
248	25-1011	Business Teachers, Postsecondary	25-1011	Business Teachers, Postsecondary	25-1011.00	Business Teachers, Postsecondary	
249	25-1021	Computer Science Teachers, Postsecondary	25-1021	Computer Science Teachers, Postsecondary	25-1021.00	Computer Science Teachers, Postsecondary	5
250	25-1022	Mathematical Science Teachers, Postsecondary	25-1022	Mathematical Science Teachers, Postsecondary	25-1022.00	Mathematical Science Teachers, Postsecondary	5
251	25-1031	Architecture Teachers, Postsecondary	25-1031	Architecture Teachers, Postsecondary	25-1031.00	Architecture Teachers, Postsecondary	
252	25-1032	Engineering Teachers, Postsecondary	25-1032	Engineering Teachers, Postsecondary	25-1032.00	Engineering Teachers, Postsecondary	5
253	25-1041	Agricultural Sciences Teachers, Postsecondary	25-1041	Agricultural Sciences Teachers, Postsecondary	25-1041.00	Agricultural Sciences Teachers, Postsecondary	5
254	25-1042	Biological Science Teachers, Postsecondary	25-1042	Biological Science Teachers, Postsecondary	25-1042.00	Biological Science Teachers, Postsecondary	5
255	25-1043	Forestry and Conservation Science Teachers, Postsecondary	25-1043	Forestry and Conservation Science Teachers, Postsecondary	25-1043.00	Forestry and Conservation Science Teachers, Postsecondary	5
256	25-1051	Atmospheric, Earth, Marine, and Space Sciences Teachers, Postsecondary	25-1051	Atmospheric, Earth, Marine, and Space Sciences Teachers, Postsecondary	25-1051.00	Atmospheric, Earth, Marine, and Space Sciences Teachers, Postsecondary	
257	25-1052	Chemistry Teachers, Postsecondary	25-1052	Chemistry Teachers, Postsecondary	25-1052.00	Chemistry Teachers, Postsecondary	5
258	25-1053	Environmental Science Teachers, Postsecondary	25-1053	Environmental Science Teachers, Postsecondary	25-1053.00	Environmental Science Teachers, Postsecondary	
259	25-1054	Physics Teachers, Postsecondary	25-1054	Physics Teachers, Postsecondary	25-1054.00	Physics Teachers, Postsecondary	5
260	25-1061	Anthropology and Archeology Teachers, Postsecondary	25-1061	Anthropology and Archeology Teachers, Postsecondary	25-1061.00	Anthropology and Archeology Teachers, Postsecondary	5
261	25-1062	Area, Ethnic, and Cultural Studies Teachers,	25-1062	Area, Ethnic, and Cultural Studies Teachers,	25-1062.00	Area, Ethnic, and Cultural Studies Teachers,	5

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Postsecondary		Postsecondary		Postsecondary	
262	25-1063	Economics Teachers, Postsecondary	25-1063	Economics Teachers, Postsecondary	25-1063.00	Economics Teachers, Postsecondary	5
263	25-1064	Geography Teachers, Postsecondary	25-1064	Geography Teachers, Postsecondary	25-1064.00	Geography Teachers, Postsecondary	
264	25-1065	Political Science Teachers, Postsecondary	25-1065	Political Science Teachers, Postsecondary	25-1065.00	Political Science Teachers, Postsecondary	5
265	25-1066	Psychology Teachers, Postsecondary	25-1066	Psychology Teachers, Postsecondary	25-1066.00	Psychology Teachers, Postsecondary	5
266	25-1067	Sociology Teachers, Postsecondary	25-1067	Sociology Teachers, Postsecondary	25-1067.00	Sociology Teachers, Postsecondary	5
267	25-1199	All Other Postsecondary Teachers	25-1069	Social Sciences Teachers, Postsecondary, All Other	25-1069.99	Social Sciences Teachers, Postsecondary, All Other	
268	25-1071	Health Specialties Teachers, Postsecondary	25-1071	Health Specialties Teachers, Postsecondary	25-1071.00	Health Specialties Teachers, Postsecondary	5
269	25-1072	Nursing Instructors and Teachers, Postsecondary	25-1072	Nursing Instructors and Teachers, Postsecondary	25-1072.00	Nursing Instructors and Teachers, Postsecondary	5
270	25-1081	Education Teachers, Postsecondary	25-1081	Education Teachers, Postsecondary	25-1081.00	Education Teachers, Postsecondary	
271	25-1082	Library Science Teachers, Postsecondary	25-1082	Library Science Teachers, Postsecondary	25-1082.00	Library Science Teachers, Postsecondary	
272	25-1111	Criminal Justice and Law Enforcement Teachers, Postsecondary	25-1111	Criminal Justice and Law Enforcement Teachers, Postsecondary	25-1111.00	Criminal Justice and Law Enforcement Teachers, Postsecondary	
273	25-1112	Law Teachers, Postsecondary	25-1112	Law Teachers, Postsecondary	25-1112.00	Law Teachers, Postsecondary	
274	25-1113	Social Work Teachers, Postsecondary	25-1113	Social Work Teachers, Postsecondary	25-1113.00	Social Work Teachers, Postsecondary	
275	25-1121	Art, Drama, and Music Teachers,	25-1121	Art, Drama, and Music Teachers,	25-1121.00	Art, Drama, and Music Teachers,	5

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Postsecondary		Postsecondary		Postsecondary	
276	25-1122	Communications Teachers, Postsecondary	25-1122	Communications Teachers, Postsecondary	25-1122.00	Communications Teachers, Postsecondary	
277	25-1123	English Language and Literature Teachers, Postsecondary	25-1123	English Language and Literature Teachers, Postsecondary	25-1123.00	English Language and Literature Teachers, Postsecondary	5
278	25-1124	Foreign Language and Literature Teachers, Postsecondary	25-1124	Foreign Language and Literature Teachers, Postsecondary	25-1124.00	Foreign Language and Literature Teachers, Postsecondary	5
279	25-1125	History Teachers, Postsecondary	25-1125	History Teachers, Postsecondary	25-1125.00	History Teachers, Postsecondary	5
280	25-1126	Philosophy and Religion Teachers, Postsecondary	25-1126	Philosophy and Religion Teachers, Postsecondary	25-1126.00	Philosophy and Religion Teachers, Postsecondary	
281	25-1191	Graduate Teaching Assistants	25-1191	Graduate Teaching Assistants	25-1191.00	Graduate Teaching Assistants	5
282	25-1192	Home Economics Teachers, Postsecondary	25-1192	Home Economics Teachers, Postsecondary	25-1192.00	Home Economics Teachers, Postsecondary	
283	25-1193	Recreation and Fitness Studies Teachers, Postsecondary	25-1193	Recreation and Fitness Studies Teachers, Postsecondary	25-1193.00	Recreation and Fitness Studies Teachers, Postsecondary	
284	25-1194	Vocational Education Teachers, Postsecondary	25-1194	Vocational Education Teachers, Postsecondary	25-1194.00	Vocational Education Teachers, Postsecondary	4
285	25-1199	Postsecondary Teachers, All Other	25-1199	Postsecondary Teachers, All Other	25-1199.99	Postsecondary Teachers, All Other	
286	25-2011	Preschool Teachers, Except Special Education	25-2011	Preschool Teachers, Except Special Education	25-2011.00	Preschool Teachers, Except Special Education	4
287	25-2012	Kindergarten Teachers, Except Special Education	25-2012	Kindergarten Teachers, Except Special Education	25-2012.00	Kindergarten Teachers, Except Special Education	4
288	25-2021	Elementary School Teachers, Except Special Education	25-2021	Elementary School Teachers, Except Special Education	25-2021.00	Elementary School Teachers, Except Special Education	4
289	25-2022	Middle School Teachers, Except Special and Vocational	25-2022	Middle School Teachers, Except Special and Vocational Education	25-2022.00	Middle School Teachers, Except Special and Vocational	4

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Education				Education	
290	25-2023	Vocational Education Teachers, Middle School	25-2023	Vocational Education Teachers, Middle School	25-2023.00	Vocational Education Teachers, Middle School	4
291	25-2031	Secondary School Teachers, Except Special and Vocational Education	25-2031	Secondary School Teachers, Except Special and Vocational Education	25-2031.00	Secondary School Teachers, Except Special and Vocational Education	4
292	25-2032	Vocational Education Teachers, Secondary School	25-2032	Vocational Education Teachers, Secondary School	25-2032.00	Vocational Education Teachers, Secondary School	4
293	25-2041	Special Education Teachers, Preschool, Kindergarten, and Elementary School	25-2041	Special Education Teachers, Preschool, Kindergarten, and Elementary School	25-2041.00	Special Education Teachers, Preschool, Kindergarten, and Elementary School	4
294	25-2042	Special Education Teachers, Middle School	25-2042	Special Education Teachers, Middle School	25-2042.00	Special Education Teachers, Middle School	4
295	25-2043	Special Education Teachers, Secondary School	25-2043	Special Education Teachers, Secondary School	25-2043.00	Special Education Teachers, Secondary School	4
296	25-3011	Adult Literacy, Remedial Education, and GED Teachers and Instructors	25-3011	Adult Literacy, Remedial Education, and GED Teachers and Instructors	25-3011.00	Adult Literacy, Remedial Education, and GED Teachers and Instructors	4
297	25-3021	Self-Enrichment Education Teachers	25-3021	Self-Enrichment Education Teachers	25-3021.00	Self-Enrichment Education Teachers	4
298	25-3999	All Other Teachers, Primary, Secondary, and Adult	25-3099	Teachers and Instructors, All Other	25-3099.99	Teachers and Instructors, All Other	
299	25-4010	Archivists, Curators, and Museum Technicians	25-4011	Archivists	25-4011.00	Archivists	5
300	25-4010	Archivists, Curators, and Museum Technicians	25-4012	Curators	25-4012.00	Curators	4

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
301	25-4010	Archivists, Curators, and Museum Technicians	25-4013	Museum Technicians and Conservators	25-4013.00	Museum Technicians and Conservators	3
302	25-4021	Librarians	25-4021	Librarians	25-4021.00	Librarians	4
303	25-4031	Library Technicians	25-4031	Library Technicians	25-4031.00	Library Technicians	2
304	25-9011	Audio-Visual Collections Specialists	25-9011	Audio-Visual Collections Specialists	25-9011.00	Audio-Visual Collections Specialists	4
305	25-9021	Farm and Home Management Advisors	25-9021	Farm and Home Management Advisors	25-9021.00	Farm and Home Management Advisors	4
306	25-9031	Instructional Coordinators	25-9031	Instructional Coordinators	25-9031.00	Instructional Coordinators	5
307	25-9041	Teacher Assistants	25-9041	Teacher Assistants	25-9041.00	Teacher Assistants	3
308	25-9099	*All Other Library, Museum, Training, and Education Workers	25-9099	Education, Training, and Library Workers, All Other	25-9099.99	Education, Training, and Library Workers, All Other	
309	27-1011	Art Directors	27-1011	Art Directors	27-1011.00	Art Directors	4
310	27-1099	All Other Art and Design Workers	27-1012	Craft Artists	27-1012.00	Craft Artists	
311	27-1013	Fine Artists, Including Painters, Sculptors, and Illustrators	27-1013	Fine Artists, Including Painters, Sculptors, and Illustrators	27-1013.00	Fine Artists, Including Painters, Sculptors, and Illustrators	
312	27-1013	Fine Artists, Including Painters, Sculptors, and Illustrators	27-1013	Fine Artists, Including Painters, Sculptors, and Illustrators	27-1013.01	Painters and Illustrators	4
313	27-1013	Fine Artists, Including Painters, Sculptors, and Illustrators	27-1013	Fine Artists, Including Painters, Sculptors, and Illustrators	27-1013.02	Sketch Artists	3
314	27-1013	Fine Artists, Including Painters, Sculptors, and Illustrators	27-1013	Fine Artists, Including Painters, Sculptors, and Illustrators	27-1013.03	Cartoonists	4
315	27-1013	Fine Artists, Including Painters, Sculptors, and Illustrators	27-1013	Fine Artists, Including Painters, Sculptors, and Illustrators	27-1013.04	Sculptors	5
316	27-1014	Multi-Media	27-1014	Multi-Media Artists	27-1014.00	Multi-Media	

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Artists and Animators		and Animators		Artists and Animators	
317	27-1099	All Other Art and Design Workers	27-1019	Artists and Related Workers, All Other	27-1019.99	Artists and Related Workers, All Other	
318	27-1021	Commercial and Industrial Designers	27-1021	Commercial and Industrial Designers	27-1021.00	Commercial and Industrial Designers	4
319	27-1022	Fashion Designers	27-1022	Fashion Designers	27-1022.00	Fashion Designers	3
320	27-1023	Floral Designers	27-1023	Floral Designers	27-1023.00	Floral Designers	2
321	27-1024	Graphic Designers	27-1024	Graphic Designers	27-1024.00	Graphic Designers	4
322	27-1025	Interior Designers	27-1025	Interior Designers	27-1025.00	Interior Designers	4
323	27-1026	Merchandise Displayers and Window Trimmers	27-1026	Merchandise Displayers and Window Trimmers	27-1026.00	Merchandise Displayers and Window Trimmers	3
324	27-1027	Set and Exhibit Designers	27-1027	Set and Exhibit Designers	27-1027.00	Set and Exhibit Designers	
325	27-1027	Set and Exhibit Designers	27-1027	Set and Exhibit Designers	27-1027.01	Set Designers	5
326	27-1027	Set and Exhibit Designers	27-1027	Set and Exhibit Designers	27-1027.02	Exhibit Designers	4
327	27-1099	All Other Art and Design Workers	27-1029	Designers, All Other	27-1029.99	Designers, All Other	
328	27-2011	Actors	27-2011	Actors	27-2011.00	Actors	3
329	27-2012	Producers and Directors	27-2012	Producers and Directors	27-2012.00	Producers and Directors	
330	27-2012	Producers and Directors	27-2012	Producers and Directors	27-2012.01	Producers	4
331	27-2012	Producers and Directors	27-2012	Producers and Directors	27-2012.02	Directors- Stage, Motion Pictures, Television, and Radio	4
332	27-2012	Producers and Directors	27-2012	Producers and Directors	27-2012.03	Program Directors	5
333	27-2012	Producers and Directors	27-2012	Producers and Directors	27-2012.04	Talent Directors	3
334	27-2012	Producers and Directors	27-2012	Producers and Directors	27-2012.05	Technical Directors/Managers	4
335	27-2021	Athletes and Sports Competitors	27-2021	Athletes and Sports Competitors	27-2021.00	Athletes and Sports Competitors	3
336	27-2022	Coaches and Scouts	27-2022	Coaches and Scouts	27-2022.00	Coaches and Scouts	5
337	27-2023	Umpires, Referees,	27-2023	Umpires, Referees,	27-2023.00	Umpires, Referees,	3

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		and Other Sports Officials		and Other Sports Officials		and Other Sports Officials	
338	27-2031	Dancers	27-2031	Dancers	27-2031.00	Dancers	4
339	27-2032	Choreographers	27-2032	Choreographers	27-2032.00	Choreographers	5
340	27-2041	Music Directors and Composers	27-2041	Music Directors and Composers	27-2041.00	Music Directors and Composers	
341	27-2041	Music Directors and Composers	27-2041	Music Directors and Composers	27-2041.01	Music Directors	5
342	27-2041	Music Directors and Composers	27-2041	Music Directors and Composers	27-2041.02	Music Arrangers and Orchestrators	4
343	27-2041	Music Directors and Composers	27-2041	Music Directors and Composers	27-2041.03	Composers	5
344	27-2042	Musicians and Singers	27-2042	Musicians and Singers	27-2042.00	Musicians and Singers	
345	27-2042	Musicians and Singers	27-2042	Musicians and Singers	27-2042.01	Singers	2
346	27-2042	Musicians and Singers	27-2042	Musicians and Singers	27-2042.02	Musicians, Instrumental	5
347	27-2099	Entertainers and Performers, Sports and Related Workers, All Other	27-2099	Entertainers and Performers, Sports and Related Workers, All Other	27-2099.99	Entertainers and Performers, Sports and Related Workers, All Other	
348	27-3010	Announcers	27-3011	Radio and Television Announcers	27-3011.00	Radio and Television Announcers	2
349	27-3010	Announcers	27-3012	Public Address System and Other Announcers	27-3012.00	Public Address System and Other Announcers	3
350	27-3020	News Analysts, Reporters and Correspondents	27-3021	Broadcast News Analysts	27-3021.00	Broadcast News Analysts	4
351	27-3020	News Analysts, Reporters and Correspondents	27-3022	Reporters and Correspondents	27-3022.00	Reporters and Correspondents	4
352	27-3031	Public Relations Specialists	27-3031	Public Relations Specialists	27-3031.00	Public Relations Specialists	4
353	27-3041	Editors	27-3041	Editors	27-3041.00	Editors	4
354	27-3042	Technical Writers	27-3042	Technical Writers	27-3042.00	Technical Writers	5
355	27-3043	Writers and Authors	27-3043	Writers and Authors	27-3043.00	Writers and Authors	
356	27-3043	Writers and Authors	27-3043	Writers and Authors	27-3043.01	Poets and Lyricists	4
357	27-3043	Writers and	27-3043	Writers and Authors	27-3043.02	Creative Writers	4

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Authors					
358	27-3043	Writers and Authors	27-3043	Writers and Authors	27-3043.03	Caption Writers	3
359	27-3043	Writers and Authors	27-3043	Writers and Authors	27-3043.04	Copy Writers	4
360	27-3091	Interpreters and Translators	27-3091	Interpreters and Translators	27-3091.00	Interpreters and Translators	3
361	27-3099	Media and Communication Workers, All Other	27-3099	Media and Communication Workers, All Other	27-3099.99	Media and Communication Workers, All Other	
362	27-4011	Audio and Video Equipment Technicians	27-4011	Audio and Video Equipment Technicians	27-4011.00	Audio and Video Equipment Technicians	4
363	27-4012	Broadcast Technicians	27-4012	Broadcast Technicians	27-4012.00	Broadcast Technicians	4
364	27-4013	Radio Operators	27-4013	Radio Operators	27-4013.00	Radio Operators	3
365	27-4014	Sound Engineering Technicians	27-4014	Sound Engineering Technicians	27-4014.00	Sound Engineering Technicians	3
366	27-4021	Photographers	27-4021	Photographers	27-4021.00	Photographers	
367	27-4021	Photographers	27-4021	Photographers	27-4021.01	Professional Photographers	3
368	27-4021	Photographers	27-4021	Photographers	27-4021.02	Photographers, Scientific	3
369	27-4031	Camera Operators, Television, Video, and Motion Picture	27-4031	Camera Operators, Television, Video, and Motion Picture	27-4031.00	Camera Operators, Television, Video, and Motion Picture	4
370	27-4032	Film and Video Editors	27-4032	Film and Video Editors	27-4032.00	Film and Video Editors	4
371	27-4099	Media and Communication Equipment Workers, All Other	27-4099	Media and Communication Equipment Workers, All Other	27-4099.99	Media and Communication Equipment Workers, All Other	
372	29-1011	Chiropractors	29-1011	Chiropractors	29-1011.00	Chiropractors	5
373	29-1020	Dentists	29-1021	Dentists, General	29-1021.00	Dentists, General	5
374	29-1020	Dentists	29-1022	Oral and Maxillofacial Surgeons	29-1022.00	Oral and Maxillofacial Surgeons	5
375	29-1020	Dentists	29-1023	Orthodontists	29-1023.00	Orthodontists	5
376	29-1020	Dentists	29-1024	Prosthodontists	29-1024.00	Prosthodontists	5
377	29-1020	Dentists	29-1029	Dentists, All Other Specialists	29-1029.99	Dentists, All Other Specialists	

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
378	29-1031	Dietitians and Nutritionists	29-1031	Dietitians and Nutritionists	29-1031.00	Dietitians and Nutritionists	5
379	29-1041	Optometrists	29-1041	Optometrists	29-1041.00	Optometrists	5
380	29-1051	Pharmacists	29-1051	Pharmacists	29-1051.00	Pharmacists	4
381	29-1061	Anesthesiologists	29-1061	Anesthesiologists	29-1061.00	Anesthesiologists	5
382	29-1062	Family and General Practitioners	29-1062	Family and General Practitioners	29-1062.00	Family and General Practitioners	5
383	29-1063	Internists, General	29-1063	Internists, General	29-1063.00	Internists, General	5
384	29-1064	Obstetricians and Gynecologists	29-1064	Obstetricians and Gynecologists	29-1064.00	Obstetricians and Gynecologists	5
385	29-1065	Pediatricians, General	29-1065	Pediatricians, General	29-1065.00	Pediatricians, General	5
386	29-1066	Psychiatrists	29-1066	Psychiatrists	29-1066.00	Psychiatrists	5
387	29-1067	Surgeons	29-1067	Surgeons	29-1067.00	Surgeons	5
388	29-1199	All Other Health Diagnosing and Treating Practitioners	29-1069	Physicians and Surgeons, All Other	29-1069.99	Physicians and Surgeons, All Other	
389	29-1071	Physician Assistants	29-1071	Physician Assistants	29-1071.00	Physician Assistants	4
390	29-1081	Podiatrists	29-1081	Podiatrists	29-1081.00	Podiatrists	4
391	29-1111	Registered Nurses	29-1111	Registered Nurses	29-1111.00	Registered Nurses	4
392	29-1121	Audiologists	29-1121	Audiologists	29-1121.00	Audiologists	4
393	29-1122	Occupational Therapists	29-1122	Occupational Therapists	29-1122.00	Occupational Therapists	4
394	29-1123	Physical Therapists	29-1123	Physical Therapists	29-1123.00	Physical Therapists	5
395	29-1124	Radiation Therapists	29-1124	Radiation Therapists	29-1124.00	Radiation Therapists	4
396	29-1125	Recreational Therapists	29-1125	Recreational Therapists	29-1125.00	Recreational Therapists	4
397	29-1126	Respiratory Therapists	29-1126	Respiratory Therapists	29-1126.00	Respiratory Therapists	3
398	29-1127	Speech-Language Pathologists	29-1127	Speech-Language Pathologists	29-1127.00	Speech-Language Pathologists	4
399	29-1199	All Other Health Diagnosing and Treating Practitioners	29-1129	Therapists, All Other	29-1129.99	Therapists, All Other	
400	29-1131	Veterinarians	29-1131	Veterinarians	29-1131.00	Veterinarians	5

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
401	29-1199	Health Diagnosing and Treating Practitioners, All Other	29-1199	Health Diagnosing and Treating Practitioners, All Other	29-1199.99	Health Diagnosing and Treating Practitioners, All Other	
402	29-2011	Medical and Clinical Laboratory Technologists	29-2011	Medical and Clinical Laboratory Technologists	29-2011.00	Medical and Clinical Laboratory Technologists	4
403	29-2012	Medical and Clinical Laboratory Technicians	29-2012	Medical and Clinical Laboratory Technicians	29-2012.00	Medical and Clinical Laboratory Technicians	2
404	29-2021	Dental Hygienists	29-2021	Dental Hygienists	29-2021.00	Dental Hygienists	3
405	29-2031	Cardiovascular Technologists and Technicians	29-2031	Cardiovascular Technologists and Technicians	29-2031.00	Cardiovascular Technologists and Technicians	3
406	29-2032	Diagnostic Medical Sonographers	29-2032	Diagnostic Medical Sonographers	29-2032.00	Diagnostic Medical Sonographers	3
407	29-2033	Nuclear Medicine Technologists	29-2033	Nuclear Medicine Technologists	29-2033.00	Nuclear Medicine Technologists	4
408	29-2034	Radiologic Technologists and Technicians	29-2034	Radiologic Technologists and Technicians	29-2034.00	Radiologic Technologists and Technicians	
409	29-2034	Radiologic Technologists and Technicians	29-2034	Radiologic Technologists and Technicians	29-2034.01	Radiologic Technologists	3
410	29-2034	Radiologic Technologists and Technicians	29-2034	Radiologic Technologists and Technicians	29-2034.02	Radiologic Technicians	4
411	29-2041	Emergency Medical Technicians and Paramedics	29-2041	Emergency Medical Technicians and Paramedics	29-2041.00	Emergency Medical Technicians and Paramedics	2
412	29-2051	Dietetic Technicians	29-2051	Dietetic Technicians	29-2051.00	Dietetic Technicians	4
413	29-2052	Pharmacy Technicians	29-2052	Pharmacy Technicians	29-2052.00	Pharmacy Technicians	2
414	29-2053	Psychiatric Technicians	29-2053	Psychiatric Technicians	29-2053.00	Psychiatric Technicians	3
415	29-2054	Respiratory Therapy Technicians	29-2054	Respiratory Therapy Technicians	29-2054.00	Respiratory Therapy Technicians	3
416	29-2055	Surgical Technologists	29-2055	Surgical Technologists	29-2055.00	Surgical Technologists	3

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
417	29-2056	Veterinary Technologists and Technicians	29-2056	Veterinary Technologists and Technicians	29-2056.00	Veterinary Technologists and Technicians	
418	29-2061	Licensed Practical and Licensed Vocational Nurses	29-2061	Licensed Practical and Licensed Vocational Nurses	29-2061.00	Licensed Practical and Licensed Vocational Nurses	3
419	29-2071	Medical Records and Health Information Technicians	29-2071	Medical Records and Health Information Technicians	29-2071.00	Medical Records and Health Information Technicians	3
420	29-2081	Opticians, Dispensing	29-2081	Opticians, Dispensing	29-2081.00	Opticians, Dispensing	4
421	29-2091	Orthotists and Prosthetists	29-2091	Orthotists and Prosthetists	29-2091.00	Orthotists and Prosthetists	3
422	29-9099	All Other Health Professionals and Technicians	29-2099	Health Technologists and Technicians, All Other	29-2099.99	Health Technologists and Technicians, All Other	
423	29-9010	Occupational Health and Safety Specialists and Technicians	29-9011	Occupational Health and Safety Specialists	29-9011.00	Occupational Health and Safety Specialists	5
424	29-9010	Occupational Health and Safety Specialists and Technicians	29-9012	Occupational Health and Safety Technicians	29-9012.00	Occupational Health and Safety Technicians	
425	29-9091	Athletic Trainers	29-9091	Athletic Trainers	29-9091.00	Athletic Trainers	5
426	29-9099	*All Other Health Professionals and Technicians	29-9099	Healthcare Practitioners and Technical Workers, All Other	29-9099.99	Healthcare Practitioners and Technical Workers, All Other	
427	31-1011	Home Health Aides	31-1011	Home Health Aides	31-1011.00	Home Health Aides	1
428	31-1012	Nursing Aides, Orderlies, and Attendants	31-1012	Nursing Aides, Orderlies, and Attendants	31-1012.00	Nursing Aides, Orderlies, and Attendants	2
429	31-1013	Psychiatric Aides	31-1013	Psychiatric Aides	31-1013.00	Psychiatric Aides	2
430	31-2011	Occupational Therapist Assistants	31-2011	Occupational Therapist Assistants	31-2011.00	Occupational Therapist Assistants	2
431	31-2012	Occupational Therapist Aides	31-2012	Occupational Therapist Aides	31-2012.00	Occupational Therapist Aides	2
432	31-2021	Physical Therapist Assistants	31-2021	Physical Therapist Assistants	31-2021.00	Physical Therapist Assistants	2
433	31-2022	Physical Therapist	31-2022	Physical Therapist	31-2022.00	Physical Therapist	2

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Aides		Aides		Aides	
434	31-9011	Massage Therapists	31-9011	Massage Therapists	31-9011.00	Massage Therapists	
435	31-9091	Dental Assistants	31-9091	Dental Assistants	31-9091.00	Dental Assistants	2
436	31-9092	Medical Assistants	31-9092	Medical Assistants	31-9092.00	Medical Assistants	3
437	31-9093	Medical Equipment Preparers	31-9093	Medical Equipment Preparers	31-9093.00	Medical Equipment Preparers	2
438	31-9094	Medical Transcriptionists	31-9094	Medical Transcriptionists	31-9094.00	Medical Transcriptionists	
439	31-9095	Pharmacy Aides	31-9095	Pharmacy Aides	31-9095.00	Pharmacy Aides	
440	31-9096	Veterinary Assistants and Laboratory Animal Caretakers	31-9096	Veterinary Assistants and Laboratory Animal Caretakers	31-9096.00	Veterinary Assistants and Laboratory Animal Caretakers	3
441	31-9099	Healthcare Support Workers, All Other	31-9099	Healthcare Support Workers, All Other	31-9099.99	Healthcare Support Workers, All Other	
442	33-1011	First-Line Supervisors/Managers of Correctional Officers	33-1011	First-Line Supervisors/Managers of Correctional Officers	33-1011.00	First-Line Supervisors/Managers of Correctional Officers	
443	33-1012	First-Line Supervisors/Managers of Police and Detectives	33-1012	First-Line Supervisors/Managers of Police and Detectives	33-1012.00	First-Line Supervisors/Managers of Police and Detectives	4
444	33-1021	First-Line Supervisors/Managers of Fire Fighting and Prevention Workers	33-1021	First-Line Supervisors/Managers of Fire Fighting and Prevention Workers	33-1021.00	First-Line Supervisors/Managers of Fire Fighting and Prevention Workers	
445	33-1021	First-Line Supervisors/Managers of Fire Fighting and Prevention Workers	33-1021	First-Line Supervisors/Managers of Fire Fighting and Prevention Workers	33-1021.01	Municipal Fire Fighting and Prevention Supervisors	4
446	33-1021	First-Line Supervisors/Managers of Fire Fighting and Prevention Workers	33-1021	First-Line Supervisors/Managers of Fire Fighting and Prevention Workers	33-1021.02	Forest Fire Fighting and Prevention Supervisors	5

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
447	33-1099	*First-Line Supervisors/Managers of Protective Service Workers, Except Police, Fire and Corrections	33-1099	First-Line Supervisors/Managers, Protective Service Workers, All Other	33-1099.99	First-Line Supervisors/Managers, Protective Service Workers, All Other	
448	33-2011	Fire Fighters	33-2011	Fire Fighters	33-2011.00	Fire Fighters	
449	33-2011	Fire Fighters	33-2011	Fire Fighters	33-2011.01	Municipal Fire Fighters	2
450	33-2011	Fire Fighters	33-2011	Fire Fighters	33-2011.02	Forest Fire Fighters	2
451	33-2021	Fire Inspectors and Investigators	33-2021	Fire Inspectors and Investigators	33-2021.00	Fire Inspectors and Investigators	
452	33-2021	Fire Inspectors and Investigators	33-2021	Fire Inspectors and Investigators	33-2021.01	Fire Inspectors	2
453	33-2021	Fire Inspectors and Investigators	33-2021	Fire Inspectors and Investigators	33-2021.02	Fire Investigators	4
454	33-2022	Forest Fire Inspectors and Prevention Specialists	33-2022	Forest Fire Inspectors and Prevention Specialists	33-2022.00	Forest Fire Inspectors and Prevention Specialists	2
455	33-3011	Bailiffs	33-3011	Bailiffs	33-3011.00	Bailiffs	1
456	33-3012	Correctional Officers and Jailers	33-3012	Correctional Officers and Jailers	33-3012.00	Correctional Officers and Jailers	2
457	33-3021	Detectives and Criminal Investigators	33-3021	Detectives and Criminal Investigators	33-3021.00	Detectives and Criminal Investigators	
458	33-3021	Detectives and Criminal Investigators	33-3021	Detectives and Criminal Investigators	33-3021.01	Police Detectives	4
459	33-3021	Detectives and Criminal Investigators	33-3021	Detectives and Criminal Investigators	33-3021.02	Police Identification and Records Officers	3
460	33-3021	Detectives and Criminal Investigators	33-3021	Detectives and Criminal Investigators	33-3021.03	Criminal Investigators and Special Agents	4
461	33-3021	Detectives and Criminal Investigators	33-3021	Detectives and Criminal Investigators	33-3021.04	Child Support, Missing Persons, and Unemployment Insurance Fraud Investigators	4
462	33-3021	Detectives and Criminal Investigators	33-3021	Detectives and Criminal Investigators	33-3021.05	Immigration and Customs Inspectors	3

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
463	33-3031	Fish and Game Wardens	33-3031	Fish and Game Wardens	33-3031.00	Fish and Game Wardens	3
464	33-3041	Parking Enforcement Workers	33-3041	Parking Enforcement Workers	33-3041.00	Parking Enforcement Workers	1
465	33-3051	Police and Sheriff's Patrol Officers	33-3051	Police and Sheriff's Patrol Officers	33-3051.00	Police and Sheriff's Patrol Officers	
466	33-3051	Police and Sheriff's Patrol Officers	33-3051	Police and Sheriff's Patrol Officers	33-3051.01	Police Patrol Officers	3
467	33-3051	Police and Sheriff's Patrol Officers	33-3051	Police and Sheriff's Patrol Officers	33-3051.02	Highway Patrol Pilots	3
468	33-3051	Police and Sheriff's Patrol Officers	33-3051	Police and Sheriff's Patrol Officers	33-3051.03	Sheriffs and Deputy Sheriffs	2
469	33-3052	Transit and Railroad Police	33-3052	Transit and Railroad Police	33-3052.00	Transit and Railroad Police	2
470	33-9011	Animal Control Workers	33-9011	Animal Control Workers	33-9011.00	Animal Control Workers	2
471	33-9021	Private Detectives and Investigators	33-9021	Private Detectives and Investigators	33-9021.00	Private Detectives and Investigators	2
472	33-9031	Gaming Surveillance Officers and Gaming Investigators	33-9031	Gaming Surveillance Officers and Gaming Investigators	33-9031.00	Gaming Surveillance Officers and Gaming Investigators	
473	33-9032	Security Guards	33-9032	Security Guards	33-9032.00	Security Guards	1
474	33-9091	Crossing Guards	33-9091	Crossing Guards	33-9091.00	Crossing Guards	1
475	33-9099	All Other Protective Service Workers	33-9092	Lifeguards, Ski Patrol, and Other Recreational Protective Service Workers	33-9092.00	Lifeguards, Ski Patrol, and Other Recreational Protective Service Workers	2
476	33-9099	Protective Service Workers, All Other	33-9099	Protective Service Workers, All Other	33-9099.99	Protective Service Workers, All Other	
477	35-1011	Chefs and Head Cooks	35-1011	Chefs and Head Cooks	35-1011.00	Chefs and Head Cooks	4
478	35-1012	First-Line Supervisors/Managers of Food Preparation and Serving Workers	35-1012	First-Line Supervisors/Managers of Food Preparation and Serving Workers	35-1012.00	First-Line Supervisors/Managers of Food Preparation and Serving Workers	3

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
479	35-2011	Cooks, Fast Food	35-2011	Cooks, Fast Food	35-2011.00	Cooks, Fast Food	2
480	35-2012	Cooks, Institution and Cafeteria	35-2012	Cooks, Institution and Cafeteria	35-2012.00	Cooks, Institution and Cafeteria	2
481	na.		35-2013	Cooks, Private Household	35-2013.00	Cooks, Private Household	
482	35-2014	Cooks, Restaurant	35-2014	Cooks, Restaurant	35-2014.00	Cooks, Restaurant	3
483	35-2015	Cooks, Short Order	35-2015	Cooks, Short Order	35-2015.00	Cooks, Short Order	1
484	35-9099	All Other Food Preparation and Serving Related Workers	35-2019	Cooks, All Other	35-2019.99	Cooks, All Other	
485	35-2021	Food Preparation Workers	35-2021	Food Preparation Workers	35-2021.00	Food Preparation Workers	1
486	35-3011	Bartenders	35-3011	Bartenders	35-3011.00	Bartenders	1
487	35-3021	Combined Food Preparation and Serving Workers, Including Fast Food	35-3021	Combined Food Preparation and Serving Workers, Including Fast Food	35-3021.00	Combined Food Preparation and Serving Workers, Including Fast Food	1
488	35-3022	Counter Attendants, Cafeteria, Food Concession, and Coffee Shop	35-3022	Counter Attendants, Cafeteria, Food Concession, and Coffee Shop	35-3022.00	Counter Attendants, Cafeteria, Food Concession, and Coffee Shop	1
489	35-3031	Waiters and Waitresses	35-3031	Waiters and Waitresses	35-3031.00	Waiters and Waitresses	1
490	35-3041	Food Servers, Nonrestaurant	35-3041	Food Servers, Nonrestaurant	35-3041.00	Food Servers, Nonrestaurant	1
491	35-9011	Dining Room and Cafeteria Attendants and Bartender Helpers	35-9011	Dining Room and Cafeteria Attendants and Bartender Helpers	35-9011.00	Dining Room and Cafeteria Attendants and Bartender Helpers	1
492	35-9021	Dishwashers	35-9021	Dishwashers	35-9021.00	Dishwashers	1
493	35-9031	Hosts and Hostesses, Restaurant, Lounge, and Coffee Shop	35-9031	Hosts and Hostesses, Restaurant, Lounge, and Coffee Shop	35-9031.00	Hosts and Hostesses, Restaurant, Lounge, and Coffee Shop	3
494	35-9099	Food Preparation and Serving Related Workers, All Other	35-9099	Food Preparation and Serving Related Workers, All Other	35-9099.99	Food Preparation and Serving Related Workers, All Other	
495	37-1011	First-Line Supervisors/Managers	37-1011	First-Line Supervisors/Managers	37-1011.00	First-Line Supervisors/Managers	

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		gers of Housekeeping and Janitorial Workers		of Housekeeping and Janitorial Workers		gers of Housekeeping and Janitorial Workers	
496	37-1011	First-Line Supervisors/Managers of Housekeeping and Janitorial Workers	37-1011	First-Line Supervisors/Managers of Housekeeping and Janitorial Workers	37-1011.01	Housekeeping Supervisors	4
497	37-1011	First-Line Supervisors/Managers of Housekeeping and Janitorial Workers	37-1011	First-Line Supervisors/Managers of Housekeeping and Janitorial Workers	37-1011.02	Janitorial Supervisors	3
498	37-1012	First-Line Supervisors/Managers of Landscaping, Lawn Service, and Groundskeeping Workers	37-1012	First-Line Supervisors/Managers of Landscaping, Lawn Service, and Groundskeeping Workers	37-1012.00	First-Line Supervisors/Managers of Landscaping, Lawn Service, and Groundskeeping Workers	
499	37-1012	First-Line Supervisors/Managers of Landscaping, Lawn Service, and Groundskeeping Workers	37-1012	First-Line Supervisors/Managers of Landscaping, Lawn Service, and Groundskeeping Workers	37-1012.01	Lawn Service Managers	4
500	37-1012	First-Line Supervisors/Managers of Landscaping, Lawn Service, and Groundskeeping Workers	37-1012	First-Line Supervisors/Managers of Landscaping, Lawn Service, and Groundskeeping Workers	37-1012.02	First-Line Supervisors and Manager/Supervisors - Landscaping Workers	3
501	37-2011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	37-2011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	37-2011.00	Janitors and Cleaners, Except Maids and Housekeeping Cleaners	1
502	37-2012	Maids and Housekeeping Cleaners	37-2012	Maids and Housekeeping Cleaners	37-2012.00	Maids and Housekeeping Cleaners	1
503	37-9099	All Other Building and Grounds Cleaning and Maintenance Workers	37-2019	Building Cleaning Workers, All Other	37-2019.99	Building Cleaning Workers, All Other	

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
504	37-2021	Pest Control Workers	37-2021	Pest Control Workers	37-2021.00	Pest Control Workers	2
505	37-3011	Landscaping and Groundskeeping Workers	37-3011	Landscaping and Groundskeeping Workers	37-3011.00	Landscaping and Groundskeeping Workers	1
506	37-3012	Pesticide Handlers, Sprayers, and Applicators, Vegetation	37-3012	Pesticide Handlers, Sprayers, and Applicators, Vegetation	37-3012.00	Pesticide Handlers, Sprayers, and Applicators, Vegetation	2
507	37-3013	Tree Trimmers and Pruners	37-3013	Tree Trimmers and Pruners	37-3013.00	Tree Trimmers and Pruners	2
508	37-9099	All Other Building and Grounds Cleaning and Maintenance Workers	37-3019	Grounds Maintenance Workers, All Other	37-3019.99	Grounds Maintenance Workers, All Other	
509	39-1011	Gaming Supervisors	39-1011	Gaming Supervisors	39-1011.00	Gaming Supervisors	3
510	39-1012	Slot Key Persons	39-1012	Slot Key Persons	39-1012.00	Slot Key Persons	
511	39-1021	First-Line Supervisors/Managers of Personal Service Workers	39-1021	First-Line Supervisors/Managers of Personal Service Workers	39-1021.00	First-Line Supervisors/Managers of Personal Service Workers	3
512	39-2011	Animal Trainers	39-2011	Animal Trainers	39-2011.00	Animal Trainers	3
513	39-2021	Nonfarm Animal Caretakers	39-2021	Nonfarm Animal Caretakers	39-2021.00	Nonfarm Animal Caretakers	1
514	39-3011	Gaming Dealers	39-3011	Gaming Dealers	39-3011.00	Gaming Dealers	2
515	39-3012	Gaming and Sports Book Writers and Runners	39-3012	Gaming and Sports Book Writers and Runners	39-3012.00	Gaming and Sports Book Writers and Runners	2
516	39-3099	All Other Gaming Service Workers	39-3019	Gaming Service Workers, All Other	39-3019.99	Gaming Service Workers, All Other	
517	39-3021	Motion Picture Projectionists	39-3021	Motion Picture Projectionists	39-3021.00	Motion Picture Projectionists	2
518	39-3031	Ushers, Lobby Attendants, and Ticket Takers	39-3031	Ushers, Lobby Attendants, and Ticket Takers	39-3031.00	Ushers, Lobby Attendants, and Ticket Takers	1
519	39-3091	Amusement and Recreation Attendants	39-3091	Amusement and Recreation Attendants	39-3091.00	Amusement and Recreation Attendants	1
520	39-3092	Costume Attendants	39-3092	Costume Attendants	39-3092.00	Costume Attendants	4
521	39-3093	Locker Room, Coatroom, and	39-3093	Locker Room, Coatroom, and	39-3093.00	Locker Room, Coatroom, and	1

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Dressing Room Attendants		Dressing Room Attendants		Dressing Room Attendants	
522	39-3099	*All Other Gaming Service Workers	39-3099	Entertainment Attendants and Related Workers, All Other	39-3099.99	Entertainment Attendants and Related Workers, All Other	
523	39-4011	Embalmers	39-4011	Embalmers	39-4011.00	Embalmers	4
524	39-4021	Funeral Attendants	39-4021	Funeral Attendants	39-4021.00	Funeral Attendants	1
525	39-5011	Barbers	39-5011	Barbers	39-5011.00	Barbers	3
526	39-5012	Hairdressers, Hairstylists, and Cosmetologists	39-5012	Hairdressers, Hairstylists, and Cosmetologists	39-5012.00	Hairdressers, Hairstylists, and Cosmetologists	3
527	39-5091	Makeup Artists, Theatrical and Performance	39-5091	Makeup Artists, Theatrical and Performance	39-5091.00	Makeup Artists, Theatrical and Performance	2
528	39-5092	Manicurists and Pedicurists	39-5092	Manicurists and Pedicurists	39-5092.00	Manicurists and Pedicurists	1
529	39-5093	Shampooers	39-5093	Shampooers	39-5093.00	Shampooers	
530	39-5094	Skin Care Specialists	39-5094	Skin Care Specialists	39-5094.00	Skin Care Specialists	
531	39-6011	Baggage Porters and Bellhops	39-6011	Baggage Porters and Bellhops	39-6011.00	Baggage Porters and Bellhops	1
532	39-6012	Concierges	39-6012	Concierges	39-6012.00	Concierges	
533	39-6021	Tour Guides and Escorts	39-6021	Tour Guides and Escorts	39-6021.00	Tour Guides and Escorts	1
534	39-6022	Travel Guides	39-6022	Travel Guides	39-6022.00	Travel Guides	2
535	39-6031	Flight Attendants	39-6031	Flight Attendants	39-6031.00	Flight Attendants	2
536	39-6032	Transportation Attendants, Except Flight Attendants and Baggage Porters	39-6032	Transportation Attendants, Except Flight Attendants and Baggage Porters	39-6032.00	Transportation Attendants, Except Flight Attendants and Baggage Porters	1
537	39-9011	Child Care Workers	39-9011	Child Care Workers	39-9011.00	Child Care Workers	1
538	39-9021	Personal and Home Care Aides	39-9021	Personal and Home Care Aides	39-9021.00	Personal and Home Care Aides	2
539	39-9031	Fitness Trainers and Aerobics Instructors	39-9031	Fitness Trainers and Aerobics Instructors	39-9031.00	Fitness Trainers and Aerobics Instructors	3
540	39-9032	Recreation Workers	39-9032	Recreation Workers	39-9032.00	Recreation Workers	3
541	39-9041	Residential Advisors	39-9041	Residential Advisors	39-9041.00	Residential Advisors	3

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
542	39-9099	Personal Care and Service Workers, All Other	39-9099	Personal Care and Service Workers, All Other	39-9099.99	Personal Care and Service Workers, All Other	
543	41-1011	First-Line Supervisors/Managers of Retail Sales Workers	41-1011	First-Line Supervisors/Managers of Retail Sales Workers	41-1011.00	First-Line Supervisors/Managers of Retail Sales Workers	2
544	41-1012	First-Line Supervisors/Managers of Non-Retail Sales Workers	41-1012	First-Line Supervisors/Managers of Non-Retail Sales Workers	41-1012.00	First-Line Supervisors/Managers of Non-Retail Sales Workers	3
545	41-2011	Cashiers	41-2011	Cashiers	41-2011.00	Cashiers	1
546	41-2012	Gaming Change Persons and Booth Cashiers	41-2012	Gaming Change Persons and Booth Cashiers	41-2012.00	Gaming Change Persons and Booth Cashiers	
547	41-2021	Counter and Rental Clerks	41-2021	Counter and Rental Clerks	41-2021.00	Counter and Rental Clerks	1
548	41-2022	Parts Salespersons	41-2022	Parts Salespersons	41-2022.00	Parts Salespersons	2
549	41-2031	Retail Salespersons	41-2031	Retail Salespersons	41-2031.00	Retail Salespersons	2
550	41-3011	Advertising Sales Agents	41-3011	Advertising Sales Agents	41-3011.00	Advertising Sales Agents	3
551	41-3021	Insurance Sales Agents	41-3021	Insurance Sales Agents	41-3021.00	Insurance Sales Agents	3
552	41-3031	Securities, Commodities, and Financial Services Sales Agents	41-3031	Securities, Commodities, and Financial Services Sales Agents	41-3031.00	Securities, Commodities, and Financial Services Sales Agents	
553	41-3031	Securities, Commodities, and Financial Services Sales Agents	41-3031	Securities, Commodities, and Financial Services Sales Agents	41-3031.01	Sales Agents, Securities and Commodities	4
554	41-3031	Securities, Commodities, and Financial Services Sales Agents	41-3031	Securities, Commodities, and Financial Services Sales Agents	41-3031.02	Sales Agents, Financial Services	3
555	41-3041	Travel Agents	41-3041	Travel Agents	41-3041.00	Travel Agents	3
556	41-9099	All Other Sales and Related Workers	41-3099	Sales Representatives, Services, All Other	41-3099.99	Sales Representatives, Services, All Other	
557	41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and	41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	41-4011.00	Sales Representatives, Wholesale and Manufacturing, Technical and	

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Scientific Products				Scientific Products	
558	41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	41-4011.01	Sales Representatives, Agricultural	2
559	41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	41-4011.02	Sales Representatives, Chemical and Pharmaceutical	3
560	41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	41-4011.03	Sales Representatives, Electrical/Electronic	2
561	41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	41-4011.04	Sales Representatives, Mechanical Equipment and Supplies	2
562	41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	41-4011.05	Sales Representatives, Medical	3
563	41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	41-4011.06	Sales Representatives, Instruments	3
564	41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	41-4012.00	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products	2
565	41-9011	Demonstrators and Product Promoters	41-9011	Demonstrators and Product Promoters	41-9011.00	Demonstrators and Product Promoters	1

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
566	41-9012	Models	41-9012	Models	41-9012.00	Models	1
567	41-9021	Real Estate Brokers	41-9021	Real Estate Brokers	41-9021.00	Real Estate Brokers	
568	41-9022	Real Estate Sales Agents	41-9022	Real Estate Sales Agents	41-9022.00	Real Estate Sales Agents	2
569	41-9031	Sales Engineers	41-9031	Sales Engineers	41-9031.00	Sales Engineers	5
570	41-9041	Telemarketers	41-9041	Telemarketers	41-9041.00	Telemarketers	1
571	41-9091	Door-To-Door Sales Workers, News and Street Vendors, and Related Workers	41-9091	Door-To-Door Sales Workers, News and Street Vendors, and Related Workers	41-9091.00	Door-To-Door Sales Workers, News and Street Vendors, and Related Workers	1
572	41-9099	Sales and Related Workers, All Other	41-9099	Sales and Related Workers, All Other	41-9099.99	Sales and Related Workers, All Other	
573	43-1011	First-Line Supervisors/Managers of Office and Administrative Support Workers	43-1011	First-Line Supervisors/Managers of Office and Administrative Support Workers	43-1011.00	First-Line Supervisors/Managers of Office and Administrative Support Workers	
574	43-1011	First-Line Supervisors/Managers of Office and Administrative Support Workers	43-1011	First-Line Supervisors/Managers of Office and Administrative Support Workers	43-1011.01	First-Line Supervisors, Customer Service	3
575	43-1011	First-Line Supervisors/Managers of Office and Administrative Support Workers	43-1011	First-Line Supervisors/Managers of Office and Administrative Support Workers	43-1011.02	First-Line Supervisors, Administrative Support	3
576	43-2011	Switchboard Operators, Including Answering Service	43-2011	Switchboard Operators, Including Answering Service	43-2011.00	Switchboard Operators, Including Answering Service	1
577	43-2021	Telephone Operators	43-2021	Telephone Operators	43-2021.00	Telephone Operators	
578	43-2021	Telephone Operators	43-2021	Telephone Operators	43-2021.01	Directory Assistance Operators	1
579	43-2021	Telephone Operators	43-2021	Telephone Operators	43-2021.02	Central Office Operators	1
580	43-2099	Communications Equipment Operators, All Other	43-2099	Communications Equipment Operators, All Other	43-2099.99	Communications Equipment Operators, All Other	

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
581	43-3011	Bill and Account Collectors	43-3011	Bill and Account Collectors	43-3011.00	Bill and Account Collectors	2
582	43-3021	Billing and Posting Clerks and Machine Operators	43-3021	Billing and Posting Clerks and Machine Operators	43-3021.00	Billing and Posting Clerks and Machine Operators	
583	43-3021	Billing and Posting Clerks and Machine Operators	43-3021	Billing and Posting Clerks and Machine Operators	43-3021.01	Statement Clerks	2
584	43-3021	Billing and Posting Clerks and Machine Operators	43-3021	Billing and Posting Clerks and Machine Operators	43-3021.02	Billing, Cost, and Rate Clerks	2
585	43-3021	Billing and Posting Clerks and Machine Operators	43-3021	Billing and Posting Clerks and Machine Operators	43-3021.03	Billing, Posting, and Calculating Machine Operators	1
586	43-3031	Bookkeeping, Accounting, and Auditing Clerks	43-3031	Bookkeeping, Accounting, and Auditing Clerks	43-3031.00	Bookkeeping, Accounting, and Auditing Clerks	2
587	43-3041	Gaming Cage Workers	43-3041	Gaming Cage Workers	43-3041.00	Gaming Cage Workers	
588	43-3051	Payroll and Timekeeping Clerks	43-3051	Payroll and Timekeeping Clerks	43-3051.00	Payroll and Timekeeping Clerks	2
589	43-3061	Procurement Clerks	43-3061	Procurement Clerks	43-3061.00	Procurement Clerks	1
590	43-3071	Tellers	43-3071	Tellers	43-3071.00	Tellers	2
591	43-4011	Brokerage Clerks	43-4011	Brokerage Clerks	43-4011.00	Brokerage Clerks	2
592	43-4021	Correspondence Clerks	43-4021	Correspondence Clerks	43-4021.00	Correspondence Clerks	2
593	43-4031	Court, Municipal, and License Clerks	43-4031	Court, Municipal, and License Clerks	43-4031.00	Court, Municipal, and License Clerks	
594	43-4031	Court, Municipal, and License Clerks	43-4031	Court, Municipal, and License Clerks	43-4031.01	Court Clerks	3
595	43-4031	Court, Municipal, and License Clerks	43-4031	Court, Municipal, and License Clerks	43-4031.02	Municipal Clerks	2
596	43-4031	Court, Municipal, and License Clerks	43-4031	Court, Municipal, and License Clerks	43-4031.03	License Clerks	2
597	43-4041	Credit Authorizers, Checkers, and Clerks	43-4041	Credit Authorizers, Checkers, and Clerks	43-4041.00	Credit Authorizers, Checkers, and Clerks	
598	43-4041	Credit Authorizers, Checkers, and Clerks	43-4041	Credit Authorizers, Checkers, and Clerks	43-4041.01	Credit Authorizers	1
599	43-4041	Credit	43-4041	Credit Authorizers,	43-4041.02	Credit Checkers	1

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Authorizers, Checkers, and Clerks		Checkers, and Clerks			
600	43-4051	Customer Service Representatives	43-4051	Customer Service Representatives	43-4051.00	Customer Service Representatives	
601	43-4051	Customer Service Representatives	43-4051	Customer Service Representatives	43-4051.01	Adjustment Clerks	2
602	43-4051	Customer Service Representatives	43-4051	Customer Service Representatives	43-4051.02	Customer Service Representatives, Utilities	2
603	43-4061	Eligibility Interviewers, Government Programs	43-4061	Eligibility Interviewers, Government Programs	43-4061.00	Eligibility Interviewers, Government Programs	
604	43-4061	Eligibility Interviewers, Government Programs	43-4061	Eligibility Interviewers, Government Programs	43-4061.01	Claims Takers, Unemployment Benefits	2
605	43-4061	Eligibility Interviewers, Government Programs	43-4061	Eligibility Interviewers, Government Programs	43-4061.02	Welfare Eligibility Workers and Interviewers	2
606	43-4071	File Clerks	43-4071	File Clerks	43-4071.00	File Clerks	1
607	43-4081	Hotel, Motel, and Resort Desk Clerks	43-4081	Hotel, Motel, and Resort Desk Clerks	43-4081.00	Hotel, Motel, and Resort Desk Clerks	2
608	43-4111	Interviewers, Except Eligibility and Loan	43-4111	Interviewers, Except Eligibility and Loan	43-4111.00	Interviewers, Except Eligibility and Loan	1
609	43-4121	Library Assistants, Clerical	43-4121	Library Assistants, Clerical	43-4121.00	Library Assistants, Clerical	1
610	43-4131	Loan Interviewers and Clerks	43-4131	Loan Interviewers and Clerks	43-4131.00	Loan Interviewers and Clerks	2
611	43-4141	New Accounts Clerks	43-4141	New Accounts Clerks	43-4141.00	New Accounts Clerks	2
612	43-4151	Order Clerks	43-4151	Order Clerks	43-4151.00	Order Clerks	2
613	43-4161	Human Resources Assistants, Except Payroll and Timekeeping	43-4161	Human Resources Assistants, Except Payroll and Timekeeping	43-4161.00	Human Resources Assistants, Except Payroll and Timekeeping	2
614	43-4171	Receptionists and Information Clerks	43-4171	Receptionists and Information Clerks	43-4171.00	Receptionists and Information Clerks	2
615	43-4181	Reservation and Transportation Ticket Agents and	43-4181	Reservation and Transportation Ticket Agents and Travel	43-4181.00	Reservation and Transportation Ticket Agents and	

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Travel Clerks		Clerks		Travel Clerks	
616	43-4181	Reservation and Transportation Ticket Agents and Travel Clerks	43-4181	Reservation and Transportation Ticket Agents and Travel Clerks	43-4181.01	Travel Clerks	2
617	43-4181	Reservation and Transportation Ticket Agents and Travel Clerks	43-4181	Reservation and Transportation Ticket Agents and Travel Clerks	43-4181.02	Reservation and Transportation Ticket Agents	2
618	43-4999	All Other Financial, Information, and Record Clerks	43-4199	Information and Record Clerks, All Other	43-4199.99	Information and Record Clerks, All Other	
619	43-5011	Cargo and Freight Agents	43-5011	Cargo and Freight Agents	43-5011.00	Cargo and Freight Agents	2
620	43-5021	Couriers and Messengers	43-5021	Couriers and Messengers	43-5021.00	Couriers and Messengers	1
621	43-5031	Police, Fire, and Ambulance Dispatchers	43-5031	Police, Fire, and Ambulance Dispatchers	43-5031.00	Police, Fire, and Ambulance Dispatchers	2
622	43-5032	Dispatchers, Except Police, Fire, and Ambulance	43-5032	Dispatchers, Except Police, Fire, and Ambulance	43-5032.00	Dispatchers, Except Police, Fire, and Ambulance	2
623	43-5041	Meter Readers, Utilities	43-5041	Meter Readers, Utilities	43-5041.00	Meter Readers, Utilities	1
624	43-5051	Postal Service Clerks	43-5051	Postal Service Clerks	43-5051.00	Postal Service Clerks	2
625	43-5052	Postal Service Mail Carriers	43-5052	Postal Service Mail Carriers	43-5052.00	Postal Service Mail Carriers	1
626	43-5053	Postal Service Mail Sorters, Processors, and Processing Machine Operators	43-5053	Postal Service Mail Sorters, Processors, and Processing Machine Operators	43-5053.00	Postal Service Mail Sorters, Processors, and Processing Machine Operators	
627	43-5061	Production, Planning, and Expediting Clerks	43-5061	Production, Planning, and Expediting Clerks	43-5061.00	Production, Planning, and Expediting Clerks	2
628	43-5071	Shipping, Receiving, and Traffic Clerks	43-5071	Shipping, Receiving, and Traffic Clerks	43-5071.00	Shipping, Receiving, and Traffic Clerks	1
629	43-5081	Stock Clerks and Order Fillers	43-5081	Stock Clerks and Order Fillers	43-5081.00	Stock Clerks and Order Fillers	
630	43-5081	Stock Clerks and Order Fillers	43-5081	Stock Clerks and Order Fillers	43-5081.01	Stock Clerks, Sales Floor	1

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
631	43-5081	Stock Clerks and Order Fillers	43-5081	Stock Clerks and Order Fillers	43-5081.02	Marking Clerks	1
632	43-5081	Stock Clerks and Order Fillers	43-5081	Stock Clerks and Order Fillers	43-5081.03	Stock Clerks-Stockroom, Warehouse, or Storage Yard	2
633	43-5081	Stock Clerks and Order Fillers	43-5081	Stock Clerks and Order Fillers	43-5081.04	Order Fillers, Wholesale and Retail Sales	2
634	43-5111	Weighers, Measurers, Checkers, and Samplers, Recordkeeping	43-5111	Weighers, Measurers, Checkers, and Samplers, Recordkeeping	43-5111.00	Weighers, Measurers, Checkers, and Samplers, Recordkeeping	1
635	43-6011	Executive Secretaries and Administrative Assistants	43-6011	Executive Secretaries and Administrative Assistants	43-6011.00	Executive Secretaries and Administrative Assistants	4
636	43-6012	Legal Secretaries	43-6012	Legal Secretaries	43-6012.00	Legal Secretaries	3
637	43-6013	Medical Secretaries	43-6013	Medical Secretaries	43-6013.00	Medical Secretaries	2
638	43-6014	Secretaries, Except Legal, Medical, and Executive	43-6014	Secretaries, Except Legal, Medical, and Executive	43-6014.00	Secretaries, Except Legal, Medical, and Executive	2
639	43-9011	Computer Operators	43-9011	Computer Operators	43-9011.00	Computer Operators	3
640	43-9021	Data Entry Keyers	43-9021	Data Entry Keyers	43-9021.00	Data Entry Keyers	2
641	43-9022	Word Processors and Typists	43-9022	Word Processors and Typists	43-9022.00	Word Processors and Typists	2
642	43-9031	Desktop Publishers	43-9031	Desktop Publishers	43-9031.00	Desktop Publishers	4
643	43-9041	Insurance Claims and Policy Processing Clerks	43-9041	Insurance Claims and Policy Processing Clerks	43-9041.00	Insurance Claims and Policy Processing Clerks	
644	43-9041	Insurance Claims and Policy Processing Clerks	43-9041	Insurance Claims and Policy Processing Clerks	43-9041.01	Insurance Claims Clerks	2
645	43-9041	Insurance Claims and Policy Processing Clerks	43-9041	Insurance Claims and Policy Processing Clerks	43-9041.02	Insurance Policy Processing Clerks	2
646	43-9051	Mail Clerks and Mail Machine Operators, Except Postal Service	43-9051	Mail Clerks and Mail Machine Operators, Except Postal Service	43-9051.00	Mail Clerks and Mail Machine Operators, Except Postal Service	

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
647	43-9051	Mail Clerks and Mail Machine Operators, Except Postal Service	43-9051	Mail Clerks and Mail Machine Operators, Except Postal Service	43-9051.01	Mail Machine Operators, Preparation and Handling	1
648	43-9051	Mail Clerks and Mail Machine Operators, Except Postal Service	43-9051	Mail Clerks and Mail Machine Operators, Except Postal Service	43-9051.02	Mail Clerks, Except Mail Machine Operators and Postal Service	1
649	43-9061	Office Clerks, General	43-9061	Office Clerks, General	43-9061.00	Office Clerks, General	2
650	43-9071	Office Machine Operators, Except Computer	43-9071	Office Machine Operators, Except Computer	43-9071.00	Office Machine Operators, Except Computer	
651	43-9071	Office Machine Operators, Except Computer	43-9071	Office Machine Operators, Except Computer	43-9071.01	Duplicating Machine Operators	1
652	43-9081	Proofreaders and Copy Markers	43-9081	Proofreaders and Copy Markers	43-9081.00	Proofreaders and Copy Markers	2
653	43-9111	Statistical Assistants	43-9111	Statistical Assistants	43-9111.00	Statistical Assistants	2
654	43-9999	All Other Secretaries, Administrative Assistants, and Other Office Support Workers	43-9199	Office and Administrative Support Workers, All Other	43-9199.99	Office and Administrative Support Workers, All Other	
655	45-1011	First-Line Supervisors/Managers of Farming, Fishing, and Forestry Workers	45-1011	First-Line Supervisors/Managers of Farming, Fishing, and Forestry Workers	45-1011.00	First-Line Supervisors/Managers of Farming, Fishing, and Forestry Workers	
656	45-1011	First-Line Supervisors/Managers of Farming, Fishing, and Forestry Workers	45-1011	First-Line Supervisors/Managers of Farming, Fishing, and Forestry Workers	45-1011.01	First-Line Supervisors and Manager/Supervisors - Agricultural Crop Workers	3
657	45-1011	First-Line Supervisors/Managers of Farming, Fishing, and Forestry Workers	45-1011	First-Line Supervisors/Managers of Farming, Fishing, and Forestry Workers	45-1011.02	First-Line Supervisors and Manager/Supervisors - Animal Husbandry Workers	3
658	45-1011	First-Line Supervisors/Managers of Farming, Fishing, and Forestry Workers	45-1011	First-Line Supervisors/Managers of Farming, Fishing, and Forestry Workers	45-1011.03	First-Line Supervisors and Manager/Supervisors - Animal Care Workers, Except	3

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
						Livestock	
659	45-1011	First-Line Supervisors/Managers of Farming, Fishing, and Forestry Workers	45-1011	First-Line Supervisors/Managers of Farming, Fishing, and Forestry Workers	45-1011.04	First-Line Supervisors and Manager/Supervisors - Horticultural Workers	3
660	45-1011	First-Line Supervisors/Managers of Farming, Fishing, and Forestry Workers	45-1011	First-Line Supervisors/Managers of Farming, Fishing, and Forestry Workers	45-1011.05	First-Line Supervisors and Manager/Supervisors - Logging Workers	4
661	45-1011	First-Line Supervisors/Managers of Farming, Fishing, and Forestry Workers	45-1011	First-Line Supervisors/Managers of Farming, Fishing, and Forestry Workers	45-1011.06	First-Line Supervisors and Manager/Supervisors - Fishery Workers	3
662	45-2011	Agricultural Inspectors	45-2011	Agricultural Inspectors	45-2011.00	Agricultural Inspectors	4
663	45-2021	Animal Breeders	45-2021	Animal Breeders	45-2021.00	Animal Breeders	3
664	45-1012	Farm Labor Contractors	45-1012	Farm Labor Contractors	45-1012.00	Farm Labor Contractors	
665	45-2041	Graders and Sorters, Agricultural Products	45-2041	Graders and Sorters, Agricultural Products	45-2041.00	Graders and Sorters, Agricultural Products	1
666	45-2091	Agricultural Equipment Operators	45-2091	Agricultural Equipment Operators	45-2091.00	Agricultural Equipment Operators	2
667	45-2092	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	45-2092	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	45-2092.00	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	
668	45-2092	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	45-2092	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	45-2092.01	Nursery Workers	1
669	45-2092	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	45-2092	Farmworkers and Laborers, Crop, Nursery, and Greenhouse	45-2092.02	General Farmworkers	1
670	45-2093	Farmworkers, Farm and Ranch Animals	45-2093	Farmworkers, Farm and Ranch Animals	45-2093.00	Farmworkers, Farm and Ranch Animals	1
671	na	All Other Farming, Fishing, and	45-2099	Agricultural Workers, All Other	45-2099.99	Agricultural Workers, All Other	

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Forestry Workers					
672	na	All Other Farming, Fishing, and Forestry Workers	45-3011	Fishers and Related Fishing Workers	45-3011.00	Fishers and Related Fishing Workers	1
673	na	All Other Farming, Fishing, and Forestry Workers	45-3021	Hunters and Trappers	45-3021.00	Hunters and Trappers	2
674	45-4011	Forest and Conservation Workers	45-4011	Forest and Conservation Workers	45-4011.00	Forest and Conservation Workers	1
675	45-4021	Fallers	45-4021	Fallers	45-4021.00	Fallers	1
676	45-4022	Logging Equipment Operators	45-4022	Logging Equipment Operators	45-4022.00	Logging Equipment Operators	
677	45-4022	Logging Equipment Operators	45-4022	Logging Equipment Operators	45-4022.01	Logging Tractor Operators	2
678	45-4023	Log Graders and Scalers	45-4023	Log Graders and Scalers	45-4023.00	Log Graders and Scalers	2
679	na	All Other Farming, Fishing, and Forestry Workers	45-4029	Logging Workers, All Other	45-4029.99	Logging Workers, All Other	
680	47-1011	First-Line Supervisors/Managers of Construction Trades and Extraction Workers	47-1011	First-Line Supervisors/Managers of Construction Trades and Extraction Workers	47-1011.00	First-Line Supervisors/Managers of Construction Trades and Extraction Workers	
681	47-1011	First-Line Supervisors/Managers of Construction Trades and Extraction Workers	47-1011	First-Line Supervisors/Managers of Construction Trades and Extraction Workers	47-1011.01	First-Line Supervisors and Manager/Supervisors- Construction Trades Workers	4
682	47-1011	First-Line Supervisors/Managers of Construction Trades and Extraction Workers	47-1011	First-Line Supervisors/Managers of Construction Trades and Extraction Workers	47-1011.02	First-Line Supervisors and Manager/Supervisors- Extractive Workers	3
683	47-2011	Boilermakers	47-2011	Boilermakers	47-2011.00	Boilermakers	4
684	47-2021	Brickmasons and Blockmasons	47-2021	Brickmasons and Blockmasons	47-2021.00	Brickmasons and Blockmasons	3

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
685	47-2022	Stonemasons	47-2022	Stonemasons	47-2022.00	Stonemasons	4
686	47-2031	Carpenters	47-2031	Carpenters	47-2031.00	Carpenters	
687	47-2031	Carpenters	47-2031	Carpenters	47-2031.01	Construction Carpenters	3
688	47-2031	Carpenters	47-2031	Carpenters	47-2031.02	Rough Carpenters	3
689	47-2031	Carpenters	47-2031	Carpenters	47-2031.03	Carpenter Assemblers and Repairers	2
690	47-2031	Carpenters	47-2031	Carpenters	47-2031.04	Ship Carpenters and Joiners	3
691	47-2031	Carpenters	47-2031	Carpenters	47-2031.05	Boat Builders and Shipwrights	4
692	47-2031	Carpenters	47-2031	Carpenters	47-2031.06	Brattice Builders	2
693	47-2041	Carpet Installers	47-2041	Carpet Installers	47-2041.00	Carpet Installers	4
694	47-2042	Floor Layers, Except Carpet, Wood, and Hard Tiles	47-2042	Floor Layers, Except Carpet, Wood, and Hard Tiles	47-2042.00	Floor Layers, Except Carpet, Wood, and Hard Tiles	3
695	47-2043	Floor Sanders and Finishers	47-2043	Floor Sanders and Finishers	47-2043.00	Floor Sanders and Finishers	2
696	47-2044	Tile and Marble Setters	47-2044	Tile and Marble Setters	47-2044.00	Tile and Marble Setters	2
697	47-2051	Cement Masons and Concrete Finishers	47-2051	Cement Masons and Concrete Finishers	47-2051.00	Cement Masons and Concrete Finishers	3
698	47-2053	Terrazzo Workers and Finishers	47-2053	Terrazzo Workers and Finishers	47-2053.00	Terrazzo Workers and Finishers	3
699	47-2061	Construction Laborers	47-2061	Construction Laborers	47-2061.00	Construction Laborers	2
700	47-2071	Paving, Surfacing, and Tamping Equipment Operators	47-2071	Paving, Surfacing, and Tamping Equipment Operators	47-2071.00	Paving, Surfacing, and Tamping Equipment Operators	2
701	47-2072	Pile-Driver Operators	47-2072	Pile-Driver Operators	47-2072.00	Pile-Driver Operators	2
702	47-2073	Operating Engineers and Other Construction Equipment Operators	47-2073	Operating Engineers and Other Construction Equipment Operators	47-2073.00	Operating Engineers and Other Construction Equipment Operators	
703	47-2073	Operating Engineers and Other Construction Equipment	47-2073	Operating Engineers and Other Construction Equipment Operators	47-2073.01	Grader, Bulldozer, and Scraper Operators	2

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Operators					
704	47-2073	Operating Engineers and Other Construction Equipment Operators	47-2073	Operating Engineers and Other Construction Equipment Operators	47-2073.02	Operating Engineers	3
705	47-2081	Drywall and Ceiling Tile Installers	47-2081	Drywall and Ceiling Tile Installers	47-2081.00	Drywall and Ceiling Tile Installers	
706	47-2081	Drywall and Ceiling Tile Installers	47-2081	Drywall and Ceiling Tile Installers	47-2081.01	Ceiling Tile Installers	4
707	47-2081	Drywall and Ceiling Tile Installers	47-2081	Drywall and Ceiling Tile Installers	47-2081.02	Drywall Installers	2
708	47-2082	Tapers	47-2082	Tapers	47-2082.00	Tapers	2
709	47-2111	Electricians	47-2111	Electricians	47-2111.00	Electricians	3
710	47-2121	Glaziers	47-2121	Glaziers	47-2121.00	Glaziers	3
711	47-2130	Insulation Workers	47-2131	Insulation Workers, Floor, Ceiling, and Wall	47-2131.00	Insulation Workers, Floor, Ceiling, and Wall	3
712	47-2130	Insulation Workers	47-2132	Insulation Workers, Mechanical	47-2132.00	Insulation Workers, Mechanical	3
713	47-2141	Painters, Construction and Maintenance	47-2141	Painters, Construction and Maintenance	47-2141.00	Painters, Construction and Maintenance	4
714	47-2142	Paperhangers	47-2142	Paperhangers	47-2142.00	Paperhangers	2
715	47-2151	Pipelayers	47-2151	Pipelayers	47-2151.00	Pipelayers	2
716	47-2152	Plumbers, Pipefitters, and Steamfitters	47-2152	Plumbers, Pipefitters, and Steamfitters	47-2152.00	Plumbers, Pipefitters, and Steamfitters	
717	47-2152	Plumbers, Pipefitters, and Steamfitters	47-2152	Plumbers, Pipefitters, and Steamfitters	47-2152.01	Pipe Fitters	4
718	47-2152	Plumbers, Pipefitters, and Steamfitters	47-2152	Plumbers, Pipefitters, and Steamfitters	47-2152.02	Plumbers	3
719	47-2152	Plumbers, Pipefitters, and Steamfitters	47-2152	Plumbers, Pipefitters, and Steamfitters	47-2152.03	Pipelaying Fitters	2
720	47-2161	Plasterers and Stucco Masons	47-2161	Plasterers and Stucco Masons	47-2161.00	Plasterers and Stucco Masons	4

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
721	47-2171	Reinforcing Iron and Rebar Workers	47-2171	Reinforcing Iron and Rebar Workers	47-2171.00	Reinforcing Iron and Rebar Workers	3
722	47-2181	Roofers	47-2181	Roofers	47-2181.00	Roofers	3
723	47-2211	Sheet Metal Workers	47-2211	Sheet Metal Workers	47-2211.00	Sheet Metal Workers	3
724	47-2221	Structural Iron and Steel Workers	47-2221	Structural Iron and Steel Workers	47-2221.00	Structural Iron and Steel Workers	3
725	47-3011	Helpers--Brickmasons, Blockmasons, Stonemasons, and Tile and Marble Setters	47-3011	Helpers--Brickmasons, Blockmasons, Stonemasons, and Tile and Marble Setters	47-3011.00	Helpers--Brickmasons, Blockmasons, Stonemasons, and Tile and Marble Setters	1
726	47-3012	Helpers--Carpenters	47-3012	Helpers--Carpenters	47-3012.00	Helpers--Carpenters	1
727	47-3013	Helpers--Electricians	47-3013	Helpers--Electricians	47-3013.00	Helpers--Electricians	2
728	47-3014	Helpers--Painters, Paperhangers, Plasterers, and Stucco Masons	47-3014	Helpers--Painters, Paperhangers, Plasterers, and Stucco Masons	47-3014.00	Helpers--Painters, Paperhangers, Plasterers, and Stucco Masons	1
729	47-3015	Helpers--Pipelayers, Plumbers, Pipefitters, and Steamfitters	47-3015	Helpers--Pipelayers, Plumbers, Pipefitters, and Steamfitters	47-3015.00	Helpers--Pipelayers, Plumbers, Pipefitters, and Steamfitters	2
730	47-3016	Helpers--Roofers	47-3016	Helpers--Roofers	47-3016.00	Helpers--Roofers	
731	47-3019	Helpers, Construction Trades, All Other	47-3019	Helpers, Construction Trades, All Other	47-3019.99	Helpers, Construction Trades, All Other	
732	47-4011	Construction and Building Inspectors	47-4011	Construction and Building Inspectors	47-4011.00	Construction and Building Inspectors	3
733	47-4021	Elevator Installers and Repairers	47-4021	Elevator Installers and Repairers	47-4021.00	Elevator Installers and Repairers	4
734	47-4031	Fence Erectors	47-4031	Fence Erectors	47-4031.00	Fence Erectors	2
735	47-4041	Hazardous Materials Removal Workers	47-4041	Hazardous Materials Removal Workers	47-4041.00	Hazardous Materials Removal Workers	
736	47-4041	Hazardous Materials Removal Workers	47-4041	Hazardous Materials Removal Workers	47-4041.01	Irradiated-Fuel Handlers	2
737	47-4051	Highway Maintenance Workers	47-4051	Highway Maintenance Workers	47-4051.00	Highway Maintenance Workers	1

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
738	47-4061	Rail-Track Laying and Maintenance Equipment Operators	47-4061	Rail-Track Laying and Maintenance Equipment Operators	47-4061.00	Rail-Track Laying and Maintenance Equipment Operators	1
739	47-4071	Septic Tank Servicers and Sewer Pipe Cleaners	47-4071	Septic Tank Servicers and Sewer Pipe Cleaners	47-4071.00	Septic Tank Servicers and Sewer Pipe Cleaners	2
740	47-2052	Segmental Pavers	47-4091	Segmental Pavers	47-4091.00	Segmental Pavers	
741	47-4999	All Other Construction Trades and Related Workers	47-4099	Construction and Related Workers, All Other	47-4099.99	Construction and Related Workers, All Other	
742	47-5011	Derrick Operators, Oil and Gas	47-5011	Derrick Operators, Oil and Gas	47-5011.00	Derrick Operators, Oil and Gas	2
743	47-5012	Rotary Drill Operators, Oil and Gas	47-5012	Rotary Drill Operators, Oil and Gas	47-5012.00	Rotary Drill Operators, Oil and Gas	3
744	47-5013	Service Unit Operators, Oil, Gas, and Mining	47-5013	Service Unit Operators, Oil, Gas, and Mining	47-5013.00	Service Unit Operators, Oil, Gas, and Mining	4
745	47-5021	Earth Drillers, Except Oil and Gas	47-5021	Earth Drillers, Except Oil and Gas	47-5021.00	Earth Drillers, Except Oil and Gas	
746	47-5021	Earth Drillers, Except Oil and Gas	47-5021	Earth Drillers, Except Oil and Gas	47-5021.01	Construction Drillers	2
747	47-5021	Earth Drillers, Except Oil and Gas	47-5021	Earth Drillers, Except Oil and Gas	47-5021.02	Well and Core Drill Operators	3
748	47-5031	Explosives Workers, Ordnance Handling Experts, and Blasters	47-5031	Explosives Workers, Ordnance Handling Experts, and Blasters	47-5031.00	Explosives Workers, Ordnance Handling Experts, and Blasters	2
749	47-5041	Continuous Mining Machine Operators	47-5041	Continuous Mining Machine Operators	47-5041.00	Continuous Mining Machine Operators	2
750	47-5042	Mine Cutting and Channeling Machine Operators	47-5042	Mine Cutting and Channeling Machine Operators	47-5042.00	Mine Cutting and Channeling Machine Operators	2
751	47-5049	Mining Machine Operators, All Other	47-5049	Mining Machine Operators, All Other	47-5049.99	Mining Machine Operators, All Other	
752	47-5051	Rock Splitters, Quarry	47-5051	Rock Splitters, Quarry	47-5051.00	Rock Splitters, Quarry	2

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
753	47-5061	Roof Bolters, Mining	47-5061	Roof Bolters, Mining	47-5061.00	Roof Bolters, Mining	2
754	47-5071	Roustabouts, Oil and Gas	47-5071	Roustabouts, Oil and Gas	47-5071.00	Roustabouts, Oil and Gas	2
755	47-5081	Helpers--Extraction Workers	47-5081	Helpers--Extraction Workers	47-5081.00	Helpers--Extraction Workers	1
756	47-5099	Extraction Workers, All Other	47-5099	Extraction Workers, All Other	47-5099.99	Extraction Workers, All Other	
757	49-1011	First-Line Supervisors/Managers of Mechanics, Installers, and Repairers	49-1011	First-Line Supervisors/Managers of Mechanics, Installers, and Repairers	49-1011.00	First-Line Supervisors/Managers of Mechanics, Installers, and Repairers	4
758	49-2011	Computer, Automated Teller, and Office Machine Repairers	49-2011	Computer, Automated Teller, and Office Machine Repairers	49-2011.00	Computer, Automated Teller, and Office Machine Repairers	
759	49-2011	Computer, Automated Teller, and Office Machine Repairers	49-2011	Computer, Automated Teller, and Office Machine Repairers	49-2011.01	Automatic Teller Machine Servicers	3
760	49-2011	Computer, Automated Teller, and Office Machine Repairers	49-2011	Computer, Automated Teller, and Office Machine Repairers	49-2011.02	Data Processing Equipment Repairers	4
761	49-2011	Computer, Automated Teller, and Office Machine Repairers	49-2011	Computer, Automated Teller, and Office Machine Repairers	49-2011.03	Office Machine and Cash Register Servicers	3
762	49-2021	Radio Mechanics	49-2021	Radio Mechanics	49-2021.00	Radio Mechanics	3
763	49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers	49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers	49-2022.00	Telecommunications Equipment Installers and Repairers, Except Line Installers	
764	49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers	49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers	49-2022.01	Central Office and PBX Installers and Repairers	4
765	49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers	49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers	49-2022.02	Frame Wirers, Central Office	2

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
766	49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers	49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers	49-2022.03	Communication Equipment Mechanics, Installers, and Repairers	3
767	49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers	49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers	49-2022.04	Telecommunications Facility Examiners	3
768	49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers	49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers	49-2022.05	Station Installers and Repairers, Telephone	4
769	49-2091	Avionics Technicians	49-2091	Avionics Technicians	49-2091.00	Avionics Technicians	4
770	49-2092	Electric Motor, Power Tool, and Related Repairers	49-2092	Electric Motor, Power Tool, and Related Repairers	49-2092.00	Electric Motor, Power Tool, and Related Repairers	
771	49-2092	Electric Motor, Power Tool, and Related Repairers	49-2092	Electric Motor, Power Tool, and Related Repairers	49-2092.01	Electric Home Appliance and Power Tool Repairers	3
772	49-2092	Electric Motor, Power Tool, and Related Repairers	49-2092	Electric Motor, Power Tool, and Related Repairers	49-2092.02	Electric Motor and Switch Assemblers and Repairers	3
773	49-2092	Electric Motor, Power Tool, and Related Repairers	49-2092	Electric Motor, Power Tool, and Related Repairers	49-2092.03	Battery Repairers	2
774	49-2092	Electric Motor, Power Tool, and Related Repairers	49-2092	Electric Motor, Power Tool, and Related Repairers	49-2092.04	Transformer Repairers	4
775	49-2092	Electric Motor, Power Tool, and Related Repairers	49-2092	Electric Motor, Power Tool, and Related Repairers	49-2092.05	Electrical Parts Reconditioners	2
776	49-2092	Electric Motor, Power Tool, and Related Repairers	49-2092	Electric Motor, Power Tool, and Related Repairers	49-2092.06	Hand and Portable Power Tool Repairers	2
777	49-2093	Electrical and Electronics Installers and Repairers, Transportation Equipment	49-2093	Electrical and Electronics Installers and Repairers, Transportation Equipment	49-2093.00	Electrical and Electronics Installers and Repairers, Transportation Equipment	3

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
778	49-2094	Electrical and Electronics Repairers, Commercial and Industrial Equipment	49-2094	Electrical and Electronics Repairers, Commercial and Industrial Equipment	49-2094.00	Electrical and Electronics Repairers, Commercial and Industrial Equipment	3
779	49-2095	Electrical and Electronics Repairers, Powerhouse, Substation, and Relay	49-2095	Electrical and Electronics Repairers, Powerhouse, Substation, and Relay	49-2095.00	Electrical and Electronics Repairers, Powerhouse, Substation, and Relay	5
780	49-2096	Electronic Equipment Installers and Repairers, Motor Vehicles	49-2096	Electronic Equipment Installers and Repairers, Motor Vehicles	49-2096.00	Electronic Equipment Installers and Repairers, Motor Vehicles	3
781	49-2097	Electronic Home Entertainment Equipment Installers and Repairers	49-2097	Electronic Home Entertainment Equipment Installers and Repairers	49-2097.00	Electronic Home Entertainment Equipment Installers and Repairers	3
782	49-2098	Security and Fire Alarm Systems Installers	49-2098	Security and Fire Alarm Systems Installers	49-2098.00	Security and Fire Alarm Systems Installers	
783	49-3011	Aircraft Mechanics and Service Technicians	49-3011	Aircraft Mechanics and Service Technicians	49-3011.00	Aircraft Mechanics and Service Technicians	
784	49-3011	Aircraft Mechanics and Service Technicians	49-3011	Aircraft Mechanics and Service Technicians	49-3011.01	Airframe-and-Power-Plant Mechanics	4
785	49-3011	Aircraft Mechanics and Service Technicians	49-3011	Aircraft Mechanics and Service Technicians	49-3011.02	Aircraft Engine Specialists	4
786	49-3011	Aircraft Mechanics and Service Technicians	49-3011	Aircraft Mechanics and Service Technicians	49-3011.03	Aircraft Body and Bonded Structure Repairers	3
787	49-3021	Automotive Body and Related Repairers	49-3021	Automotive Body and Related Repairers	49-3021.00	Automotive Body and Related Repairers	3
788	49-3022	Automotive Glass Installers and Repairers	49-3022	Automotive Glass Installers and Repairers	49-3022.00	Automotive Glass Installers and Repairers	2

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
789	49-3023	Automotive Service Technicians and Mechanics	49-3023	Automotive Service Technicians and Mechanics	49-3023.00	Automotive Service Technicians and Mechanics	
790	49-3023	Automotive Service Technicians and Mechanics	49-3023	Automotive Service Technicians and Mechanics	49-3023.01	Automotive Master Mechanics	3
791	49-3023	Automotive Service Technicians and Mechanics	49-3023	Automotive Service Technicians and Mechanics	49-3023.02	Automotive Specialty Technicians	2
792	49-3031	Bus and Truck Mechanics and Diesel Engine Specialists	49-3031	Bus and Truck Mechanics and Diesel Engine Specialists	49-3031.00	Bus and Truck Mechanics and Diesel Engine Specialists	3
793	49-3041	Farm Equipment Mechanics	49-3041	Farm Equipment Mechanics	49-3041.00	Farm Equipment Mechanics	3
794	49-3042	Mobile Heavy Equipment Mechanics, Except Engines	49-3042	Mobile Heavy Equipment Mechanics, Except Engines	49-3042.00	Mobile Heavy Equipment Mechanics, Except Engines	4
795	49-3043	Rail Car Repairers	49-3043	Rail Car Repairers	49-3043.00	Rail Car Repairers	3
796	49-3051	Motorboat Mechanics	49-3051	Motorboat Mechanics	49-3051.00	Motorboat Mechanics	3
797	49-3052	Motorcycle Mechanics	49-3052	Motorcycle Mechanics	49-3052.00	Motorcycle Mechanics	2
798	49-3053	Outdoor Power Equipment and Other Small Engine Mechanics	49-3053	Outdoor Power Equipment and Other Small Engine Mechanics	49-3053.00	Outdoor Power Equipment and Other Small Engine Mechanics	3
799	49-3091	Bicycle Repairers	49-3091	Bicycle Repairers	49-3091.00	Bicycle Repairers	2
800	49-3092	Recreational Vehicle Service Technicians	49-3092	Recreational Vehicle Service Technicians	49-3092.00	Recreational Vehicle Service Technicians	2
801	49-3093	Tire Repairers and Changers	49-3093	Tire Repairers and Changers	49-3093.00	Tire Repairers and Changers	1
802	49-9011	Mechanical Door Repairers	49-9011	Mechanical Door Repairers	49-9011.00	Mechanical Door Repairers	3
803	49-9012	Control and Valve Installers and Repairers, Except Mechanical Door	49-9012	Control and Valve Installers and Repairers, Except Mechanical Door	49-9012.00	Control and Valve Installers and Repairers, Except Mechanical Door	
804	49-9012	Control and Valve Installers and Repairers, Except	49-9012	Control and Valve Installers and Repairers, Except	49-9012.01	Electric Meter Installers and Repairers	3

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Mechanical Door		Mechanical Door			
805	49-9012	Control and Valve Installers and Repairers, Except Mechanical Door	49-9012	Control and Valve Installers and Repairers, Except Mechanical Door	49-9012.02	Valve and Regulator Repairers	3
806	49-9012	Control and Valve Installers and Repairers, Except Mechanical Door	49-9012	Control and Valve Installers and Repairers, Except Mechanical Door	49-9012.03	Meter Mechanics	2
807	49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	49-9021.00	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	
808	49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	49-9021.01	Heating and Air Conditioning Mechanics	3
809	49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers	49-9021.02	Refrigeration Mechanics	4
810	49-9031	Home Appliance Repairers	49-9031	Home Appliance Repairers	49-9031.00	Home Appliance Repairers	
811	49-9031	Home Appliance Repairers	49-9031	Home Appliance Repairers	49-9031.01	Home Appliance Installers	3
812	49-9031	Home Appliance Repairers	49-9031	Home Appliance Repairers	49-9031.02	Gas Appliance Repairers	4
813	49-9041	Industrial Machinery Mechanics	49-9041	Industrial Machinery Mechanics	49-9041.00	Industrial Machinery Mechanics	3
814	49-9042	Maintenance and Repair Workers, General	49-9042	Maintenance and Repair Workers, General	49-9042.00	Maintenance and Repair Workers, General	3
815	49-9043	Maintenance Workers, Machinery	49-9043	Maintenance Workers, Machinery	49-9043.00	Maintenance Workers, Machinery	1
816	49-9044	Millwrights	49-9044	Millwrights	49-9044.00	Millwrights	4
817	49-9045	Refractory Materials Repairers, Except Brickmasons	49-9045	Refractory Materials Repairers, Except Brickmasons	49-9045.00	Refractory Materials Repairers, Except Brickmasons	1
818	49-9051	Electrical	49-9051	Electrical Power-Line	49-9051.00	Electrical	4

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Power-Line Installers and Repairers		Installers and Repairers		Power-Line Installers and Repairers	
819	49-9052	Telecommunications Line Installers and Repairers	49-9052	Telecommunications Line Installers and Repairers	49-9052.00	Telecommunications Line Installers and Repairers	3
820	49-9061	Camera and Photographic Equipment Repairers	49-9061	Camera and Photographic Equipment Repairers	49-9061.00	Camera and Photographic Equipment Repairers	4
821	49-9062	Medical Equipment Repairers	49-9062	Medical Equipment Repairers	49-9062.00	Medical Equipment Repairers	3
822	49-9063	Musical Instrument Repairers and Tuners	49-9063	Musical Instrument Repairers and Tuners	49-9063.00	Musical Instrument Repairers and Tuners	
823	49-9063	Musical Instrument Repairers and Tuners	49-9063	Musical Instrument Repairers and Tuners	49-9063.01	Keyboard Instrument Repairers and Tuners	3
824	49-9063	Musical Instrument Repairers and Tuners	49-9063	Musical Instrument Repairers and Tuners	49-9063.02	Stringed Instrument Repairers and Tuners	3
825	49-9063	Musical Instrument Repairers and Tuners	49-9063	Musical Instrument Repairers and Tuners	49-9063.03	Reed or Wind Instrument Repairers and Tuners	4
826	49-9063	Musical Instrument Repairers and Tuners	49-9063	Musical Instrument Repairers and Tuners	49-9063.04	Percussion Instrument Repairers and Tuners	3
827	49-9064	Watch Repairers	49-9064	Watch Repairers	49-9064.00	Watch Repairers	3
828	49-9069	Precision Instrument and Equipment Repairers, All Other	49-9069	Precision Instrument and Equipment Repairers, All Other	49-9069.99	Precision Instrument and Equipment Repairers, All Other	
829	49-9091	Coin, Vending, and Amusement Machine Servicers and Repairers	49-9091	Coin, Vending, and Amusement Machine Servicers and Repairers	49-9091.00	Coin, Vending, and Amusement Machine Servicers and Repairers	2
830	49-9092	Commercial Divers	49-9092	Commercial Divers	49-9092.00	Commercial Divers	2
831	49-9093	Fabric Menders,	49-9093	Fabric Menders,	49-9093.00	Fabric Menders,	1

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Except Garment		Except Garment		Except Garment	
832	49-9094	Locksmiths and Safe Repairers	49-9094	Locksmiths and Safe Repairers	49-9094.00	Locksmiths and Safe Repairers	3
833	49-9095	Manufactured Building and Mobile Home Installers	49-9095	Manufactured Building and Mobile Home Installers	49-9095.00	Manufactured Building and Mobile Home Installers	2
834	49-9096	Riggers	49-9096	Riggers	49-9096.00	Riggers	3
835	49-9097	Signal and Track Switch Repairers	49-9097	Signal and Track Switch Repairers	49-9097.00	Signal and Track Switch Repairers	4
836	49-9098	Helpers--Installation, Maintenance, and Repair Workers	49-9098	Helpers--Installation, Maintenance, and Repair Workers	49-9098.00	Helpers--Installation, Maintenance, and Repair Workers	1
837	49-9099	Installation, Maintenance, and Repair Workers, All Other	49-9099	Installation, Maintenance, and Repair Workers, All Other	49-9099.99	Installation, Maintenance, and Repair Workers, All Other	
838	51-1011	First-Line Supervisors/Managers of Production and Operating Workers	51-1011	First-Line Supervisors/Managers of Production and Operating Workers	51-1011.00	First-Line Supervisors/Managers of Production and Operating Workers	3
839	51-2011	Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	51-2011	Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	51-2011.00	Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	
840	51-2011	Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	51-2011	Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	51-2011.01	Aircraft Structure Assemblers, Precision	3
841	51-2011	Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	51-2011	Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	51-2011.02	Aircraft Systems Assemblers, Precision	3
842	51-2011	Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	51-2011	Aircraft Structure, Surfaces, Rigging, and Systems Assemblers	51-2011.03	Aircraft Rigging Assemblers	3
843	51-2021	Coil Winders, Tapers, and Finishers	51-2021	Coil Winders, Tapers, and Finishers	51-2021.00	Coil Winders, Tapers, and Finishers	2
844	51-2022	Electrical and Electronic Equipment Assemblers	51-2022	Electrical and Electronic Equipment Assemblers	51-2022.00	Electrical and Electronic Equipment Assemblers	3

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
845	51-2023	Electromechanical Equipment Assemblers	51-2023	Electromechanical Equipment Assemblers	51-2023.00	Electromechanical Equipment Assemblers	3
846	51-2031	Engine and Other Machine Assemblers	51-2031	Engine and Other Machine Assemblers	51-2031.00	Engine and Other Machine Assemblers	3
847	51-2041	Structural Metal Fabricators and Fitters	51-2041	Structural Metal Fabricators and Fitters	51-2041.00	Structural Metal Fabricators and Fitters	
848	51-2041	Structural Metal Fabricators and Fitters	51-2041	Structural Metal Fabricators and Fitters	51-2041.01	Metal Fabricators, Structural Metal Products	4
849	51-2041	Structural Metal Fabricators and Fitters	51-2041	Structural Metal Fabricators and Fitters	51-2041.02	Fitters, Structural Metal- Precision	4
850	51-2091	Fiberglass Laminators and Fabricators	51-2091	Fiberglass Laminators and Fabricators	51-2091.00	Fiberglass Laminators and Fabricators	
851	51-2092	Team Assemblers	51-2092	Team Assemblers	51-2092.00	Team Assemblers	
852	51-2093	Timing Device Assemblers, Adjusters, and Calibrators	51-2093	Timing Device Assemblers, Adjusters, and Calibrators	51-2093.00	Timing Device Assemblers, Adjusters, and Calibrators	2
853	51-2099	Assemblers and Fabricators, All Other	51-2099	Assemblers and Fabricators, All Other	51-2099.99	Assemblers and Fabricators, All Other	
854	51-3011	Bakers	51-3011	Bakers	51-3011.00	Bakers	
855	51-3011	Bakers	51-3011	Bakers	51-3011.01	Bakers, Bread and Pastry	3
856	51-3011	Bakers	51-3011	Bakers	51-3011.02	Bakers, Manufacturing	3
857	51-3021	Butchers and Meat Cutters	51-3021	Butchers and Meat Cutters	51-3021.00	Butchers and Meat Cutters	3
858	51-3022	Meat, Poultry, and Fish Cutters and Trimmers	51-3022	Meat, Poultry, and Fish Cutters and Trimmers	51-3022.00	Meat, Poultry, and Fish Cutters and Trimmers	1
859	51-3023	Slaughterers and Meat Packers	51-3023	Slaughterers and Meat Packers	51-3023.00	Slaughterers and Meat Packers	2
860	51-3091	Food and Tobacco Roasting, Baking, and Drying Machine Operators and Tenders	51-3091	Food and Tobacco Roasting, Baking, and Drying Machine Operators and Tenders	51-3091.00	Food and Tobacco Roasting, Baking, and Drying Machine Operators and Tenders	1
861	51-3092	Food Batchmakers	51-3092	Food Batchmakers	51-3092.00	Food Batchmakers	3
862	51-3093	Food Cooking	51-3093	Food Cooking	51-3093.00	Food Cooking	1

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Machine Operators and Tenders		Machine Operators and Tenders		Machine Operators and Tenders	
863	51-4011	Computer-Controlled Machine Tool Operators, Metal and Plastic	51-4011	Computer-Controlled Machine Tool Operators, Metal and Plastic	51-4011.00	Computer-Controlled Machine Tool Operators, Metal and Plastic	
864	51-4011	Computer-Controlled Machine Tool Operators, Metal and Plastic	51-4011	Computer-Controlled Machine Tool Operators, Metal and Plastic	51-4011.01	Numerical Control Machine Tool Operators and Tenders, Metal and Plastic	2
865	51-4012	Numerical Tool and Process Control Programmers	51-4012	Numerical Tool and Process Control Programmers	51-4012.00	Numerical Tool and Process Control Programmers	3
866	51-4021	Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic	51-4021	Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic	51-4021.00	Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic	2
867	51-4022	Forging Machine Setters, Operators, and Tenders, Metal and Plastic	51-4022	Forging Machine Setters, Operators, and Tenders, Metal and Plastic	51-4022.00	Forging Machine Setters, Operators, and Tenders, Metal and Plastic	2
868	51-4023	Rolling Machine Setters, Operators, and Tenders, Metal and Plastic	51-4023	Rolling Machine Setters, Operators, and Tenders, Metal and Plastic	51-4023.00	Rolling Machine Setters, Operators, and Tenders, Metal and Plastic	2
869	51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	51-4031.00	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	
870	51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	51-4031.01	Sawing Machine Tool Setters and Set-Up Operators, Metal and Plastic	2
871	51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	51-4031.02	Punching Machine Setters and Set-Up Operators, Metal and Plastic	2
872	51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders,	51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and	51-4031.03	Press and Press Brake Machine Setters and Set-Up Operators, Metal	2

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Metal and Plastic		Plastic		and Plastic	
873	51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic	51-4031.04	Shear and Slitter Machine Setters and Set-Up Operators, Metal and Plastic	2
874	51-4032	Drilling and Boring Machine Tool Setters, Operators, and Tenders, Metal and Plastic	51-4032	Drilling and Boring Machine Tool Setters, Operators, and Tenders, Metal and Plastic	51-4032.00	Drilling and Boring Machine Tool Setters, Operators, and Tenders, Metal and Plastic	2
875	51-4033	Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Pl	51-4033	Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic	51-4033.00	Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic	
876	51-4033	Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Pl	51-4033	Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic	51-4033.01	Grinding, Honing, Lapping, and Deburring Machine Set-Up Operators	3
877	51-4033	Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Pl	51-4033	Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Plastic	51-4033.02	Buffing and Polishing Set-Up Operators	2
878	51-4034	Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic	51-4034	Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic	51-4034.00	Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic	3
879	51-4035	Milling and Planing Machine Setters, Operators, and Tenders, Metal and Plastic	51-4035	Milling and Planing Machine Setters, Operators, and Tenders, Metal and Plastic	51-4035.00	Milling and Planing Machine Setters, Operators, and Tenders, Metal and Plastic	3
880	51-4041	Machinists	51-4041	Machinists	51-4041.00	Machinists	4
881	51-4051	Metal-Refining Furnace Operators	51-4051	Metal-Refining Furnace Operators and	51-4051.00	Metal-Refining Furnace Operators	2

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		and Tenders		Tenders		and Tenders	
882	51-4052	Pourers and Casters, Metal	51-4052	Pourers and Casters, Metal	51-4052.00	Pourers and Casters, Metal	1
883	51-4061	Model Makers, Metal and Plastic	51-4061	Model Makers, Metal and Plastic	51-4061.00	Model Makers, Metal and Plastic	4
884	51-4062	Patternmakers, Metal and Plastic	51-4062	Patternmakers, Metal and Plastic	51-4062.00	Patternmakers, Metal and Plastic	4
885	51-4071	Foundry Mold and Coremakers	51-4071	Foundry Mold and Coremakers	51-4071.00	Foundry Mold and Coremakers	2
886	51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	51-4072.00	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	
887	51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	51-4072.01	Plastic Molding and Casting Machine Setters and Set-Up Operators	2
888	51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	51-4072.02	Plastic Molding and Casting Machine Operators and Tenders	1
889	51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	51-4072.03	Metal Molding, Coremaking, and Casting Machine Setters and Set-Up Operators	2
890	51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	51-4072.04	Metal Molding, Coremaking, and Casting Machine Operators and Tenders	1
891	51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic	51-4072.05	Casting Machine Set-Up Operators	3

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
892	51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	51-4081.00	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	
893	51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	51-4081.01	Combination Machine Tool Setters and Set-Up Operators, Metal and Plastic	3
894	51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic	51-4081.02	Combination Machine Tool Operators and Tenders, Metal and Plastic	2
895	51-4111	Tool and Die Makers	51-4111	Tool and Die Makers	51-4111.00	Tool and Die Makers	4
896	51-4121	Welders, Cutters, Solderers, and Brazers	51-4121	Welders, Cutters, Solderers and Brazers	51-4121.00	Welders, Cutters, Solderers, and Brazers	
897	51-4121	Welders, Cutters, Solderers, and Brazers	51-4121	Welders, Cutters, Solderers and Brazers	51-4121.01	Welders, Production	1
898	51-4121	Welders, Cutters, Solderers, and Brazers	51-4121	Welders, Cutters, Solderers and Brazers	51-4121.02	Welders and Cutters	2
899	51-4121	Welders, Cutters, Solderers, and Brazers	51-4121	Welders, Cutters, Solderers and Brazers	51-4121.03	Welder-Fitters	4
900	51-4121	Welders, Cutters, Solderers, and Brazers	51-4121	Welders, Cutters, Solderers and Brazers	51-4121.04	Solderers	1
901	51-4121	Welders, Cutters, Solderers, and Brazers	51-4121	Welders, Cutters, Solderers and Brazers	51-4121.05	Brazers	2
902	51-4122	Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders	51-4122	Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders	51-4122.00	Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders	
903	51-4122	Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders	51-4122	Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders	51-4122.01	Welding Machine Setters and Set-Up Operators	3

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
904	51-4122	Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders	51-4122	Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders	51-4122.02	Welding Machine Operators and Tenders	2
905	51-4122	Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders	51-4122	Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders	51-4122.03	Soldering and Brazing Machine Setters and Set-Up Operators	2
906	51-4122	Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders	51-4122	Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders	51-4122.04	Soldering and Brazing Machine Operators and Tenders	1
907	51-4191	Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic	51-4191	Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic	51-4191.00	Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic	
908	51-4191	Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic	51-4191	Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic	51-4191.01	Heating Equipment Setters and Set-Up Operators, Metal and Plastic	3
909	51-4191	Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic	51-4191	Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic	51-4191.02	Heat Treating, Annealing, and Tempering Machine Operators and Tenders, Metal and Plastic	2
910	51-4191	Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic	51-4191	Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic	51-4191.03	Heaters, Metal and Plastic	2
911	51-4192	Lay-Out Workers, Metal and Plastic	51-4192	Lay-Out Workers, Metal and Plastic	51-4192.00	Lay-Out Workers, Metal and Plastic	3
912	51-4193	Plating and Coating Machine Setters, Operators, and Tenders, Metal and Plastic	51-4193	Plating and Coating Machine Setters, Operators, and Tenders, Metal and Plastic	51-4193.00	Plating and Coating Machine Setters, Operators, and Tenders, Metal and Plastic	
913	51-4193	Plating and Coating Machine Setters, Operators, and Tenders,	51-4193	Plating and Coating Machine Setters, Operators, and Tenders, Metal and	51-4193.01	Electrolytic Plating and Coating Machine Setters and Set-Up	3

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Metal and Plastic		Plastic		Operators, Metal and Plastic	
914	51-4193	Plating and Coating Machine Setters, Operators, and Tenders, Metal and Plastic	51-4193	Plating and Coating Machine Setters, Operators, and Tenders, Metal and Plastic	51-4193.02	Electrolytic Plating and Coating Machine Operators and Tenders, Metal and Plastic	2
915	51-4193	Plating and Coating Machine Setters, Operators, and Tenders, Metal and Plastic	51-4193	Plating and Coating Machine Setters, Operators, and Tenders, Metal and Plastic	51-4193.03	Nonelectrolytic Plating and Coating Machine Setters and Set-Up Operators, Metal and Plastic	3
916	51-4193	Plating and Coating Machine Setters, Operators, and Tenders, Metal and Plastic	51-4193	Plating and Coating Machine Setters, Operators, and Tenders, Metal and Plastic	51-4193.04	Nonelectrolytic Plating and Coating Machine Operators and Tenders, Metal and Plastic	1
917	51-4194	Tool Grinders, Filers, and Sharpeners	51-4194	Tool Grinders, Filers, and Sharpeners	51-4194.00	Tool Grinders, Filers, and Sharpeners	3
918	51-4199	Metal Workers and Plastic Workers, All Other	51-4199	Metal Workers and Plastic Workers, All Other	51-4199.99	Metal Workers and Plastic Workers, All Other	
919	51-5011	Bindery Workers	51-5011	Bindery Workers	51-5011.00	Bindery Workers	
920	51-5011	Bindery Workers	51-5011	Bindery Workers	51-5011.01	Bindery Machine Setters and Set-Up Operators	2
921	51-5011	Bindery Workers	51-5011	Bindery Workers	51-5011.02	Bindery Machine Operators and Tenders	1
922	51-5012	Bookbinders	51-5012	Bookbinders	51-5012.00	Bookbinders	4
923	51-5021	Job Printers	51-5021	Job Printers	51-5021.00	Job Printers	5
924	51-5022	Prepress Technicians and Workers	51-5022	Prepress Technicians and Workers	51-5022.00	Prepress Technicians and Workers	
925	51-5022	Prepress Technicians and Workers	51-5022	Prepress Technicians and Workers	51-5022.01	Hand Compositors and Typesetters	4
926	51-5022	Prepress Technicians and Workers	51-5022	Prepress Technicians and Workers	51-5022.02	Paste-Up Workers	4
927	51-5022	Prepress	51-5022	Prepress Technicians	51-5022.03	Photoengravers	4

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Technicians and Workers		and Workers			
928	51-5022	Prepress Technicians and Workers	51-5022	Prepress Technicians and Workers	51-5022.04	Camera Operators	4
929	51-5022	Prepress Technicians and Workers	51-5022	Prepress Technicians and Workers	51-5022.05	Scanner Operators	4
930	51-5022	Prepress Technicians and Workers	51-5022	Prepress Technicians and Workers	51-5022.06	Strippers	4
931	51-5022	Prepress Technicians and Workers	51-5022	Prepress Technicians and Workers	51-5022.07	Platemakers	3
932	51-5022	Prepress Technicians and Workers	51-5022	Prepress Technicians and Workers	51-5022.08	Dot Etchers	5
933	51-5022	Prepress Technicians and Workers	51-5022	Prepress Technicians and Workers	51-5022.09	Electronic Masking System Operators	4
934	51-5022	Prepress Technicians and Workers	51-5022	Prepress Technicians and Workers	51-5022.10	Electrotypers and Stereotypers	5
935	51-5022	Prepress Technicians and Workers	51-5022	Prepress Technicians and Workers	51-5022.11	Plate Finishers	5
936	51-5022	Prepress Technicians and Workers	51-5022	Prepress Technicians and Workers	51-5022.12	Typesetting and Composing Machine Operators and Tenders	2
937	51-5022	Prepress Technicians and Workers	51-5022	Prepress Technicians and Workers	51-5022.13	Photoengraving and Lithographing Machine Operators and Tenders	2
938	51-5023	Printing Machine Operators	51-5023	Printing Machine Operators	51-5023.00	Printing Machine Operators	
939	51-5023	Printing Machine Operators	51-5023	Printing Machine Operators	51-5023.01	Precision Printing Workers	2
940	51-5023	Printing Machine Operators	51-5023	Printing Machine Operators	51-5023.02	Offset Lithographic Press Setters and Set-Up Operators	5
941	51-5023	Printing Machine Operators	51-5023	Printing Machine Operators	51-5023.03	Letterpress Setters and Set-Up Operators	3

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
942	51-5023	Printing Machine Operators	51-5023	Printing Machine Operators	51-5023.04	Design Printing Machine Setters and Set-Up Operators	3
943	51-5023	Printing Machine Operators	51-5023	Printing Machine Operators	51-5023.05	Marking and Identification Printing Machine Setters and Set-Up Operators	1
944	51-5023	Printing Machine Operators	51-5023	Printing Machine Operators	51-5023.06	Screen Printing Machine Setters and Set-Up Operators	3
945	51-5023	Printing Machine Operators	51-5023	Printing Machine Operators	51-5023.07	Embossing Machine Set-Up Operators	3
946	51-5023	Printing Machine Operators	51-5023	Printing Machine Operators	51-5023.08	Engraver Set-Up Operators	4
947	51-5023	Printing Machine Operators	51-5023	Printing Machine Operators	51-5023.09	Printing Press Machine Operators and Tenders	1
948	51-6011	Laundry and Dry-Cleaning Workers	51-6011	Laundry and Dry-Cleaning Workers	51-6011.00	Laundry and Dry-Cleaning Workers	
949	51-6011	Laundry and Dry-Cleaning Workers	51-6011	Laundry and Dry-Cleaning Workers	51-6011.01	Spotters, Dry Cleaning	1
950	51-6011	Laundry and Dry-Cleaning Workers	51-6011	Laundry and Dry-Cleaning Workers	51-6011.02	Precision Dyers	3
951	51-6011	Laundry and Dry-Cleaning Workers	51-6011	Laundry and Dry-Cleaning Workers	51-6011.03	Laundry and Drycleaning Machine Operators and Tenders, Except Pressing	1
952	51-6021	Pressers, Textile, Garment, and Related Materials	51-6021	Pressers, Textile, Garment, and Related Materials	51-6021.00	Pressers, Textile, Garment, and Related Materials	
953	51-6021	Pressers, Textile, Garment, and Related Materials	51-6021	Pressers, Textile, Garment, and Related Materials	51-6021.01	Pressers, Delicate Fabrics	2
954	51-6021	Pressers, Textile, Garment, and Related Materials	51-6021	Pressers, Textile, Garment, and Related Materials	51-6021.02	Pressing Machine Operators and Tenders- Textile, Garment, and Related Materials	1

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
955	51-6021	Pressers, Textile, Garment, and Related Materials	51-6021	Pressers, Textile, Garment, and Related Materials	51-6021.03	Pressers, Hand	1
956	51-6031	Sewing Machine Operators	51-6031	Sewing Machine Operators	51-6031.00	Sewing Machine Operators	
957	51-6031	Sewing Machine Operators	51-6031	Sewing Machine Operators	51-6031.01	Sewing Machine Operators, Garment	1
958	51-6031	Sewing Machine Operators	51-6031	Sewing Machine Operators	51-6031.02	Sewing Machine Operators, Non-Garment	1
959	51-6041	Shoe and Leather Workers and Repairers	51-6041	Shoe and Leather Workers and Repairers	51-6041.00	Shoe and Leather Workers and Repairers	2
960	51-6042	Shoe Machine Operators and Tenders	51-6042	Shoe Machine Operators and Tenders	51-6042.00	Shoe Machine Operators and Tenders	1
961	51-6051	Sewers, Hand	51-6051	Sewers, Hand	51-6051.00	Sewers, Hand	1
962	51-6052	Tailors, Dressmakers, and Custom Sewers	51-6052	Tailors, Dressmakers, and Custom Sewers	51-6052.00	Tailors, Dressmakers, and Custom Sewers	
963	51-6052	Tailors, Dressmakers, and Custom Sewers	51-6052	Tailors, Dressmakers, and Custom Sewers	51-6052.01	Shop and Alteration Tailors	3
964	51-6052	Tailors, Dressmakers, and Custom Sewers	51-6052	Tailors, Dressmakers, and Custom Sewers	51-6052.02	Custom Tailors	4
965	51-6061	Textile Bleaching and Dyeing Machine Operators and Tenders	51-6061	Textile Bleaching and Dyeing Machine Operators and Tenders	51-6061.00	Textile Bleaching and Dyeing Machine Operators and Tenders	1
966	51-6062	Textile Cutting Machine Setters, Operators, and Tenders	51-6062	Textile Cutting Machine Setters, Operators, and Tenders	51-6062.00	Textile Cutting Machine Setters, Operators, and Tenders	3
967	51-6063	Textile Knitting and Weaving Machine Setters, Operators, and Tenders	51-6063	Textile Knitting and Weaving Machine Setters, Operators, and Tenders	51-6063.00	Textile Knitting and Weaving Machine Setters, Operators, and Tenders	3
968	51-6064	Textile Winding, Twisting, and Drawing Out Machine Setters, Operators, and Tenders	51-6064	Textile Winding, Twisting, and Drawing Out Machine Setters, Operators, and Tenders	51-6064.00	Textile Winding, Twisting, and Drawing Out Machine Setters, Operators, and Tenders	3

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
969	51-6091	Extruding and Forming Machine Setters, Operators, and Tenders, Synthetic and Glass Fibers	51-6091	Extruding and Forming Machine Setters, Operators, and Tenders, Synthetic and Glass Fibers	51-6091.00	Extruding and Forming Machine Setters, Operators, and Tenders, Synthetic and Glass Fibers	
970	51-6091	Extruding and Forming Machine Setters, Operators, and Tenders, Synthetic and Glass Fibers	51-6091	Extruding and Forming Machine Setters, Operators, and Tenders, Synthetic and Glass Fibers	51-6091.01	Extruding and Forming Machine Operators and Tenders, Synthetic or Glass Fibers	1
971	51-6092	Fabric and Apparel Patternmakers	51-6092	Fabric and Apparel Patternmakers	51-6092.00	Fabric and Apparel Patternmakers	2
972	51-6093	Upholsterers	51-6093	Upholsterers	51-6093.00	Upholsterers	3
973	51-6099	Textile, Apparel, and Furnishings Workers, All Other	51-6099	Textile, Apparel, and Furnishings Workers, All Other	51-6099.99	Textile, Apparel, and Furnishings Workers, All Other	
974	51-7011	Cabinetmakers and Bench Carpenters	51-7011	Cabinetmakers and Bench Carpenters	51-7011.00	Cabinetmakers and Bench Carpenters	3
975	51-7021	Furniture Finishers	51-7021	Furniture Finishers	51-7021.00	Furniture Finishers	2
976	51-7031	Model Makers, Wood	51-7031	Model Makers, Wood	51-7031.00	Model Makers, Wood	4
977	51-7032	Patternmakers, Wood	51-7032	Patternmakers, Wood	51-7032.00	Patternmakers, Wood	4
978	51-7041	Sawing Machine Setters, Operators, and Tenders, Wood	51-7041	Sawing Machine Setters, Operators, and Tenders, Wood	51-7041.00	Sawing Machine Setters, Operators, and Tenders, Wood	
979	51-7041	Sawing Machine Setters, Operators, and Tenders, Wood	51-7041	Sawing Machine Setters, Operators, and Tenders, Wood	51-7041.01	Sawing Machine Setters and Set-Up Operators	2
980	51-7041	Sawing Machine Setters, Operators, and Tenders, Wood	51-7041	Sawing Machine Setters, Operators, and Tenders, Wood	51-7041.02	Sawing Machine Operators and Tenders	2
981	51-7042	Woodworking Machine Setters, Operators, and Tenders, Except Sawing	51-7042	Woodworking Machine Setters, Operators, and Tenders, Except Sawing	51-7042.00	Woodworking Machine Setters, Operators, and Tenders, Except Sawing	
982	51-7042	Woodworking Machine Setters, Operators, and	51-7042	Woodworking Machine Setters, Operators, and	51-7042.01	Woodworking Machine Setters and Set-Up	2

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Tenders, Except Sawing		Tenders, Except Sawing		Operators, Except Sawing	
983	51-7042	Woodworking Machine Setters, Operators, and Tenders, Except Sawing	51-7042	Woodworking Machine Setters, Operators, and Tenders, Except Sawing	51-7042.02	Woodworking Machine Operators and Tenders, Except Sawing	1
984	51-7099	Woodworkers, All Other	51-7099	Woodworkers, All Other	51-7099.99	Woodworkers, All Other	
985	51-8011	Nuclear Power Reactor Operators	51-8011	Nuclear Power Reactor Operators	51-8011.00	Nuclear Power Reactor Operators	4
986	51-8012	Power Distributors and Dispatchers	51-8012	Power Distributors and Dispatchers	51-8012.00	Power Distributors and Dispatchers	4
987	51-8013	Power Plant Operators	51-8013	Power Plant Operators	51-8013.00	Power Plant Operators	
988	51-8013	Power Plant Operators	51-8013	Power Plant Operators	51-8013.01	Power Generating Plant Operators, Except Auxiliary Equipment Operators	4
989	51-8013	Power Plant Operators	51-8013	Power Plant Operators	51-8013.02	Auxiliary Equipment Operators, Power	2
990	51-8021	Stationary Engineers and Boiler Operators	51-8021	Stationary Engineers and Boiler Operators	51-8021.00	Stationary Engineers and Boiler Operators	
991	51-8021	Stationary Engineers and Boiler Operators	51-8021	Stationary Engineers and Boiler Operators	51-8021.01	Boiler Operators and Tenders, Low Pressure	2
992	51-8021	Stationary Engineers and Boiler Operators	51-8021	Stationary Engineers and Boiler Operators	51-8021.02	Stationary Engineers	3
993	51-8031	Water and Liquid Waste Treatment Plant and System Operators	51-8031	Water and Liquid Waste Treatment Plant and System Operators	51-8031.00	Water and Liquid Waste Treatment Plant and System Operators	3
994	51-8091	Chemical Plant and System Operators	51-8091	Chemical Plant and System Operators	51-8091.00	Chemical Plant and System Operators	2
995	51-8092	Gas Plant Operators	51-8092	Gas Plant Operators	51-8092.00	Gas Plant Operators	
996	51-8092	Gas Plant Operators	51-8092	Gas Plant Operators	51-8092.01	Gas Processing Plant Operators	2
997	51-8092	Gas Plant Operators	51-8092	Gas Plant Operators	51-8092.02	Gas Distribution Plant Operators	3

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
998	51-8093	Petroleum Pump System Operators, Refinery Operators, and Gaugers	51-8093	Petroleum Pump System Operators, Refinery Operators, and Gaugers	51-8093.00	Petroleum Pump System Operators, Refinery Operators, and Gaugers	
999	51-8093	Petroleum Pump System Operators, Refinery Operators, and Gaugers	51-8093	Petroleum Pump System Operators, Refinery Operators, and Gaugers	51-8093.01	Petroleum Pump System Operators	3
1000	51-8093	Petroleum Pump System Operators, Refinery Operators, and Gaugers	51-8093	Petroleum Pump System Operators, Refinery Operators, and Gaugers	51-8093.02	Petroleum Refinery and Control Panel Operators	4
1001	51-8093	Petroleum Pump System Operators, Refinery Operators, and Gaugers	51-8093	Petroleum Pump System Operators, Refinery Operators, and Gaugers	51-8093.03	Gaugers	3
1002	51-8099	Plant and System Operators, All Other	51-8099	Plant and System Operators, All Other	51-8099.99	Plant and System Operators, All Other	
1003	51-9011	Chemical Equipment Operators and Tenders	51-9011	Chemical Equipment Operators and Tenders	51-9011.00	Chemical Equipment Operators and Tenders	
1004	51-9011	Chemical Equipment Operators and Tenders	51-9011	Chemical Equipment Operators and Tenders	51-9011.01	Chemical Equipment Controllers and Operators	2
1005	51-9011	Chemical Equipment Operators and Tenders	51-9011	Chemical Equipment Operators and Tenders	51-9011.02	Chemical Equipment Tenders	2
1006	51-9012	Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders	51-9012	Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders	51-9012.00	Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders	1
1007	51-9021	Crushing, Grinding, and Polishing Machine Setters, Operators, and Tenders	51-9021	Crushing, Grinding, and Polishing Machine Setters, Operators, and Tenders	51-9021.00	Crushing, Grinding, and Polishing Machine Setters, Operators, and Tenders	1

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
1008	51-9022	Grinding and Polishing Workers, Hand	51-9022	Grinding and Polishing Workers, Hand	51-9022.00	Grinding and Polishing Workers, Hand	1
1009	51-9023	Mixing and Blending Machine Setters, Operators, and Tenders	51-9023	Mixing and Blending Machine Setters, Operators, and Tenders	51-9023.00	Mixing and Blending Machine Setters, Operators, and Tenders	1
1010	51-9031	Cutters and Trimmers, Hand	51-9031	Cutters and Trimmers, Hand	51-9031.00	Cutters and Trimmers, Hand	1
1011	51-9032	Cutting and Slicing Machine Setters, Operators, and Tenders	51-9032	Cutting and Slicing Machine Setters, Operators, and Tenders	51-9032.00	Cutting and Slicing Machine Setters, Operators, and Tenders	
1012	51-9032	Cutting and Slicing Machine Setters, Operators, and Tenders	51-9032	Cutting and Slicing Machine Setters, Operators, and Tenders	51-9032.01	Fiber Product Cutting Machine Setters and Set-Up Operators	2
1013	51-9032	Cutting and Slicing Machine Setters, Operators, and Tenders	51-9032	Cutting and Slicing Machine Setters, Operators, and Tenders	51-9032.02	Stone Sawyers	2
1014	51-9032	Cutting and Slicing Machine Setters, Operators, and Tenders	51-9032	Cutting and Slicing Machine Setters, Operators, and Tenders	51-9032.03	Glass Cutting Machine Setters and Set-Up Operators	1
1015	51-9032	Cutting and Slicing Machine Setters, Operators, and Tenders	51-9032	Cutting and Slicing Machine Setters, Operators, and Tenders	51-9032.04	Cutting and Slicing Machine Operators and Tenders	1
1016	51-9041	Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders	51-9041	Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders	51-9041.00	Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders	
1017	51-9041	Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders	51-9041	Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders	51-9041.01	Extruding, Forming, Pressing, and Compacting Machine Setters and Set-Up Operators	2
1018	51-9041	Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders	51-9041	Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders	51-9041.02	Extruding, Forming, Pressing, and Compacting Machine Operators and Tenders	1

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
1019	51-9051	Furnace, Kiln, Oven, Drier, and Kettle Operators and Tenders	51-9051	Furnace, Kiln, Oven, Drier, and Kettle Operators and Tenders	51-9051.00	Furnace, Kiln, Oven, Drier, and Kettle Operators and Tenders	1
1020	51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	51-9061.00	Inspectors, Testers, Sorters, Samplers, and Weighers	
1021	51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	51-9061.01	Materials Inspectors	3
1022	51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	51-9061.02	Mechanical Inspectors	4
1023	51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	51-9061.03	Precision Devices Inspectors and Testers	3
1024	51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	51-9061.04	Electrical and Electronic Inspectors and Testers	3
1025	51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers	51-9061.05	Production Inspectors, Testers, Graders, Sorters, Samplers, Weighers	1
1026	51-9071	Jewelers and Precious Stone and Metal Workers	51-9071	Jewelers and Precious Stone and Metal Workers	51-9071.00	Jewelers and Precious Stone and Metal Workers	
1027	51-9071	Jewelers and Precious Stone and Metal Workers	51-9071	Jewelers and Precious Stone and Metal Workers	51-9071.01	Jewelers	4
1028	51-9071	Jewelers and Precious Stone and Metal Workers	51-9071	Jewelers and Precious Stone and Metal Workers	51-9071.02	Silversmiths	3
1029	51-9071	Jewelers and Precious Stone and Metal Workers	51-9071	Jewelers and Precious Stone and Metal Workers	51-9071.03	Model and Mold Makers, Jewelry	3
1030	51-9071	Jewelers and Precious Stone and Metal Workers	51-9071	Jewelers and Precious Stone and Metal Workers	51-9071.04	Bench Workers, Jewelry	3
1031	51-9071	Jewelers and Precious Stone and	51-9071	Jewelers and Precious Stone and Metal	51-9071.05	Pewter Casters and Finishers	4

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Metal Workers		Workers			
1032	51-9071	Jewelers and Precious Stone and Metal Workers	51-9071	Jewelers and Precious Stone and Metal Workers	51-9071.06	Gem and Diamond Workers	2
1033	51-9081	Dental Laboratory Technicians	51-9081	Dental Laboratory Technicians	51-9081.00	Dental Laboratory Technicians	3
1034	51-9082	Medical Appliance Technicians	51-9082	Medical Appliance Technicians	51-9082.00	Medical Appliance Technicians	2
1035	51-9083	Ophthalmic Laboratory Technicians	51-9083	Ophthalmic Laboratory Technicians	51-9083.00	Ophthalmic Laboratory Technicians	
1036	51-9083	Ophthalmic Laboratory Technicians	51-9083	Ophthalmic Laboratory Technicians	51-9083.01	Precision Lens Grinders and Polishers	3
1037	51-9083	Ophthalmic Laboratory Technicians	51-9083	Ophthalmic Laboratory Technicians	51-9083.02	Optical Instrument Assemblers	4
1038	51-9111	Packaging and Filling Machine Operators and Tenders	51-9111	Packaging and Filling Machine Operators and Tenders	51-9111.00	Packaging and Filling Machine Operators and Tenders	1
1039	51-9121	Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	51-9121	Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	51-9121.00	Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	
1040	51-9121	Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	51-9121	Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	51-9121.01	Coating, Painting, and Spraying Machine Setters and Set-Up Operators	2
1041	51-9121	Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	51-9121	Coating, Painting, and Spraying Machine Setters, Operators, and Tenders	51-9121.02	Coating, Painting, and Spraying Machine Operators and Tenders	1
1042	51-9122	Painters, Transportation Equipment	51-9122	Painters, Transportation Equipment	51-9122.00	Painters, Transportation Equipment	2
1043	51-9123	Painting, Coating, and Decorating Workers	51-9123	Painting, Coating, and Decorating Workers	51-9123.00	Painting, Coating, and Decorating Workers	1
1044	51-9131	Photographic Process Workers	51-9131	Photographic Process Workers	51-9131.00	Photographic Process Workers	
1045	51-9131	Photographic Process Workers	51-9131	Photographic Process Workers	51-9131.01	Photographic Retouchers and	3

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
						Restorers	
1046	51-9131	Photographic Process Workers	51-9131	Photographic Process Workers	51-9131.02	Photographic Reproduction Technicians	3
1047	51-9131	Photographic Process Workers	51-9131	Photographic Process Workers	51-9131.03	Photographic Hand Developers	2
1048	51-9131	Photographic Process Workers	51-9131	Photographic Process Workers	51-9131.04	Film Laboratory Technicians	4
1049	51-9132	Photographic Processing Machine Operators	51-9132	Photographic Processing Machine Operators	51-9132.00	Photographic Processing Machine Operators	2
1050	51-9141	Semiconductor Processors	51-9141	Semiconductor Processors	51-9141.00	Semiconductor Processors	1
1051	51-9191	Cementing and Gluing Machine Operators and Tenders	51-9191	Cementing and Gluing Machine Operators and Tenders	51-9191.00	Cementing and Gluing Machine Operators and Tenders	1
1052	51-9192	Cleaning, Washing, and Metal Pickling Equipment Operators and Tenders	51-9192	Cleaning, Washing, and Metal Pickling Equipment Operators and Tenders	51-9192.00	Cleaning, Washing, and Metal Pickling Equipment Operators and Tenders	1
1053	51-9193	Cooling and Freezing Equipment Operators and Tenders	51-9193	Cooling and Freezing Equipment Operators and Tenders	51-9193.00	Cooling and Freezing Equipment Operators and Tenders	1
1054	51-9194	Etchers and Engravers	51-9194	Etchers and Engravers	51-9194.00	Etchers and Engravers	
1055	51-9194	Etchers and Engravers	51-9194	Etchers and Engravers	51-9194.01	Precision Etchers and Engravers, Hand or Machine	3
1056	51-9194	Etchers and Engravers	51-9194	Etchers and Engravers	51-9194.02	Engravers/Carvers	3
1057	51-9194	Etchers and Engravers	51-9194	Etchers and Engravers	51-9194.03	Etchers	3
1058	51-9194	Etchers and Engravers	51-9194	Etchers and Engravers	51-9194.04	Pantograph Engravers	1
1059	51-9194	Etchers and Engravers	51-9194	Etchers and Engravers	51-9194.05	Etchers, Hand	1
1060	51-9194	Etchers and Engravers	51-9194	Etchers and Engravers	51-9194.06	Engravers, Hand	3
1061	51-9195	Molders, Shapers, and Casters,	51-9195	Molders, Shapers, and Casters, Except Metal	51-9195.00	Molders, Shapers, and Casters,	

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Except Metal and Plastic		and Plastic		Except Metal and Plastic	
1062	51-9195	Molders, Shapers, and Casters, Except Metal and Plastic	51-9195	Molders, Shapers, and Casters, Except Metal and Plastic	51-9195.01	Precision Mold and Pattern Casters, except Nonferrous Metals	3
1063	51-9195	Molders, Shapers, and Casters, Except Metal and Plastic	51-9195	Molders, Shapers, and Casters, Except Metal and Plastic	51-9195.02	Precision Pattern and Die Casters, Nonferrous Metals	4
1064	51-9195	Molders, Shapers, and Casters, Except Metal and Plastic	51-9195	Molders, Shapers, and Casters, Except Metal and Plastic	51-9195.03	Stone Cutters and Carvers	3
1065	51-9195	Molders, Shapers, and Casters, Except Metal and Plastic	51-9195	Molders, Shapers, and Casters, Except Metal and Plastic	51-9195.04	Glass Blowers, Molders, Benders, and Finishers	4
1066	51-9195	Molders, Shapers, and Casters, Except Metal and Plastic	51-9195	Molders, Shapers, and Casters, Except Metal and Plastic	51-9195.05	Potters	4
1067	51-9195	Molders, Shapers, and Casters, Except Metal and Plastic	51-9195	Molders, Shapers, and Casters, Except Metal and Plastic	51-9195.06	Mold Makers, Hand	2
1068	51-9195	Molders, Shapers, and Casters, Except Metal and Plastic	51-9195	Molders, Shapers, and Casters, Except Metal and Plastic	51-9195.07	Molding and Casting Workers	2
1069	51-9196	Paper Goods Machine Setters, Operators, and Tenders	51-9196	Paper Goods Machine Setters, Operators, and Tenders	51-9196.00	Paper Goods Machine Setters, Operators, and Tenders	2
1070	51-9197	Tire Builders	51-9197	Tire Builders	51-9197.00	Tire Builders	1
1071	51-9198	Helpers--Production Workers	51-9198	Helpers--Production Workers	51-9198.00	Helpers--Production Workers	
1072	51-9198	Helpers--Production Workers	51-9198	Helpers--Production Workers	51-9198.01	Production Laborers	1
1073	51-9198	Helpers--Production Workers	51-9198	Helpers--Production Workers	51-9198.02	Production Helpers	1
1074	51-9199	Production Workers, All Other	51-9199	Production Workers, All Other	51-9199.99	Production Workers, All Other	
1075	53-1011	Aircraft Cargo Handling	53-1011	Aircraft Cargo Handling Supervisors	53-1011.00	Aircraft Cargo Handling	

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Supervisors				Supervisors	
1076	53-1021	First-Line Supervisors/Managers of Helpers, Laborers, and Material Movers, Hand	53-1021	First-Line Supervisors/Managers of Helpers, Laborers, and Material Movers, Hand	53-1021.00	First-Line Supervisors/Managers of Helpers, Laborers, and Material Movers, Hand	3
1077	53-1031	First-Line Supervisors/Managers of Transportation and Material-Moving Machine and Vehicle Operators	53-1031	First-Line Supervisors/Managers of Transportation and Material-Moving Machine and Vehicle Operators	53-1031.00	First-Line Supervisors/Managers of Transportation and Material-Moving Machine and Vehicle Operators	3
1078	53-2011	Airline Pilots, Copilots, and Flight Engineers	53-2011	Airline Pilots, Copilots, and Flight Engineers	53-2011.00	Airline Pilots, Copilots, and Flight Engineers	4
1079	53-2012	Commercial Pilots	53-2012	Commercial Pilots	53-2012.00	Commercial Pilots	4
1080	53-2021	Air Traffic Controllers	53-2021	Air Traffic Controllers	53-2021.00	Air Traffic Controllers	4
1081	53-2022	Airfield Operations Specialists	53-2022	Airfield Operations Specialists	53-2022.00	Airfield Operations Specialists	
1082	53-3011	Ambulance Drivers and Attendants, Except Emergency Medical Technicians	53-3011	Ambulance Drivers and Attendants, Except Emergency Medical Technicians	53-3011.00	Ambulance Drivers and Attendants, Except Emergency Medical Technicians	1
1083	53-3021	Bus Drivers, Transit and Intercity	53-3021	Bus Drivers, Transit and Intercity	53-3021.00	Bus Drivers, Transit and Intercity	1
1084	53-3022	Bus Drivers, School	53-3022	Bus Drivers, School	53-3022.00	Bus Drivers, School	2
1085	53-3031	Driver/Sales Workers	53-3031	Driver/Sales Workers	53-3031.00	Driver/Sales Workers	1
1086	53-3032	Truck Drivers, Heavy and Tractor-Trailer	53-3032	Truck Drivers, Heavy and Tractor-Trailer	53-3032.00	Truck Drivers, Heavy and Tractor-Trailer	
1087	53-3032	Truck Drivers, Heavy and Tractor-Trailer	53-3032	Truck Drivers, Heavy and Tractor-Trailer	53-3032.01	Truck Drivers, Heavy	1
1088	53-3032	Truck Drivers, Heavy and Tractor-Trailer	53-3032	Truck Drivers, Heavy and Tractor-Trailer	53-3032.02	Tractor-Trailer Truck Drivers	2
1089	53-3033	Truck Drivers,	53-3033	Truck Drivers, Light	53-3033.00	Truck Drivers,	1

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Light or Delivery Services		or Delivery Services		Light or Delivery Services	
1090	53-3041	Taxi Drivers and Chauffeurs	53-3041	Taxi Drivers and Chauffeurs	53-3041.00	Taxi Drivers and Chauffeurs	1
1091	53-3099	Motor Vehicle Operators, All Other	53-3099	Motor Vehicle Operators, All Other	53-3099.99	Motor Vehicle Operators, All Other	
1092	53-4011	Locomotive Engineers	53-4011	Locomotive Engineers	53-4011.00	Locomotive Engineers	4
1093	53-4012	Locomotive Firers	53-4012	Locomotive Firers	53-4012.00	Locomotive Firers	3
1094	53-4013	Rail Yard Engineers, Dinkey Operators, and Hostlers	53-4013	Rail Yard Engineers, Dinkey Operators, and Hostlers	53-4013.00	Rail Yard Engineers, Dinkey Operators, and Hostlers	2
1095	53-4021	Railroad Brake, Signal, and Switch Operators	53-4021	Railroad Brake, Signal, and Switch Operators	53-4021.00	Railroad Brake, Signal, and Switch Operators	
1096	53-4021	Railroad Brake, Signal, and Switch Operators	53-4021	Railroad Brake, Signal, and Switch Operators	53-4021.01	Train Crew Members	2
1097	53-4021	Railroad Brake, Signal, and Switch Operators	53-4021	Railroad Brake, Signal, and Switch Operators	53-4021.02	Railroad Yard Workers	1
1098	53-4031	Railroad Conductors and Yardmasters	53-4031	Railroad Conductors and Yardmasters	53-4031.00	Railroad Conductors and Yardmasters	4
1099	53-4041	Subway and Streetcar Operators	53-4041	Subway and Streetcar Operators	53-4041.00	Subway and Streetcar Operators	2
1100	53-4099	Rail Transportation Workers, All Other	53-4099	Rail Transportation Workers, All Other	53-4099.99	Rail Transportation Workers, All Other	
1101	53-5011	Sailors and Marine Oilers	53-5011	Sailors and Marine Oilers	53-5011.00	Sailors and Marine Oilers	
1102	53-5011	Sailors and Marine Oilers	53-5011	Sailors and Marine Oilers	53-5011.01	Able Seamen	2
1103	53-5011	Sailors and Marine Oilers	53-5011	Sailors and Marine Oilers	53-5011.02	Ordinary Seamen and Marine Oilers	2
1104	53-5021	Captains, Mates, and Pilots of Water Vessels	53-5021	Captains, Mates, and Pilots of Water Vessels	53-5021.00	Captains, Mates, and Pilots of Water Vessels	
1105	53-5021	Captains, Mates, and Pilots of Water Vessels	53-5021	Captains, Mates, and Pilots of Water Vessels	53-5021.01	Ship and Boat Captains	4

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
1106	53-5021	Captains, Mates, and Pilots of Water Vessels	53-5021	Captains, Mates, and Pilots of Water Vessels	53-5021.02	Mates- Ship, Boat, and Barge	3
1107	53-5021	Captains, Mates, and Pilots of Water Vessels	53-5021	Captains, Mates, and Pilots of Water Vessels	53-5021.03	Pilots, Ship	5
1108	53-5022	Motorboat Operators	53-5022	Motorboat Operators	53-5022.00	Motorboat Operators	2
1109	53-5031	Ship Engineers	53-5031	Ship Engineers	53-5031.00	Ship Engineers	5
1110	53-6011	Bridge and Lock Tenders	53-6011	Bridge and Lock Tenders	53-6011.00	Bridge and Lock Tenders	2
1111	53-6021	Parking Lot Attendants	53-6021	Parking Lot Attendants	53-6021.00	Parking Lot Attendants	1
1112	53-6031	Service Station Attendants	53-6031	Service Station Attendants	53-6031.00	Service Station Attendants	1
1113	53-6041	Traffic Technicians	53-6041	Traffic Technicians	53-6041.00	Traffic Technicians	4
1114	53-6051	Transportation Inspectors	53-6051	Transportation Inspectors	53-6051.00	Transportation Inspectors	
1115	53-6051	Transportation Inspectors	53-6051	Transportation Inspectors	53-6051.01	Aviation Inspectors	4
1116	53-6051	Transportation Inspectors	53-6051	Transportation Inspectors	53-6051.02	Public Transportation Inspectors	4
1117	53-6051	Transportation Inspectors	53-6051	Transportation Inspectors	53-6051.03	Marine Cargo Inspectors	5
1118	53-6051	Transportation Inspectors	53-6051	Transportation Inspectors	53-6051.04	Railroad Inspectors	2
1119	53-6051	Transportation Inspectors	53-6051	Transportation Inspectors	53-6051.05	Motor Vehicle Inspectors	2
1120	53-6051	Transportation Inspectors	53-6051	Transportation Inspectors	53-6051.06	Freight Inspectors	2
1121	53-6099	Transportation Workers, All Other	53-6099	Transportation Workers, All Other	53-6099.99	Transportation Workers, All Other	
1122	53-7011	Conveyor Operators and Tenders	53-7011	Conveyor Operators and Tenders	53-7011.00	Conveyor Operators and Tenders	1
1123	53-7021	Crane and Tower Operators	53-7021	Crane and Tower Operators	53-7021.00	Crane and Tower Operators	2
1124	53-7031	Dredge Operators	53-7031	Dredge Operators	53-7031.00	Dredge Operators	2
1125	53-7032	Excavating and Loading Machine and Dragline Operators	53-7032	Excavating and Loading Machine and Dragline Operators	53-7032.00	Excavating and Loading Machine and Dragline Operators	

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
1126	53-7032	Excavating and Loading Machine and Dragline Operators	53-7032	Excavating and Loading Machine and Dragline Operators	53-7032.01	Excavating and Loading Machine Operators	2
1127	53-7032	Excavating and Loading Machine and Dragline Operators	53-7032	Excavating and Loading Machine and Dragline Operators	53-7032.02	Dragline Operators	2
1128	53-7033	Loading Machine Operators, Underground Mining	53-7033	Loading Machine Operators, Underground Mining	53-7033.00	Loading Machine Operators, Underground Mining	2
1129	53-7041	Hoist and Winch Operators	53-7041	Hoist and Winch Operators	53-7041.00	Hoist and Winch Operators	1
1130	53-7051	Industrial Truck and Tractor Operators	53-7051	Industrial Truck and Tractor Operators	53-7051.00	Industrial Truck and Tractor Operators	1
1131	53-7061	Cleaners of Vehicles and Equipment	53-7061	Cleaners of Vehicles and Equipment	53-7061.00	Cleaners of Vehicles and Equipment	1
1132	53-7062	Laborers and Freight, Stock, and Material Movers, Hand	53-7062	Laborers and Freight, Stock, and Material Movers, Hand	53-7062.00	Laborers and Freight, Stock, and Material Movers, Hand	
1133	53-7062	Laborers and Freight, Stock, and Material Movers, Hand	53-7062	Laborers and Freight, Stock, and Material Movers, Hand	53-7062.01	Stevedores, Except Equipment Operators	1
1134	53-7062	Laborers and Freight, Stock, and Material Movers, Hand	53-7062	Laborers and Freight, Stock, and Material Movers, Hand	53-7062.02	Grips and Set-Up Workers, Motion Picture Sets, Studios, and Stages	2
1135	53-7062	Laborers and Freight, Stock, and Material Movers, Hand	53-7062	Laborers and Freight, Stock, and Material Movers, Hand	53-7062.03	Freight, Stock, and Material Movers, Hand	1
1136	53-7063	Machine Feeders and Offbearers	53-7063	Machine Feeders and Offbearers	53-7063.00	Machine Feeders and Offbearers	1
1137	53-7064	Packers and Packagers, Hand	53-7064	Packers and Packagers, Hand	53-7064.00	Packers and Packagers, Hand	1
1138	53-7071	Gas Compressor and Gas Pumping Station Operators	53-7071	Gas Compressor and Gas Pumping Station Operators	53-7071.00	Gas Compressor and Gas Pumping Station Operators	
1139	53-7071	Gas Compressor and Gas Pumping	53-7071	Gas Compressor and Gas Pumping Station	53-7071.01	Gas Pumping Station Operators	2

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
		Station Operators		Operators			
1140	53-7071	Gas Compressor and Gas Pumping Station Operators	53-7071	Gas Compressor and Gas Pumping Station Operators	53-7071.02	Gas Compressor Operators	4
1141	53-7072	Pump Operators, Except Wellhead Pumpers	53-7072	Pump Operators, Except Wellhead Pumpers	53-7072.00	Pump Operators, Except Wellhead Pumpers	2
1142	53-7073	Wellhead Pumpers	53-7073	Wellhead Pumpers	53-7073.00	Wellhead Pumpers	4
1143	53-7081	Refuse and Recyclable Material Collectors	53-7081	Refuse and Recyclable Material Collectors	53-7081.00	Refuse and Recyclable Material Collectors	1
1144	53-7111	Shuttle Car Operators	53-7111	Shuttle Car Operators	53-7111.00	Shuttle Car Operators	2
1145	53-7121	Tank Car, Truck, and Ship Loaders	53-7121	Tank Car, Truck, and Ship Loaders	53-7121.00	Tank Car, Truck, and Ship Loaders	3
1146	53-7199	Material Moving Workers, All Other	53-7199	Material Moving Workers, All Other	53-7199.99	Material Moving Workers, All Other	
1147	na	Air Crew Officers	55-1011	Air Crew Officers	55-1011.00	Air Crew Officers	
1148	na	Aircraft Launch and Recovery Officers	55-1012	Aircraft Launch and Recovery Officers	55-1012.00	Aircraft Launch and Recovery Officers	
1149	na	Armored Assault Vehicle Officers	55-1013	Armored Assault Vehicle Officers	55-1013.00	Armored Assault Vehicle Officers	
1150	na	Artillery and Missile Officers	55-1014	Artillery and Missile Officers	55-1014.00	Artillery and Missile Officers	
1151	na	Command and Control Center Officers	55-1015	Command and Control Center Officers	55-1015.00	Command and Control Center Officers	
1152	na	Infantry Officers	55-1016	Infantry Officers	55-1016.00	Infantry Officers	
1153	na	Special Forces Officers	55-1017	Special Forces Officers	55-1017.00	Special Forces Officers	
1154	na	Military Officer Special and Tactical Operations Leaders/Managers, All Other	55-1019	Military Officer Special and Tactical Operations Leaders/Managers, All Other	55-1019.99	Military Officer Special and Tactical Operations Leaders/Managers, All Other	
1155	na	First-Line Supervisors/Managers of Air Crew Members	55-2011	First-Line Supervisors/Managers of Air Crew Members	55-2011.00	First-Line Supervisors/Managers of Air Crew Members	

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
1156	na	First-Line Supervisors/Managers of Weapons Specialists/Crew Members	55-2012	First-Line Supervisors/Managers of Weapons Specialists/Crew Members	55-2012.00	First-Line Supervisors/Managers of Weapons Specialists/Crew Members	
1157	na	First-Line Supervisors/Managers of All Other Tactical Operations Specialists	55-2013	First-Line Supervisors/Managers of All Other Tactical Operations Specialists	55-2013.00	First-Line Supervisors/Managers of All Other Tactical Operations Specialists	
1158	na	Air Crew Members	55-3011	Air Crew Members	55-3011.00	Air Crew Members	
1159	na	Aircraft Launch and Recovery Specialists	55-3012	Aircraft Launch and Recovery Specialists	55-3012.00	Aircraft Launch and Recovery Specialists	
1160	na	Armored Assault Vehicle Crew Members	55-3013	Armored Assault Vehicle Crew Members	55-3013.00	Armored Assault Vehicle Crew Members	
1161	na	Artillery and Missile Crew Members	55-3014	Artillery and Missile Crew Members	55-3014.00	Artillery and Missile Crew Members	
	na	Command and Control Center Specialists	55-3015	Command and Control Center Specialists	55-3015.00	Command and Control Center Specialists	
1163	na	Infantry	55-3016	Infantry	55-3016.00	Infantry	
1164	na	Radar and Sonar Technicians	55-3017	Radar and Sonar Technicians	55-3017.00	Radar and Sonar Technicians	
1165	na	Special Forces	55-3018	Special Forces	55-3018.00	Special Forces	
1166	na	Military Enlisted Tactical Operations and Air/Weapons Specialists and Crew Members, All Other	55-3019	Military Enlisted Tactical Operations and Air/Weapons Specialists and Crew Members, All Other	55-3019.99	Military Enlisted Tactical Operations and Air/Weapons Specialists and Crew Members, All Other	
1167	17-1099	All Other Architects, Surveyors, and Cartographers					
1168	43-5199	All Other Material Recording, Scheduling, Dispatching, and Distributing Workers					

Table A2 (continued)

ID	OES Code	1999 OES Title	SOC Code	2000 SOC Title	O*NET-SOC Code	O*NET-SOC Title	Job Zone
1169	49-2099	All Other Electrical and Electronic Equipment Mechanics, Installers, and Repairers					
1170	49-3012	Aircraft Mechanics and Service Technicians, FAA certified					
1171	49-3013	Aircraft Mechanics and Service Technicians, not FAA certified					
1172	49-3099	All Other Vehicle and Mobile Equipment Mechanics, Installers, and Repairers					
1173	51-3099	All Other Food Processing Workers					
1174	51-5099	All Other Printing Workers					
1175	53-2099	All Other Air Transportation Workers					
1176	53-5099	All Other Water Transportation Workers					

Source: National Crosswalk Service Center, Career OneStop Official Crosswalk Tables (http://www.state.ia.us/ncdc/xw_ackx.html) : 1. O*NET-SOC and 2. SOC-OES

Note: 1. O*NET- 2000 SOC linkages are part of the O*NET 3.1 database

2. Spreadsheet file linking the 1998 SOC and 1999 OES (six-digit SOC-based) furnished by BLS. The 1998 SOC occupations in that file were converted to 2000 SOC occupations by the NCSC.

3. SOC-OES crosswalk table was modified by author 1) in order to update SOC changes and 2) in order to make the classification convertible from ONET to OES via SOC.

i) The code for "Mathematical Technicians" has been changed from 15-3011 to 15-2091.

ii) "Farm Laborer Contractors" moved from 45-2031 to 45-1012.

iii) 45-9099 "Farming, Fishing, and Forestry Workers, All Other" has been deleted

iv) SOC code 49-3011 "Aircraft Mechanics and Service Technicians" has been converted to OES code 49-3011 "Aircraft Mechanics and Service Technicians" only.

4. O*NET-SOC have 1166 occupations including 902 jobs defined by Job Zone. In this crosswalk table, SOC includes 2 minor groups and 821 detailed occupations. OES includes 770 detailed occupations.

Table A3. Information vs. Non-Information Occupations: 770 OES Occupations by Job Zone

Job Zone	ID	OES Code	1999 OES Title
Information Occupation: Job Zone 4 and 5			
5	1	11-3021	Computer and Information Systems Managers
5	2	11-3031	Financial Managers
5	3	11-9033	Education Administrators, Postsecondary
5	4	11-9041	Engineering Managers
5	5	11-9111	Medical and Health Services Managers
5	6	11-9121	Natural Sciences Managers
5	7	11-1011	Chief Executives
5	8	13-2051	Financial Analysts
5	9	15-2011	Actuaries
5	10	15-2021	Mathematicians
5	11	17-1011	Architects, Except Landscape and Naval
5	12	17-2011	Aerospace Engineers
5	13	17-2021	Agricultural Engineers
5	14	17-2041	Chemical Engineers
5	15	17-2071	Electrical Engineers
5	16	17-2072	Electronics Engineers, Except Computer
5	17	17-2121	Marine Engineers and Naval Architects
5	18	17-2131	Materials Engineers
5	19	17-2161	Nuclear Engineers
5	20	17-2171	Petroleum Engineers
5	21	19-1010	Agricultural and Food Scientists
5	22	19-1021	Biochemists and Biophysicists
5	23	19-1022	Microbiologists
5	24	19-1023	Zoologists and Wildlife Biologists
5	25	19-2011	Astronomers
5	26	19-2012	Physicists
5	27	19-2041	Environmental Scientists and Specialists, Including Health
5	28	19-2042	Geoscientists, Except Hydrologists and Geographers
5	29	19-2043	Hydrologists
5	30	19-3011	Economists
5	31	19-3032	Industrial-Organizational Psychologists
5	32	19-3094	Political Scientists
5	33	21-1021	Child, Family, and School Social Workers
5	34	21-1022	Medical and Public Health Social Workers
5	35	21-1023	Mental Health and Substance Abuse Social Workers
5	36	21-1091	Health Educators
5	37	21-2011	Clergy
5	38	21-2021	Directors, Religious Activities and Education
5	39	23-1011	Lawyers
5	40	23-1021	Administrative Law Judges, Adjudicators, and Hearing Officers
5	41	23-1022	Arbitrators, Mediators, and Conciliators

Table A3 (continued)

Job Zone	ID	OES Code	1999 OES Title
5	42	23-1023	Judges, Magistrate Judges, and Magistrates
5	43	25-1021	Computer Science Teachers, Postsecondary
5	44	25-1022	Mathematical Science Teachers, Postsecondary
5	45	25-1032	Engineering Teachers, Postsecondary
5	46	25-1041	Agricultural Sciences Teachers, Postsecondary
5	47	25-1042	Biological Science Teachers, Postsecondary
5	48	25-1043	Forestry and Conservation Science Teachers, Postsecondary
5	49	25-1052	Chemistry Teachers, Postsecondary
5	50	25-1054	Physics Teachers, Postsecondary
5	51	25-1061	Anthropology and Archeology Teachers, Postsecondary
5	52	25-1062	Area, Ethnic, and Cultural Studies Teachers, Postsecondary
5	53	25-1063	Economics Teachers, Postsecondary
5	54	25-1065	Political Science Teachers, Postsecondary
5	55	25-1066	Psychology Teachers, Postsecondary
5	56	25-1067	Sociology Teachers, Postsecondary
5	57	25-1071	Health Specialties Teachers, Postsecondary
5	58	25-1072	Nursing Instructors and Teachers, Postsecondary
5	59	25-1121	Art, Drama, and Music Teachers, Postsecondary
5	60	25-1123	English Language and Literature Teachers, Postsecondary
5	61	25-1124	Foreign Language and Literature Teachers, Postsecondary
5	62	25-1125	History Teachers, Postsecondary
5	63	25-1191	Graduate Teaching Assistants
5	64	25-9031	Instructional Coordinators
5	65	27-1027	Set and Exhibit Designers
5	66	27-2022	Coaches and Scouts
5	67	27-2032	Choreographers
5	68	27-2041	Music Directors and Composers
5	69	27-3042	Technical Writers
5	70	29-1011	Chiropractors
5	71	29-1020	Dentists
5	72	29-1031	Dietitians and Nutritionists
5	73	29-1041	Optometrists
5	74	29-1061	Anesthesiologists
5	75	29-1062	Family and General Practitioners
5	76	29-1063	Internists, General
5	77	29-1064	Obstetricians and Gynecologists
5	78	29-1065	Pediatricians, General
5	79	29-1066	Psychiatrists
5	80	29-1067	Surgeons
5	81	29-1123	Physical Therapists
5	82	29-1131	Veterinarians
5	83	29-9010	Occupational Health and Safety Specialists and Technicians
5	84	29-9091	Athletic Trainers

Table A3 (continued)

Job Zone	ID	OES Code	1999 OES Title
5	85	33-1021	First-Line Supervisors/Managers of Fire Fighting and Prevention Workers
5	86	41-9031	Sales Engineers
5	87	49-2095	Electrical and Electronics Repairers, Powerhouse, Substation, and Relay
5	88	51-5021	Job Printers
5	89	53-5031	Ship Engineers
4	1	11-2011	Advertising and Promotions Managers
4	2	11-2021	Marketing Managers
4	3	11-2022	Sales Managers
4	4	11-3011	Administrative Services Managers
4	5	11-3040	Human Resources Managers
4	6	11-3051	Industrial Production Managers
4	7	11-3061	Purchasing Managers
4	8	11-3071	Transportation, Storage, and Distribution Managers
4	9	11-9011	Farm, Ranch, and Other Agricultural Managers
4	10	11-9021	Construction Managers
4	11	11-9031	Education Administrators, Preschool and Child Care Center/Program
4	12	11-9032	Education Administrators, Elementary and Secondary School
4	13	11-9051	Food Service Managers
4	14	11-9061	Funeral Directors
4	15	11-9131	Postmasters and Mail Superintendents
4	16	11-9141	Property, Real Estate, and Community Association Managers
4	17	11-9151	Social and Community Service Managers
4	18	13-1021	Purchasing Agents and Buyers, Farm Products
4	19	13-1023	Purchasing Agents, Except Wholesale, Retail, and Farm Products
4	20	13-1031	Claims Adjusters, Examiners, and Investigators
4	21	13-1032	Insurance Appraisers, Auto Damage
4	22	13-1041	Compliance Officers, Except Agriculture, Construction, Health and Safety, and Transportation
4	23	13-1051	Cost Estimators
4	24	13-1073	Training and Development Specialists
4	25	13-1111	Management Analysts
4	26	13-1121	Meeting and Convention Planners
4	27	13-2011	Accountants and Auditors
4	28	13-2021	Appraisers and Assessors of Real Estate
4	29	13-2031	Budget Analysts
4	30	13-2041	Credit Analysts
4	31	13-2053	Insurance Underwriters
4	32	13-2061	Financial Examiners
4	33	13-2071	Loan Counselors
4	34	13-2072	Loan Officers
4	35	13-2081	Tax Examiners, Collectors, and Revenue Agents
4	36	15-1021	Computer Programmers

Table A3 (continued)

Job Zone	ID	OES Code	1999 OES Title
4	37	15-1031	Computer Software Engineers, Applications
4	38	15-1032	Computer Software Engineers, Systems Software
4	39	15-1041	Computer Support Specialists
4	40	15-1061	Database Administrators
4	41	15-1071	Network and Computer Systems Administrators
4	42	15-1081	Network Systems and Data Communications Analysts
4	43	15-2031	Operations Research Analysts
4	44	15-2041	Statisticians
4	45	15-2091	Mathematical Technicians
4	46	17-1012	Landscape Architects
4	47	17-1021	Cartographers and Photogrammetrists
4	48	17-1022	Surveyors
4	49	17-2051	Civil Engineers
4	50	17-2061	Computer Hardware Engineers
4	51	17-2111	Health and Safety Engineers, Except Mining Safety Engineers and Inspectors
4	52	17-2112	Industrial Engineers
4	53	17-2141	Mechanical Engineers
4	54	17-2151	Mining and Geological Engineers, Including Mining Safety Engineers
4	55	17-3012	Electrical and Electronics Drafters
4	56	17-3013	Mechanical Drafters
4	57	17-3021	Aerospace Engineering and Operations Technicians
4	58	17-3022	Civil Engineering Technicians
4	59	17-3023	Electrical and Electronic Engineering Technicians
4	60	17-3024	Electro-Mechanical Technicians
4	61	17-3027	Mechanical Engineering Technicians
4	62	17-3031	Surveying and Mapping Technicians
4	63	19-1031	Conservation Scientists
4	64	19-1032	Foresters
4	65	19-1041	Epidemiologists
4	66	19-1042	Medical Scientists, Except Epidemiologists
4	67	19-2021	Atmospheric and Space Scientists
4	68	19-2031	Chemists
4	69	19-2032	Materials Scientists
4	70	19-3021	Market Research Analysts
4	71	19-3031	Clinical, Counseling, and School Psychologists
4	72	19-3051	Urban and Regional Planners
4	73	19-3091	Anthropologists and Archeologists
4	74	19-3092	Geographers
4	75	19-3093	Historians
4	76	19-4092	Forensic Science Technicians
4	77	21-1011	Substance Abuse and Behavioral Disorder Counselors
4	78	21-1012	Educational, Vocational, and School Counselors
4	79	21-1014	Mental Health Counselors

Table A3 (continued)

Job Zone	ID	OES Code	1999 OES Title
4	80	23-2011	Paralegals and Legal Assistants
4	81	23-2092	Law Clerks
4	82	25-1194	Vocational Education Teachers, Postsecondary
4	83	25-2011	Preschool Teachers, Except Special Education
4	84	25-2012	Kindergarten Teachers, Except Special Education
4	85	25-2021	Elementary School Teachers, Except Special Education
4	86	25-2022	Middle School Teachers, Except Special and Vocational Education
4	87	25-2023	Vocational Education Teachers, Middle School
4	88	25-2031	Secondary School Teachers, Except Special and Vocational Education
4	89	25-2032	Vocational Education Teachers, Secondary School
4	90	25-2041	Special Education Teachers, Preschool, Kindergarten, and Elementary School
4	91	25-2042	Special Education Teachers, Middle School
4	92	25-2043	Special Education Teachers, Secondary School
4	93	25-3011	Adult Literacy, Remedial Education, and GED Teachers and Instructors
4	94	25-3021	Self-Enrichment Education Teachers
4	95	25-4010	Archivists, Curators, and Museum Technicians
4	96	25-4021	Librarians
4	97	25-9011	Audio-Visual Collections Specialists
4	98	25-9021	Farm and Home Management Advisors
4	99	27-1011	Art Directors
4	100	27-1013	Fine Artists, Including Painters, Sculptors, and Illustrators
4	101	27-1021	Commercial and Industrial Designers
4	102	27-1024	Graphic Designers
4	103	27-1025	Interior Designers
4	104	27-2012	Producers and Directors
4	105	27-2031	Dancers
4	106	27-2042	Musicians and Singers
4	107	27-3020	News Analysts, Reporters and Correspondents
4	108	27-3031	Public Relations Specialists
4	109	27-3041	Editors
4	110	27-3043	Writers and Authors
4	111	27-4011	Audio and Video Equipment Technicians
4	112	27-4012	Broadcast Technicians
4	113	27-4031	Camera Operators, Television, Video, and Motion Picture
4	114	27-4032	Film and Video Editors
4	115	29-1051	Pharmacists
4	116	29-1071	Physician Assistants
4	117	29-1081	Podiatrists
4	118	29-1111	Registered Nurses
4	119	29-1121	Audiologists
4	120	29-1122	Occupational Therapists
4	121	29-1124	Radiation Therapists
4	122	29-1125	Recreational Therapists
4	123	29-1127	Speech-Language Pathologists

Table A3 (continued)

Job Zone	ID	OES Code	1999 OES Title
4	124	29-2011	Medical and Clinical Laboratory Technologists
4	125	29-2033	Nuclear Medicine Technologists
4	126	29-2034	Radiologic Technologists and Technicians
4	127	29-2051	Dietetic Technicians
4	128	29-2081	Opticians, Dispensing
4	129	33-1012	First-Line Supervisors/Managers of Police and Detectives
4	130	33-3021	Detectives and Criminal Investigators
4	131	35-1011	Chefs and Head Cooks
4	132	37-1011	First-Line Supervisors/Managers of Housekeeping and Janitorial Workers
4	133	37-1012	First-Line Supervisors/Managers of Landscaping, Lawn Service, and Groundskeeping Workers
4	134	39-3092	Costume Attendants
4	135	39-4011	Embalmers
4	136	41-3031	Securities, Commodities, and Financial Services Sales Agents
4	137	43-6011	Executive Secretaries and Administrative Assistants
4	138	43-9031	Desktop Publishers
4	139	45-2011	Agricultural Inspectors
4	140	47-1011	First-Line Supervisors/Managers of Construction Trades and Extraction Workers
4	141	47-2011	Boilermakers
4	142	47-2022	Stonemasons
4	143	47-2041	Carpet Installers
4	144	47-2141	Painters, Construction and Maintenance
4	145	47-2161	Plasterers and Stucco Masons
4	146	47-4021	Elevator Installers and Repairers
4	147	47-5013	Service Unit Operators, Oil, Gas, and Mining
4	148	49-1011	First-Line Supervisors/Managers of Mechanics, Installers, and Repairers
4	149	49-2091	Avionics Technicians
4	150	49-3011	Aircraft Mechanics and Service Technicians
4	151	49-3042	Mobile Heavy Equipment Mechanics, Except Engines
4	152	49-9021	Heating, Air Conditioning, and Refrigeration Mechanics and Installers
4	153	49-9031	Home Appliance Repairers
4	154	49-9044	Millwrights
4	155	49-9051	Electrical Power-Line Installers and Repairers
4	156	49-9061	Camera and Photographic Equipment Repairers
4	157	49-9097	Signal and Track Switch Repairers
4	158	51-2041	Structural Metal Fabricators and Fitters
4	159	51-4041	Machinists
4	160	51-4061	Model Makers, Metal and Plastic
4	161	51-4062	Patternmakers, Metal and Plastic
4	162	51-4111	Tool and Die Makers
4	163	51-5012	Bookbinders
4	164	51-5022	Prepress Technicians and Workers
4	165	51-6052	Tailors, Dressmakers, and Custom Sewers
4	166	51-7031	Model Makers, Wood

Table A3 (continued)

Job Zone	ID	OES Code	1999 OES Title
4	167	51-7032	Patternmakers, Wood
4	168	51-8011	Nuclear Power Reactor Operators
4	169	51-8012	Power Distributors and Dispatchers
4	170	51-9083	Ophthalmic Laboratory Technicians
4	171	53-2011	Airline Pilots, Copilots, and Flight Engineers
4	172	53-2012	Commercial Pilots
4	173	53-2021	Air Traffic Controllers
4	174	53-4011	Locomotive Engineers
4	175	53-4031	Railroad Conductors and Yardmasters
4	176	53-5021	Captains, Mates, and Pilots of Water Vessels
4	177	53-6041	Traffic Technicians
4	178	53-7073	Wellhead Pumpers
Non-Information Occupation : Job Zone 1, 2, and 3			
3	1	11-9071	Gaming Managers
3	2	11-9081	Lodging Managers
3	3	11-9199	Managers, All Other
3	4	13-1011	Agents and Business Managers of Artists, Performers, and Athletes
3	5	13-1022	Wholesale and Retail Buyers, Except Farm Products
3	6	13-1071	Employment, Recruitment, and Placement Specialists
3	7	13-1072	Compensation, Benefits, and Job Analysis Specialists
3	8	13-2052	Personal Financial Advisors
3	9	15-1051	Computer Systems Analysts
3	10	17-3011	Architectural and Civil Drafters
3	11	17-3026	Industrial Engineering Technicians
3	12	19-3041	Sociologists
3	13	19-4031	Chemical Technicians
3	14	19-4041	Geological and Petroleum Technicians
3	15	19-4051	Nuclear Technicians
3	16	19-4091	Environmental Science and Protection Technicians, Including Health
3	17	19-4099	Life, Physical, and Social Science Technicians, All Other
3	18	21-1092	Probation Officers and Correctional Treatment Specialists
3	19	23-2093	Title Examiners, Abstractors, and Searchers
3	20	25-9041	Teacher Assistants
3	21	27-1022	Fashion Designers
3	22	27-1026	Merchandise Displayers and Window Trimmers
3	23	27-2011	Actors
3	24	27-2021	Athletes and Sports Competitors
3	25	27-2023	Umpires, Referees, and Other Sports Officials
3	26	27-3010	Announcers
3	27	27-3091	Interpreters and Translators
3	28	27-4013	Radio Operators
3	29	27-4014	Sound Engineering Technicians
3	30	27-4021	Photographers

Table A3 (continued)

Job Zone	ID	OES Code	1999 OES Title
3	31	29-1126	Respiratory Therapists
3	32	29-2021	Dental Hygienists
3	33	29-2031	Cardiovascular Technologists and Technicians
3	34	29-2032	Diagnostic Medical Sonographers
3	35	29-2053	Psychiatric Technicians
3	36	29-2054	Respiratory Therapy Technicians
3	37	29-2055	Surgical Technologists
3	38	29-2061	Licensed Practical and Licensed Vocational Nurses
3	39	29-2071	Medical Records and Health Information Technicians
3	40	29-2091	Orthotists and Prosthetists
3	41	31-9092	Medical Assistants
3	42	31-9096	Veterinary Assistants and Laboratory Animal Caretakers
3	43	33-2021	Fire Inspectors and Investigators
3	44	33-3031	Fish and Game Wardens
3	45	33-3051	Police and Sheriff's Patrol Officers
3	46	35-1012	First-Line Supervisors/Managers of Food Preparation and Serving Workers
3	47	35-2014	Cooks, Restaurant
3	48	35-9031	Hosts and Hostesses, Restaurant, Lounge, and Coffee Shop
3	49	39-1011	Gaming Supervisors
3	50	39-1021	First-Line Supervisors/Managers of Personal Service Workers
3	51	39-2011	Animal Trainers
3	52	39-5011	Barbers
3	53	39-5012	Hairdressers, Hairstylists, and Cosmetologists
3	54	39-9031	Fitness Trainers and Aerobics Instructors
3	55	39-9032	Recreation Workers
3	56	39-9041	Residential Advisors
3	57	41-1012	First-Line Supervisors/Managers of Non-Retail Sales Workers
3	58	41-3011	Advertising Sales Agents
3	59	41-3021	Insurance Sales Agents
3	60	41-3041	Travel Agents
3	61	41-4011	Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products
3	62	43-1011	First-Line Supervisors/Managers of Office and Administrative Support Workers
3	63	43-6012	Legal Secretaries
3	64	43-9011	Computer Operators
3	65	45-1011	First-Line Supervisors/Managers of Farming, Fishing, and Forestry Workers
3	66	45-2021	Animal Breeders
3	67	47-2021	Brickmasons and Blockmasons
3	68	47-2031	Carpenters
3	69	47-2042	Floor Layers, Except Carpet, Wood, and Hard Tiles
3	70	47-2051	Cement Masons and Concrete Finishers
3	71	47-2053	Terrazzo Workers and Finishers

Table A3 (continued)

Job Zone	ID	OES Code	1999 OES Title
3	72	47-2073	Operating Engineers and Other Construction Equipment Operators
3	73	47-2081	Drywall and Ceiling Tile Installers
3	74	47-2111	Electricians
3	75	47-2121	Glaziers
3	76	47-2130	Insulation Workers
3	77	47-2152	Plumbers, Pipefitters, and Steamfitters
3	78	47-2171	Reinforcing Iron and Rebar Workers
3	79	47-2181	Roofers
3	80	47-2211	Sheet Metal Workers
3	81	47-2221	Structural Iron and Steel Workers
3	82	47-4011	Construction and Building Inspectors
3	83	47-5012	Rotary Drill Operators, Oil and Gas
3	84	47-5021	Earth Drillers, Except Oil and Gas
3	85	49-2011	Computer, Automated Teller, and Office Machine Repairers
3	86	49-2021	Radio Mechanics
3	87	49-2022	Telecommunications Equipment Installers and Repairers, Except Line Installers
3	88	49-2092	Electric Motor, Power Tool, and Related Repairers
3	89	49-2093	Electrical and Electronics Installers and Repairers, Transportation Equipment
3	90	49-2094	Electrical and Electronics Repairers, Commercial and Industrial Equipment
3	91	49-2096	Electronic Equipment Installers and Repairers, Motor Vehicles
3	92	49-2097	Electronic Home Entertainment Equipment Installers and Repairers
3	93	49-3021	Automotive Body and Related Repairers
3	94	49-3023	Automotive Service Technicians and Mechanics
3	95	49-3031	Bus and Truck Mechanics and Diesel Engine Specialists
3	96	49-3041	Farm Equipment Mechanics
3	97	49-3043	Rail Car Repairers
3	98	49-3051	Motorboat Mechanics
3	99	49-3053	Outdoor Power Equipment and Other Small Engine Mechanics
3	100	49-9011	Mechanical Door Repairers
3	101	49-9012	Control and Valve Installers and Repairers, Except Mechanical Door
3	102	49-9041	Industrial Machinery Mechanics
3	103	49-9042	Maintenance and Repair Workers, General
3	104	49-9052	Telecommunications Line Installers and Repairers
3	105	49-9062	Medical Equipment Repairers
3	106	49-9063	Musical Instrument Repairers and Tuners
3	107	49-9064	Watch Repairers
3	108	49-9094	Locksmiths and Safe Repairers
3	109	49-9096	Riggers
3	110	51-1011	First-Line Supervisors/Managers of Production and Operating Workers
3	111	51-2011	Aircraft Structure, Surfaces, Rigging, and Systems Assemblers
3	112	51-2022	Electrical and Electronic Equipment Assemblers
3	113	51-2023	Electromechanical Equipment Assemblers

Table A3 (continued)

Job Zone	ID	OES Code	1999 OES Title
3	114	51-2031	Engine and Other Machine Assemblers
3	115	51-3011	Bakers
3	116	51-3021	Butchers and Meat Cutters
3	117	51-3092	Food Batchmakers
3	118	51-4012	Numerical Tool and Process Control Programmers
3	119	51-4033	Grinding, Lapping, Polishing, and Buffing Machine Tool Setters, Operators, and Tenders, Metal and Pl
3	120	51-4034	Lathe and Turning Machine Tool Setters, Operators, and Tenders, Metal and Plastic
3	121	51-4035	Milling and Planing Machine Setters, Operators, and Tenders, Metal and Plastic
3	122	51-4081	Multiple Machine Tool Setters, Operators, and Tenders, Metal and Plastic
3	123	51-4192	Lay-Out Workers, Metal and Plastic
3	124	51-4194	Tool Grinders, Filers, and Sharpeners
3	125	51-5023	Printing Machine Operators
3	126	51-6062	Textile Cutting Machine Setters, Operators, and Tenders
3	127	51-6063	Textile Knitting and Weaving Machine Setters, Operators, and Tenders
3	128	51-6064	Textile Winding, Twisting, and Drawing Out Machine Setters, Operators, and Tenders
3	129	51-6093	Upholsterers
3	130	51-7011	Cabinetmakers and Bench Carpenters
3	131	51-8013	Power Plant Operators
3	132	51-8021	Stationary Engineers and Boiler Operators
3	133	51-8031	Water and Liquid Waste Treatment Plant and System Operators
3	134	51-8092	Gas Plant Operators
3	135	51-8093	Petroleum Pump System Operators, Refinery Operators, and Gaugers
3	136	51-9061	Inspectors, Testers, Sorters, Samplers, and Weighers
3	137	51-9071	Jewelers and Precious Stone and Metal Workers
3	138	51-9081	Dental Laboratory Technicians
3	139	51-9131	Photographic Process Workers
3	140	51-9195	Molders, Shapers, and Casters, Except Metal and Plastic
3	141	53-1021	First-Line Supervisors/Managers of Helpers, Laborers, and Material Movers, Hand
3	142	53-1031	First-Line Supervisors/Managers of Transportation and Material-Moving Machine and Vehicle Operators
3	143	53-4012	Locomotive Firers
3	144	53-6051	Transportation Inspectors
3	145	53-7071	Gas Compressor and Gas Pumping Station Operators
3	146	53-7121	Tank Car, Truck, and Ship Loaders
2	1	13-2082	Tax Preparers
2	2	19-4011	Agricultural and Food Science Technicians
2	3	19-4021	Biological Technicians

Table A3 (continued)

Job Zone	ID	OES Code	1999 OES Title
2	4	21-1093	Social and Human Service Assistants
2	5	25-4031	Library Technicians
2	6	27-1023	Floral Designers
2	7	29-2012	Medical and Clinical Laboratory Technicians
2	8	29-2041	Emergency Medical Technicians and Paramedics
2	9	29-2052	Pharmacy Technicians
2	10	31-1012	Nursing Aides, Orderlies, and Attendants
2	11	31-1013	Psychiatric Aides
2	12	31-2011	Occupational Therapist Assistants
2	13	31-2012	Occupational Therapist Aides
2	14	31-2021	Physical Therapist Assistants
2	15	31-2022	Physical Therapist Aides
2	16	31-9091	Dental Assistants
2	17	31-9093	Medical Equipment Preparers
2	18	33-2011	Fire Fighters
2	19	33-2022	Forest Fire Inspectors and Prevention Specialists
2	20	33-3012	Correctional Officers and Jailers
2	21	33-3052	Transit and Railroad Police
2	22	33-9011	Animal Control Workers
2	23	33-9021	Private Detectives and Investigators
2	24	33-9099	Protective Service Workers, All Other
2	25	35-2011	Cooks, Fast Food
2	26	35-2012	Cooks, Institution and Cafeteria
2	27	37-2021	Pest Control Workers
2	28	37-3012	Pesticide Handlers, Sprayers, and Applicators, Vegetation
2	29	37-3013	Tree Trimmers and Pruners
2	30	39-3011	Gaming Dealers
2	31	39-3012	Gaming and Sports Book Writers and Runners
2	32	39-3021	Motion Picture Projectionists
2	33	39-5091	Makeup Artists, Theatrical and Performance
2	34	39-6022	Travel Guides
2	35	39-6031	Flight Attendants
2	36	39-9021	Personal and Home Care Aides
2	37	41-1011	First-Line Supervisors/Managers of Retail Sales Workers
2	38	41-2022	Parts Salespersons
2	39	41-2031	Retail Salespersons
2	40	41-4012	Sales Representatives, Wholesale and Manufacturing, Except Technical and Scientific Products
2	41	41-9022	Real Estate Sales Agents
2	42	43-3011	Bill and Account Collectors
2	43	43-3021	Billing and Posting Clerks and Machine Operators
2	44	43-3031	Bookkeeping, Accounting, and Auditing Clerks
2	45	43-3051	Payroll and Timekeeping Clerks
2	46	43-3071	Tellers

Table A3 (continued)

Job Zone	ID	OES Code	1999 OES Title
2	47	43-4011	Brokerage Clerks
2	48	43-4021	Correspondence Clerks
2	49	43-4031	Court, Municipal, and License Clerks
2	50	43-4051	Customer Service Representatives
2	51	43-4061	Eligibility Interviewers, Government Programs
2	52	43-4081	Hotel, Motel, and Resort Desk Clerks
2	53	43-4131	Loan Interviewers and Clerks
2	54	43-4141	New Accounts Clerks
2	55	43-4151	Order Clerks
2	56	43-4161	Human Resources Assistants, Except Payroll and Timekeeping
2	57	43-4171	Receptionists and Information Clerks
2	58	43-4181	Reservation and Transportation Ticket Agents and Travel Clerks
2	59	43-5011	Cargo and Freight Agents
2	60	43-5031	Police, Fire, and Ambulance Dispatchers
2	61	43-5032	Dispatchers, Except Police, Fire, and Ambulance
2	62	43-5051	Postal Service Clerks
2	63	43-5061	Production, Planning, and Expediting Clerks
2	64	43-5081	Stock Clerks and Order Fillers
2	65	43-6013	Medical Secretaries
2	66	43-6014	Secretaries, Except Legal, Medical, and Executive
2	67	43-9021	Data Entry Keyers
2	68	43-9022	Word Processors and Typists
2	69	43-9041	Insurance Claims and Policy Processing Clerks
2	70	43-9061	Office Clerks, General
2	71	43-9081	Proofreaders and Copy Markers
2	72	43-9111	Statistical Assistants
2	73	45-2091	Agricultural Equipment Operators
2	74	45-4022	Logging Equipment Operators
2	75	45-4023	Log Graders and Scalers
2	76	47-2043	Floor Sanders and Finishers
2	77	47-2044	Tile and Marble Setters
2	78	47-2061	Construction Laborers
2	79	47-2071	Paving, Surfacing, and Tamping Equipment Operators
2	80	47-2072	Pile-Driver Operators
2	81	47-2082	Tapers
2	82	47-2142	Paperhangers
2	83	47-2151	Pipelayers
2	84	47-3013	Helpers--Electricians
2	85	47-3015	Helpers--Pipelayers, Plumbers, Pipefitters, and Steamfitters
2	86	47-4031	Fence Erectors
2	87	47-4041	Hazardous Materials Removal Workers
2	88	47-4071	Septic Tank Servicers and Sewer Pipe Cleaners
2	89	47-5011	Derrick Operators, Oil and Gas
2	90	47-5031	Explosives Workers, Ordnance Handling Experts, and Blasters

Table A3 (continued)

Job Zone	ID	OES Code	1999 OES Title
2	91	47-5041	Continuous Mining Machine Operators
2	92	47-5042	Mine Cutting and Channeling Machine Operators
2	93	47-5051	Rock Splitters, Quarry
2	94	47-5061	Roof Bolters, Mining
2	95	47-5071	Roustabouts, Oil and Gas
2	96	49-3022	Automotive Glass Installers and Repairers
2	97	49-3052	Motorcycle Mechanics
2	98	49-3091	Bicycle Repairers
2	99	49-3092	Recreational Vehicle Service Technicians
2	100	49-9091	Coin, Vending, and Amusement Machine Servicers and Repairers
2	101	49-9092	Commercial Divers
2	102	49-9095	Manufactured Building and Mobile Home Installers
2	103	51-2021	Coil Winders, Tapers, and Finishers
2	104	51-2093	Timing Device Assemblers, Adjusters, and Calibrators
2	105	51-3023	Slaughterers and Meat Packers
2	106	51-4011	Computer-Controlled Machine Tool Operators, Metal and Plastic
2	107	51-4021	Extruding and Drawing Machine Setters, Operators, and Tenders, Metal and Plastic
2	108	51-4022	Forging Machine Setters, Operators, and Tenders, Metal and Plastic
2	109	51-4023	Rolling Machine Setters, Operators, and Tenders, Metal and Plastic
2	110	51-4031	Cutting, Punching, and Press Machine Setters, Operators, and Tenders, Metal and Plastic
2	111	51-4032	Drilling and Boring Machine Tool Setters, Operators, and Tenders, Metal and Plastic
2	112	51-4051	Metal-Refining Furnace Operators and Tenders
2	113	51-4071	Foundry Mold and Coremakers
2	114	51-4072	Molding, Coremaking, and Casting Machine Setters, Operators, and Tenders, Metal and Plastic
2	115	51-4121	Welders, Cutters, Solderers, and Brazers
2	116	51-4122	Welding, Soldering, and Brazing Machine Setters, Operators, and Tenders
2	117	51-4191	Heat Treating Equipment Setters, Operators, and Tenders, Metal and Plastic
2	118	51-4193	Plating and Coating Machine Setters, Operators, and Tenders, Metal and Plastic
2	119	51-5011	Bindery Workers
2	120	51-6011	Laundry and Dry-Cleaning Workers
2	121	51-6041	Shoe and Leather Workers and Repairers
2	122	51-6092	Fabric and Apparel Patternmakers
2	123	51-7021	Furniture Finishers
2	124	51-7041	Sawing Machine Setters, Operators, and Tenders, Wood
2	125	51-7042	Woodworking Machine Setters, Operators, and Tenders, Except Sawing
2	126	51-8091	Chemical Plant and System Operators
2	127	51-9011	Chemical Equipment Operators and Tenders
2	128	51-9032	Cutting and Slicing Machine Setters, Operators, and Tenders

Table A3 (continued)

Job Zone	ID	OES Code	1999 OES Title
2	129	51-9041	Extruding, Forming, Pressing, and Compacting Machine Setters, Operators, and Tenders
2	130	51-9082	Medical Appliance Technicians
2	131	51-9121	Coating, Painting, and Spraying Machine Setters, Operators, and Tenders
2	132	51-9122	Painters, Transportation Equipment
2	133	51-9132	Photographic Processing Machine Operators
2	134	51-9194	Etchers and Engravers
2	135	51-9196	Paper Goods Machine Setters, Operators, and Tenders
2	136	53-3022	Bus Drivers, School
2	137	53-3032	Truck Drivers, Heavy and Tractor-Trailer
2	138	53-4013	Rail Yard Engineers, Dinkey Operators, and Hostlers
2	139	53-4021	Railroad Brake, Signal, and Switch Operators
2	140	53-4041	Subway and Streetcar Operators
2	141	53-5011	Sailors and Marine Oilers
2	142	53-5022	Motorboat Operators
2	143	53-6011	Bridge and Lock Tenders
2	144	53-7021	Crane and Tower Operators
2	145	53-7031	Dredge Operators
2	146	53-7032	Excavating and Loading Machine and Dragline Operators
2	147	53-7033	Loading Machine Operators, Underground Mining
2	148	53-7072	Pump Operators, Except Wellhead Pumps
2	149	53-7111	Shuttle Car Operators
1	1	31-1011	Home Health Aides
1	2	33-3011	Bailiffs
1	3	33-3041	Parking Enforcement Workers
1	4	33-9032	Security Guards
1	5	33-9091	Crossing Guards
1	6	35-2015	Cooks, Short Order
1	7	35-2021	Food Preparation Workers
1	8	35-3011	Bartenders
1	9	35-3021	Combined Food Preparation and Serving Workers, Including Fast Food
1	10	35-3022	Counter Attendants, Cafeteria, Food Concession, and Coffee Shop
1	11	35-3031	Waiters and Waitresses
1	12	35-3041	Food Servers, Nonrestaurant
1	13	35-9011	Dining Room and Cafeteria Attendants and Bartender Helpers
1	14	35-9021	Dishwashers
1	15	37-2011	Janitors and Cleaners, Except Maids and Housekeeping Cleaners
1	16	37-2012	Maids and Housekeeping Cleaners
1	17	37-3011	Landscaping and Groundskeeping Workers
1	18	39-2021	Nonfarm Animal Caretakers
1	19	39-3031	Ushers, Lobby Attendants, and Ticket Takers
1	20	39-3091	Amusement and Recreation Attendants
1	21	39-3093	Locker Room, Coatroom, and Dressing Room Attendants
1	22	39-4021	Funeral Attendants

Table A3 (continued)

Job Zone	ID	OES Code	1999 OES Title
1	23	39-5092	Manicurists and Pedicurists
1	24	39-6011	Baggage Porters and Bellhops
1	25	39-6021	Tour Guides and Escorts
1	26	39-6032	Transportation Attendants, Except Flight Attendants and Baggage Porters
1	27	39-9011	Child Care Workers
1	28	41-2011	Cashiers
1	29	41-2021	Counter and Rental Clerks
1	30	41-9011	Demonstrators and Product Promoters
1	31	41-9012	Models
1	32	41-9041	Telemarketers
1	33	41-9091	Door-To-Door Sales Workers, News and Street Vendors, and Related Workers
1	34	43-2011	Switchboard Operators, Including Answering Service
1	35	43-2021	Telephone Operators
1	36	43-3061	Procurement Clerks
1	37	43-4041	Credit Authorizers, Checkers, and Clerks
1	38	43-4071	File Clerks
1	39	43-4111	Interviewers, Except Eligibility and Loan
1	40	43-4121	Library Assistants, Clerical
1	41	43-5021	Couriers and Messengers
1	42	43-5041	Meter Readers, Utilities
1	43	43-5052	Postal Service Mail Carriers
1	44	43-5071	Shipping, Receiving, and Traffic Clerks
1	45	43-5111	Weighers, Measurers, Checkers, and Samplers, Recordkeeping
1	46	43-9051	Mail Clerks and Mail Machine Operators, Except Postal Service
1	47	43-9071	Office Machine Operators, Except Computer
1	48	45-2041	Graders and Sorters, Agricultural Products
1	49	45-2092	Farmworkers and Laborers, Crop, Nursery, and Greenhouse
1	50	45-2093	Farmworkers, Farm and Ranch Animals
1	51	45-4011	Forest and Conservation Workers
1	52	45-4021	Fallers
1	53	47-3011	Helpers--Brickmasons, Blockmasons, Stonemasons, and Tile and Marble Setters
1	54	47-3012	Helpers--Carpenters
1	55	47-3014	Helpers--Painters, Paperhangers, Plasterers, and Stucco Masons
1	56	47-4051	Highway Maintenance Workers
1	57	47-4061	Rail-Track Laying and Maintenance Equipment Operators
1	58	47-5081	Helpers--Extraction Workers
1	59	49-3093	Tire Repairers and Changers
1	60	49-9043	Maintenance Workers, Machinery
1	61	49-9045	Refractory Materials Repairers, Except Brickmasons
1	62	49-9093	Fabric Menders, Except Garment
1	63	49-9098	Helpers--Installation, Maintenance, and Repair Workers
1	64	51-3022	Meat, Poultry, and Fish Cutters and Trimmers

Table A3 (continued)

Job Zone	ID	OES Code	1999 OES Title
1	65	51-3091	Food and Tobacco Roasting, Baking, and Drying Machine Operators and Tenders
1	66	51-3093	Food Cooking Machine Operators and Tenders
1	67	51-4052	Pourers and Casters, Metal
1	68	51-6021	Pressers, Textile, Garment, and Related Materials
1	69	51-6031	Sewing Machine Operators
1	70	51-6042	Shoe Machine Operators and Tenders
1	71	51-6051	Sewers, Hand
1	72	51-6061	Textile Bleaching and Dyeing Machine Operators and Tenders
1	73	51-6091	Extruding and Forming Machine Setters, Operators, and Tenders, Synthetic and Glass Fibers
1	74	51-9012	Separating, Filtering, Clarifying, Precipitating, and Still Machine Setters, Operators, and Tenders
1	75	51-9021	Crushing, Grinding, and Polishing Machine Setters, Operators, and Tenders
1	76	51-9022	Grinding and Polishing Workers, Hand
1	77	51-9023	Mixing and Blending Machine Setters, Operators, and Tenders
1	78	51-9031	Cutters and Trimmers, Hand
1	79	51-9051	Furnace, Kiln, Oven, Drier, and Kettle Operators and Tenders
1	80	51-9111	Packaging and Filling Machine Operators and Tenders
1	81	51-9123	Painting, Coating, and Decorating Workers
1	82	51-9141	Semiconductor Processors
1	83	51-9191	Cementing and Gluing Machine Operators and Tenders
1	84	51-9192	Cleaning, Washing, and Metal Pickling Equipment Operators and Tenders
1	85	51-9193	Cooling and Freezing Equipment Operators and Tenders
1	86	51-9197	Tire Builders
1	87	51-9198	Helpers--Production Workers
1	88	53-3011	Ambulance Drivers and Attendants, Except Emergency Medical Technicians
1	89	53-3021	Bus Drivers, Transit and Intercity
1	90	53-3031	Driver/Sales Workers
1	91	53-3033	Truck Drivers, Light or Delivery Services
1	92	53-3041	Taxi Drivers and Chauffeurs
1	93	53-6021	Parking Lot Attendants
1	94	53-6031	Service Station Attendants
1	95	53-7011	Conveyor Operators and Tenders
1	96	53-7041	Hoist and Winch Operators
1	97	53-7051	Industrial Truck and Tractor Operators
1	98	53-7061	Cleaners of Vehicles and Equipment
1	99	53-7062	Laborers and Freight, Stock, and Material Movers, Hand
1	100	53-7063	Machine Feeders and Offbearers
1	101	53-7064	Packers and Packagers, Hand
1	102	53-7081	Refuse and Recyclable Material Collectors
Occupations without Job Zone			
	1	11-2031	Public Relations Managers

Table A3 (continued)

Job Zone	ID	OES Code	1999 OES Title
	2	11-1021	General and Operations Managers
	3	11-1031	Legislators
	4	13-1061	Emergency Management Specialists
	5	13-1199	*All Other Business Operations and Human Resources Specialists
	6	13-2099	Financial Specialists, All Other
	7	15-1011	Computer and Information Scientists, Research
	8	15-1099	Computer Specialists, All Other
	9	15-9099	All Other Mathematical Occupations
	10	17-1099	All Other Architects, Surveyors, and Cartographers
	11	17-2031	Biomedical Engineers
	12	17-2081	Environmental Engineers
	13	17-2199	Engineers, All Other
	14	17-3025	Environmental Engineering Technicians
	15	17-3099	All Other Drafters, Engineering, and Mapping Technicians
	16	19-1099	All Other Life Scientists
	17	19-2099	Physical Scientists, All Other
	18	19-3022	Survey Researchers
	19	19-3099	Social Scientists and Related Workers, All Other
	20	19-4093	Forest and Conservation Technicians
	21	21-1013	Marriage and Family Therapists
	22	21-1015	Rehabilitation Counselors
	23	21-9099	All Other Counselors, Social and Religious Workers
	24	23-2091	Court Reporters
	25	23-9099	All Other Legal and Related Workers
	26	25-1011	Business Teachers, Postsecondary
	27	25-1031	Architecture Teachers, Postsecondary
	28	25-1051	Atmospheric, Earth, Marine, and Space Sciences Teachers, Postsecondary
	29	25-1053	Environmental Science Teachers, Postsecondary
	30	25-1064	Geography Teachers, Postsecondary
	31	25-1081	Education Teachers, Postsecondary
	32	25-1082	Library Science Teachers, Postsecondary
	33	25-1111	Criminal Justice and Law Enforcement Teachers, Postsecondary
	34	25-1112	Law Teachers, Postsecondary
	35	25-1113	Social Work Teachers, Postsecondary
	36	25-1122	Communications Teachers, Postsecondary
	37	25-1126	Philosophy and Religion Teachers, Postsecondary
	38	25-1192	Home Economics Teachers, Postsecondary
	39	25-1193	Recreation and Fitness Studies Teachers, Postsecondary
	40	25-1199	Postsecondary Teachers, All Other
	41	25-3999	All Other Teachers, Primary, Secondary, and Adult
	42	25-9099	*All Other Library, Museum, Training, and Education Workers
	43	27-1014	Multi-Media Artists and Animators
	44	27-1099	All Other Art and Design Workers
	45	27-2099	Entertainers and Performers, Sports and Related Workers, All Other

Table A3 (continued)

Job Zone	ID	OES Code	1999 OES Title
	46	27-3099	Media and Communication Workers, All Other
	47	27-4099	Media and Communication Equipment Workers, All Other
	48	29-1199	Health Diagnosing and Treating Practitioners, All Other
	49	29-2056	Veterinary Technologists and Technicians
	50	29-9099	*All Other Health Professionals and Technicians
	51	31-9011	Massage Therapists
	52	31-9094	Medical Transcriptionists
	53	31-9095	Pharmacy Aides
	54	31-9099	Healthcare Support Workers, All Other
	55	33-1011	First-Line Supervisors/Managers of Correctional Officers
	56	33-1099	*First-Line Supervisors/Managers of Protective Service Workers, Except Police, Fire and Corrections
	57	33-9031	Gaming Surveillance Officers and Gaming Investigators
	58	35-9099	Food Preparation and Serving Related Workers, All Other
	59	37-9099	All Other Building and Grounds Cleaning and Maintenance Workers
	60	39-1012	Slot Key Persons
	61	39-3099	*All Other Gaming Service Workers
	62	39-5093	Shampooers
	63	39-5094	Skin Care Specialists
	64	39-6012	Concierges
	65	39-9099	Personal Care and Service Workers, All Other
	66	41-2012	Gaming Change Persons and Booth Cashiers
	67	41-9021	Real Estate Brokers
	68	41-9099	Sales and Related Workers, All Other
	69	43-2099	Communications Equipment Operators, All Other
	70	43-3041	Gaming Cage Workers
	71	43-4999	All Other Financial, Information, and Record Clerks
	72	43-5053	Postal Service Mail Sorters, Processors, and Processing Machine Operators
	73	43-5199	All Other Material Recording, Scheduling, Dispatching, and Distributing Workers
	74	43-9999	All Other Secretaries, Administrative Assistants, and Other Office Support Workers
	75	45-1012	Farm Labor Contractors
	76	47-2052	Segmental Pavers
	77	47-3016	Helpers--Roofers
	78	47-3019	Helpers, Construction Trades, All Other
	79	47-4999	All Other Construction Trades and Related Workers
	80	47-5049	Mining Machine Operators, All Other
	81	47-5099	Extraction Workers, All Other
	82	49-2098	Security and Fire Alarm Systems Installers
	83	49-2099	All Other Electrical and Electronic Equipment Mechanics, Installers, and Repairers
	84	49-3012	Aircraft Mechanics and Service Technicians, FAA certified

Table A3 (continued)

Job Zone	ID	OES Code	1999 OES Title
	85	49-3013	Aircraft Mechanics and Service Technicians, not FAA certified
	86	49-3099	All Other Vehicle and Mobile Equipment Mechanics, Installers, and Repairers
	87	49-9069	Precision Instrument and Equipment Repairers, All Other
	88	49-9099	Installation, Maintenance, and Repair Workers, All Other
	89	51-2091	Fiberglass Laminators and Fabricators
	90	51-2092	Team Assemblers
	91	51-2099	Assemblers and Fabricators, All Other
	92	51-3099	All Other Food Processing Workers
	93	51-4199	Metal Workers and Plastic Workers, All Other
	94	51-5099	All Other Printing Workers
	95	51-6099	Textile, Apparel, and Furnishings Workers, All Other
	96	51-7099	Woodworkers, All Other
	97	51-8099	Plant and System Operators, All Other
	98	51-9199	Production Workers, All Other
	99	53-1011	Aircraft Cargo Handling Supervisors
	100	53-2022	Airfield Operations Specialists
	101	53-2099	All Other Air Transportation Workers
	102	53-3099	Motor Vehicle Operators, All Other
	103	53-4099	Rail Transportation Workers, All Other
	104	53-5099	All Other Water Transportation Workers
	105	53-6099	Transportation Workers, All Other
	106	53-7199	Material Moving Workers, All Other

Table B1. Employment Growth by Education Attainment from 1994 to 2004:
Information vs. Non-Information Workers

Education Attainment	Employment (Thousands)		Employment Growth	
	Jan 1994	Jan 2004	Number	Rate
Core Information Workers	10,114	13,898	3,784	37.40%
Doctorate Degree	1,302	1,918	616	47.30%
Master's Degree	6,970	9,607	2,637	37.80%
Professional School Degree	1,841	2,372	531	28.80%
Regular Information Workers	20,322	26,970	6,647	32.70%
Bachelor's Degree	20,322	26,970	6,647	32.70%
Non-information Workers	89,713	96,466	6,752	7.50%
Some College or Associate's Degree	33,817	38,584	4,766	14.10%
High School Grad-Diploma or GED	40,615	41,619	1,004	2.50%
Less Than a High School Diploma	15,280	16,261	981	6.40%
Total	120,150	137,335	17,184	14.30%
	Employment Share		Growth Share	
	Jan 1994	Jan 2004	percent	
Core Information Workers	8.4%	10.1%	22.0%	
Doctorate Degree	1.1%	1.4%	3.6%	
Master's Degree	5.8%	7.0%	15.3%	
Professional School Degree	1.5%	1.7%	3.1%	
Regular Information Workers	16.9%	19.6%	38.7%	
Bachelor's Degree	16.9%	19.6%	38.7%	
Non-information Workers	74.7%	70.2%	39.3%	
Some College or Associate's Degree	28.1%	28.1%	27.7%	
High School Grad-Diploma or GED	33.8%	30.3%	5.8%	
Less Than a High School Diploma	12.7%	11.8%	5.7%	
Total	100.0%	100.0%	100.0%	

Source: BLS, Current Population Survey, 1994-2004. Data were extracted using DataFerrett and calculated by Author.

Table B2. Occupational Projections by the Required Education and Training Levels of Employees Aged 25 to 44 Years: from 2002 to 2012

Info/ Non-Info	Education & Training Levels *	Employment (Thousands)		Employment Growth	
		2002	2012	Number	Rate
Core Information Occupations		5,741	7,174	1,433	25.0%
Job Zone 5	First professional degree	2,213	2,616	402	18.2%
Job Zone 5	Doctoral degree	1,847	2,514	667	36.1%
Job Zone 5	Master's degree	1,681	2,045	364	21.6%
Regular Information Occupations		24,018	28,982	4,963	20.7%
Job Zone 4	Bachelor's or higher degree, plus work experience	7,057	8,468	1,411	20.0%
Job Zone 4	Bachelor's degree	16,961	20,514	3,552	20.9%
Non-information Occupations		114,254	129,163	14,909	13.0%
Job zone 3	Associate degree	5,226	6,567	1,340	25.6%
Job zone 3	Postsecondary vocational award	6,133	7,209	1,076	17.5%
Job zone 3	Work experience in a related occupation	11,152	12,365	1,213	10.9%
Job zone 3	Long-term on-the-job training	10,585	11,585	1,000	9.4%
Job zone 2	Moderate-term on-the-job training	29,319	32,411	3,092	10.5%
Job zone 1	Short-term on-the-job training	51,839	59,026	7,188	13.9%
Total		144,014	165,319	21,305	14.80%
		Employment Share		Growth Share	
		2002	2012	percent	
Core Information Occupations		4.0%	4.3%	6.7%	
Job Zone 5	First professional degree	1.5%	1.6%	1.9%	
Job Zone 5	Doctoral degree	1.3%	1.5%	3.1%	
Job Zone 5	Master's degree	1.2%	1.2%	1.7%	
Regular Information Occupations		16.7%	17.5%	23.3%	
Job Zone 4	Bachelor's or higher degree, plus work experience	4.9%	5.1%	6.6%	
Job Zone 4	Bachelor's degree	11.8%	12.4%	16.7%	
Non-information Occupations		79.3%	78.1%	70.0%	
Job Zone 5	Associate's degree	3.6%	4.0%	6.3%	
Job Zone 5	Postsecondary vocational award	4.3%	4.4%	5.1%	
Job Zone 5	Work experience in a related occupation	7.7%	7.5%	5.7%	
Job Zone 5	Long-term on-the-job training	7.3%	7.0%	4.7%	
Job Zone 5	Moderate-term on-the-job training	20.4%	19.6%	14.5%	
Job Zone 5	Short-term on-the-job training	36.0%	35.7%	33.7%	
Total		100.0%	100.0%	100.0%	

Source: BLS, Education and Training Data, Occupational Projections from 2002 to 2012.

Note: An occupation is placed into one of 11 categories that best describes the education or training needed by most workers to become fully qualified in the occupation.

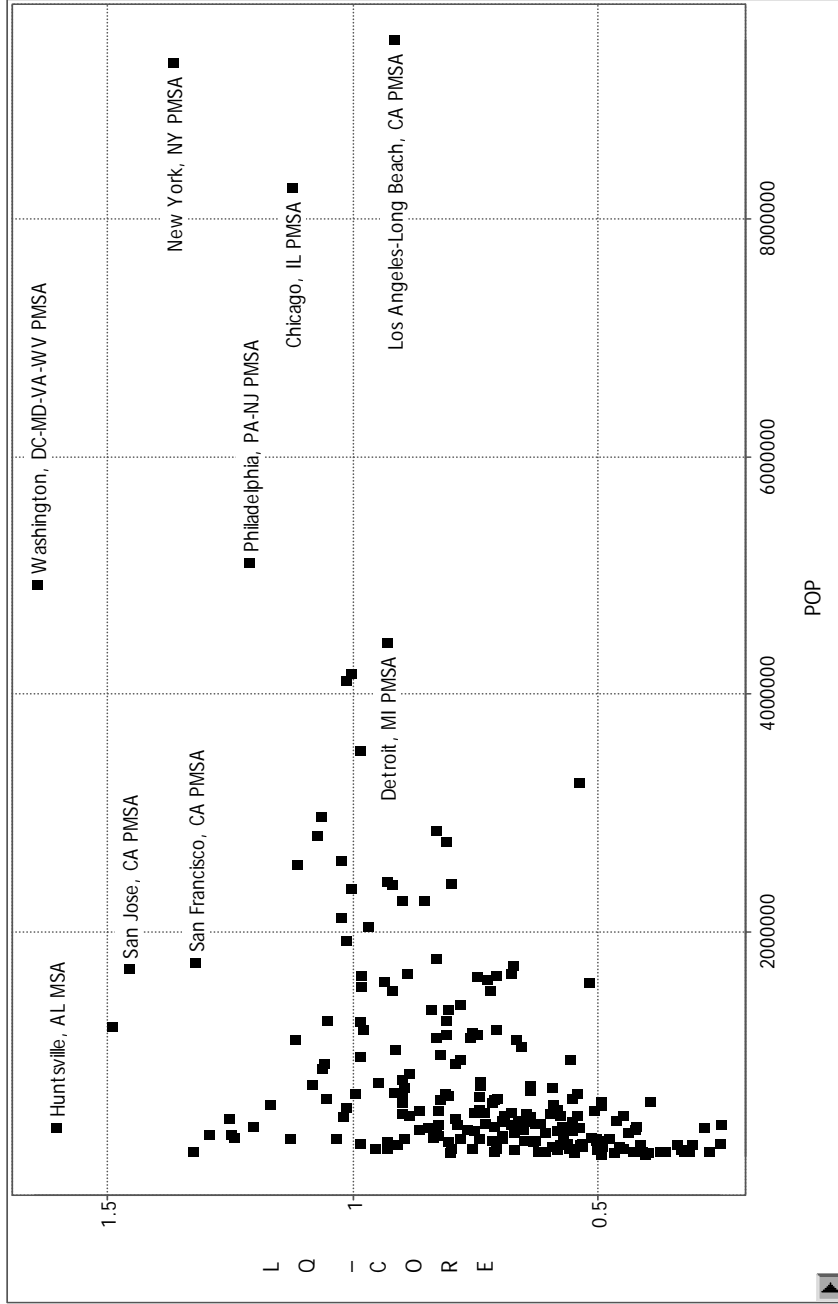


Figure C1. Plots of Location Quotients of Core Information Occupations against Population in 220 Metropolitan Areas

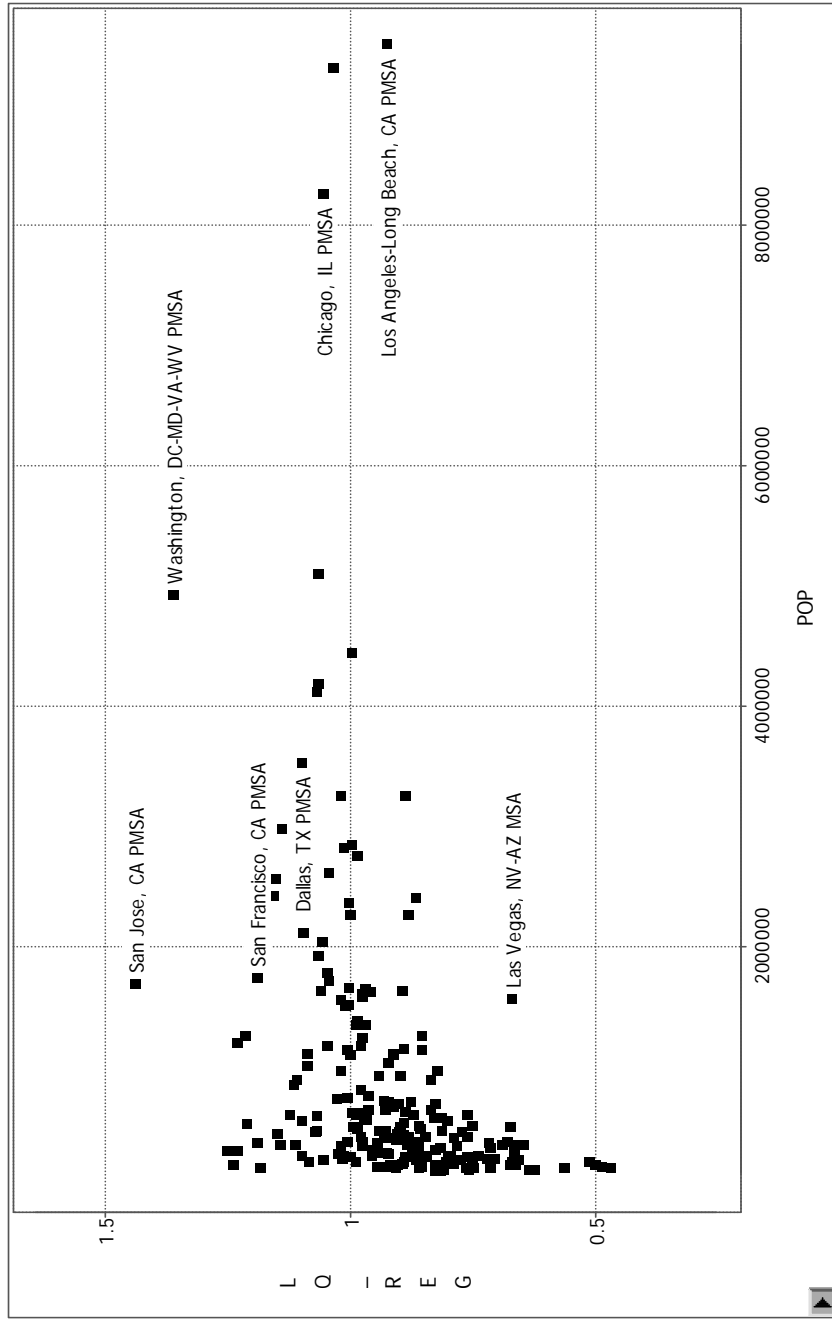


Figure C2. Plots of Location Quotients of Regular Information Occupations against Population in 220 Metropolitan Areas

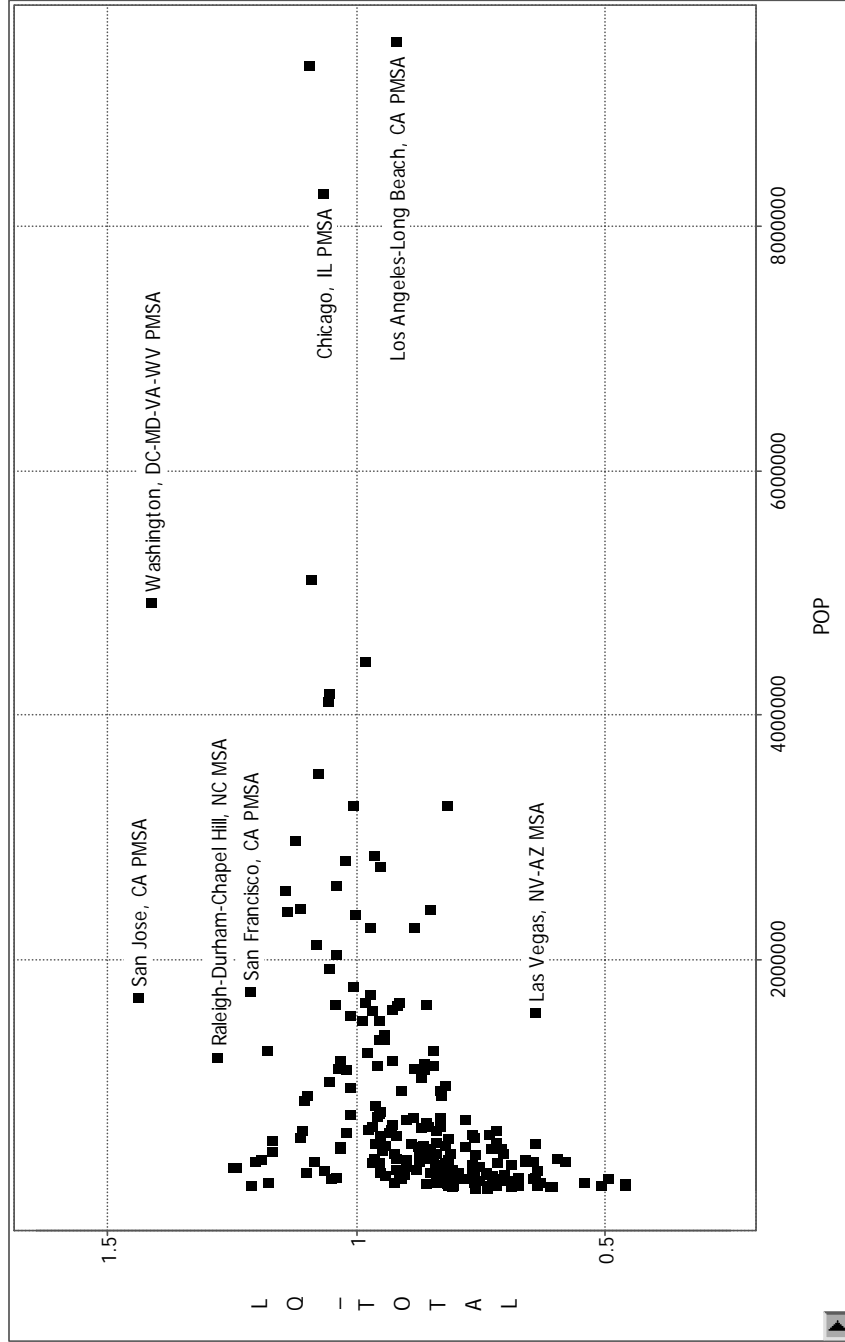


Figure C3. Plots of Location Quotients of Total Information Occupations against Population in 220 Metropolitan Areas

Table C1. Specialized Information Occupation Type of 220 Metropolitan Areas (MSA/PMSA) by Size, in 2003 (LQ \geq 1:√)

Metropolitan Size (Population)	220 Metropolitan Area		Information Occupation		
	Fips	Name	Core	Regular	Total
4 million and more					
number of specialized metros (out of 8 metros)			6	7	6
520		Atlanta, GA MSA	√	√	√
1600		Chicago, IL PMSA	√	√	√
3360		Houston, TX PMSA	√	√	√
5600		New York, NY PMSA	√	√	√
6160		Philadelphia, PA-NJ PMSA	√	√	√
8840		Washington, DC-MD-VA-WV PMSA	√	√	√
2160		Detroit, MI PMSA		√	
4480		Los Angeles-Long Beach, CA PMSA			
1.8 - 4 million					
number of specialized metros (out of 18 metros)			7	14	12
720		Baltimore, MD PMSA	√	√	√
2080		Denver, CO PMSA	√	√	√
5120		Minneapolis-St. Paul, MN-WI MSA	√	√	√
6280		Pittsburgh, PA MSA	√	√	√
6440		Portland-Vancouver, OR-WA PMSA	√	√	√
7040		St. Louis, MO-IL MSA	√	√	√
7320		San Diego, CA MSA	√	√	√
1920		Dallas, TX PMSA		√	√
5640		Newark, NJ PMSA		√	√
5775		Oakland, CA PMSA		√	√
6200		Phoenix-Mesa, AZ MSA		√	√
7600		Seattle-Bellevue-Everett, WA PMSA		√	√
1680		Cleveland-Lorain-Elyria, OH PMSA		√	
5945		Orange County, CA PMSA		√	
5000		Miami, FL PMSA			
5380		Nassau-Suffolk, NY PMSA			
6780		Riverside-San Bernardino, CA PMSA			
8280		Tampa-St. Petersburg-Clearwater, FL MSA			
Less than 1.8 million					
number of specialized metros (out of 194 metros)			22	45	33
160		Albany-Schenectady-Troy, NY MSA	√	√	√
380		Anchorage, AK MSA	√	√	√
640		Austin-San Marcos, TX MSA	√	√	√
1125		Boulder-Longmont, CO PMSA	√	√	√
1720		Colorado Springs, CO MSA	√	√	√
1760		Columbia, SC MSA	√	√	√
3440		Huntsville, AL MSA	√	√	√
4720		Madison, WI MSA	√	√	√

Table C1 (continued)

Metropolitan Size (Population)	220 Metropolitan Area		Information Occupation		
	Fips	Name	Core	Regular	Total
	5880	Oklahoma City, OK MSA	Y	Y	Y
	6640	Raleigh-Durham-Chapel Hill, NC MSA	Y	Y	Y
	7360	San Francisco, CA PMSA	Y	Y	Y
	7400	San Jose, CA PMSA	Y	Y	Y
	7490	Santa Fe, NM MSA	Y	Y	Y
	8240	Tallahassee, FL MSA	Y	Y	Y
	8480	Trenton, NJ PMSA	Y	Y	Y
	8520	Tucson, AZ MSA	Y	Y	Y
	9160	Wilmington-Newark, DE-MD PMSA	Y	Y	Y
	200	Albuquerque, NM MSA	Y		
	1080	Boise City, ID MSA	Y		
	2920	Galveston-Texas City, TX PMSA	Y		
	3240	Harrisburg-Lebanon-Carlisle, PA MSA	Y		
	440	Ann Arbor, MI PMSA		Y	Y
	1840	Columbus, OH MSA		Y	Y
	2000	Dayton-Springfield, OH MSA		Y	Y
	2120	Des Moines, IA MSA		Y	Y
	3560	Jackson, MS MSA		Y	Y
	3760	Kansas City, MO-KS MSA		Y	Y
	5015	Middlesex-Somerset-Hunterdon, NJ PMSA		Y	Y
	5910	Olympia, WA PMSA		Y	Y
	5920	Omaha, NE-IA MSA		Y	Y
	6120	Peoria-Pekin, IL MSA		Y	Y
	6760	Richmond-Petersburg, VA MSA		Y	Y
	6840	Rochester, NY MSA		Y	Y
	6920	Sacramento, CA PMSA		Y	Y
	7880	Springfield, IL MSA		Y	Y
	8440	Topeka, KS MSA		Y	Y
	760	Baton Rouge, LA MSA		Y	
	960	Binghamton, NY MSA		Y	
	1145	Brazoria, TX PMSA		Y	
	1520	Charlotte-Gastonia-Rock Hill, NC-SC MSA		Y	
	1640	Cincinnati, OH-KY-IN PMSA		Y	
	2800	Fort Worth-Arlington, TX PMSA		Y	
	3080	Green Bay, WI MSA		Y	
	4680	Macon, GA MSA		Y	
	5080	Milwaukee-Waukesha, WI PMSA		Y	
	5190	Monmouth-Ocean, NJ PMSA		Y	
	6880	Rockford, IL MSA		Y	
	8160	Syracuse, NY MSA		Y	
	80	Akron, OH PMSA			

Table C1 (continued)

Metropolitan Size (Population)	220 Metropolitan Area		Information Occupation		
	Fips	Name	Core	Regular	Total
240		Allentown-Bethlehem-Easton, PA MSA			
450		Anniston, AL MSA			
460		Appleton-Oshkosh-Neenah, WI MSA			
480		Asheville, NC MSA			
560		Atlantic-Cape May, NJ PMSA			
600		Augusta-Aiken, GA-SC MSA			
680		Bakersfield, CA MSA			
840		Beaumont-Port Arthur, TX MSA			
860		Bellingham, WA MSA			
870		Benton Harbor, MI MSA			
875		Bergen-Passaic, NJ PMSA			
1000		Birmingham, AL MSA			
1240		Brownsville-Harlingen-San Benito, TX MSA			
1280		Buffalo-Niagara Falls, NY MSA			
1320		Canton-Massillon, OH MSA			
1360		Cedar Rapids, IA MSA			
1440		Charleston-North Charleston, SC MSA			
1480		Charleston, WV MSA			
1560		Chattanooga, TN-GA MSA			
1620		Chico-Paradise, CA MSA			
1660		Clarksville-Hopkinsville, TN-KY MSA			
1800		Columbus, GA-AL MSA			
1880		Corpus Christi, TX MSA			
1960		Davenport-Moline-Rock Island, IA-IL MSA			
2020		Daytona Beach, FL MSA			
2030		Decatur, AL MSA			
2040		Decatur, IL MSA			
2190		Dover, DE MSA			
2240		Duluth-Superior, MN-WI MSA			
2281		Dutchess County, NY PMSA			
2290		Eau Claire, WI MSA			
2320		El Paso, TX MSA			
2360		Erie, PA MSA			
2400		Eugene-Springfield, OR MSA			
2440		Evansville-Henderson, IN-KY MSA			
2520		Fargo-Moorhead, ND-MN MSA			
2560		Fayetteville, NC MSA			
2580		Fayetteville-Springdale-Rogers, AR MSA			
2640		Flint, MI PMSA			
2650		Florence, AL MSA			
2670		Fort Collins-Loveland, CO MSA			

Table C1 (continued)

Metropolitan Size (Population)	220 Metropolitan Area		Information Occupation		
	Fips	Name	Core	Regular	Total
2680		Fort Lauderdale, FL PMSA			
2700		Fort Myers-Cape Coral, FL MSA			
2710		Fort Pierce-Port St. Lucie, FL MSA			
2720		Fort Smith, AR-OK MSA			
2750		Fort Walton Beach, FL MSA			
2760		Fort Wayne, IN MSA			
2840		Fresno, CA MSA			
2900		Gainesville, FL MSA			
2960		Gary, IN PMSA			
3000		Grand Rapids-Muskegon-Holland, MI MSA			
3060		Greeley, CO PMSA			
3120		Greensboro--Winston-Salem--High Point, NC MSA			
3150		Greenville, NC MSA			
3160		Greenville-Spartanburg-Anderson, SC MSA			
3180		Hagerstown, MD PMSA			
3200		Hamilton-Middletown, OH PMSA			
3290		Hickory-Morganton-Lenoir, NC MSA			
3320		Honolulu, HI MSA			
3350		Houma, LA MSA			
3400		Huntington-Ashland, WV-KY-OH MSA			
3480		Indianapolis, IN MSA			
3520		Jackson, MI MSA			
3600		Jacksonville, FL MSA			
3610		Jamestown, NY MSA			
3640		Jersey City, NJ PMSA			
3660		Johnson City-Kingsport-Bristol, TN-VA MSA			
3680		Johnstown, PA MSA			
3720		Kalamazoo-Battle Creek, MI MSA			
3840		Knoxville, TN MSA			
3880		Lafayette, LA MSA			
3960		Lake Charles, LA MSA			
3980		Lakeland-Winter Haven, FL MSA			
4000		Lancaster, PA MSA			
4040		Lansing-East Lansing, MI MSA			
4080		Laredo, TX MSA			
4100		Las Cruces, NM MSA			
4120		Las Vegas, NV-AZ MSA			
4280		Lexington, KY MSA			
4400		Little Rock-North Little Rock, AR MSA			
4520		Louisville, KY-IN MSA			

Table C1 (continued)

Metropolitan Size (Population)	220 Metropolitan Area		Information Occupation		
	Fips	Name	Core	Regular	Total
4600		Lubbock, TX MSA			
4880		McAllen-Edinburg-Mission, TX MSA			
4890		Medford-Ashland, OR MSA			
4900		Melbourne-Titusville-Palm Bay, FL MSA			
4920		Memphis, TN-AR-MS MSA			
5160		Mobile, AL MSA			
5170		Modesto, CA MSA			
5200		Monroe, LA MSA			
5240		Montgomery, AL MSA			
5330		Myrtle Beach, SC MSA			
5345		Naples, FL MSA			
5360		Nashville, TN MSA			
5560		New Orleans, LA MSA			
5660		Newburgh, NY-PA PMSA			
5720		Norfolk-Virginia Beach-Newport News, VA-NC MSA			
5790		Ocala, FL MSA			
5800		Odessa-Midland, TX MSA			
5960		Orlando, FL MSA			
6015		Panama City, FL MSA			
6080		Pensacola, FL MSA			
6520		Provo-Orem, UT MSA			
6560		Pueblo, CO MSA			
6580		Punta Gorda, FL MSA			
6600		Racine, WI PMSA			
6680		Reading, PA MSA			
6720		Reno, NV MSA			
6800		Roanoke, VA MSA			
6960		Saginaw-Bay City-Midland, MI MSA			
7080		Salem, OR PMSA			
7120		Salinas, CA MSA			
7160		Salt Lake City-Ogden, UT MSA			
7240		San Antonio, TX MSA			
7460		San Luis Obispo-Atascadero-Paso Robles, CA MSA			
7480		Santa Barbara-Santa Maria-Lompoc, CA			
7500		Santa Rosa, CA PMSA			
7510		Sarasota-Bradenton, FL MSA			
7560		Scranton-Wilkes-Barre-Hazleton, PA MSA			
7680		Shreveport-Bossier City, LA MSA			
7760		Sioux Falls, SD MSA			
7800		South Bend, IN MSA			
7840		Spokane, WA MSA			
7920		Springfield, MO MSA			

Table C4 (continued)

Metropolitan Size (Population)	Fips	220 Metropolitan Area Name	Information Occupation		
			Core	Regular	Total
8120		Stockton-Lodi, CA MSA			
8200		Tacoma, WA PMSA			
8400		Toledo, OH MSA			
8560		Tulsa, OK MSA			
8600		Tuscaloosa, AL MSA			
8680		Utica-Rome, NY MSA			
8720		Vallejo-Fairfield-Napa, CA PMSA			
8735		Ventura, CA PMSA			
8760		Vineland-Millville-Bridgeton, NJ PMSA			
8780		Visalia-Tulare-Porterville, CA MSA			
8800		Waco, TX MSA			
8920		Waterloo-Cedar Falls, IA MSA			
8960		West Palm Beach-Boca Raton, FL MSA			
9000		Wheeling, WV-OH MSA			
9040		Wichita, KS MSA			
9200		Wilmington, NC MSA			
9270		Yolo, CA PMSA			
9280		York, PA MSA			
9320		Youngstown-Warren, OH MSA			
9340		Yuba City, CA MSA			
9360		Yuma, AZ MSA			

Table C2. Industry Compositions of Six Traded Goods and Services Groups, by NAICS Code

Group	NAICS	Industry Title
Goods Production and Distribution Sector (GP&D)		
Primary Production (PRM)		
	11	Agriculture, Forestry, Fishing and Hunting
	111	Crop production
	112	Animal production
	113	Forestry and logging
	114	Fishing, hunting and trapping
	115	Support activities for agriculture and forestry
	22	Mining
	211	Oil and gas extraction
	212	Mining (except oil and gas)
	213	Support activities for mining
Manufacturing (MFG)		
	31-33	Manufacturing
	311	Food manufacturing
	312	Beverage and tobacco product manufacturing
	313	Textile mills
	314	Textile product mills
	315	Apparel manufacturing
	316	Leather and allied product manufacturing
	321	Wood product manufacturing
	322	Paper manufacturing
	323	Printing and related support activities
	324	Petroleum and coal products manufacturing
	325	Chemical manufacturing
	326	Plastics and rubber products manufacturing
	327	Nonmetallic mineral product manufacturing
	331	Primary metal manufacturing
	332	Fabricated metal product manufacturing
	333	Machinery manufacturing
	334	Computer and electronic product manufacturing
	335	Electrical equipment, appliance, and component manufacturing
	336	Transportation equipment manufacturing
	337	Furniture and related product manufacturing
	339	Miscellaneous manufacturing
Distribution (DIST)		
	42	Wholesale trade
	423	Durable goods wholesalers (except agents, brokers, and electronic markets)
	424	Nondurable goods wholesalers (except agents, brokers, and electronic markets)
	425	Wholesale trade, agents, brokers, and electronic markets
	48-49	Transportation and warehousing
	481	Air transportation

Table C2 (continued)

Group	NAICS	Industry Title
	483	Water transportation
	484	Truck transportation
	486	Pipeline transportation
	487	Scenic and sightseeing transportation
	488	Support activities for transportation
	492	Couriers and messengers
	493	Warehousing and storage
Information Sector		
Financial Producer Services (PSFIN)		
52		Finance and insurance
	521	Monetary authorities - central bank
	522	Credit intermediation and related activities
	523	Securities, commodity contracts, other financial investments, and related activities
	524	Insurance carriers and related activities
	525	Funds, trusts, and other financial vehicles (part)
53		Real estate and rental and leasing
	531	Real estate
	532	Rental and leasing services
Other Producer Services (PSOTH)		
51		Information
	511	Publishing industries (except Internet)
	516	Internet publishing and broadcasting
	517	Telecommunications
	518	Internet service providers, web search portals, and data processing services
	519	Other information services
53		Real estate and rental and leasing
	533	Lessors of nonfinancial intangible assets (exc. copyrighted works)
54		Professional, scientific, and technical services
	541	Professional, scientific, and technical services
55		Management of companies and enterprises
	551	Management of companies and enterprises
Advanced Consumer Services (ACS)		
51		Information
	512	Motion picture and sound recording industries
	515	Broadcasting (except Internet)
61		Educational services
	611	Educational services
62		Health care and social assistance
	621	Ambulatory health care services
	622	Hospitals
71		Arts, entertainment, and recreation
	711	Performing arts, spectator sports, and related industries
	712	Museums, historical sites, and similar institutions
	713	Amusement, gambling, and recreation industries

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