Colorado Advanced Technology Employment Proposal

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The advanced technology economy plainly has a large presence in Colorado. In March 2004, the Milken Institute's State Technology & Science Index placed Colorado third in the nation in technology and science assets, and the 2005 edition of *Cyberstates* from the American Electronics Association ranked the state first in the country for its concentration of advanced tech workers. Despite this, a comprehensive NAICS (North American Industry Classification System) based definition of "advanced tech" has not yet been established for the state.

In the mid-1990s, the American Electronics Association (AeA) established a definition of high-tech industries which consisted of some 45 Standard Industrial Classification (SIC) codes. This classification system, however, was last updated in 1987 and did not take into consideration future emerging industries. When the NAICS system was devised in the 1990's, the AeA definition of high-tech became entirely obsolete, as there was no direct crosswalk between the two types of codes. Whereas SIC had been based on the type of activity in which an establishment was engaged, NAICS was constructed around the concept of production processes. The AeA then revised its definition in 2003, establishing a new list of 49 NAICS codes. This was accomplished using the principle that "an industry had to be a maker/creator of technology, whether it be in the form of products, communications, or services."

In a 2004 study, Chappele et al. approaches the subject of a high-tech definition from a new direction, one centered on the scientific and technical (S&T) composition of an industry's workforce. Using Occupational Employment Statistics (OES) data, they map S&T occupations to SIC industries, and rank them according to the share of the national workforce which is engaged in those occupations. An industry was then defined as high-tech if its share of S&T occupations was 9%, or three times the national norm across industries. Building from this definition, Paytas and Berglund (2004) use an updated crosswalk from OES to NAICS in order to translate the occupations identified by Chappele et al. into NAIC-based industries. Similar to their predecessor, they define an industry as high-tech if its employment in S&T occupations exceeds three times the national average across industries, or 9.98% (the higher standard is used because it excludes several borderline industries).

Hecker (2005) employs a similar occupational-based method to establish a high-tech definition, but with a somewhat looser definition of "scientific and technical" that includes more occupations. Hecker defines an industry as high-tech if its S&T employment concentration is at least twice the 4.9% national average for all industries. Within the group of included industries, he then specifies three levels of distinction based on the S&T employment intensity. Hecker's approach is advantageous in that it includes a wider range of industries than previous studies, and allows for the separation of these industries according to their "high-techness".

Beginning with the list of NAICS industries established in Hecker (2005), an analogous advanced tech series was assembled for Colorado from Quarterly Census of Employment and Wages (QCEW) data. The original list of NAICS codes was pared down from 45 to 21 based on the pertinence of the industry to Colorado's economy, as well as its statewide employment level. This progression is now the proposed comprehensive advanced tech series to be used for studying employment and wage data for Colorado. Although this definitive list of industries is appropriate for QCEW data, the construction of a separate Current Employment Statistics (CES) based series is also desirable for two reasons: first, QCEW data are on a lag of at least six months, and second, they do not form a time-series. CES data are far timelier, with a lag of less than one month, and CES data were reconstructed back to 1990 after the conversion to NAICS, thus creating a usable time-series. However, due to publishing structure, most of the identified 4-digit level industries are not estimated in CES. To discern which higher-level NAICS industries should be used in the advanced tech series, the ratio of the sum of the 4-digit NAICS employment to the higher level (2 or 3 digit) QCEW employment is calculated.   For concentrations of 50% or greater, the data are aggregated to the higher level according to the CES publishing structure and used in the series.

Industry	CES Supersector	NAICS Industry	Concentration
Computer and Electronic Product Manufacturing	31	334	97.2%
Transportation Equipment Manufacturing	31	336	73.3%
Software Publishing	50	5112	100.0%
Telecommunications	50	517	85.0%
Architectural, Engineering and Related Services	60	5413	100.0%
Computer Systems Design and Related Services	60	5415	100.0%
Management, Scientific, and Technical Consulting Services	60	5416	100.0%

This results in the inclusion of seven CES published series being used in the advanced tech employment data. Using March 2005 QCEW data, this proposed advanced tech series is 10.2% lower than the exhaustive QCEW series.

Original CES Advanced Tech Employment ('000s)
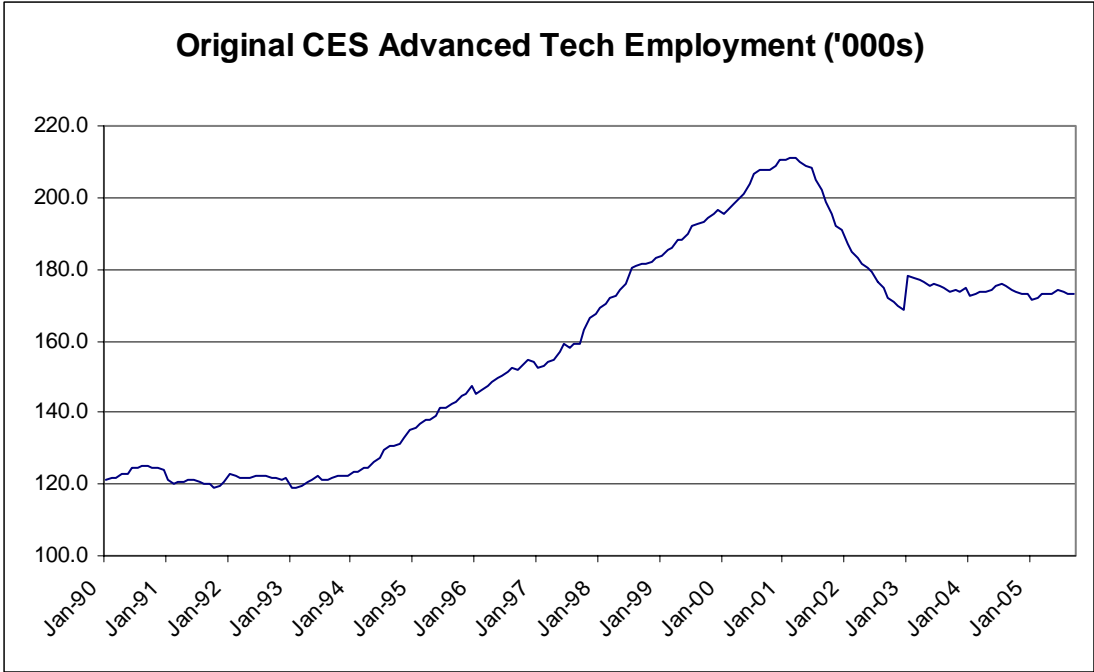
Prior to 2003, the CES program in Colorado did not publish the Management, Scientific and Technical Consulting Services, or 60-5416, series. The reporting of this series resulted in a more than 12,000 (5%) jump in the advanced tech series in January 2003. To correct this non-economic event, the data were wedged back over the prior 3 years.

Wedged Advanced Tech Employment ('000s)

QCEW v. CES Advanced Tech Employment ('000s)

Total Nonfarm and Advanced Tech Employment ('000s)
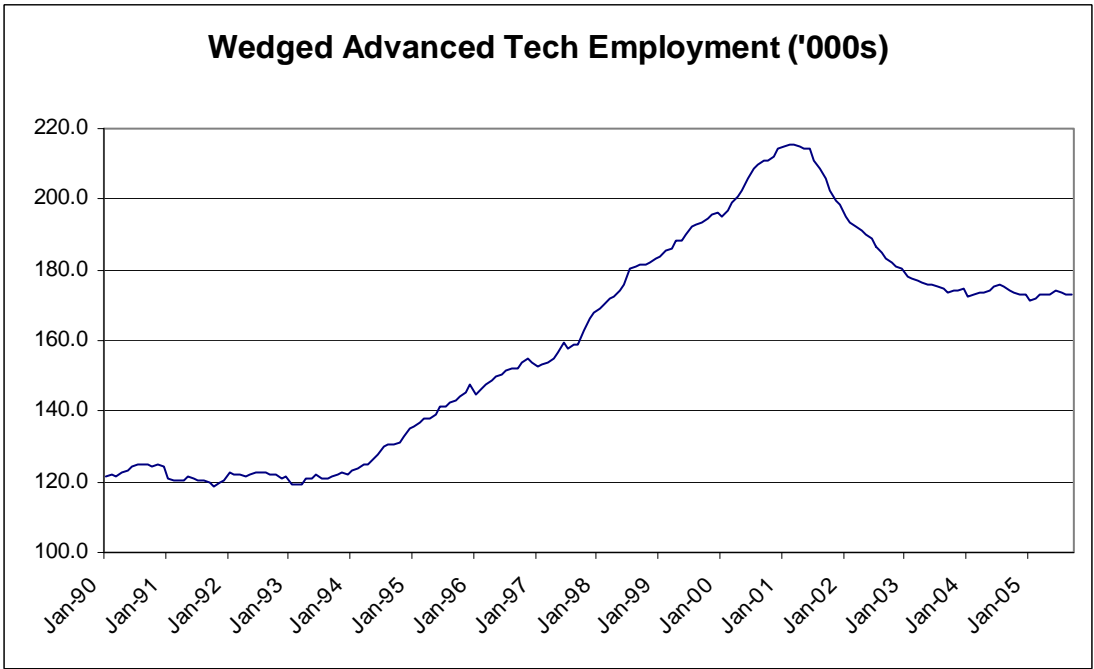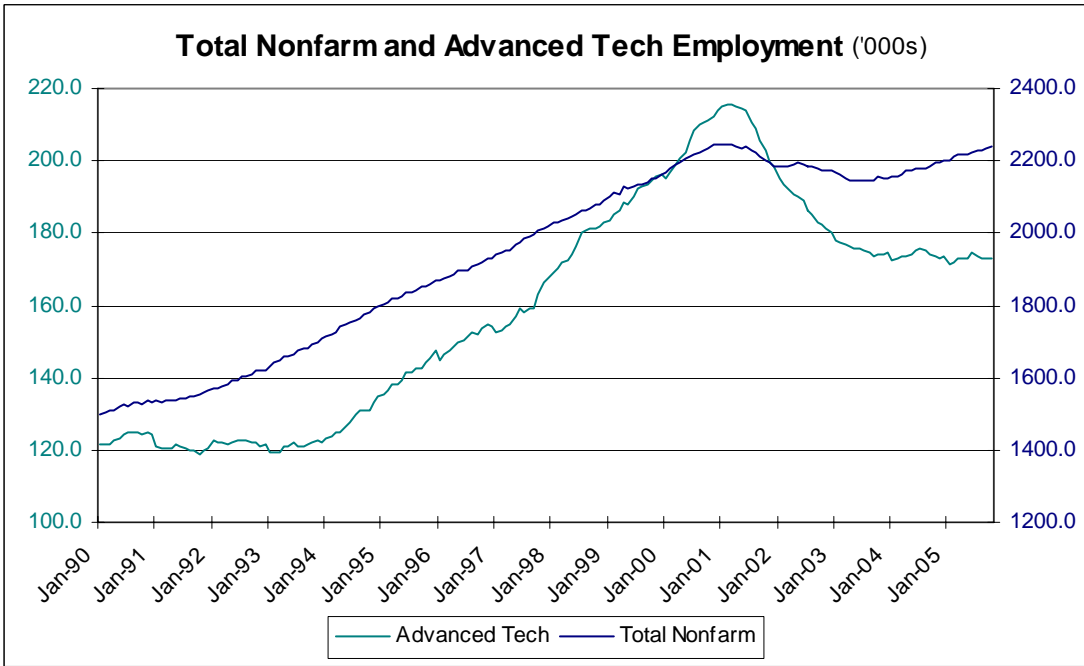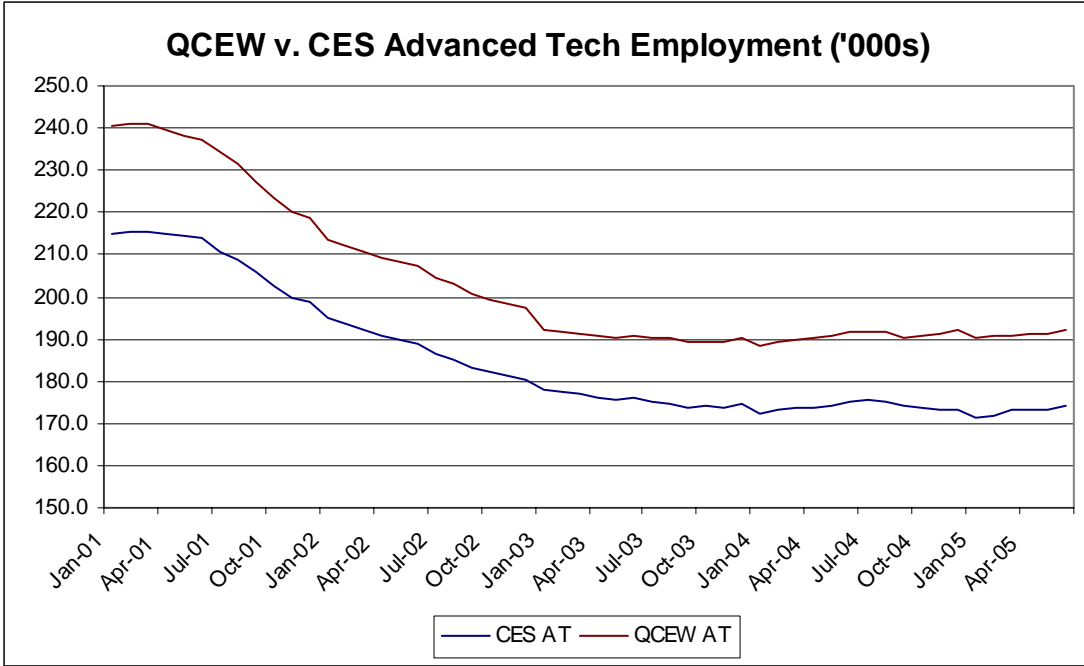
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Appendix: Comprehensive Advanced tech NAICS list

NAICS	Industry
3332	Industrial Machinery Manufacturing
3333	Commercial and Service Industry Machinery Manufacturing
3336	Engine, Turbine, and Power Transmission Equipment Manufacturing
3341	Computer and Peripheral Equipment Manufacturing
3342	Communications Equipment Manufacturing
3344	Semiconductor and Other Electronic Component Manufacturing
3345	Navigational, Measuring, Electromedical, and Control Instruments Manufacturing
3364	Aerospace Product and Parts Manufacturing
3251	Basic Chemical Manufacturing
3254	Pharmaceutical and Medicine Manufacturing
5112	Software Publishers
5161	Internet Publishing and Broadcasting
5171	Wired Telecommunications Carriers
5172	Wireless Telecommunications Carriers (except satellite)
5179	Other Telecommunications
5181	Internet Service Providers and Web Search Portals
5182	Data Processing, Hosting, and Related Services
5413	Architectural, Engineering, and Related Services
5415	Computer Systems Design and Related Services
5416	Management, Scientific, and Technical Consulting Services
5417	Scientific Research and Development Services