The Role of Universities In Economic Development

By Tim R. Smith, Mark Drabenstott, and Lynn Gibson

Universities play a valuable role in economic development, but that role is neither well defined nor easily understood. The recent economic problems of the Tenth Federal Reserve District states and relatively low and uneven funding for higher education in the region make it especially important to understand the current and potential economic development opportunities available to universities in the region. States seeking to improve their economic fortunes are turning to universities to participate more fully in economic development. For their part, universities are promoting their own economic development agenda while trying to increase state support. How will district universities become more involved in economic development?

Universities in the Tenth District are taking steps toward economic development initiatives, but a bank-conducted survey of major state-supported universities in the seven states of the Tenth Federal Reserve District—Colorado, Kansas, Missouri, Nebraska, New Mexico, Oklahoma, and Wyoming—shows that these initiatives stand a better chance of succeeding with closer cooperation between universities and state governments and among universities themselves. It is too early to judge the effectiveness of the new efforts universities are making to spur economic development. Instead, this article uses a survey of 11 major universities to explore the directions the universities are taking in fostering development.[1]

The first section of the article provides a brief overview of the recent sluggish economic performance of district states—the backdrop against which interest in economic development has grown. The second section discusses the connection between those economic conditions and state

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[1] The 11 major state-supported universities in the Tenth District states are the University of Colorado, Colorado State University, University of Kansas, Kansas State University, University of Missouri at Columbia, University of Nebraksa, University of New Mexico, New Mexico State University, University of Oklahoma, Oklahoma State University, and the University of Wyoming.

funding for higher education, while reviewing patterns of overall spending for higher education in these states. The third section presents the results of an informal survey conducted by the authors of university presidents and other officials at the 11 large public universities in the district. The survey results provide insight into what universities are doing—and what they can do—to become more active in improving the region's economic outlook. The fourth section explores how cooperation between universities and state governments and among universities can be important to the success of economic development initiatives.

Recent regional economic conditions

Economic growth in states of the Tenth Federal Reserve District has been sluggish for several years, and continued sluggish growth seems likely for the near future. Weak prospects for economic conditions in the region provide the critical backdrop for increased awareness of the need for economic development, both inside and outside of universities. And there are important links between economic activity and state financial support of higher education—a potential roadblock to successful university economic development efforts.

The slow growth of the district economy stems mainly from weakness in its two dominant sectors—agriculture and energy. Most states of the district have suffered from the effects of this weakness in recent years. Severe agricultural credit problems brought widespread farm and nonfarm business failures. Dramatically reduced discretionary purchases by farmers have further slowed the regional economy, with especially negative effects on rural communities. After peaking in 1982, the district's important energy industry weakened and was dealt a devastating blow when world oil prices plummeted in 1986. Currently, there are signs that both the agricultural and the energy sectors are stabilizing. Farm finances are improving due to record farm income and stabilizing land values, and firming oil prices have brought some improvement to the energy sector. But over the next few years, these sectors are not likely to be the sources of rapid growth that they were in the 1970s.

Further underscoring the weakness of the region's economy, the Tenth Federal Reserve District generally has not performed as well as the nation as a whole during the current business expansion. Measured by growth in total nonagricultural employment, economic activity in the district has lagged the nation since the 1982 recession (Chart 1). Job growth in the district was flat in 1985 and 1986, for example, while the nation added jobs at rates of 2.4 percent in 1985 and 1.8 percent in 1986.

Economic conditions vary widely across the district, but conditions have been weaker in most of these states than in the nation. In all but two of the district states, employment growth has been slower than in the nation (Chart 2). Only New Mexico and Missouri recorded employment growth slightly higher than the nation between 1982 and 1986. Growth varied over this period from 11.5 percent in New Mexico to −8.4 percent in Wyoming, compared with an employment gain of 10.8 percent in the nation.

Tenth District higher education funding in perspective

The economic strength of the region has considerable influence on funding for its universities. And the level of funding for higher education and the consistency of that funding affect the ability of the region's universities to become more active in economic development. Thus, efforts by district universities to become more involved in economic development must be gauged against the financial resources that will be available to fund those efforts. In good times, when the coffers are full and state revenue pies are expanding, it might be

CHART 1

Employment growth, Tenth District and the United States

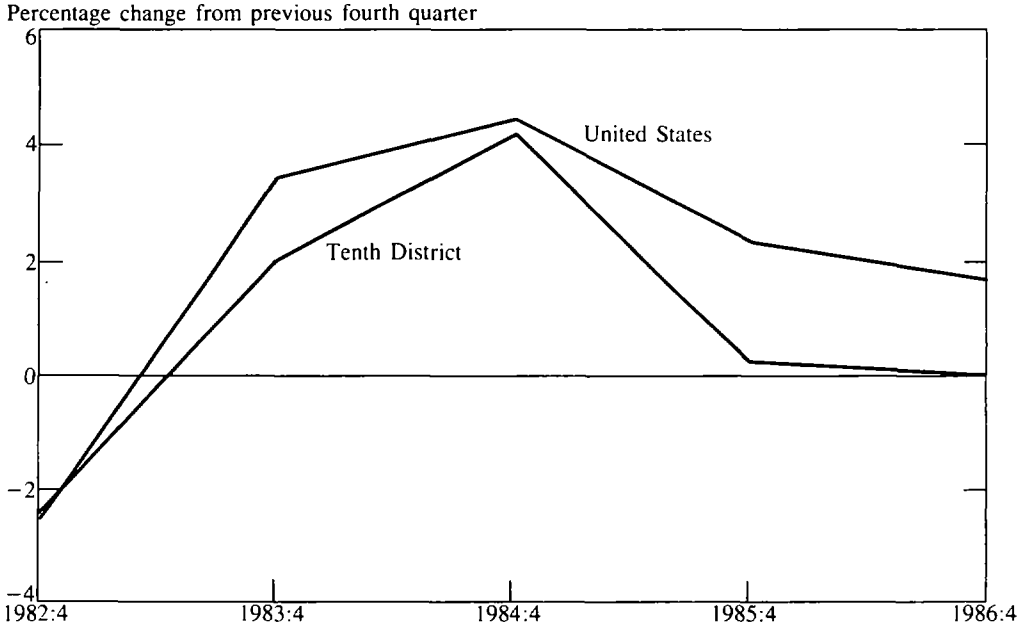


CHART 2

Employment growth, Tenth District states, 1982-86

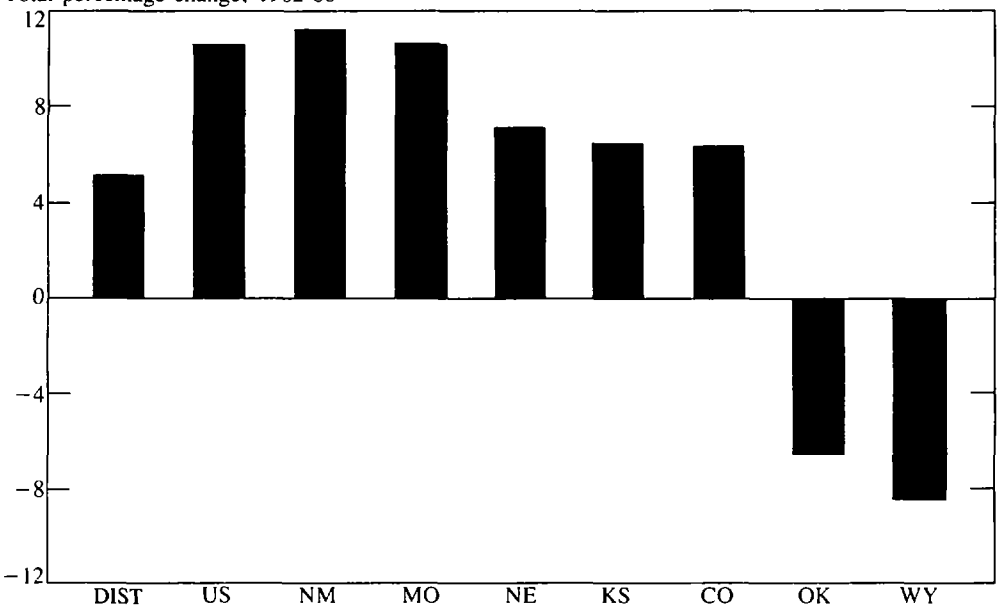
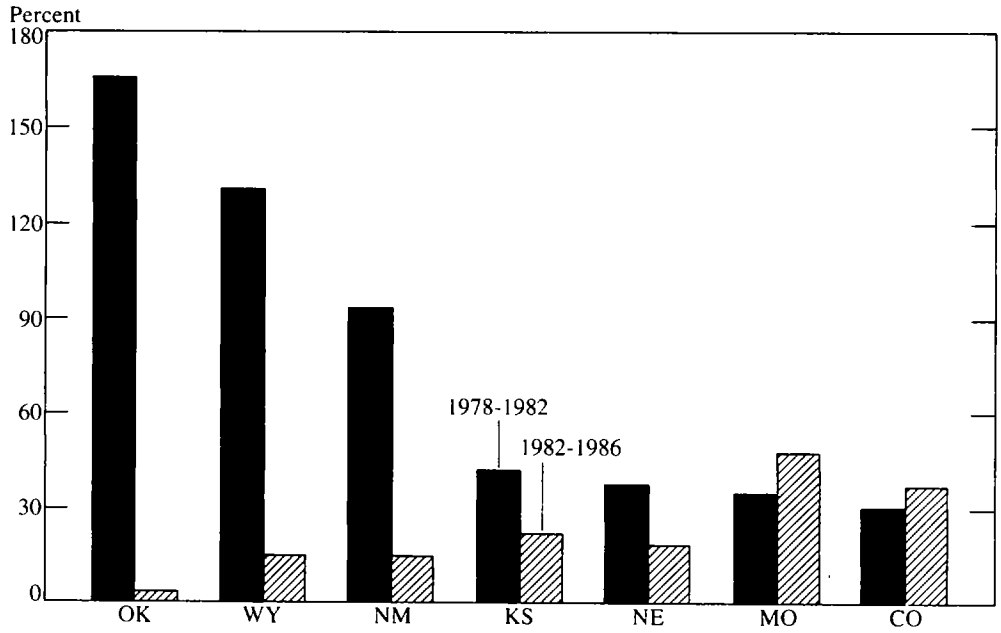


CHART 3

State fiscal conditions: growth in total resources

Tenth District states



expected that the slice for higher education would also grow. But as the pie shrinks, so do the slices. Charts 3 and 4 help illustrate this point.

District states are ranked in Chart 3 by the rate of growth in state budget resources for two periods, 1978-82 and 1982-86. During the first period, the energy sector prospered, and as might be expected, Oklahoma, Wyoming, and New Mexico led the district in growth of state fiscal resources. These three states also took the lead in growth of per-student state and local appropriations to higher education (Chart 4). In fact, the rankings in the two charts are similar. The increase in funding for higher education seemed to go hand-in-hand with the growth in state resources.

The downturn in the energy sector and the economic stress facing agriculture in the 1980s are clearly reflected in the slower rates of growth for state fiscal resources from 1982 to 1986 (Chart 3). And as the growth in state resources slowed, so did the growth in appropriations for higher education (Chart 4). Missouri and Colorado were the only district states with an increase in resources during the 1982-86 period. Missouri, however, was the only state where appropriations to higher education increased faster during the 1982-86 period than during the 1978-82 period.

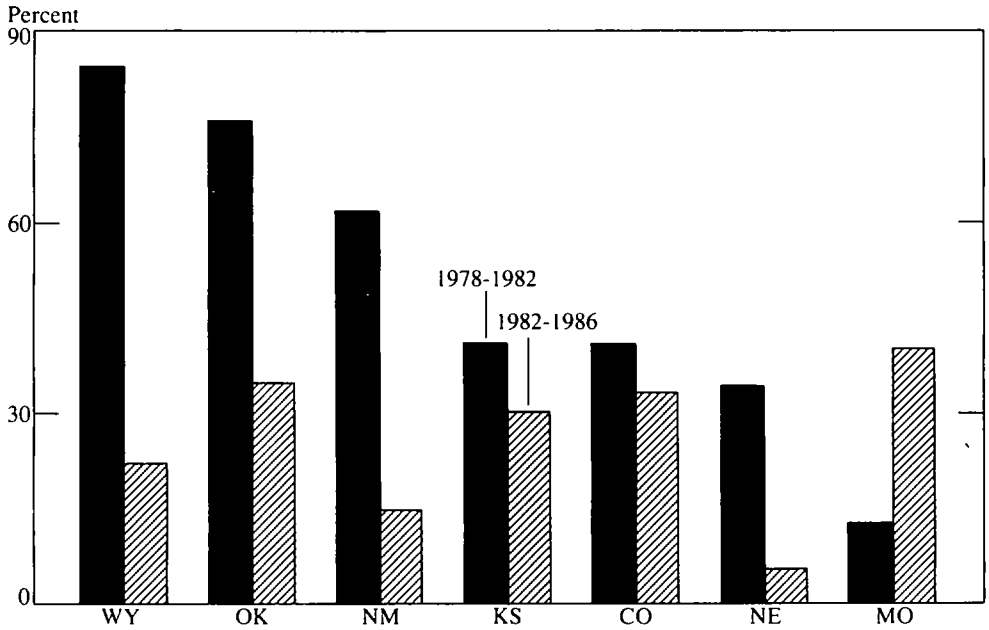
During the earlier period, state resources were expanding faster than appropriations for higher education in every district state but Colorado. During the more recent period, however, appropriations grew as fast or faster than state resources in Kansas, Oklahoma, New Mexico, and Wyoming. The pie was not expanding as rapidly as it had in the earlier period, but higher education was increasing its budget share in these states.

For a picture of state funding for higher education in the Tenth District, it is helpful to look at

CHART 4

Growth in per student appropriations for higher education

Tenth District states



spending in the district states relative to other states. The 50 states are ranked in Table 1 by the per-student level of state and local appropriations to higher education in 1984, the most recent year for which data are available.[2] Also presented in the table are the indexes for the state "Tax Capacity," a measure of a state's potential to raise revenues, state "Tax Effort," a measure of a state's actual revenues as a proportion of potential revenues, and the percentage of state expenditures going to higher education.[3] These figures provide proxy measures of a state's potential fiscal condition, the willingness of the state to raise public funds through taxation, and the relative importance the state places on higher education.

Four district states—Kansas, Nebraska, New Mexico, and Wyoming—funded higher education at levels above the national average in 1984. The other three—Colorado, Missouri, and Oklahoma—funded higher education at levels well

[2] State and local appropriations per student do not represent total funding for higher education. Some state universities depend heavily on tuition and fees to supplement their budgets. It should also be noted that ranking states by per student appropriations do not account for the costs each state faces for higher education. States supporting one or more medical schools, for example, will have higher education costs than states with no medical school facility.

[3] Tax capacity, as developed by the Advisory Commission on Intergovernmental Relations, is ". . . the revenue that each state would raise if it applied a nationally uniform set of tax rates to a common set of tax bases . . . . Because the same tax rates are used for every state, estimated tax yields vary only because of differences in the underlying basis." A tax capacity of more than 100 indicates the state has more fiscal capacity than average for the 50 states. Similarly, tax effort measures a state's total tax collection relative to its total capacity.

TABLE 1
State and local fiscal condition and support for higher education in the 50 states, 1984

State	Appropriations for Higher Education per Student (Index)*	Tax Capacity (Index)	Tax Effort (Index)	Higher Education as Percent of Total Expenditures
U.S. Average	100	100	100	9.5
Alaska	312	272	166	6.6
Dist. Columbia	214	117	146	3.2
Wyoming	179	182	113	10.0
Hawaii	129	114	108	11.2
Kentucky	128	79	91	11.0
Texas	125	124	67	12.7
New York	122	95	163	5.5
Georgia	122	87	93	9.5
North Carolina	117	87	88	14.3
Iowa	117	91	109	13.6
South Carolina	116	76	96	12.5
Kansas	108	102	92	12.8
Florida	107	103	75	7.8
Wisconsin	106	87	137	12.7
Nebraska	104	101	94	11.6
Louisiana	104	107	81	9.6
Idaho	104	83	87	12.4
Utah	102	82	98	14.3
California	102	119	92	10.5
New Mexico	102	108	79	11.7
Maryland	101	99	107	9.5
Mississippi	100	68	95	11.8
Oregon	99	96	104	10.8
Arkansas	99	78	83	10.0
Rhode Island	99	86	126	7.9

*State and local appropriations are expressed as dollars per full-time equivalent student and then indexed to the U.S. average. These figures include only state and local government tax revenues appropriated for higher education. Tuition and fees charged to students are not included.

below the national average. All the district states except Missouri have tax capacities above the national average. District states generally, however, have low tax efforts relative to the nation. Of the district states, only Wyoming used its taxing capacity at a level above the national average. Thus, it appears that the Tenth District states are more fiscally conservative than the nation, though except for Missouri, they appear to have above-average revenue potential.

If the district states seem reluctant to realize their full revenue potential, they do not appear reluctant to use available funds for higher education. A look at the percentage of state and local government expenditures going to higher education shows that all district states, except Missouri,

State	Appropriations for Higher Education per Student (Index)*	Tax Capacity (Index)	Tax Effort (Index)	Higher Education as Percent of Total Expenditures
Washington	98	101	104	11.1
New Jersey	98	112	109	6.4
North Dakota	95	111	81	13.4
Minnesota	94	97	124	9.5
Indiana	92	86	89	12.3
Alabama	91	75	87	12.9
Connecticut	90	124	96	6.1
Arizona	89	97	91	13.6
Montana	88	105	94	8.6
West Virginia	88	87	88	9.2
Delaware	87	118	82	13.6
Illinois	86	98	107	8.8
Oklahoma	85	115	80	11.4
Virginia	83	96	89	11.6
Michigan	83	90	128	10.1
Maine	82	90	100	8.7
Ohio	81	89	103	9.4
Nevada	81	147	64	6.4
Tennessee	81	80	82	9.9
Colorado	81	122	79	11.6
Missouri	80	89	87	9.2
Pennsylvania	78	88	105	5.5
Massachusetts	75	107	112	5.0
South Dakota	70	87	85	9.3
Vermont	58	94	95	12.5
New Hampshire	51	108	69	8.6

Source: *Higher Education Financing in the Fifty States, Fiscal Year 1984*, National Center for Higher Education Management Systems, Marilyn McCoy and D. Kent Halstead.

are above the national average. A picture emerges, therefore, of a group of states relatively generous toward higher education—willing to give higher education a respectable slice of the revenue pie—but unwilling to increase the size of the pie through taxation.

Although a broad view of state spending for higher education in the district is provided in Table 1, "higher education" does not mean a completely homogeneous group of institutions. Of the 151 public institutions of higher education in the district, 11 are major state universities with significant emphasis on research. These 11 state universities are discussed in the next section. They account for 35 percent of the total post-secondary enrollment in the district and receive 40 percent

of the seven-state total of state appropriations to higher education. Except for Wyoming, a state which supports only one public university, the district states fall below the national average for state and local appropriations per student for their major universities.[4] In addition to the 11 largest universities in the district, 45 other public colleges or universities offer at least a four-year degree. Except for those in Nebraska and New Mexico, these schools also are funded below the national average.

With below-average funding to major universities, how do district states achieve generally above-average rankings in total appropriations to higher education? How can the states excel in overall funding if they fall behind in funding for universities and four-year colleges? The answer is that two-year institutions—both academic and occupational—receive above-average state and local appropriations. There are 94 two-year schools in the district, and these schools received 20 percent of the district's total appropriations to higher education in 1984. While the existence of numerous two-year institutions in the district may have led some states to spread their resources too thin, the major universities across the seven-state region still received a major proportion of appropriations and enrollment.

The district's major universities received more than three-quarters of a billion dollars in state and local funding in 1984. They also contributed significantly to state resources. These universities have traditionally provided jobs, stimulated local economies, and helped supply the district and the nation with an educated workforce. Now states and universities are seeking more active roles in state economic development. The major state universities, with their high visibility, large student bodies, and tremendous research potentials, are likely to play a significant part in new initiatives for state economic development. The next section provides a look at how the 11 major state universities in the district are becoming involved in the region's economic development.

Public universities and economic development in the district

A survey of the administrations of the 11 major state-supported universities in the district indicates that the region's recent economic problems have caused the universities to adopt an increasingly more active position in economic development.[5] Although activities related to economic development, both planned and ongoing, vary across universities and across states, two main themes emerge from discussions with university officials. One theme is that the universities are seeking to expand their role in economic development. The first subsection looks at three characteristics of this expanding role: the move from a passive to more active economic development, the increased emphasis on strategic planning, and the strengthening of university-business partnerships. The other theme is that universities are being influenced by the fundamental transition underway in the region's economy and, in turn, are becoming involved in shaping that transition. The second subsection looks at how the universities are responding to and participating in the regional economic transition with respect to traditional industries, emerging industries, international competitiveness, and rural development.

[4] See state rankings for state and local appropriations per student for medical research universities, nonmedical research universities, medical universities, and nonmedical universities, Kent Halstead and Marilyn McCoy, "Higher Education Financing in the Fifty States, Fiscal Year 1984."

[5] The survey, conducted by the authors of this article in July 1987, consisted of interviews with administrators at all 11 major state-supported universities in the Tenth Federal Reserve District. Those interviewed included presidents, vice presidents, and deans. These individuals were asked questions about the general nature and specific characteristics of their economic development efforts.

Universities expand their role in economic development

Universities have numerous opportunities to enhance the economic future of their states. Some of these opportunities were seized long ago, while others are only now being recognized. Although some universities have long viewed their traditional research and teaching functions as major contributors to regional economic growth, their overall posture in the past can be described as passive. Except for the extension service at land grant institutions, few resources were directed to specific economic development objectives. Now all major state-supported district universities are becoming much more active. But in spite of the recent attention being given to the universities' role in economic development, few of the universities have formed an economic development agenda with clearly stated objectives. Few major changes have been made in university programs to reflect economic development efforts and few resources have been earmarked for economic development. Clearly, active university involvement in economic development is only beginning to take shape in Tenth District states.

Moving from passive to active. Economic development activities at universities can be ranked on a continuum from "passive" to "active." For example, this article considers the de facto provision of jobs and direct economic stimulus that a university campus brings to its local community to be passive since no specific economic development strategy is involved. Technical assistance to businesses and technology transfer are examples of active economic development initiatives. Somewhere between the active and passive extremes lie such activities as basic research and human resource development.

Although all 11 universities consider basic research and teaching to be the key to long-term economic development, they also consider themselves moving in a more active direction. This change stems from two sources. First, the universities are reevaluating their traditional roles and focusing attention on the contribution of basic research and teaching to economic growth. Second, universities are starting to engage in new activities that directly contribute to economic development by fostering a stronger relationship between the universities' traditional functions and the private business sector.

(Continued on page 14)

Major District Universities: Economic Development Prospects in Brief

The authors of this article conducted interviews with presidents, vice presidents, and deans of 11 major state-supported universities in the Tenth Federal Reserve District in July 1987. These individuals were asked questions about the general nature and specific characteristics of their economic development efforts. Their answers form the basis for the following summaries of individual university economic development activities.

University of Colorado

The University of Colorado views itself as having a very active role in economic development. Compared with the nation as a whole, Colorado's support of higher education is not high. As a result, CU has turned to private industry and the federal government for support of research. Recent economic problems in the state, therefore, have focused even more attention on the university's already important economic development function. As a result of the business community's importance to university funding, officials feel that the university can play the lead role in state economic

development. Space sciences, telecommunications, and microelectronics are some of the fields targeted for growth.

Colorado State University

Colorado State is expanding its role in Colorado's economic development by continuing to build on its academic and research strengths. Its Center for Advanced Technology is just one outgrowth of the university's emphasis on basic and applied research. With more than $70 million a year for sponsored research, CSU has produced world class research in engineering, veterinary medicine and biomedical science, natural sciences, and agriculture. The commitment to research provides creative outlets for the university's faculty members and valuable learning opportunities for students. Research has also built strong ties between CSU and the Colorado front-range economy through spinoff businesses and support for industry moving into the area.

University of Kansas

The University of Kansas regards education as its principal economic development activity. Still, the university is actively seeking new opportunities to become involved in state economic development objectives. The university is developing its research strengths through the Kansas centers of excellence program, and there is interest in expanding existing research ties to the pharmaceutical industry. A university Task Force on Economic Development formed in 1986 has recommended program changes and initiatives, but the university considers education its number-one mission and its primary contribution to state economic development.

Kansas State University

Kansas State is assessing the role it will play in economic development. The university envisions a more active role, though new initiatives are still being planned. Undergraduate teaching and basic research in material sciences, biotechnology (plant genetics), value-added agricultural products, and industrial technology transfer (including robotics) are the major focus of a new emphasis on economic development. Some faculty openings are being filled with an aim to building excellence in selected fields with economic development priority. The engineering college is establishing innovative partnerships with industry to encourage entrepreneurial discovery and alleviate research budget constraints.

University of Missouri at Columbia

The University of Missouri is beginning to reassess its contributions to economic development. As a land grant institution, it has long supported the traditional Missouri agricultural economy. As the Missouri economy has changed, diversifying and expanding, the university has sought to keep pace. The Columbia campus boasts two state-funded programs to build centers of academic and research excellence—a molecular biology program and food for the 21st century program. In combination with other projects, these programs are part of the university's effort to take a more active part in Missouri's changing economic outlook.

University of Nebraska

Nebraska appears to be in the early stages of economic development initiatives. The uni-

versity believes its best contribution will be in long-run investments in research and new partnerships with industry. Four areas of research are receiving emphasis: value-added agricultural products, biotechnology (especially plant genetics), optical measurements, and water resources. The Nebraska Food Processing Center, a joint venture with the state, provides technical and business support to food companies. The International Center on Franchising and the Nebraska Technical Development Corporation are university-related programs to assist small businesses.

University of New Mexico

Basic research has been the traditional role of UNM in economic development, and plans are for the university to continue in this role. But the university is moving toward the center of the passive-active continuum with more emphasis on applied research. Attention has focused on business research and services (Institute for Applied Research Services) and technology transfer activities (New Mexico Technology Innovation Program). Government research at the nearby Sandia and Los Alamos laboratories is seen as an important seed for technology transfer to both established companies and to new homegrown spinoffs. The "UNM-Business Link," now in planning stages, promises to establish working groups that can address such economic development issues as a planned research park, data networks, business assistance, and international affairs.

New Mexico State University

New Mexico State regards economic development as a fourth dimension to add to its traditional mission of education, research, and extension. The flagship development effort is Arrowhead Research Park. Envisioned as a 40-year project, the newly created park is intended to lure headquarters of budding companies as well as entrepreneurs from the university. The startup companies are expected to be attracted to the university's fields of research excellence in computers, telemetry, plant genetic engineering, and solar and geothermal energy. The university will take small equity positions in park companies.

University of Oklahoma

The University of Oklahoma views its role in economic development as long term, primarily involving "the creation of new knowledge" through basic research. However, the recent downturn in the energy industry and a new university president have shifted the focus of economic development toward partnerships with private business. Most economic development activities are directed at the state's natural resource base, primarily energy, with the first priority being to keep and expand businesses already in Oklahoma. The primary vehicle for carrying out these activities is the Office of Business and Industrial Cooperation.

Oklahoma State University

As a land grant institution, OSU has always been involved in economic development, but recent economic conditions have brought more interest in development. While the university has no formal economic development agenda, several initiatives have been developed in a decentralized fashion. The Telecommunications Center is aimed at improving university-industry relations and technology transfer. State

economic development is the primary objective for the university's planned Center for International Trade. Longer run plans include the establishment of research centers in biotechnology, manufacturing automation design, optical communications, international trade, and hazardous waste/water.

University of Wyoming

The University of Wyoming seeks to improve the economic future of Wyoming through research programs aimed at diversification. Projects are being designed to help broaden the state's industry base and support traditional Wyoming businesses. The university's faculty and students continue to explore new directions for established industries, such as agriculture and tourism, while breaking ground in such diverse areas as composite materials, plant science, molecular biology, and computer vision. With the cooperation of state administrators, the university is helping address both the academic and economic needs shaping Wyoming's future.

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New Mexico provides examples of these two sources of change. The University of New Mexico at Albuquerque has long emphasized basic research, but it stresses the contribution research makes to economic development and giving more attention to applications of research. The university also calls attention to its importance as an enhancement to the Albuquerque area through continuing education and cultural amenities.

New Mexico State University at Las Cruces has taken a different approach. Most of its recent economic development efforts center around Arrowhead Research Park, a business park serving as a new vehicle for technology transfer and business incubation. Both of New Mexico's major universities are developing business parks, but Arrowhead appears to be much more central to New Mexico State's overall economic development strategy. The objectives of this long-term investment in university-business cooperation are to foster entrepreneurial ventures by university personnel and attract new firms to Las Cruces by using the university's research strengths as a lure.

What is responsible for the heightened awareness of economic development at universities in the region? According to the university administrators, their heightened awareness of economic development has been due primarily to the sluggish economic climate in their states stemming from problems in agriculture and energy. In some cases, new university presidents and other administrative officials led the movement toward more active university involvement in economic development. The change was clearly induced, however, by regional economic difficulties.

More strategic planning. Universities also are expanding their role in economic development by increasingly incorporating development considerations into their strategic planning. Most of the universities view economic development as a long-term undertaking, but since they are just beginning to formulate economic development strategies, many of their initial developmental activities are designed to alleviate short-term problems.

The University of Oklahoma, for example, views its role in economic development as long term, with the role primarily involving "the creation of new knowledge" through basic research. But there is also increased awareness at the university that Oklahoma and the surrounding region must move their economies in new directions in response to competition from other regions in the United States and other parts of the world. To that end, the university's overall economic development strategy involves using more of its resources to improve growth in existing businesses in the state because university officials see importing jobs to the state as risky, sometimes very costly,

and often unproductive. Thus, programs aimed at assisting small businesses are expected help to fill the short-term needs of existing businesses while the university takes aim at longer run goals such as adding value to Oklahoma's natural resource base.

The long-term nature of regional economic development can also be seen in the emphasis district universities continue to place on their traditional research and teaching functions. These activities lie somewhere midway between passive and active. Once entirely passive, universities are now incorporating strong research and human resource development into their overall economic development plans. Like other land grant institutions, Oklahoma State University's extension service has filled short-term economic development needs, but the university is now turning attention to long-term concerns. Central to their evolving economic development strategy is the creation of research "centers." Centers in fields such as biotechnology, automation design for manufacturing, optical communications, and robotics are expected to enhance technology transfer to the private sector. By bolstering basic research and education in these areas, the university also expects improvement in the skill level of the Oklahoma workforce.

Universities are reevaluating educational curricula with a goal of providing students diverse and flexible skills. Many universities are emphasizing liberal arts courses and communications skills, recognizing that graduates are likely to make an average of six to seven job changes in their careers. Thus, another example of traditional university functions forming the central focus of economic development efforts is at the University of Missouri-Columbia, where an important contribution to economic development is believed to be the preparation of responsible, educated citizens to take new jobs.

Strengthening partnerships with business. Besides strengthening traditional research and teaching functions, universities are turning their attention increasingly to new initiatives that strengthen ties to private business. The survey revealed significant university resources being used to foster new relations with the private sector.

Two of the more successful examples of cooperation between the universities and businesses are at the University of Colorado and Colorado State University. According to administrators at both universities, comparatively low levels of state funding over many years have induced them to seek support from private businesses in building strong research programs and attracting federal grants. The currently active position these universities have taken toward economic development has increased attention to their usefulness to the state's business community. The increased cooperation has led to several economic development successes. In Boulder, for example, such firms as Ball Aerospace, Synergen, NBI, and Cadnedix trace their successes to the research faculty and students at the university.

The University of Nebraska has also stressed ties with business. One of the university's main initiatives in forging university-industry cooperation is its Food Processing Center, started in 1982 as a joint venture between the university and Nebraska's Department for Economic Development. So far, the center has been responsible for over 1,000 contacts with businesses and the creation of over 30 new food processing companies.

At Oklahoma State University, the partnership between business and the university has been increasingly important in funding research. The university established research expertise in web-handling technology, the running and handling of continuous flat materials through process machines. This expertise attracted to Oklahoma such firms as Armstrong, Moore Business Forms, and World Color Press, all of which rely on web-handling technology. These firms, in turn, can provide financial support to the university and share capital and human resources. Then, as the quality of research increases, the region becomes

more attractive to expansion of existing businesses and entry of new businesses that rely on similar technology.

Universities and economic transition

Universities are becoming more active in economic development at the very time that the regional economy is undergoing transition. The decline of traditional industries and the emergence of new industries provide a challenge to the universities as they try more actively to mold the economic future of their states. Moreover, an increased awareness of the global marketplace and a renewed commitment to the region's rural economic development will no doubt influence the overall economic development strategies at universities in the district. How have the region's universities responded and how might they participate in this transition?

Universities and agriculture. Of traditional industries in the Tenth Federal Reserve District, agriculture is the most important. As a result, land grant universities have been especially important to the economic development of the district. The region's farm economy became an engine for economic growth partly because of the agricultural education and research that emanated from the land grant universities. Now, as agriculture undergoes a fundamental transition in response to international competitive pressures, the land grant universities are being forced to reevaluate the role agriculture will play in their programs.

Land grant institutions were built around the triad of education, research, and extension. Agriculture—specifically, production agriculture—has been at the heart of the triad. Though land grant universities have been committing more resources to other disciplines for years, agriculture still forms an arching theme to their mission. Education at these universities has been broadly based from the beginning, with special emphasis on agriculture and the mechanical arts (engineering). The research has emphasized agriculture and engineering as well. In recent decades, however, research has been broadened to include such disciplines as architecture, energy, and computers. The extension leg of the triad has continued to focus almost entirely on production agriculture, however, with a growing emphasis on managing production, financial, and marketing risk.

What should be the central focus of the land grant triad today? Should it continue to be agriculture, or even more narrowly, production agriculture? These fundamental questions are now the subject of great debate in land grant universities across the district. At this point, three preliminary conclusions can be drawn.

First, land grant institutions are redirecting agricultural programs with two main objectives in mind. One is making U.S. agriculture more efficient. Past advances in agricultural technology have been aimed at increasing output by improving productivity. These efforts have been marvelously successful, so successful that grain surpluses are now at record highs. But in an era of surplus and intense international competition for markets, universities are appropriately turning their attention to technologies that will cut costs and make U.S. producers more competitive. Current research is aimed at cutting production costs of major crops while improving financial management methods to emphasize efficiency still further.

Food processing is the other new focus of agricultural programs. Research dollars are being redirected at improving the industrial equipment and processes used in the manufacture of food products. Some states are creating centers that offer expertise in solving business, industrial, and marketing problems of food processing firms. The objective of these initiatives is to create a base of knowledge and technical support that will attract additional economic activity to the district's farm states. Thus, the attention of land grant institutions is beginning to shift away from the farm to the rest of the food chain.

Second, even as agricultural programs are redirected, land grant universities appear determined to continue supporting agriculture but at a reduced level in their overall curriculum. But they are having difficulty implementing that decision. The land grant system, with more than a hundred years of integral leadership in the farm economy, has a significant farm constituency that resists any reduction in emphasis. But agriculture is no longer the all-important industry it once was to district states. The share of state population engaged in farming has continued to dwindle, and in district states is now less than 5 percent. Thus, the administrations of district land grant institutions envision a more diverse mission in the future, but the mission has been slow to develop because the traditional farm constituent base opposes any deemphasis of production agriculture.

This political dilemma is creating some tension and frustration on land grant campuses. The engineering faculty at one district university, for example, felt constrained and frustrated in pursuing creative economic development ventures with corporate partners because the university budget and decisionmaking is "still hide-bound to production agriculture." Resources are being shifted to nonagricultural programs, but the shift is slow and deliberate.

Third, and related to the second, land grant institutions are seeking new arenas in which to concentrate excellence. Applied science is the theme of these new areas. The land grant system prides itself—rightfully so—on its ability to apply new frontiers of science to practical situations. That resident skill is being applied to such fields as biotechnology, material sciences, and computers to find commercially viable uses for technology. Many of these fields will have primary application beyond agriculture.

In many respects, the changes now sweeping land grant universities are historic. These institutions have been adjusting to a diminished role for agriculture for years. But it is only recently that many of these changes have been fully recognized, and the universities have forced themselves to formulate, communicate, and begin to implement their new mission, which will involve redirecting and deemphasizing agricultural programs while identifying and nurturing new fields of excellence. The process is well underway, but the results may continue to be slow in manifesting themselves.

Universities and alternative industries. The land grant institutions and other surveyed universities recognize the need to adapt to changes in traditional industries. While most of the universities are looking to advanced technology as a means of enhancing the performance of traditional industries, others are targeting entirely different industries for prospective growth.

Many of the new areas being targeted rely on pioneering research in a variety of fields. Examples include space sciences, biotechnology, and telecommunications. Establishing research excellence in new areas requires a long planning horizon. Uneven funding has made it difficult for the universities to attract high-quality faculty and establish high-quality programs in new areas. But there have been some successes.

Although much of the economy of New Mexico is based on natural resources, the University of New Mexico views itself as a high-technology center because of its proximity to government research laboratories. The university has expanded its engineering programs, especially those involving the transfer of technology from military research to commercial applications. This effort has formal roots in the New Mexico Technology Innovation Program started six years ago to facilitate technology transfer. Therefore, the university supports an ongoing broadbased effort to move the state economy in new directions.

The emergence of new industries and programs to support them appears to be more deliberate at the University of Colorado. But as in New Mexico, the proximity to military installations has influenced the direction of new programs. Space

sciences, telecommunications, and microelectronics are examples of new industries targeted to grow in importance while reliance on traditional industries fades. In the words of the university president, "Until recently, the state's economic growth was based heavily upon agriculture, mining, and petroleum industries. Those industries are now giving way to new technology industries, and the change in economic trends will require a major strategic investment in development if the state is going to be able to compete on a national and international basis."

Universities and international competitiveness. International competitiveness in agriculture, energy, and manufacturing weighs heavily in the formula for improved economic growth in the region. Universities clearly regard competitiveness as a principal factor molding their economic development initiatives. Little is being done by the universities, however, to develop specific strategies that might enhance the region's international competitiveness. Most of the universities have only just begun thinking about the response their curriculums will make to an increasingly competitive international market. Many of the universities cite foreign language programs and exchange programs, but few are directing significant resources toward improvement of the region's competitiveness in world markets.

Of the universities making some effort to address competitiveness, Colorado State University appears to have committed significant resources. It ranks fourth among U.S. universities in the dollar volume spent on international research.[6] And other universities are targeting industries that may hold some promise for international competition. For example, the University of Colorado has directed research in microelectronics to improve the competitiveness of the U.S. semiconductor industry. Research programs at the University of Oklahoma have focused on food processing, enhanced oil recovery, and chemical processes.

Oklahoma State University has one of the most visible international initiatives. Now in the planning phase, its Center for International Trade Development will coordinate, enlarge, and make accessible university resources to solve problems and identify opportunities arising from increasing international interdependence. The center will be linked to the university's already extensive communications facilities, and its programs will be developed and conducted by academic units with faculty associates.

Universities and rural economic development. The region's economic transition of the 1980s has had a pronounced effect on the rural areas of the district. It is not surprising, therefore, that many existing and planned economic development efforts at universities in the district have a marked rural emphasis. In some states, such as Wyoming, the very nature of the state economy dictates a rural emphasis. In other states with more urban centers, universities appear to have taken an approach to economic development that addresses both urban and rural problems. These universities consider themselves statewide resources, regardless of their particular location.

At some universities, multiple campuses allow urban and rural problems to be treated differently. Campuses in urban areas can tailor programs to meet the needs of the surrounding metropolitan area, while campuses in rural areas target rural problems. For example, the University of Missouri-Kansas City has begun developing an economic development strategy that will be of benefit to the Kansas City metropolitan area. Likewise, the University of Colorado's Denver campus is more urban-oriented than the main campus at

[6] "International research dollar volume" is a measure of the average annual dollar value of university grants and contracts for United States Agency for International Development programs. Source: *Research at Colorado State University, 1987,* editor Celia Walker, Colorado State University, Robinson Press, Inc., 1987.

Boulder. However, all of the major research universities, including those with a single campus, have taken an approach to economic development that reaches in principle to both urban and rural communities.

Although there is some degree of specialization in rural development at land grant institutions, all the single-campus universities either do not distinguish between urban and rural-oriented activities or take a statewide approach to their planning for economic development. Examples of programs aimed specifically at rural communities range from the broadbased agricultural extension services of the land grant institutions to small business assistance programs at other universities. Both the University of Oklahoma and the University of New Mexico, for example, include business assistance and infrastructure development as part of their overall economic development plans to help foster small business development in rural communities. At the University of New Mexico, a data network called Technet will be available to business firms in small communities throughout the state.

Future challenges for the region's universities

Our survey of district educational institutions underscores the conclusion that a major evaluation is being made to determine what universities can do to stimulate economic development. Discussions with university administrators revealed the vigor with which those evaluations are being undertaken. Some universities have a clear vision of the role they will play and how their role will evolve. And major new university initiatives keyed to economic development are beginning to emerge. For the most part, however, economic development is still the subject of analysis, planning, and policy debate. In most cases, implementation is still in the future.

Will the region's universities fully implement the economic development initiatives being discussed? Will these initiatives stimulate the region's economy? Two challenges will affect the outcome: university-state cooperation and university-university cooperation.

Cooperation between universities and their state governments appears to be the biggest challenge in implementing effective university economic development programs. Asked to rank the chief constraints they face in implementing their new initiatives, nearly all respondents listed inadequate state funding support as their main hurdle. University administrators expressed frustration at being unable to convince state leaders of the need for a stronger commitment to excellence at the universities. While acknowledging the budget pressures on their states, the administrators generally agreed that the states were not willing to make the sustained commitments to long-run investments in universities necessary for the planned economic development initiatives to succeed.

The challenge to improved university-state cooperation lies in overcoming problems with communication and commitment. The communication problem centers in different perspectives. Well aware of their economic problems, the states look to the universities for quick solutions to economic distress. The universities, with much longer planning horizons, look to state governments for sustained high levels of funding to produce results over many years. In fact, state funding of higher education in the region varies directly with economic conditions. This uneven funding commitment keeps the universities from fully implementing long-run investments in research.

Although states in the region may need to reevaluate their long-run commitment to university programs, the problem is finding the resources in already pressured state budgets to make additional investments in universities. Some empirical evidence suggests that if states raised taxes and then devoted the additional revenues to higher education, the resulting gains in economic activity

might more than offset the initially negative effects of the tax.[7]

If states make a greater financial commitment, it will be necessary for the universities to follow through with economic development initiatives. There is concern in some quarters that the universities might regard the current interest in economic development as only an opportunity to bolster their budgets. Cooperation between states and universities, therefore, is vital to successes in economic development.

States in the region must decide if they are willing to make the concerted effort needed to raise their universities to a higher echelon. Some university administrators admitted that unless such an effort was made, it would be increasingly difficult for their universities to take a meaningful part in technological advances. And with few large private universities in the region, states will have to turn to public universities for long-run economic development assistance.

States may be wary of long-run economic development projects, questioning whether the projects will produce results that are economically relevant. One way to offset that risk is to encourage projects in which private industry is a partner. Such partnership appears likely to yield practical results. Most of the universities appear eager to broaden their partnerships with the private sector.

Improved cooperation among universities also poses a challenge to successful economic development initiatives. Universities were asked about the extent of their cooperation with other universities. The results indicate that cooperation among most universities in the region is limited at best. Even universities in the same state have virtually no channels of cooperation. University administrators admitted that improved cooperation could limit duplication of effort and free resources for high-priority programs, but they also admitted that there are few mechanisms for developing cooperation.

A need for regional university excellence is beginning to be recognized by university administrators in the district. The opinion was often expressed that the nation's heartland, including the Tenth District, is behind other regions in university excellence. Many administrators further agreed that the region could close that gap significantly by pooling its university resources in some type of regional centers of excellence. But there is no active discussion of this idea. A helpful first step would appear to be more open cooperation among universities within each state.

Conclusions

Universities have been credited with stimulating local and state economies in many areas of the United States. How will universities help the region overcome the economic sluggishness brought on by recent problems in the agriculture and energy sectors? Interviews with administrators of large major public universities in the Tenth Federal Reserve District indicate that they are generally only in the first stages of formulating economic development agendas. However, their current activities provide a framework for understanding their prospective roles.

A more active posture toward economic development is clearly evident at all the major universities in the district. Recent economic problems have caused the universities to reevaluate their traditional roles and add new programs aimed

[7] For a discussion of taxation and expenditures for higher education, see L. Jay Helms, "The Effect of State and Local Taxes on Economic Growth: A Time Series-Cross Section Approach," *The Review of Economics and Statistics*, 67, November 1985, pp. 574-582. Helms concludes that higher state taxes retard economic growth when the revenue is used to fund transfer payments. But if the additional revenue is used to fund education or some other public service, such as health and public safety, the improved economic performance may outweigh the negative influence of the tax. For further information on this issue, see Stephen P. A. Brown, "New Directions for Economic Growth: Redesigning Fiscal Policies in Louisiana, New Mexico and Texas," *Economic Review*, Federal Reserve Bank of Dallas, July 1987, pp. 13-20.

at improving the economic outlook for their states. Many of the new initiatives are aimed at building links with private businesses and applying advanced technology to traditional industries. But the universities are just getting started. Much more time must pass before the effectiveness of these efforts can be evaluated. Meantime, it appears that more cooperation between state governments and universities and coordination of economic development efforts among universities could enhance the overall effectiveness of their strategies. In addition, the survey of university officials supports the claim that regional cooperation may lead to more successful economic development plans.