



# State-by-state variations in high-tech employment through the great recession



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## ABSTRACT

This paper explores the relationship between state-level high-tech employment and state economic development, labor, and tax policies over the 2007–2012 period. During this period national high-tech manufacturing employment decreased, national high-tech service employment increased and the nation experienced a severe recession. Overall high-tech employment grew very little during this time period but changes in high-tech employment varied substantially from state-to-state. This paper asks why. A two-stage empirical model is developed and estimated. Among other things the results indicate that these policies did influence employment in the period although perhaps in unexpected ways.

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## 1. Introduction

One of the more universal goals of economic policy is to provide high-quality jobs for residents of the policy jurisdiction (Adkisson & Saucedo, 2010). In recent decades high-quality jobs and high-tech jobs have been taken as nearly synonymous terms, and substantial policy effort has been undertaken with the goal of increasing high-tech employment. States are big players in this effort, yet not all states have been equally successful. Part of the problem is that, on the whole, high-tech employment has not shown substantial growth for some time. This general lack of growth in high-tech employment has more recently been confounded by the Great Recession during which nationwide high-tech employment has suffered. In

this environment states are fighting to divide a pie of sometimes decreasing size, so in some cases states may be using policy initiatives as much to stem employment losses as to gain employment.

The primary purpose of this paper is to examine state-by-state variation in high-tech employment both in manufacturing and services through the Great Recession and recovery. The main focus is to explore the effectiveness of state policies in directing employment changes during this period. Of primary interest is state economic development policy, although labor and tax policy are included as well. Labor and tax issues are often discussed when employment levels are at issue.

This purpose is pursued in several steps. Immediately below a brief literature review is provided to set the stage for the analysis and guide the empirical modeling. Then the definition of high-tech is discussed and evidence on recent trends in high-tech employment is presented. An empirical model, based primarily on the literature review, is posited, operationalized, and estimated using a pool of data from 2007 to 2012 for the 50 United States. The model is

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estimated in two stages to control for endogeneity. Finally, the results are presented and discussed and conclusions are drawn.

## 2. Literature review

The evolution of state economic development policies through three waves is discussed in [Bradshaw and Blakely \(1999\)](#). The authors identify the first wave as one associated with attracting industries from other areas into the target area, smokestack chasing. The second wave, beginning around the early 1980s, gave more attention to the retention and expansion of firms already in existence in an area. The third wave followed wherein states and localities developed more strategic foci to direct their economic development efforts. First and second wave efforts did not disappear; rather, the third wave represented a new policy direction where states had more detailed industrial strategies. One important, if not universal, goal of third wave policies is to “aim at building a new economic base of small and usually high-technology, growth-oriented firms” ([Bradshaw & Blakely, p. 237](#)).

One problem that arises when studying economic development policy is that it can be difficult to determine the extent to which stated policies are actually pursued. A state or other entity can easily adopt a policy, but if the policy is afterward unfunded or ignored, the policy is irrelevant, or at best, symbolic. [Hanley and Douglass \(2014\)](#) reason that actual economic development spending should reveal more about a state’s economic development strategy than its list of policies and programs. In response, they study the 2007 State Economic Development Expenditure Database collected and organized by the Council for Community and Economic Research (C2ER) to reveal the relative intensity of various state policy efforts. They hypothesize three policy categories: supply-oriented policies that aim to reduce costs of production in the state; demand-oriented policies that aim to help businesses find new sources of demand for their products; and minority development policies aimed at meeting the business needs of disadvantaged groups. Using confirmatory factor analysis, they conclude that in most cases states follow hybrid strategies including “(a) export-driven recruitment; (b) entrepreneurial; (c) rapid-response export-driven recruitment; (d) education-driven recruitment; (e) high-tech recruitment or ‘chip chasing’; and (f) minority development” ([Hanley & Douglass, 2014, p. 9](#)). Alaska and Hawaii are excluded from the analysis.

Another question is the degree of commitment states and other entities have to economic development policies and spending. In the 2000s the United States experienced two significant downturns, the first in 2001 and the second, the Great Recession of late 2007 through early 2009. [Osgood, Opp, & Bernotsky \(2012\)](#) analyze a series of three national-level surveys conducted by the International City/County Management Association (ICMA). The surveys were conducted in 1999, 2004, and 2009. The surveys gather information on the economic development strategies of municipalities. A major purpose of the work is to explore trends in local economic development strategies in times of significant economic stress. Their major conclusion was that hard times tended to push localities

toward reliance on first wave – business attraction – economic development strategies even while recognizing the risk and potential zero-sum rewards associated with these strategies.

While there is ample evidence that states and localities are interested in attracting high-tech employment, defining what high-technology is and tracking employment patterns is still a significant challenge to researchers. [Jenkins, Leicht, & Jaynes \(2008\)](#) studied the 1988–1998 growth of high-tech employment in U.S. metropolitan areas. They describe the difficulties in distinguishing high-tech from other employment. For their study they adopt a method first employed by [Hecker \(1999\)](#). They identify an industry as high-tech if, at the Standard Industrial Classification (SIC) three-digit level, an industry has “twice the private-sector industrial mean in research and development employment” and “twice the private sector industrial mean in technology workers” ([Jenkins et al., 2008, p. 458](#)). To measure high-tech intensity, employment in these high-tech sectors is expressed as a percentage of all private employment in each metropolitan area. The change in high-tech employment intensity becomes their dependent variable. Their independent variables are intended to operationalize costs (location effects), agglomeration, and technology and entrepreneurial policies. After estimating various specifications of a generalized linear model, they conclude that state and local technology and entrepreneurial policies can be used to encourage relative growth in high-tech jobs. Similarly, [Wu \(2008\)](#) finds that the adoption of state research and development tax credits increased the number of high-tech establishments in adopting states.

Although [Jenkins et al. \(2008\)](#) focus on metropolitan areas, [Wojan and Pulver \(1995\)](#) argue that some rural areas provide good prospects as high-tech industry locations. This is similar to the conclusion drawn by [Dorfman, Partridge, & Galloway \(2011\)](#) who find little evidence that truly rural areas are attractive to high-tech workers. Alternatively, micropolitan areas with complementary characteristics can attract high-tech workers. In other words, natural amenities alone are not a reliable predictor of the location of high-tech jobs. Amenities must combine with other factors like a minimum population base, proximity to a metropolitan area, large supply of young educated people, and low housing prices.

[Luker and Lyons \(1997\)](#) study broad shifts in high-tech employment over the 1988–1996 period. They observe that overall employment growth in high-tech employment increases very slowly and that employment shifts away from high-tech manufacturing and toward high-tech services. They attribute changes in defense research and development spending, technological change, high levels of competition in consumer electronics, and vertical disintegration as the main drivers of these shifts. High-tech developments have increased labor productivity across industries, including high-tech manufacturing, thus lessening the relative need for labor. Simultaneously technological change has made global outsourcing of goods and services production easier. Competition on the goods side encourages producers to focus on the production of goods, and particularly services, which complement the now less

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