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Socioeconomic Environment and Technological Change: The Case of California

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ABSTRACT

This paper examines the influence of socioeconomic factors on the receipts and payroll of three technology sectors for 13 counties in California. Based on correlation and regression analyses, the results reveal that factors that are important correlates of several technology sectors are professional/scientific/technical services, other services, and educational services workforce, ethnicity, and college education. As a whole, the findings emphasize the importance of the association of socioeconomic factors with the per capita magnitude of the technology sectors. The paper suggests steps that can be taken by the state of California and its county and local governments to reduce the digital divide.

INTRODUCTION

The continued existence of the "digital divide" and the increasing inequality of wages in the U.S. during the last two decades poses considerable challenges to policy makers. California with its incredible diverse workforce has a unique role in this equation. It has been recognized as one of the leading high-tech exporting and job creating states in the U.S. In the year 2000 it ranked first in high-tech employment, first in venture capital investment, and second in high-tech average wage. Furthermore, 77 of every 1,000 private sector workers were employed by high-tech firms (AEA, 2001). Therefore its economic activities and slowdown, which include the Silicon Valley, much of the entertainment industry, and 48 federal government research labs, have repercussions on a global basis. In 2001 the high-tech industry grew in California only by one percent, down sharply from 1999 and 2000 and this rate of growth varied from county to county. "California is lagging behind other states in workforce readiness. If California cannot meet industry's demand for skilled labor, it could lose science and technology jobs to other states" (Conrad, 1999, p. 1). The technology leadership of California could be threatened.

This paper has the objective to better understand the relationship between socioeconomic factors and the information technology sectors for the counties in California. It raises some relevant questions that may help policy makers and experts to identify and address potential and already developing social and economic problems based on the recent budget shortfall. It may also help to increase dialogue among different stakeholders.

BACKGROUND

The term "digital divide" entered the American vocabulary in the mid-1990s and refers to the unequal access to information technology (Light, 2001). It is not limited to consumer (household) access to technology but is also used to define and distinguish the level of penetration and diffusion of ICT in large and small and medium size enterprises (OECD, 2000). Furthermore, Lentz (2000) argued that the concept of the digital divide should be used in broader terms than merely describing end user problems and should extend also to community development. Other researchers have applied the term to business, economy, and/or society levels, rather than the individual level (OECD, 2000; Baker, 2001). Baker points out that the policy problem of the digital divide is best addressed through multiple dimensions, i.e., policies that address disparities in information technology diffusion at different geographic, economic, social, and organizational levels.

The uneven distribution of IT benefits across the U.S. is frequently reported. Major reports from the National Telecommunications and Information Administration (NTIA, 2000, 2002) utilized U.S. Census national data to examine household distribution of access to technology including computers, phones, and the Internet. It defined "digital divide" as the divide between those with access to new technologies and those without. This report concluded that even though the utilization of electronic tools and computers expanded dramatically in the last two years for all groups in the U.S., a digital divide remained and in some cases grew slightly.

Another issue that widens this gap is the phenomenon of wage divergence and inequality related to technological change. This has received the attention of many labor and trade economists (Feenstra, 1997). It is widely believed that the development of the new technology increases the demand for skilled workers, thereby increasing the wage differential between skilled and unskilled workers. Even though empirical evidence from the literature on wage inequality is inconclusive and fragmented (Deardorff, 1998, p. 371), there is a wide consensus among many economists that technological change is the primary explanation for the widening gap in inequality of wages in the United States. The World Employment Report (2001, p. 56) writes "that the issue of a digital divide between developed and developing countries has come to top the joint policy agenda of the world's wealthiest countries, many developing countries, as well as intergovernmental and development organizations worldwide."

We consider digital divide and wage inequality as a broad concept that includes economic, educational, and social aspects. For instance, a rich economy is better able to afford technology and a highly educated community can better use technology. Furthermore, social issues may also stimulate technology use. For example, socioeconomic characteristics influence consumer uses of technology. In turn consumers with scientific and technology skills provide technology employees for businesses. Those employees contribute to corporate receipts and payrolls. Corporate results add up to constitute technology sectors in counties.

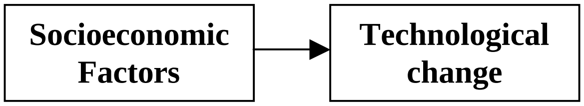
Literature on the digital divide does not address wage inequality. It avoids discussing the broader social problem of this division and focuses mainly on the technical aspect of the issue. But the widening gap in wages in the long run directly or indirectly influences the digital divide in a region, county or country and vice versa. In other words, they are interrelated. It is obvious that technology does not develop by itself but in context with predisposing characteristics of the environment. Today technology has become so intertwined with our everyday life that a broad understanding of its utilization and distribution requires a thorough examination of the socioeconomic environment. Paying attention to the relationship between socioeconomic factors and the changes in the high-tech sectors may further shed some light on the problem and help to alleviate it.

RESEARCH QUESTIONS

This paper has two research questions:

1. What are the most important socioeconomic factors overall that influence the per capita economic sizes of the information, information services/data processing, telecommunications/broadcasting, and motion

Figure 1.



picture/sound recording technology sectors for counties in California?; and

2. How do these three sectors differ with respect to the most important socioeconomic factors that influence their economic sizes?

METHODOLOGY

Our research framework is based on the unidirectional relationship between the socioeconomic factors and technological change as depicted in Figure 1. These factors are one of the most important variables in social study. The socioeconomic position of a person affects his/her chances for education, income, occupation, and health (Miller, 1991).

We are aware that this framework may also flow in a feedback way in the opposite direction, in that larger county technology sectors may attract population with certain socioeconomic characteristics. We are not ready to present a comprehensive framework of these different dimensions and their linkages. Rather, in this paper, we focus on unidirectional linkage as shown in the figure above.

To measure technological change we used the size of payroll and receipts (dependent variables in our regression models) of the main components of the 2000 Economic Census of the Information sector. Data for the Census are published based on the North American Industry Classification System (NAICS); the report presents sources of receipts data for establishments with payroll by kind of business. The three main components of information sectors selected for this study are: Information Services/Data Processing [IS/DP], Broadcasting/Telecomm [B/T], and Motion Picture/Sound Recording [MP/SR]. Following are several reasons why we selected the information technology sectors: 1) The universal use of computers and modern information communication technology in all form of works, 2) IT has increased the productivity of our institutions, shortened the product life cycle, and reversed the composition of our labor force, 3) it diminished the importance of distance and globalized the markets and economies, and 4) it contributes nearly 60 percent to the American gross national product.

We explored the association of twelve socioeconomic factors with six variables that measure the size of industry sectors. The socioeconomic factors are: professional/scientific/technical, other services, and educational services workforce, median household income, college graduates, change in population 1990-2000, and proportions Black, Asian, Latino, and female. Our unit of analysis was the county, because it is the smallest geographical unit for which a wide range of statistical data can be obtained and its unit applies across the entire state, has accurate and extensive variables collected through the U.S. Census and other sources, and is stable geographically over time. It also represents a governmental and policy unit, so policy suggestions from research can inform governmental decision-making. Correlation and linear regression analysis were conducted to test our models. Data were collected from the U.S. Census and the American Electronic Association (AEA).

FINDINGS

The regression findings demonstrate that for the overall aggregated category of information industries, the two most important variables are the professional, scientific, technical (PST) workforce, followed by median household income. For the information services-data processing (IS-DP) information industry sub-category, the most informant associated variable is PST. Education services payroll per capita is also significantly associated with IS-DP payroll. Likewise, for the broadcasting-telecommunications (B-T) information industry subcategory, PST is the most important predictor. Also significant are federal funds per capita (associated with B-T employees per capita) and proportion Black (associated with BT payroll per capita). For the motion picture – sound recording (MP-SR) sub-category, PST is not significant. Instead, for MP-SR employees per capita, educational services is the most important, and for MP-SR payroll per capita, college graduation and percent population change are significant.

Overall, then, the most important single predictor of technology industry sector sizes per capita is PST per capita, followed by household income. The implication is that wealthier California counties with significant intensity of scientific and professional institutions and workforces tend to have larger per capita high tech sectors. An example is the Silicon Valley area near San Jose, located in the midst of substantial scientific workforce and institutions including such famous universities as Stanford and U.C. Berkeley. Lower profile but also important for information systems and telecommunications technology to thrive are presence of educational services, federal funds, and black ethnicity. The finding that black ethnicity is associated with B-T is also in line with recent studies that associate workforce diversity with technology advance (Florida and Gates, 2001). For motion picture sound recording, college graduation and educational services are the most significant.

CONCLUSION

In summary, the findings support both of the research questions. This study for California corresponds with our earlier findings at the national level. The results suggest that California counties need to plan for and invest in building a scientific and professional workforce and related educational and scientific institutions; stimulate great diversity in the workforce; and encourage development of educational services, as well as support services.

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