

Creating a “Great River” of Growth for Ohio?

Ohio is painstakingly reinventing its economy. The state is seeing a time of investment and divestiture; a time to invent and create new technologies that will underpin industry sectors and fuel the economies of the ‘Great River’ state. Just as the Ohio of a bygone era depended on access to the St. Lawrence Seaway to move goods, this economy is looking to the next generation of technology adoption to rejuvenate the currently lagging state economy. Governor Ted Strickland’s 2007 budget certainly reflects the state’s commitment to innovation:¹

A new Ohio Innovation Partnership will be created that includes two new programs:

- 1. The Choose Ohio First Scholarship, a \$100 million scholarship program, to be leveraged by at least \$100 million in private dollars or other support, to encourage Ohio students to study science, technology, engineering or mathematics, or become teachers in those fields.*
- 2. The Ohio Research Scholars program, a \$50 million effort to recruit world-class scholars tied to job creation in Ohio’s regional economies.*

Employment growth is the broadest and most timely measure of economic activity at the regional level. Employment in the Ohio economy has lagged behind that of the United States over the past several years. As shown in the state profile on page 8, employment averaged a 0.55% annual contraction in Ohio from 2001 through 2006 compared with a 0.55% annual expansion in the nation over the same period.

Strong innovative capacity can catalyze economic growth, especially when economic climates are transforming from market obsolescence to knowledge-led inventive regions. Ohio and the nation are undergoing changes due to the increasing impacts of the global economy. Factors such as the implementation of the North American Free Trade Agreement (NAFTA) and the economic growth in Southeast Asia—especially China—have had profound effects in the nation and in Ohio. Some impacts led to lower prices for consumers but also to fewer jobs in some labor-intensive industries.

The New Economy

A measure of how states are poised for economic growth is provided in The 2007 *State New Economy Index* developed by The International Technology & Innovation Foundation (ITIF). Some of the characteristics used to

describe the *New Economy* are a dynamic market with global competition, innovation and ideas as keys to a flexible production system, broad and changing workforce skills, and risky rather than secure employment.

The ITIF ranks Ohio 29th overall in its *New Economy Index*, which can be described as a measure of how far along a state is in making the transition to the *New Economy*. Among the 26 indicators composing the index, Ohio ranked highest in e-government (5th), a measure of the utilization of digital technologies in state governments, and in immigration of knowledge workers (7th), a measure of the average educational attainment of recent immigrants from abroad. Ohio ranked lowest in venture capital (47th), venture capital invested as a share of worker earnings, and job churning (48th), a measure of new start-ups and business failures.

Patents Rank Ohio Ninth in the Nation

Patent data point to the innovative capacity of a region. The origins of patent activity point to resources for innovation that may be underlying drivers for future economic growth. Ohio was the locality² of 1,436 worldwide patent filings in 2006, ranking it 9th among the 50 states.

Research universities are often looked at as drivers of innovation. However, patent ownership data suggests the role is limited and points to the location of highly innovative firms setting the bar for innovative capacity for regions. Of the 1,436 worldwide patents filed by Ohio authors in 2006, only 8%, about one in twelve, included a university as one of the owners of the patent. In the United States, a similar ratio of patents included university owners. Since 1998, the ratio of university

	Patents and Origins						
	Total Number of Patents		Patents with One or More Universities as Owner		2006 Patents with at Least One Author of:		
	1998	2006	1998	2006	Chinese Descent	Indian Descent	Foreign National Status
Ohio	1,112	1,436	5%	8%	> 12%	> 10%	> 16%
United States	23,343	42,019	9%	8%	> 17%	> 14%	> 26%

Sources: World Intellectual Property Organization, Duke University, and Chmura Economics & Analytics

¹ http://www.allamericanpatriots.com/48725923_ohio_ohio_governor_praises_passage_first_budget

² Locality is assigned based upon the zip code of the author or first-listed author in cases of more than one author.

ownership decreased slightly in the United States but rose in Ohio. University activity varies significantly by state. Among Ohio's border states, for example, university patent ownership in 2006 varied from 10% in Michigan to 3% in West Virginia.

Among Ohio's six largest MSAs, Cincinnati led in worldwide patent filings in 2006 with Cleveland contributing the second most. Patent filings in Cincinnati, however, declined from 1998 to 2006—in 1998, the Cincinnati metro had contributed over 45% of Ohio's worldwide patents. In terms of patents per worker, Cincinnati, Cleveland, and Akron performed above the state average in 2006. Compared to the rest of the country, Ohio averaged 0.27 worldwide patents per 1,000 workers in 2006, below the 0.31 average in the country. The top two states in this regard, Delaware and Massachusetts, garnered at least 0.80 patents per 1,000 workers in 2006.

Worldwide Patents by Metropolitan Area*

MSA	1998		2006	
	Patents	Patents per 1,000 Workers	Patents	Patents per 1,000 Workers
Akron	78	0.25	116	0.36
Cincinnati-Middletown**	509	0.65	438	0.55
Cleveland-Elyria-Mentor	190	0.17	391	0.37
Columbus	120	0.15	201	0.23
Dayton	75	0.18	68	0.17
Toledo	44	0.14	66	0.21
Ohio Total	1,112	0.21	1,436	0.27
USA Total	23,343	0.19	42,019	0.31

Sources: World Intellectual Property Organization, Duke University, Bureau of Labor Statistics, and Chmura Economics & Analytics

*Region is assigned based on the address supplied by the patent author.

**Ohio portion only.

The most active company owner of Ohio worldwide patents in 2006 was Proctor & Gamble—by far the leader with over 250 patents. Proctor & Gamble, headquartered in Cincinnati, is said to have “operated one of the greatest research and development operations in corporate history.”³ Other top patenting firms in Ohio include the Cleveland Clinic Foundation, Lubrizol Corporation, and the Timken Company.⁴ Among the most prevalent Ohio university owners in 2006 worldwide patents were the Ohio State University, the University of Akron, Case Western Reserve University, Ohio University, the University of Cincinnati, and the University of Dayton.

A significant influence upon the number and perhaps types of patents is the concentration of foreign authors. This fact sets the stage for policy discussion in terms of intellectual property and immigration laws. In the United States, at least 26% of patents were filed with at least one of the authors being a foreign national⁵ and in Ohio at least 16% included a foreign national author. (Note that these numbers do not include recently nationalized individuals, a group that likely also significantly impacts patent writing.) Individuals of Indian and Chinese descent are especially active in patenting. In Ohio, no less than 12% of patents included at least one author of Chinese descent

and no less than 10% of patents included at least one author of Indian descent—this share of patenting activity, however, is lower than average in the nation as well as lower than in each of the top six patent-producing states.⁶

Foreign-Born Authors Boosting Ohio's Innovative Capacity

A 2004 University of Colorado study affirmed that skilled immigrants have a positive impact on patent applications. The study noted that foreign students also play a major role in driving innovation. As the authors put it,

Relatively open access to international students has allowed U.S. universities to accept the brightest graduate students in science and engineering from all over the world. In turn, international graduate students contribute to innovation and patenting in science and engineering....⁷

Foreign Students at Ohio Institutions

Institution	Number of Foreign Students
Ohio State	4,476
University of Cincinnati	2,216
Case Western Reserve	1,153
Kent State	938
Ohio University	931
University of Akron	880
University of Toledo	838
Cleveland State	688
Bowling Green	622
Wright State	565
Total - All Ohio Institutions	18,002

Sources: NAFSA, Association of International Educators and the Institute of International Education

In the 2005-2006 academic year, Ohio hosted 18,002 foreign students, the 9th most among the fifty states. Ohio's foreign students accounted for 3.2% of the 564,766 total in the United States. The countries of origin for the greatest numbers of these students in Ohio were India (3,735) and China⁸ (2,866). About 44% of Ohio's foreign students attended one of three

³ “Connect and Develop: Inside Proctor & Gamble's New Model for Innovation,” *Harvard Business Review*, Vol. 84, No. 3, March 2006. This article describes Proctor & Gamble's shift to a “connect and development” innovation model that allows the company to tap into innovation and creative developments occurring outside of the company.

⁴ Primary firm locations by MSA: Cleveland Clinic Foundation and Lubrizol Corporation, Cleveland; Timken Company, Canton.

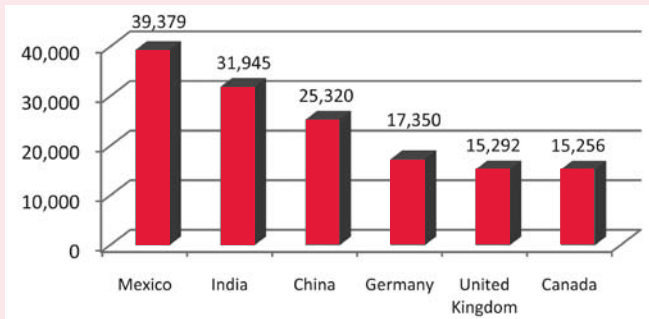
⁵ A foreign national is defined for these purposes as a resident of the United States that is not a citizen.

⁶ For additional information at the national level, see *America's New Immigrant Entrepreneurs*, Wadhwa et al., Duke University and UC Berkeley, 2007.

⁷ *The Contribution of Skilled Immigration and International Graduate Students to U.S. Innovation*, G. Chellaraj et al., University of Colorado at Boulder, 2004.

⁸ People's Republic of China.

Leading Countries of Origin of Ohio's Foreign-Born 2005 Population



Source: Migration Policy Institute

Percent Change in Employment by Employment Size Cohort: 2003-2004

Employment Size	United States	Ohio
1-9	11.4%	8.6%
10-19	2.4%	0.9%
20-99	1.0%	-0.3%
100-499	0.4%	-0.1%
500+	-0.4%	-1.9%
TOTAL	1.5%	-0.1%

Source: 1989-2004 Business Information Tracking Series, U.S. Census Bureau

schools: Ohio State, University of Cincinnati, and Case Western Reserve. Besides this, foreign students are spread fairly well throughout the state: each of the six largest metro areas in the state had at least one school among the top ten in foreign student attendance.⁹

The number of foreign students in the United States increased dramatically over the last four decades of the twentieth century – from 48,486 in the 1959-1960 academic year to 514,723 in the 1999-2000 academic year. This growth may have leveled off, however. In the United States, the number of foreign students peaked in the 2002-2003 academic year and fell 3.7% over the next three years. The number of foreign students in Ohio peaked in the 2001-2002 year with the 2005-2006 attendance figures 7.1% lower than this peak.¹⁰

While growth in foreign students may have slowed, the percent of population that is foreign-born has increased over the last five years. It is estimated that 3.5% of Ohio's population in 2005 were born outside the country as compared with 3.1% in 2000 and 2.3% in 1990. Despite this growth, Ohio ranked 39th

in 2005 among the fifty states in percentage of foreign-born population.¹¹ The countries with the largest contingencies of foreign-born residents in Ohio are Mexico, India, and China. By continent, 36.9% of Ohio's foreign-born are from Asia and 29.4% are from Europe.¹²

Immigrants to the United States are closely tied to entrepreneurship. Of all engineering and technology companies started in the nation from 1995 to 2005, 25% included a key founder that was foreign-born. Nearly 80% of these startups were in software and innovation/manufacturing-related services. Indi-

⁹ Institute of International Education.

¹⁰ Ibid.

¹¹ Migration Policy Institute.

¹² Ibid.

¹³ *America's New Immigrant Entrepreneurs*, Wadhwa et al., Duke University and UC Berkeley, 2007.

¹⁴ Finance, information, and real estate industries.

¹⁵ Transportation, warehousing, and utilities industries.

¹⁶ Professional and business services industries.

Ohio Employment Growth by Sector: 2003-2004

	Initial Year Employment	Change in Employment	Percent Change in Employment	Percent Employment Growth by Employment Size Cohort				
				1-9	10-19	20-99	100-499	500+
Construction	220,924	5,159	2.3%	14.7%	0.8%	-0.9%	-6.7%	-3.1%
Leisure	482,446	7,434	1.5%	13.4%	3.5%	-1.5%	-0.1%	1.6%
FIRE ¹⁴	321,313	4,221	1.3%	6.5%	-0.7%	-0.8%	1.2%	1.0%
Education Services	100,002	1,301	1.3%	15.5%	-0.2%	3.0%	2.9%	-1.3%
TWU ¹⁵	192,437	2,446	1.3%	13.0%	2.3%	1.0%	1.3%	0.3%
Retail Trade	614,769	5,397	0.9%	5.7%	-1.5%	-0.7%	-0.2%	0.9%
Other Services (except Public Administration)	230,945	438	0.2%	5.6%	-3.3%	-1.8%	-3.6%	-0.8%
Health Care and Social Services	705,701	253	0.0%	9.1%	2.8%	3.9%	-2.1%	-1.7%
PBS ¹⁶	701,429	-1,711	-0.2%	8.4%	2.0%	-0.1%	6.4%	-3.7%
Wholesale Trade	237,376	-1,194	-0.5%	5.8%	1.2%	0.0%	-2.0%	-2.3%
Manufacturing	838,573	-24,446	-2.9%	5.4%	2.5%	-1.4%	-1.0%	-4.8%
Information	111,317	-5,926	-5.3%	3.9%	-0.1%	-5.5%	-1.1%	-6.3%
Total*	4,769,406	-6,163	-0.1%	8.6%	0.9%	-0.3%	-0.1%	-1.9%

Source: 1989-2004 Business Information Tracking Series, U.S. Census Bureau

*The total includes sectors not shown individually in this table: mining; forestry, fishing, hunting, and agricultural support; and unclassified.

ans have been especially active in this regard, being involved in 26% of all immigrant-founded engineering and tech companies during this period.¹³

Entrepreneurs are Moving the Markets

Multiple studies on return-on-investment strategies at a regional level indicate that resources are better spent on entrepreneurial and expansion projects than on business retention efforts in old economy industry sectors. Even though entrepreneurs may make up a small percentage of total employment, entrepreneurial firms add flexibility to a region's industry base as they are able to react quickly to changes in market demands. From this point of view, they are often innovative with opportunities for rapid growth. Although many startups go out of business within the first three years, regions that experience a larger proportion of startups generally see faster overall employment growth compared to regions with fewer startups.

Recent data show that in both the United States and Ohio, employment growth has been most robust among cohorts based on smaller-sized firms. In Ohio, cohorts of firms with 19 and fewer employees expanded from 2003 to 2004 while groups of larger firms contracted. Overall employment contracted 0.1% in Ohio over this period and firms with 500 or more employees contracted 1.9%. Firms with 9 or fewer employees, however, expanded employment 8.6% and firms with 10-19 employees grew 0.9%. A similar pattern was found in the nation over this period, with the smaller-firm-size cohorts performing better, though growth in the nation was stronger across the board.

Sector data for Ohio by firm size reveals the importance of small business in generating jobs. Between 2003 and 2004, the declining manufacturing sector posted job growth in cohorts with 19 or fewer employees despite tremendous losses among larger-sized firms. The cohorts with 500 or more employees did not decline in every sector, but expanded in retail trade; leisure; finance, insurance, and real estate; and transportation, warehousing, and utilities (TWU). TWU, in fact, was the only sector to post job gains in every cohort. Retail trade between 2003 and 2004, grew in both the largest and smallest cohorts but declined in the mid-size cohorts.

Professional and business services (PBS) firms with 9 and fewer employees added 5,745 jobs between 2003 and 2004. PBS is seen as an especially desirable sector because of its higher-than-average wages. PBS is also home to high-tech industries that include architectural, engineering, and related services; computer systems design and related services; and scientific research and development services—industries projected to have good growth.

High-Growth Entrepreneurship

Job growth from small firms is not evenly spread among sectors, nor is it evenly spread within sectors. A small percentage of firms can account for a large percentage of job growth. In a study in Virginia, for example, it was shown that 2.7% of a group of entrepreneurial high-tech firms accounted for half of the cohort's job growth in ten years' time.¹⁷

Additionally, the Global Entrepreneurship Monitor (GEM) conducted research on high-growth entrepreneurs (entrepreneurs currently employing 20 or more) and high-expectation entrepreneurs (new entrepreneurs expecting to have 20 or more employees in five years' time). Their research showed that merely 1.7% of recently new entrepreneurs expected to create nearly half of all expected jobs.¹⁸ Since the quality of entrepreneurial activity may be just as important if not more important than the quantity of activity, GEM surmised that governments need to carefully account for the importance of high-growth entrepreneurs in devising policies:

It may well be that policies aimed at raising overall levels of entrepreneurship produce even counterproductive results for high-growth entrepreneurship. There is increasing empirical evidence to suggest that the relationship between "numbers-oriented" entrepreneurship policies and subsequent job creation in the economy is not automatic and may, in some situations, even be negative.¹⁹

A 2006 study of Ohio's startups found mixed results and room for improvement in the state. In contrast to comparative regions, the Ohio regions produced a higher percentage of startups that employed at least five people within a given time frame, but these Ohio firms averaged a fewer number of jobs created and were less likely to reach high revenue categories.²⁰ The study drew this conclusion:

A major bottleneck clearly exists when it comes to growing entrepreneurial companies in Ohio...better resources and incentives are needed for Ohio's significant start-ups to compete globally and accelerate annual revenue growth.... Then and only then, will Ohio experience the job creation, economic output, and tax base of a new knowledge-based entrepreneurship economy.²¹

¹⁷ *Virginia Economic Trends*, 2nd Quarter 2007, Chmura Economics & Analytics.

¹⁸ *2007 Global Report on High-Growth Entrepreneurship*, Global Entrepreneurship Monitor.

¹⁹ *Ibid*, page 39.

²⁰ *Ohio Entrepreneurship: A Comparative Assessment of Business Startups in Select Regions*, Buckeye Gazelles Association, September 2006.

²¹ *Ibid*.