

Scoping Comment Document:

**Analyses of Economic Costs
of the
Proposed Rosemont Copper Project**

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For submittal to:

Coronado National Forest

Rosemont Copper Project EIS Project

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Overview

This Scoping Comment Document consists of the materials indexed on the following page. These materials have been prepared as formal Scoping Comments on the Proposed Rosemont Copper Project, specifically in response to the Rosemont Economic Impacts Study and the Tucson Forum sponsored and conducted by Rosemont.

A review of the Rosemont Economic Impact Study, the press articles that followed the release of the Rosemont study, and the widespread public relations campaign mounted by Rosemont and focused solely on the alleged economic benefits of the proposed mine, clearly warranted an informed response. Somewhat ironically, the study reporting on the Rosemont Economic Impacts, actually focused exclusively on the purported economic “benefits”, with virtually no mention of any “costs” or “adverse impacts” to either the public or private sector.

In light of this unbalanced story of the economic effects of the Rosemont proposal, the Mountain Empire Action Alliance, a Sonoita-based community organization dedicated to maintaining the quality of life and livelihoods in the greater Sonoita Basin, commissioned Dr. Thomas Power, Research Professor and Professor Emeritus, Department of Economics, University of Montana, to conduct an independent, objective study of the economic impacts of the proposed Rosemont Mine. Dr. Power was specifically asked to address the adverse economic impacts that the proposed Rosemont Mine would pose to our local businesses, regional economy, and quality of life.

Dr. Power is a nationally recognized expert on the economic impacts of industrial exploitation of natural resources on surrounding communities, and is the author of “LOST LANDSCAPES AND FAILED ECONOMIES: THE SEARCH FOR A VALUE OF PLACE.” In his book, Dr. Power makes a persuasive case that preservation of the natural landscape can be more valuable to the local community’s long-term economic development and health than the short-lived value of extracting and processing local natural resources. For almost 40 years, Dr. Power has been applying the analytical tools of Natural Resource Economics and Regional Economics to public policy issues, focusing on how extractive industries such as mining are intertwined with and adversely impacting environmental factors central to local economic vitality and well being. During his career, Dr. Power has assisted over 50 local and state governments, non-governmental organizations, and Tribal governments.

The scoping comments set forth herein were specifically prepared as scoping comments in order to assist the Coronado National Forest and their associated consultants in preparing a Draft Environmental Impact Statement that incorporated a full discussion of the economic and non-market costs and benefits of the proposed Rosemont Copper Project.

Index to Materials:

The following five scoping comment papers were prepared by Dr. Powers and are included in this document compilation:

- I. Thinking Analytically about the Local Economy and Local Economic Well Being: The Limits of the “Cattle, Cotton, and Copper” View of the Arizona Economy (pp. 1-12)**
- II. The Economic Context in Which to Evaluate the Proposed Rosemont Mine (pp. 13-36)**
- III. The Promises and Reality of Copper Mining (pp. 37-46)**
- IV. Rosemont Copper’s Projections of Economic Impacts (pp. 47-52)**
- V. Economic Values Put at Risk by the Proposed Rosemont Mine (pp. 53-61)**

The following scoping comment papers constitute appendices created as background material for Dr. Powers; this work was prepared by the Mountain Empire Action Alliance:

Appendix A: Public Land Investments

Appendix B: Greater Tucson Region – Study Area Data

Table B-1: Public Land Areas

Table B-2: Public Land Values

Appendix C-1: Summary of Likely Significant Adverse Impacts on Non-Market Values

Appendix C-2: Illustrative Examples of Non-Market Values

This submittal of scoping comments also includes a copy of the Powerpoint presentation given by Dr. Powers at a Tucson meeting of the Coronado National Forest - Rosemont Interdisciplinary Team, and Cooperating Agencies on June 30, 2010, and to members of the community at public meetings in Sonoita and Tucson on July 1, 2010.

The materials noted above are being submitted in the form of a CD containing PDF files of the printed materials, and a Powerpoint file containing the referenced presentation.

Analyzing the Local Economic Impacts of a Large Copper Mine: Including Both Benefits and Costs

I. Thinking Analytically about the Local Economy and Local Economic Well Being: The Limits of the “Cattle, Cotton, and Copper” View of the Arizona Economy

Introduction

Long before a minority of us ever take an economics class or read an economics text book, we all have been learning “economics” from our parents, grandparents, elementary school teachers, and neighbors. We are informally taught “tales of livelihoods” that explain to us how our families several generations back came to inhabit areas and made livings for themselves. This *popular or folk economics* tends to stick with us just as other cultural values and traditions do. It simply becomes part of the way we look at the world.

One almost universal element of that popular economics is what economists have labeled an *export base* view of the local economy. In Arizona it is encapsulated in the “cattle, cotton, and copper” explanation for how European-Americans came to inhabit Arizona and build a successful and thriving economy. This view is called an export base view because it focuses on the economic activities in which the local population specializes, producing more than it needs for its own consumption, and exports the surplus to the rest of the national or international economy. Those exports are seen as bringing money into the local economy from outside. That money then can circulate within the local economy putting people to work in locally-oriented economic activities and to import vital goods and services that could not easily or economically be produced locally. Unless the local residents want to live a self-sufficient non-monetary, subsistence way of life, those exports and the resulting income flows into the economy from outside sources are seen as necessary for a modern, vital economy. In that sense those export-oriented activities are the region’s *economic base*: the economic energy driving the local economy.

Most regions have an export-oriented story similar to Arizona’s “cattle, cotton, and copper” about the traditional economic activities that brought people to and held people in any given region: automobiles in Detroit, dairy farms in Wisconsin, corn in Iowa, wheat and cattle on the Great Plains, timber and hydroelectric power in the Pacific Northwest, coal in Appalachia, metal mining in the Rocky Mountains, etc.

No widely held popular understanding of this sort could have become established and persisted for so long unless it had an important element of truth to it. In the context of the European-American settlement of a continent depopulated of its indigenous population by disease and warfare, the export base view was largely accurate in depicting how settlers were able to move from subsistence homesteads on a wilderness frontier to a prosperous commercial economy. Whatever its historical accuracy, however, it is important to ask whether that original 19th and early 20th century economic insight is a sufficient guide for understanding a modern 21st century economy. We will assert below that the export base view of the local economy is now seriously incomplete and needs to be supplemented in several ways that allow us to accurately look at the *total* economy and all the sources of local economic well being when developing public economic policies.

Completing Our Analytical View of the Local Economy: The Total Economy

As we will develop in more detail below, there are three important other economic insights that have to be integrated with the export base view to complete our view of the local economy:

- i. The export base view focuses only on what creates a local demand for workers. In that sense it ignores the other half of the twin blades of the “economic scissors,” the important role of the local supply of labor in encouraging the expansion of local economic activity.
- ii. The export base view focuses only on commercial goods and services sold in markets in exchange for money. It ignores non-commercial, non-market sources of scarce and valuable goods and services that support and facilitate commercial activities and contribute to local economic well being
- iii. The export base view, as the name makes clear, focuses on exports as the sole determinant of local economic vitality. Its message is that “only exports matter.” We need to understand that locally-oriented economic activity is not a passive, unimportant or “secondary” aspect of the local economy. By capturing, holding, and re-circulating income that comes into the local economy, the web of locally-oriented economic activities create the “multiplier” impacts associated with exports and other income injected into the local economy.

i. Incorporating Labor Supply into Our View of the Local Economy

The export base view focuses on what the commercial forces are that draw workers and population to a particular area. What are the export-oriented activities the local area can support and thus create a local demand for workers? In a frontier economy these are likely to be land-based economic activities, hence “cattle, cotton, and copper.”

That narrative has a compelling historical ring to it. But most economic activities in the 21st century are not land-based. The total of all jobs in agriculture, mineral extraction, and forest products represents only about 3 percent of total jobs in the American economy in 2008.¹ Clearly we cannot explain the location of economic activity across the American landscape on the basis of this tiny part of the total economy. We have to be able to explain why non-land-based economic activity locates where it does.

Even if we stick with a focus on export-oriented economic activities as the engine driving a local economy, we are still left with the question of why a particular export-oriented firm chose to locate where it did. If we cannot explain that, we have not really explained what the economic forces are

¹ Agriculture, agricultural services, fishing, forestry, mining (including oil and gas), wood products, paper, and primary metals. U.S. Department of Commerce, BEA, REIS data base.
<http://www.bea.gov/regional/spi/default.cfm?selTable=SA25N&selSeries=NAICS>

supporting the local economy. For instance, much of light manufacturing (computer assembly, chip manufacturing, appliance manufacturing, etc.) as well as export-oriented services (publishers, information businesses, financial services, technical support, professional services, etc.) are relatively “foot-loose” in terms of where they locate. The fertility of the land, minerals in the ground, commercially valuable natural vegetation including livestock forage are unlikely to provide an explanation for why most of the firms found in the Tucson area chose to locate there. For that reason, the export base view of the economy provides only limited insight into the local sources of economic vitality.

Businesses locate in particular areas for a wide variety of reasons, but two considerations are almost always important: i. the availability of a sufficiently skilled workforce at an affordable cost, and ii. access to the markets for the firm’s products at an affordable cost. The geographic distribution of the population and people’s preferences for where they would like to live influence both of these. Businesses cannot afford to ignore either of these: markets and the cost of reaching them and adequate labor supply at a reasonable cost are central to any business.

The export base view of the world implicitly assumes that people do not care where they live. People are assumed to passively go to where the jobs are because they have no choice if they want to be employed and their families to prosper. But in the 21st century continental-wide American economy individuals and families do have a choice as to where they chose to live. They face a broad range of economic opportunities mixed with an equally broad range of regions and communities that have a broad range of attractive and unattractive characteristics that are unrelated to job availability and pay. Individuals and families can make tradeoffs and choices that mix labor market opportunities and pay with other local characteristics such as quality of schools, crime rates, levels of congestion, intensity of social conflict, pace of life, familiarity, cultural variety, recreation and cultural opportunities, etc.

Areas that have mixes of qualities that make it easy for those areas to attract and hold residents, will have a relatively large, diverse, and skilled workforce available at a somewhat lower price. Alternatively, such areas can get workers to move to the area without wages being bid up significantly. That makes such areas attractive to businesses. The fact that businesses are run by people who also have preferences about where they and their families live, only adds to the economic importance of a community’s attractive qualities. To the extent the dynamic between the attractiveness of a community to new residents and businesses has triggered ongoing economic development, local markets for goods and services will also be expanding, increasing the economic attractiveness of the area to firms.

In brief, labor supply and its cost and the location of population concentrations matter to businesses. Areas that attract high quality workers at a relatively low price will, in turn, be attractive to business firms. Ignoring labor supply and focusing only on labor demand, as the export base view does, is inappropriate economic analysis. As in most components of a market economy, both supply and demand matter.

It is important to keep in mind that conceptually, we do not have to choose between the export base view of the economy and the residential location choice view. These two views encompass between the two of them the two primary market forces of supply and demand. We should be careful to consider both. The relative importance of labor supply and labor demand can be expected to shift over time and vary across geographic areas. At any particular location at a given time, the relative importance of these two sets of forces is an empirical matter. Local economic development policy, however, may choose to focus strategically on some elements of one or both of these sets of economic forces.

ii. Looking at All Sources of Economic Value Including Non-Market Economic Values

The economic dynamic describe above has been called *amenity-supported local economic development*. This economic potential in some ways is the opposite of the economic force that the export base view of the economy emphasizes. Within the export base view, people move to where the jobs are. Within the amenity-supported economic development model, economic activity follows the residential preferences of the population. Economic activity shifts in this way because the existence of local amenities provides businesses with access to a lower cost skilled labor force and to markets for their goods and services. In essence, because workers and families value local amenities, they are willing to sacrifice a certain amount of income to gain access to those site-specific qualities. They accept lower wages than they could earn in less attractive locations as an effective “price of admission” to what potential residents judge to be a more valuable set of local qualities. The *total real income* being received by residents comes in two parts: The value of the conventional paycheck and the value of the site specific amenities to which living in that location provides access. The value of those local amenities provides residents with a “second paycheck.”²

This is not a new way of looking at the local economy.. Since the mid-1950s economists have emphasized the importance of residential location decisions as a powerful economic force. They focused on the role of local environmental “amenities” such as climate and natural landscapes in the settlement of the desert Southwest (including Arizona, New Mexico, and Southern California), Florida, and the Pacific Northwest.³ Tiebout underlined the fact that people “shop around” for the social amenities produced by different levels of local government taxation and different public spending patterns such as

²Ed Whitelaw at the University of Oregon and with ECONorthwest coined that phrase. Local economies can be a bit more complicated than this. As the local economy expands, limited supplies of land for commercial and residential development can lead to land values rising and both the cost of living and the cost of doing business rising. This can ultimately work to stabilize community size limiting that location to those for whom it is the most productive site for a business and to those residents who most highly value the qualities of that location. The higher cost of living will reduce the purchasing power of local wages and residents will pay an effective access fee in the form of lower real (cost of living adjusted) wages. To the extent that the available land base is not a serious constrain on ongoing development, the effective price residents pay to gain access to the qualities associated with that location are likely to be reflected in the lower pay they accept compared to what they could earn in less attractive locations.

³ Ullman, Edward, 1954, “Amenities As a Factor in Regional Growth, *Geographic Review*, 44(1):119-132.

on schools, parks, and roads.⁴ Borts and Stein argued that in a mobile, open economy, it would be an area's ability to attract and hold a labor force without bidding up labor costs that would determine the geographic distribution of economic activity.⁵

These economic forces tied to local amenities have transformed many parts of the nation's economic geography help to explain the above average economic performance of the Mountain West, including Arizona, as well as in the Southeast and the Pacific Northwest over the last two decades before the Great Recession struck.⁶ Ten years ago the Economic Research Service of the U.S. Department of Agriculture published a special edition of *Rural Development Perspectives* on the rapid growth in population in the rural counties of the Mountain West. That growth attracted attention of analysts because it could not be explained by the Mountain West's traditional land-based activities of farming, ranching, forest products, and mineral extraction, all of which were in relative or absolute decline. These USDA studies were focused on the non-metropolitan West, where one would expect these traditional land-based economic activities would dominate. The titles of the studies indicated the common theme: "Amenities Increasingly Draw People to the Rural West," "Quality of Life, Nontraditional Income and Economic Growth: New Development Opportunities for the Rural West," "Wildlife Conservation and Economic Development in the West," and "Jobs Follow People in the Rocky Mountain West."⁷

This half-century of economic research simply underlines the important role that non-commercial, non-market goods and services can play both in contributing to the economic well-being of individuals and households as well as the economic vitality of communities. Some of these non-market economic value are human created, others are gifts of nature, flowing as they do from well functioning natural systems. All of them are often encompassed in the larger concept of "quality of life" or "local amenities."

The social environment is the source of some of the most important of these non-market economic values including among other things:

- A legal system and the rule of law the establishes the context for productive private economic activity,
- education from preschool through graduate school,
- public transportation networks including our road and highway systems,
- waste treatment including air and water quality protection,
- public health and safety protection,
- providing security from crime against persons and property,
- land use regulation to protect neighborhood liveability and reduce congestion,

⁴ Tiebout, Charles, 1956, "A Pure Theory of Local Expenditures, *Journal of Political Economy*, 64(2):160-164.

⁵ Borts, G.H., and J.L. Stein, 1964, *Economic Growth in a Free Market*, New York: Columbia University Press

⁶ Thomas M. Power and Richard Barrett, *Post Cowboy Economics: Pay and Prosperity in the New American West*, Island Press, Spring 2000; Power, Thomas M., 1995, editor, "Economic Well-Being and Environmental Protection in the Pacific Northwest: A Consensus Report by Pacific Northwest Economists", Department of Economics, University of Montana, Missoula, MT, December.

⁷ See the special issue of *Rural Development Perspectives* on the rural West, 14(2), August 1999, USDA, Economic Research Service.

- provide parks, open space, and public outdoor recreation opportunities,
- protect wildlife and wildlife habitat,
- protect watersheds and water supplies,
- provide a safety net for families in crisis.

Most citizens recognize that all of these are valuable to them and their families, enhancing their personal well being, as well as valuable to the overall economy, boosting its productivity and vitality.

But non-market goods and services do not just flow from government units and non-profit organizations, they also flow from the natural environment and, because of the role of governments and non-profit organizations in protecting the natural environment, there is some overlap in the listing of those valuable, non-market but economic, goods and services. These non-market economic values flowing from natural systems and landscapes have come to be called environmental or ecosystem services. They are the basis for much of the concern about the impact the proposed Rosemont Mine will have on the natural landscape. The better known of those environmental services at risk include:

- natural landscapes accessible for dispersed outdoor recreation,
- scenic beauty,
- wildlife, hunting, and fishing,
- clean water and air,
- climate stabilization,
- storing and stabilizing water flows,
- cultural and spiritual support,
- complex biological and chemical process that support the web of life on which we rely.

Again, most people would agree that all of these contribute relatively directly to their well being and to the attractiveness of their communities as places to live, work, and do business. Although these goods and services flowing from natural systems are often described in terms of their contribution to the “quality of life,” that does not make them “non-economic.” As the discussion above documented, local “quality of life” matters to people, the pursuit of it changes the location of economic activity, and protecting or enhancing local quality of life is often a central focus of local economic development strategies. The goods and services flowing from natural systems contribute directly to human well being and become scarcer as natural systems and landscapes are degraded. For that reason, even though they are not provided by commercial businesses or directly traded in commercial markets, they have an important economic aspect to them.

Because the pursuit of some of these non-market economic values involves market economic behavior, we can obtain evidence of their value in dollar terms from that behavior. Consider the following:

- Residential property of similar age and quality varies in market value depending, among other things, on neighborhood crime rates, air pollution concentration, presence of toxic or industrial

facilities, traffic congestion, air traffic and other sources of noise, quality of schools, presence of safe parklands. Statistical analysis called **Hedonic Analysis** can tease out the price people are willing to pay to avoid each of these negative characteristics and each of the positive characteristics. The values, not surprisingly, can run into the tens of thousands of dollars.

- People spend considerable time and money traveling to enjoy relatively attractive and unique natural areas for recreation purposes. Visitation rates tend to fall off with the time and travel costs associated with reaching such natural areas from any given residential location. Those travel costs can be analyzed to determine the equivalent of the demand curve for those natural areas expressed directly in money terms. That is the logic of the **Travel Cost** method.
- Potential in-migrants to particular areas as well as potential out-migrants from other areas weigh both the money income they can earn in different locations, the cost of the move, the cost of living (including housing) at alternative locations, and the attractive “pull” factors associated with a new location and the unattractive “push” factors associated with their current residential location. Analysis of in- and out-migration and the market payoff of a move as well as the non-market characteristics of different locations can provide evidence of the dollar value people place on different site-specific non-market amenities. This is the basis for estimating **Compensating Differentials** to evaluate site specific amenities.

Of course, all non-market values are not tied to market behavior. Some, for instance preserving unique landscapes such as the Grand Canyon or endangered species of animals and plants, may not be tied to personal use at all. Such non-use or intrinsic values obviously cannot be expressed in dollar terms by studying use patterns. Only careful survey work can elicit expressions of these values in dollar terms. That is the objective of the **Contingent Valuation** methods. For some environmental services, where the link to things of personal concern is not understood or too complex or abstract for people to evaluate in terms of tradeoffs with market-related goods and services, even careful interviewing citizen may not allow expression of those non-market economic values in dollar terms.⁸

Over the last several decades economists have carried out hundreds of economic valuations of various non-market goods and services. On major focus has been on outdoor recreation, especially on federal lands. A recent summary of the results of those studies was published by the U.S. Forest Service. The following table is taken from the compilation of results. These results are presented for illustrative purposes, to simply indicate that the non-market values we are talking about can be substantial.

⁸ For a more detailed discussion of the methods available for economic nonmarket valuation see Chapter 4 “methods of Nonmarket Valuation” in the National Research Council’s **Valuing Ecosystem Services: Toward Better Environmental Decision-Making**, Committee on Assessing and Valuing the Services of Aquatic and Related Terrestrial Ecosystems, National Research Council of the National Academies, National Academies Press, Washington, D.C. 2004. <http://books.nap.edu/catalog/11139.html>

Average Economic Value Per Person Per Day--Consumer Surplus Recreation Benefits Studies, 1967-2003					
Type of Outdoor Recreation Activity	Number of Studies	Number of Estimates	Average Value (2004 \$s)	Range of Estimates	
				(2004 \$s)	(2004 \$s)
Backpacking	1	6	\$52.10	\$26.82	\$80.34
Birdwatching	4	8	\$29.60	\$5.80	\$78.46
Camping	29	48	\$37.19	\$2.03	\$224.53
Fishing	129	177	\$47.16	\$2.08	\$556.82
Floatboating/Rafting/Canoeing	20	81	\$100.91	\$2.70	\$394.82
General Recreation	15	39	\$35.10	\$1.42	\$257.51
Hiking	21	68	\$30.84	\$0.40	\$262.04
Horseback Rding	1	1	\$18.12	\$18.12	\$18.12
Hunting	192	277	\$46.92	\$2.60	\$250.90
Mountain Biking	7	32	\$73.78	\$20.86	\$295.69
Off-Road Vehicle Driving	4	10	\$22.92	\$5.24	\$40.86
Picnicking	8	13	\$41.46	\$8.94	\$142.74
Pleasure Driving	4	11	\$59.23	\$3.02	\$167.74
Rock Climbing	4	27	\$56.26	\$26.62	\$135.82
Sightseeing	15	28	\$36.84	\$0.65	\$209.77
Swimming	11	26	\$42.68	\$2.20	\$134.34
Wildlife Viewing	69	240	\$42.36	\$2.40	\$347.88
Other Recreation	15	16	\$48.70	\$5.71	\$206.82

Source: "Updated Outdoor Recreation Use Values on National Forests and Other Public Lands," John Loomis, Table 1 U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, PNW-GTR-658, 2005.

It should be emphasized that although it is often convenient to quantify non-market economic values in dollar terms that is not the only way that all benefits and all costs can be accounted for before making a public resource decision. Putting dollar values on non-market goods and services is convenient because then those non-market values can be directly compared to the market value, for instance, associated with the production of copper. Such quantification, however, can be costly in terms of both time and money since it often requires very site specific survey information. In addition, although most people recognize environmental damage as a real cost that decreases well being and may negatively impact local economic vitality, many of those same people find expressing that environmental damage in dollar terms at best unconvincing and confusing and at worst inappropriate or ethically wrong.

A thorough analysis of all benefits and all costs, that is, a review of the total economic impact or the net economic impact, can be carried out without putting all the values at issue in dollar terms. Environmental risks of significant economic concern can be evaluated in physical terms that quantify the degree of damage, the geographic extent of the damage, and the level of public concern about that damage.

iii. Capturing, Holding, and Circulating Income in the Local Economy

We return to a discussion of how the modeling of the local economic impacts has to move beyond an “only exports matter” point of view. Most economic impact modeling, including that done on the Rosemont Mine, implicitly takes that point of view, effectively dismissing the bulk of local economic activity as “secondary” or “passive.” This is an important error. Elsewhere in this report we discuss in some detail the failure of a conventional export base modeling approach to explain the actual economic vitality of the Greater Tucson area. Here we focus on the important economic role of locally-oriented economic activity in boosting the local economy.

Exports by themselves do not create a local economy. On the North Slope of Alaska billions of dollars worth of oil have been produced but there is almost no “local economy” on the North Slope. That value of that oil and the wages earned producing it all flow to other areas a great distance from the North Slope where people actually live and where there is the commercial infrastructure in which that income can be spent. This is an extreme example, but the mining, timber, cattle, and farm towns that grew up around a primary export often had similar limiting characteristics: the income generated by the exports primarily went to fund imports. That is, the income from the exports almost immediately “leaked out” of the region. That is why many of these towns became the equivalent of ghost towns as demand for the exports declined or technological change reduce the size of the workforce needed to produce the exports. Empirical economic analysis of the impact of natural resource activities in rural areas confirms that the multiplier impacts associated with natural resource extraction activities in contemporary rural areas can also be nearly zero.⁹

The actual size of the impact of an export activity on the local economy is determined by the interaction of two sets of local economic characteristics: The size of the flow of income into the local economy from the outside and the web of local economic interconnections among residents that captures and circulates that income among businesses and households. The “multiplier” impacts associated with export income is determined by that ability to capture and circulate income locally. It is the local web of specialized and interdependent businesses and households that actually make up the local economy. Without those locally-oriented businesses there can be enormous export flows but only a primitive local economy.

Both export-oriented and locally-oriented businesses contribute to the vitality of the local economy. It can be a serious economic error to ignore either of these two sides of the local economy.

⁹ “A Test of the Economic Base Hypothesis in the Small Forest Communities of Southeast Alaska,” Guy C. Robertson, U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station, General Technical Report, PNW-GTR-592, December 2003.
http://www.fs.fed.us/pnw/pubs/pnw_gtr592.pdf

An Overview of All of the Economic Aspects of a Mineral Development

The following flow chart outlines the full set of economic consequences that would be required for a complete evaluation of the economic impacts of the proposed Rosemont Mine. This outline follows the discussion above which distinguishing two quite different but related types of economic consequences: impacts directly on the well being of residents by changing the mix of valuable goods and services to which they have access and impacts on the vitality of the regional economy in which residents, local businesses, and the proposed Rosemont Mine are enmeshed. “Economic impact analysis” usually refers the impact on the vitality of the local economy using various economic metrics such as employment, earnings, output, expenditures, etc. Analysis of changes in economic values, the focus of conventional benefit-cost analysis, does not focus so much on local economic transactions as on the change in the mix of valuable goods and services to which people have access as a result of some change in public policy or some private action. The third “economic consequence” emphasized in the outline is the distribution of benefits and costs among those who shoulder the costs and receive the benefits. Here the focus is on the perceived equity of the distribution of benefits and costs. In contemporary terms, this is partially a review of the “environmental justice” aspects of the public decision or private action.

The figure below uses the conceptual framework developed above to categorize *some* of the economic consequences that might be associated with the development of the Rosemont Mine. It provides a road map through what is a relatively complex set of diverse benefits and costs. Note that there are two dimensions to this outline of the potential impacts of the mining project. One focuses on including all of the direct, external, and intrinsic consequences, whether market or non-market in character. That is the horizontal dimension in the following figure. The other seeks to take account of the full range of economic consequences that people worry about. That is the vertical dimension in the figure. The essential point is that, if one wants to characterize fully the economic consequences of a large project such as the Rosemont Mine, one must examine all the issues and concerns outline in the figure.¹⁰

The outline of economic consequences contained in this figure is likely to intimidate anyone seeking to evaluate a project like the Rosemont Mine. It may appear to bury the analyst in a complex formal analysis that would paralyze and demand far more resources for the project evaluation than the budget allows. That, of course, is not the intent. The figure outlines the types of questions that need to be asked and answered, at least informally, about any project. The initial focus should be to determine what the significant changes associated with the project are likely to be. Complete economic analysis does not demand any particular level of empirical analysis or quantification; it only seeks to systematically reveal the tradeoffs that decision makers necessarily confront so that decisions can be more fully informed. In some ways the figure simply provides a check list to reduce the likelihood that some important economic consideration is not overlooked.

¹⁰ As is true of any schematic outline, the following figure both simplifies some relationships and is incomplete. There is only one brief mention of the impacts of subsidies, for instance. As to simplification, note, for instance, that amenities are treated as “non-market” goods and services. But it is access to social and natural amenities that real estate agents regularly buy and sell. There is a market-value aspect to amenities that is not explicitly stated in the figure.

At a minimum, this requires that the flow of goods and services from both the existing natural systems and related human activities that are now supported by those natural systems be compared with the flow of goods and services that would result if the proposed mining project were to proceed. The point is to have a side-by-side comparison of all of the significant changes, both positive and negative, associated with the proposed mine as well as those associated with “doing nothing.”

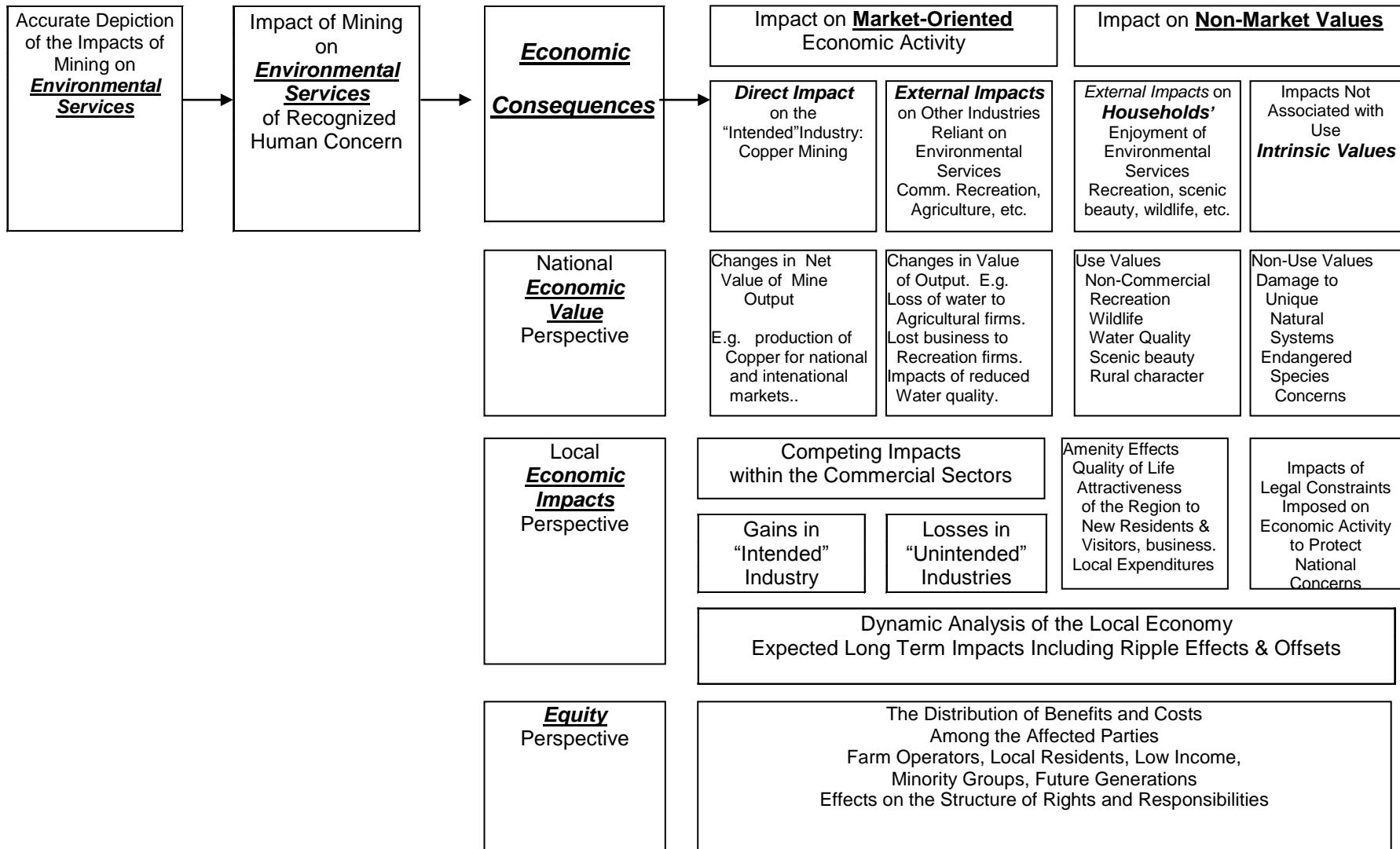
At its most informal level, all that is required for this type of tradeoff analysis is a listing of the significant changes expected from the project, no matter what type of value they might impact: environmental, narrowly economic, recreational, cultural, equity, etc. If people are likely to be concerned about the size and/or type of a change, it should be included in the analysis.

Conclusion

Narrowly defined “economic impact analysis” is often offered up as “economic analysis” by the private advocates of particular development projects that require the use of public resources. Such economic impact analysis assures that only positive impacts are reported because external costs are assumed away in the design of the analysis. That type of incomplete economic analysis is clearly not reliable. Economic impact analysis also tends to present an export base view of the economy, reinforcing a rear-view mirror “cattle, cotton, and copper” way of thinking about the Tucson and Arizona economies that was outdated a half-century ago.

Reliable economic analysis and rational decision-making requires that *all* costs and benefits be taken into account and put in the context of the actual 21st century economy that Tucson has before a public policy decision is made about the private use of important and valuable public resources.

Analysis of the Economic Consequences of a Mining Project



II. The Economic Context in Which to Evaluate the Proposed Rosemont Mine

1. Maintaining Local Economic Vitality: Taking a Longer-Run View of the Greater Tucson Area

The national Great Recession and the bursting of the real estate bubble that had been over-stimulating the economies of the fastest growing parts of the Mountain West have reminded us that local and regional economies are vulnerable to periodic fluctuations that disrupt businesses, households, and governments. Living in the West, we also know that some areas and towns can enter long-run decline, generating “ghost towns” or persistent poverty in the process. Being painfully reminded of that economic vulnerability can energize thoughtful review of public policy that leads to ongoing improvements in our economy and public policy. Alternatively it can lead to fear and short-sighted quick fixes that can cause damage to the long-run economic vitality of our communities. We need to put the current Great Recession in perspective as a familiar (if unusually severe) periodic national economic fluctuation that has to be distinguished from long-run economic trends.

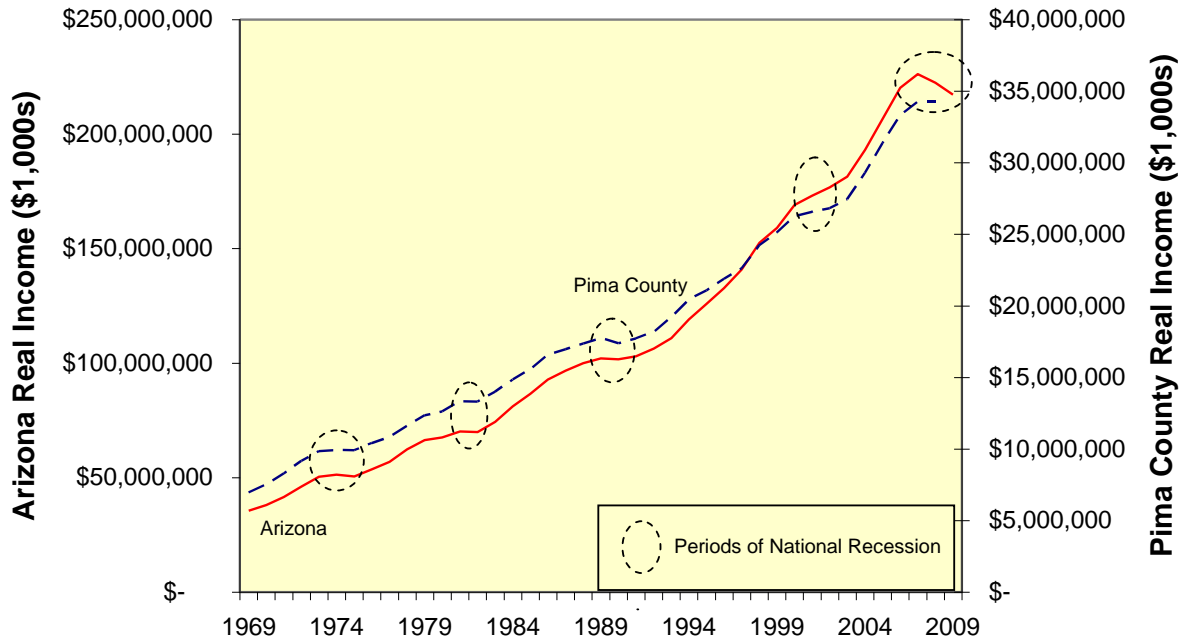
The chart below shows how real, i.e. inflation removed, personal income earned by all Arizona and Pima County residents has changed over the last forty years. The five national recessions that took place during the time period are also marked on the chart.¹¹

Note that the recessions had only modest impacts on the overall expansion of the economy in Arizona and Pima County. There were slight dips away from the growth path that lasted a year or two and then the economy returned to its longer term growth trend line. During the 2001 recession, the Arizona and Pima County economies simply slowed down. There was not an actual contraction. This is not to say that the individuals and families that lost jobs and businesses that saw sales evaporate were not disrupted and hurt by these national economic downturns. Also note that the current recession has come to be labeled the Great Recession for good reason. The down turn in Arizona has been much deeper than the recessions of the previous forty years. Finally, note the steep rate of growth in real income just before the beginning of the current recession. Clearly part of that expansion was tied to speculative construction activity that is an important part of the current “correction,” otherwise known as a recession.

If the ellipses showing the recessions were not drawn on this chart, however, most people looking at it would be impressed by the ongoing expansion from 1969 to 2007 in aggregate real income that residents enjoyed. The economy was clearly on a relatively smooth expansion path. While it is always possible that the current recession will continue longer than most recessions, possibly even “double dip,” as the national economy did during the 1980-1982 recessions, almost all economists expect the economy to recover and return to a growth path as it has repeatedly done over the last 40 years.

¹¹ U.S. Department of Commerce, Bureau of Economic Affairs, Regional Economic Information System. Total personal income deflated by the Consumer Price Index.

Arizona and Pima County (Tucson) Total Real Personal Income



Focusing on the current recession does not provide us with much of an understanding of the underlying forces that have generated the long-run trend of substantial economic vitality that has transformed the Greater Tucson and Arizona economies. It is those longer term trends that this section of the report will seek to explain.

2. Tucson's Competitive Position in Arizona and the United States

Residents and businesses of the Greater Tucson area, like the residents of almost any region, are concerned about maintaining a vital regional economy that can continue to supply jobs and incomes to residents and allow them to continue to improve their lives and those of their families. A stagnant or declining economy that cannot provide employment opportunities at income levels that allow residents to fully participate in the social life of their community is unlikely to be acceptable to most.

The concern that communities maintain a good level of economic vitality does not mean an uncritical advocacy for any and all economic growth. Pure quantitative growth could lead to ever larger numbers of residents earning very low wages. It could lead to congestion, pollution, ravaged natural landscapes, the loss of open space, and public and private squalor. That is why qualitative words like "vitality" have been used. Residents want more from their community and economy than just more people living in a particular location or just more income at whatever cost the production of that income might impose. Economic activity imposes costs in the process of generating benefits. The function of good public economic policy is to try to control the public costs while not choking off the private and public benefits. Of course, if the total costs associated with an activity or policy overwhelm the benefits, that activity or policy does not have an economic rationale and should not proceed.

The 2006 *Tucson Economic Blueprint*¹² produced for Tucson Regional Economic Opportunities (TREO) made this distinction between pure growth and focused economic development in the following way:

¹² Strategic Analysis Report, December 27, 2006, by the KMK Consulting. Page 2.

For more than a generation, many economic development organizations have largely operated on autopilot, relentlessly pursuing the goal of growing and adding more jobs — whenever, wherever, whatever. In many cases, the unemployment rate was not a worry if some parts of the region were booming (leading to high housing prices and transportation congestion). It was of no concern if the companies receiving incentives provided low-paying, poor-quality jobs and were likely to leave for even greener pastures in a decade. The goal was simple: the more jobs, the better. But in many regions, an approach focused almost exclusively on getting more jobs did little to help residents earn higher incomes and enjoy a better quality of life.

This Tucson **Blueprint** was prepared by the business consulting firm KMK Consulting in partnership with the global accounting and business advising firm KPMG and Moody's investment advising firm. The **Blueprint** focused on public and private policies that could guide the Greater Tucson economy on a path of continued economic vitality that would protect and enhance quality of life while improving the prosperity of all residents. To do that it analyzed the strengths, weaknesses, opportunities, and threats facing the Tucson economy. The "highest ranking...economic development strengths" it listed were:¹³

1. The University of Arizona.
2. Pima Community College.
3. Tucson's proximity to Mexico.
4. Cultural diversity in the region.
5. Tucson region's current image as a place for leisure, recreation, and entertainment.
6. Military bases in the region.
7. Recreational and entertainment resources within the region.
8. Tucson region's current image as a place to live.
9. Executive housing.
10. Art and cultural venues in the region.
11. Tucson's proximity to Phoenix.

Note that most of these "economic development strengths" of the Tucson area are tied to public institutions, the quality of the cultural, social, and natural environments, and geographic location. Only the military bases and executive housing are narrowly economic in character.

Although some people in Tucson concerned with Tucson's ongoing economic development see Tucson primarily competing with Phoenix for new business activity and residents, the **Blueprint** lists Tucson's proximity to Phoenix as an **advantage**, not a liability. A recent report by the Sonoran Institute focused on exactly that issue. The title of the report indicated the context in which its authors thought the Greater Tucson economy could be most productively analyzed: **Tucson's New Prosperity: Capitalizing on the Sun Corridor.**¹⁴ The "Sun Corridor" is a name that has come to be applied to the increasingly urban and metropolitan area stretching from northwest of Prescott to Nogales and Sierra Vista south of Tucson on the Mexican border. The Morrison Institute for Public Policy at Arizona State University used that term in its 2008 Study **Megapolitan: Arizona's Sun Corridor.**¹⁵ This is an economically interconnected extended urban economic area similar to the urban belts found in Southern California or the Northeast of the United States.

¹³ Page. 29.

¹⁴ Dan Hunting, Joseph Kalt, and Luther Propst, May 2010.

¹⁵ Grady Gammage, Jr. et al. May 2008.

Thought of as a single “megapolitan” area, the Sun Corridor would be the 12th largest economic region in the United States, while Phoenix by itself would rank 16th and Tucson 68th.¹⁶ This large population, work force, and concentration of economic activity represents an attractive market for goods produced, a large and diverse labor pool to be tapped, and an aggregation of income and wealth attractive to new and existing businesses.

Tucson, as an important part of that larger economy, can enjoy the benefits of that connection in terms of access to markets, specialized supplies, technical expertise, public and private infrastructure, etc. But Tucson does not have to imitate Phoenix (or Denver or Salt Lake City, for that matter) as it seeks to protect and enhance its own economic vitality. Instead, as the *Blueprint* also made clear, Tucson should play to its strengths to enhance its advantages as a place to live, work, and do business. As the Sonoran Institute’s Tucson study put it in a section entitled “Play to Our Competitive Advantages”¹⁷

In a competitive world, where virtually every nation, province, state, county and city is out trolling for the best employers, the smartest people, and the most capable managers and workers, Tucson and Pima County need to follow the first rule of the management gurus: *Do what you are good at*. This means protect and enhance the assets that make Tucson what it is.

The greatest competitive advantage that Tucson has over metropolitan Phoenix is its spectacular natural setting with abundant opportunities for outdoor recreation. The extremely large size of the Valley of the Sun [Greater Phoenix area] makes accessing trails for hiking and mountain biking difficult for many in Maricopa County, but these amenities are much closer at hand in Tucson. The natural beauty and environment of Tucson are already in place and remarkably intact. Nature’s bequest of mountains and the desert has been augmented by land use protections that make access easy and affordable. Pima County’s strategy of acquisition with access is in place and successful. In short, the big picture is a good one.

This version of one of Tucson’s main economic development strengths echoes three of the *Blueprint’s* eleven strengths, those dealing with livability, scenic beauty, and outdoor recreation. As the Sonoran Institute Tucson concluded:¹⁸

There is little advantage to replicating an urban form that has been executed on a much larger scale a hundred miles to the north [Phoenix]. Instead, development plans need to capitalize on metropolitan Tucson’s strongest asset in relation to Phoenix: the incredible natural amenities of southern Arizona coupled with a lifestyle centered on enjoying that environment. Under this model, the old tension of economic development versus smart growth and the environment disappears. With the environment as Tucson’s prime competitive advantage in the Sun Corridor, it becomes clear that conservation and smart growth policies will spur economic development, not impede it.

These conclusions about quality of life, natural landscape setting, and recreation opportunities being a major economic strength of the Greater Tucson area are also reflected in the “best cities” ratings that various organizations periodically publish.

¹⁶ *Tucson’s New Prosperity*, op. cit. p. 7.

¹⁷ *Ibid.* p. 17

¹⁸ *Ibid.* p. 6.

Some specialized consulting firms have taken to ranking cities for specialized purposes. For instance Next Generation Consulting ranked “Next Cities” in terms of how competitive the cities are in attracting skilled young professionals. In 2009, Tucson was ranked No. 16 among the cities with populations over one million. The ratings were base on the diversity of employment opportunities, the quality of the educational opportunities, the health of the population, the cost of living, livability, social and cultural diversity, and leisure time opportunities. Phoenix did not make the list.

AARP also ranks cities on the basis of quality of life and low stress of living for people aged 50 years and older. They used 20 different quality of life metrics including congestion, crime, presence of universities, the health and fitness of the population, park acreage, outdoor amenities, hiking and biking trails, number of farmers markets, commuting time, cost of living, household income, unemployment rate, and quality of climate. In 2009 and 2010 Tucson was rated number one on their list.¹⁹

More conventional ratings based on more narrow “business climate” metrics such as the various costs of doing business in a particular location (taxes, labor costs, quality of services and infrastructure) also tend to confirm the strengths of the Greater Tucson area as a place to start or operate a business. For instance, Forbes magazine regularly rates the nation’s 200 largest cities to determine the “Best Places for Business and Careers.” Before the real estate meltdown and the Great Recession, Forbes rated Tucson close to the top ten percent of those large cities. As the economy deteriorated, especially in areas where the real estate bubble was perceived to be especially over-inflated, Tucson’s ratings deteriorated. See the table below.

Forbes Magazine’s 200 Best Places for Business and Careers

Year	Tucson’s Ranking
2005	22
2006	49
2007	85
2008	131

Source: http://www.forbes.com/2010/04/13/best-places-for-business-beltway-business-places-10_lander.html

Inc. Magazine has carried out similar ratings of the Best Cities for Doing Business. It does the comparison across all approximately 400 metropolitan areas in the United States as well as within various size-classes of cities. Tucson, along with about 100 other cities, is in the mid-sized city category. In the earlier part of this decade, the Inc. Magazine ratings of Tucson, like those of Forbes, had Tucson in the top 10 percent. Tucson retained a high rating until the recession hit at which time it fell to the middle of the pack for the mid-sized cities. It retained its position, however, within the top 15 percent of all 400 metropolitan cities. See the table below.

¹⁹ http://www.aarp.org/about-aarp/press-center/info-07-2009/best_places_to_live.html

Inc. Magazine's "Best Cities for Doing Business"

Year	Rank: 100 Mid-Sized Cities	Rank: All 400 Metro Cities
2004	8	60
2005	25	60
2006	13	52
2007	12	52
2008	46	NA

Source: <http://www.inc.com/bestcities/index.html>

Going into the Great Recession, Tucson's economy was perceived by outside observers as a vital and attractive place to engage in business. As the region and the nation recover from the recession, one can expect the Tucson area to return to the vitality it has demonstrated over the last several decades.

3. The Impact of the Recession and the Beginning of Recovery in Tucson

Although we want to focus on long-term trends in the Greater Tucson economy and the forces driving them, when discussing "the economy" in 2010 it is difficult to ignore the Great Recession we are suffering through. For that reason we briefly discuss Tucson's experience thus far in the recession and recovery, putting that experience in a national context.

Tucson, of course, like most of the Mountain West and the nation is still burdened by the impact of the Great Recession and, again, like the nation and region, Tucson is only slowly recovering. It is important not to primarily blame flaws in the local economy for the economic downturn that the Tucson area has been suffering through. Tucson is unavoidably linked to the national and international economy. The Tucson economy's export or "traded" sectors are the conduit through which both economic growth and economic recession are imported into the local economy. Tucson did not **cause** the national recession and Tucson's recovery is likely to be closely tied to the recovery of the national economy.

The University of Arizona's Economic and Business Research Center declared in its March 1, 2010, issue of **Arizona's Economy** that "Recent data show that the recession in Arizona came to an end as 2010 began. Employment is no longer falling, retail sales are increasing, personal income has stabilized, and housing markets are in the early stages of recovery." The recovery, if it is underway, however, is quite weak and many economists are worried about its vigor and continuity.

In terms of job loss, between the pre-recession peak in 2007 and March 2010, Tucson lost 7.3 percent of its jobs. This was a somewhat worse performance than the nation as a whole that lost 6.1 percent of its jobs. But Tucson was largely following the national economic downturn. However, in the pre-recession expansion between 2002 and 2007, employment in Tucson expanded by almost 24 percent while in the nation employment expanded by only 5.6 percent. Thus Tucson, despite the job losses during the recession, on net, has seen substantial job growth. Nationwide, however, the recession has actually wiped out *all* of the job growth between 2002 and 2007.²⁰

²⁰ This information and that contained in this and the next paragraph come from "Tracking Economic Recession and Recovery in the Intermountain West's Metropolitan Areas, Mark Muro and Jonathan Rothwell and K. Fikri, **Mountain**

Tucson’s unemployment rate did not rise as much as the national rate did during the recession. Tucson’s unemployment rate rose 5.1 percentage points while across the nation the unemployment rate rose 5.8 percentage points. In March of 2010 the unemployment rate in Tucson was 8.5 percent, well below the national rate of 10.2 percent. Tucson was in the lowest half of the 100 largest metropolitan areas in the U.S. in terms of its unemployment rate.

In the last quarter of 2009 and first quarter of 2010 there were signs that the Tucson area economy was recovering. Over the last two quarters, production in the Tucson area rose almost 3 percent bringing total production to within one percent of its earlier peak. This, however, as the employment figures discussed above indicate, has been a jobless recovery thus far. This is about the same rate of recovery found in the Mountain West as a whole but somewhat slower than the nation. It placed Tucson right in the middle of the 100 largest metro areas of the nation in terms of recovery.

The housing collapse was centered in the Mountain West with Provo, UT, Boise, ID, and Las Vegas, NV, joining Phoenix in the top ten metro areas in terms of housing price declines among the largest 100 metro areas in the nation. Tucson’s 30 percent decline in housing prices placed it within the highest 20 percent of the 100 largest metro areas in terms of housing price collapse. Just as the housing boom and housing price bubble contributed to Tucson’s economic expansion through 2008, this housing price collapse is depressing construction activity and retarding recovery.

The table below summarizes these statistics on how Tucson has been recovering from the Great Recession.

The Great Recession and the Tucson Metropolitan Area Economy					
Economic Measure	Tucson	U.S.	Tucson Rank 100 Largest US Metro Areas	Pre-Recession Growth 2002-2007	
				Tucson	U.S.
Employment					
Change in Employment: Pre-Recession Peak to March 2010	-7.3%	-6.1%	58th	23.8%	5.6%
Unemployment					
% Point Increase in Unemployment Rate: Peak to March 2010	5.1%	5.8%	46th		
Unemployment Rate: March 2010	8.5%	10.2%			
Total Economic Production					
Change in Value of Production: Peak to March 2010	-1.0%	0.8%	48th		
Growth in Value of Production: October 2009-March 2010	1.4%	0.9%			
Housing Values					
Changes in Housing Values: Peak to March 2010	-30.1%	-17.0%	81st		

Source: *Mountain Monitor*, M. Muro, J. Rothwell, and K. Fikri, Brookings Institution and University of Nevada Las Vegas, June 2010.

4. The Growing Importance of Quality of Life in the Location of Economic Activity

As pointed out in the earlier discussion of how to model “the total economy,” the assertion, found in the Tucson *Blueprint*, that *qualitative* characteristics of the social, cultural, and natural environments in a particular location can be a powerful force energizing regional economic development is not a new idea. It has been recognized for at least a half a century.

Monitor, June 2010, the Brookings Institution’s Mountain West program, Washington DC and University of Nevada Las Vegas.

As also pointed out in the *Blueprint* and the Sonoran Institute's Tucson report, these economic forces tied to local amenities continue to operate in important ways today, helping to explain the above average economic performance of the Mountain West led by the Sun Corridor in Arizona, as well as in the Southeast and the Pacific Northwest over the last two decades.²¹ Ten years ago the Economic Research Service of the U.S. Department of Agriculture published a special edition of *Rural Development Perspectives* on the rapid growth in population in the rural counties of the Mountain West.²² That growth attracted attention of analysts because it could not be explained by the Mountain West's traditional land-based activities of farming, ranching, forest products, and mineral extraction, all of which were in relative or absolute decline. These USDA studies were focused on the non-metropolitan West, where one would expect these traditional land-based economic activities would dominate.

When we recognize the importance of social and natural amenities to local economic vitality, as the *Blueprint* and Sonoran Institute Tucson study did, a quite different picture of the forces driving the local economy emerges. The ability of an area to attract and hold residents is central to its economic vitality. In that context, those locally specific qualities that make a particular area an attractive place to live, work, and do business are not just of aesthetic interest, they are part of the local area's economic base. High quality living environments attract and hold people and businesses. That in turn triggers a series of dynamic changes that support ongoing local economic vitality. The quality of the social and natural environments can have profound economic implications.

The increasing importance of the attractiveness of an area to its present and future economic vitality has an economic explanation. Advances in transportation and communications and changes in what it is that the economy produces (the shift from goods to services) have dramatically reduced the costs associated with geographic isolation. As economic activity has become relatively more mobile, a different set of local characteristics, other than the presence of extractable natural resources and the manufacturing based on them, has become important in determining the location of economic activity: the quality of the local labor force, the quality of the public infrastructure, including schools, parks, and libraries, and the quality of the social and natural environments. In the jargon of economics these factors can be labeled human, social, and natural capital. That is exactly what the Tucson *Blueprint* focused on.

The U.S. Department of Agriculture, in trying to understand why some rural counties have shown considerable economic vitality while others have stagnated, giving up their population to other regions, have categorized non-metropolitan counties by over a dozen non-exclusive characteristics including familiar categories such as agriculture, manufacturing, and mining. But the Department of Agriculture has had to add categories to understand all of the sources of economic vitality, including recreation, federal lands, retirement-destination, commuting, and federal lands. As the table below shows, in the 1990s it was retirement, federal lands, and recreation counties that led economic vitality in rural counties. Counties focused on traditional exports like mining, manufacturing, and agriculture were the slowest growing rural counties. Counties that remained specialized in mining actually saw net outmigration in the 1990s. It has been areas that are perceived to have the human, public, and environmental resources that made them attractive residential locations that have prospered.²³

²¹Thomas M. Power and Richard Barrett, *Post Cowboy Economics: Pay and Prosperity in the New American West*, Island Press, Spring 2000; Power, Thomas M., 1995, editor, "Economic Well-Being and Environmental Protection in the Pacific Northwest: A Consensus Report by Pacific Northwest Economists", Department of Economics, University of Montana, Missoula, MT, December.

²² See the special issue of *Rural Development Perspectives* on the rural West, 14(2), August 1999, USDA, Economic Research Service.

²³ With the 2010 Census just finishing, it will be several years before data is available to do similar analysis for the 2000-2010 period. For supporting evidence from the Western states in the 1990s see: "Amenities Increasingly Draw People to

Population Change in Non-Metro Counties by Type of County, 1990-2000		
County Type	Population Change	Net Migration
Retirement	28.4%	25.9%
Federal Lands	22.3%	16.4%
Recreation	20.2%	16.9%
Commuting	15.2%	12.0%
Services	14.6%	11.7%
Government	11.5%	5.2%
Non-Specialized	10.9%	8.4%
Total Non-Metro	10.3%	6.9%
Manufacturing	9.5%	6.1%
Poverty	9.1%	4.4%
Transfer Payments	8.5%	6.5%
Farming	6.6%	3.9%
Mining	2.3%	-1.5%

High quality natural amenities contribute in a dynamic way to the location of economic activity. Areas that have been able to attract and retain a high quality labor force are attractive because of those human resources. Areas that do not have that labor force but have attractive characteristics that allow the recruitment of the necessary skilled workforce without paying inflated wages also have an advantage.

5. The Failure of the “Cattle, Copper, and Cotton” Export-Base View of the Greater Tucson Area Economy

As pointed out earlier in the discussion of how to analyze a contemporary local economy, often the economic forces supporting local economic vitality are over-simplified into what has come to be called an “export base” or “economic base” view of the economy. In Arizona this is summarized by the common reference to “cattle, cotton, and copper” as the historic export base. Within that export base view, local economic health is claimed to be determined by the health and profitability of those export-oriented businesses that the local community hosts. That approach to the local economy artificially narrows our view of the actual sources of local economic vitality and encourages us to limit ourselves to the view through the rear-view mirror rather than directing our attention to present reality and future trends.

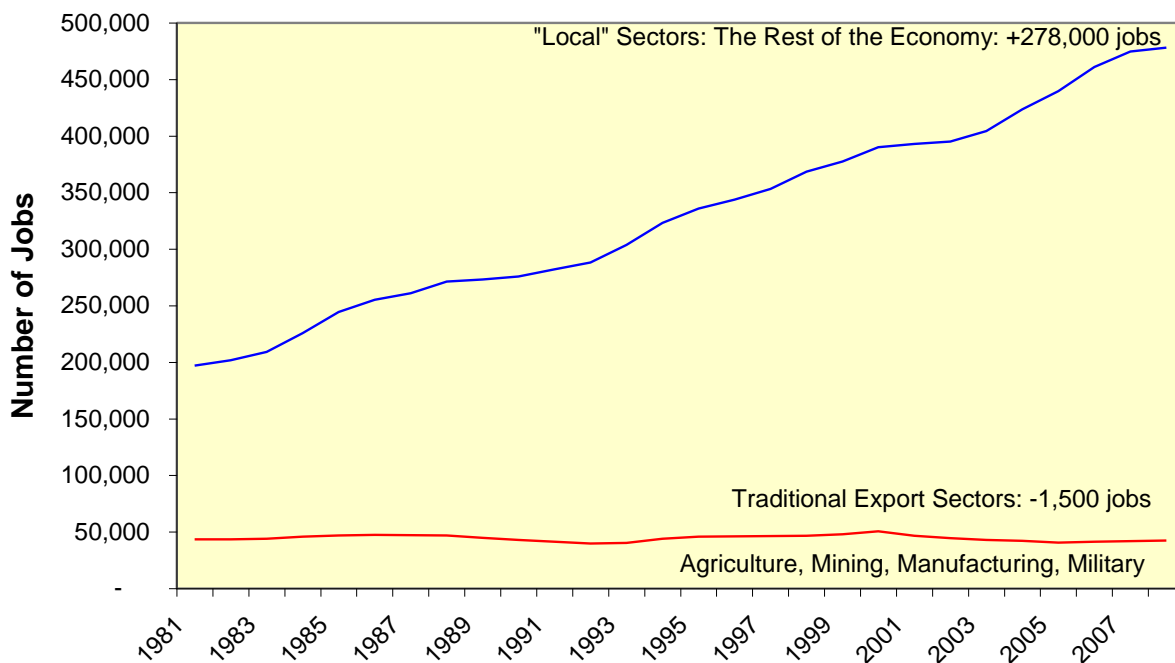
Discussions of the Greater Tucson economy often are carried out in the context of the export base view. In that view, businesses are assumed to locate in a community because of certain site-specific economic resources such as copper deposits, grazing land or good crop land. These business firms create jobs and workers and their families move to where those jobs have to be located. The distribution of these export-oriented natural resource firms is claimed to explain why people live where they do. To many this is just hard-nosed economic realism. “That’s the way the economy is.”

the Rural West,” Gundars Rudzitis, and “Jobs Follow People in the Rural Rocky Mountain West,” Alexander C. Vias, *Rural Development Perspectives*, 14(2), August 1999. For the Great Plains see “Net Migration in the Great Plains Increasingly Linked to Natural Amenities and Suburbanization,” John B. Cromartie, *Rural Development Perspectives*, 13(1), June 1998. For the South see “Migrants in the Rural South Choose Urban and Natural Amenities, John B. Cromartie, *Rural Development Perspectives*, 14(4), February 2001.

One serious limitation of this over-simplified view of what makes the local economy tick is that it does not explain very well the changes in the Arizona or Tucson economies over the last several decades. If we separate the traditional export-oriented sectors from the rest of the economy and look at how employment and income have changed, it is clear that there are other forces driving the economic vitality of the Greater Tucson area.

If we approximate the export sectors as agriculture, forestry, mining, manufacturing, and military bases and look back over the last three decades, we see employment in those export sectors stagnant and declining slightly in Pima County at the same time that employment in the rest of the economy was exploding.²⁴ Between 1981 and 2008 jobs in the export sectors declined by 1,500 while 278,000 jobs were added in the rest of the economy.²⁵ That is, each lost export sector job was replaced by 185 other jobs. If we look, instead, at aggregate real income received by residents of Pima County from employment in the export sectors and the rest of the locally-oriented economy, between 1981 and 2008 the export sectors *did* increase their real pay by about a billion dollars while income received from other sources expanded by \$20 billion. See the figures below.

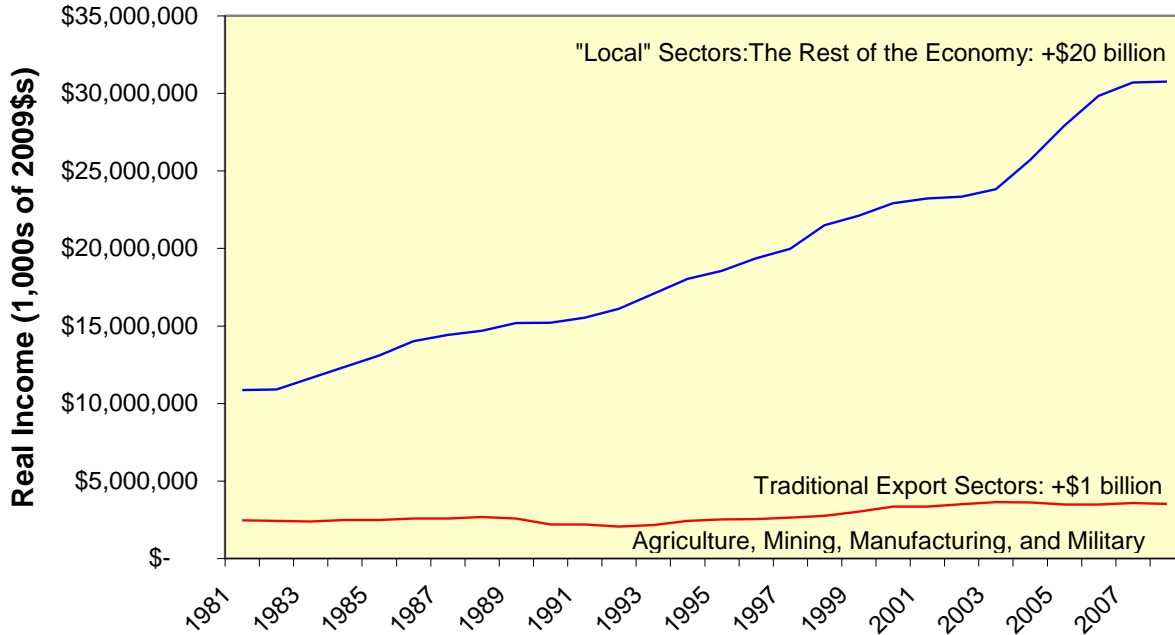
Pima County Employment: Traditional Export and Local Sectors



²⁴ I have labeled this the “traditional export sectors” because they are the sectors that are usually mentioned when an area’s “economic base” is discussed. Most economic observers today would go beyond these “traditional” sectors to include economic activity associated with visitors (“tourists”), educational institutions serving primarily non-residents, and specialized services being provided to clients outside of the local economy. There are tools available to identify all sectors of the economy that appear to be serving customers beyond the local area. The *Blueprint* identified a detailed list of these “Traded Sector Clusters” (Section 6: Industry Cluster Analysis, Figure 1, p. 201). Most of what is listed there is manufacturing and agriculture, but Hospitality and Tourism, Education and Research, and Business Services are also listed as “exports.” Mining (as opposed to metal processing) is not included for some reason. My “local” sectors, thus, include some economic activity aimed at customers outside the local economy. This will be discussed later in the report.

²⁵ All economic statistics, unless otherwise indicated, come from the U.S. Department of Commerce’s Regional Economic Information System. Income figures are converted to 2009 dollars using the CPI. The 1981 starting point was chosen as it marked the end of the 1970s expansion in the export sector and the end of the 1980 recession.

Pima County Total Real Income: Export and Local Sectors



One reason for the failure of the traditional export approach to explaining local economic vitality in the Greater Tucson area is that the economic base approach implicitly makes two assumptions that, when stated, appear very questionable. The first implied assumption is that people do not care where they live. They simply move to where the economy demands. The second implied assumption is that business firms also do not care about where workers live or would like to live or where the markets for those business' products are located. The location of the population determines both of these, but firms are assumed to ignore both and choose their location on some other basis. Neither of these assumptions can be defended on either theoretical or factual grounds. When these indefensible assumptions are modified, residential location choice is seen as an important economic force in determining the location of economic activity and that seriously undermines the reliability of the export base view of the Greater Tucson area economy.

As briefly noted above, during the second half of the twentieth century, changes in the economy have made residential location choices increasingly important in the determination of the location of economic activity. These changes have made both people and businesses more mobile. The following changes have contributed to the increased importance of residential location choice:

- i. Improvements in transportation and communications that have drastically reduced the costs associated with geographic distance from economic centers. These changes include improved highway systems, the extension of regular airline service to small cities, the development of modern telecommunications networks and technology, the development of national and international television networks that reach the most isolated locations, and the emergence of competing next-day courier service. These changes significantly reduce isolation from the national economy and culture due to distance from the nation's largest metropolitan areas.

ii. Changes in what the economy produces have also had an important impact on the location of economic activity. With the shift from the dominance of extractive and heavy industry to light manufacturing and services, the relative importance of transportation costs has declined as the value to weight ratio has risen dramatically. The incredible array of electronic equipment that now dominates our purchases is a good example. Transportation costs no longer tie economic activity as tightly to particular locations.²⁶

As a result of these changes and the relative mobility of economic activity, it is less costly for citizens to act on their preferences for certain types of living environments. Similarly, it has made it more feasible for economic activity to follow the population as it makes residential location decisions. The result is that economic activity can increasingly follow people as they make location decisions rather than people only following the location decisions of businesses. Consider the shift of economic activity from center cities to suburbs: First people fled those centers of employment and commercial activity and commuted back for work and shopping. Later the manufacturing base followed the population to the suburbs, as did the shopping centers. Similar things can be said about the dramatic in-migration to Arizona and the rest of the Sunbelt and the ongoing “resettlement” of the Mountain West.

It is this these interactive economic forces that led the *Blueprint* and the Sonoran Institute Tucson study to highlight the economic importance of the quality of Tucson’s public institutions, especially educational institutions, its rich cultural environment, its attractiveness as a residential location, and the expansive protected lands and the scenic beauty, open space, and recreational opportunities they provide.

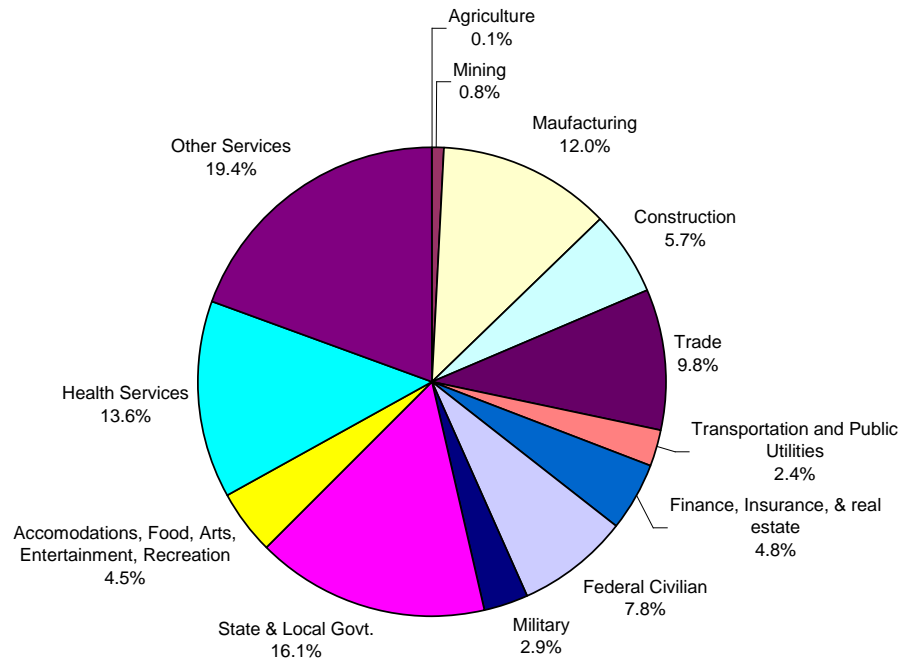
6. The New Sources of Economic Vitality in the Greater Tucson Area

The ongoing expansion of the Greater Tucson economy despite declines in employment in the traditional export sectors or relative stagnation in the earnings being generated by those sectors may appear to be an economic puzzle to some. For that reason it is important to understand what sectors of the economy have been responsible for the dramatic economic vitality of the Tucson area despite the difficulties in mining, manufacturing, and agriculture over the last several decades.

²⁶ Mills, Edwin S., and Gary Chodes. 1988. "Non Extractive Employment Outside Metropolitan Areas" in *National Rural Studies Committee: A Proceedings*. Hood River, Oregon. May 24-25, 1988. Corvallis, OR: Western Rural Development Center, Oregon State University. Edited by Emery Castle and Barbara Baldwin, pp. 29-36. Mills, Edwin S. 1987. The Determinants of Small Area Growth. Lecture Series 1. Corvallis, OR: Oregon State University, Graduate Faculty of Economics.

A. A 2008 Snapshot of the Tucson Area

Sources of Real Earnings: Tucson Area (Pima County) 2008



Economy

The pie chart above provides a 2008 snapshot of the relative importance of various economic sectors as a source of real earnings (wages, salaries, and the “profits” of the self-employed). Note that mining employment was the source of less than one percent of the earnings generated within Pima County. The processing of copper ore or copper metal away from the mine site is not counted in “mining,” but, instead is included in manufacturing as “primary metals.” Averaged over the 1969-2000 period, however, primary metals would have added only about 4 percent to mining earnings, less than a few hundredths of one percent to mining’s overall share of Greater Tucson payrolls. On the other hand, all of mining is not metal mining. The mining of sand and gravel for construction purposes is included in the mining category. The use of mining to represent copper mining tends to somewhat exaggerate the actual relative importance of copper mining in the Tucson area.²⁷

The sectors that are the source of most of the labor earnings are the service sectors (38 percent), government (27 percent), retail and wholesale trade (10 percent). Those three broad sectors represent about three-quarters of all earnings. About half of the remaining quarter is explained by manufacturing, mining, and agriculture, as discussed above. The remaining one-eighth of the earnings comes from the combination of the financial, transportation, public utilities, and construction sectors.

It should be pointed out that the “Accommodations, Food, Arts, Entertainment, and Recreation” sector shown in the figure above represents only part of the visitor economy. The retail sales, transportation, and other sectors impacted by

²⁷ In the discussion here I focus on the direct impact of industry sectors on the local economy. Within the *economic base* or *export base* view of the local economy, a multiplier would be applied to this direct impact to include indirect and induced impacts as the earnings associated with mining circulate through the economy. These multipliers are often used to grossly exaggerate the actual impacts. The problems with the economic base view of the local economy and the multipliers used by it will be discussed later in this report.

visitors are not included in that total. The Arizona Office of Tourism estimates that for Pima County in 2008 these travel sectors represented 77 percent of the direct impact on earnings due to visitor spending.²⁸

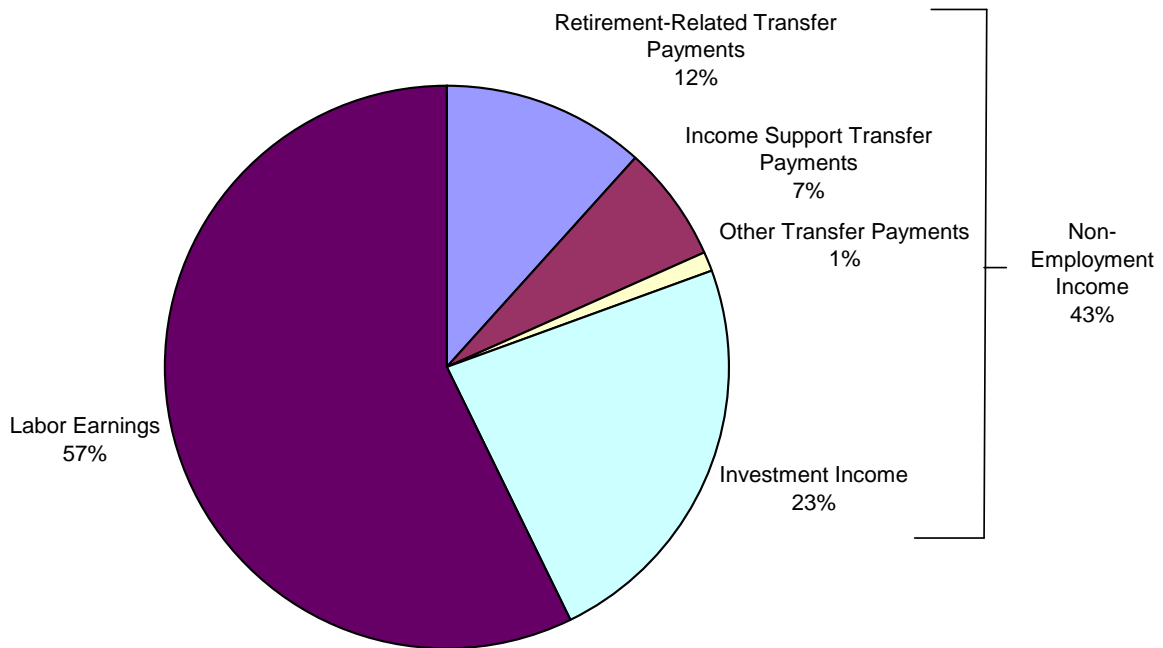
These labor earnings, however, are not the only source of income to individuals and households. Income is also received from investments in stocks, bonds, and real property in the form of dividends, interest, and rent. Some of this investment income is also retirement income. In addition, people receive income from government-run programs such as Social Security, Medicare, Medicaid, Food Stamps, Unemployment Compensation, other government support programs, and military pensions. These collectively are labeled *transfer payments* in the national economic accounting because they involve the government collecting revenues from one group of people and transferring it to another group of people in a form that is not current wages or salaries.

Investment income and transfer payments represent substantial flows of income. Total labor earnings in 2008 in the Tucson area were \$19.6 billion. Investment income was \$8 billion and transfer payments were \$6.6 billion. That is, investment income added about 41 percent to the labor earnings and transfer payments added another 33 percent. As a result, total personal income was \$34.2 billion, 74 percent larger than labor earnings alone. Put slightly differently, labor earnings were the source of only 57 percent of total personal income. The other 43 percent of personal income was received from sources not related to current employment in the economy. For that reason, investment income and transfer payments are often called *non-employment income*. The chart below shows the way labor earnings, transfer payments, and investment income contributed to total personal income in Pima County in 2008.

In addition to its relatively large size, non-employment income has another characteristic that makes it economically important: This type of income is “footloose” in the sense that it follows people to wherever they choose to reside. In that sense it makes people more mobile because they have a source of income that is not tied to employment opportunities at any particular location.

²⁸ “Arizona Travel Impacts 1998-2009p,” Arizona Office of Tourism, July 2010, Dean Runyan Associates, p. 46.

Sources of Total Personal Income: Pima County 2008



B. A Longer-Run View of the Dynamics of the Tucson Area Economy

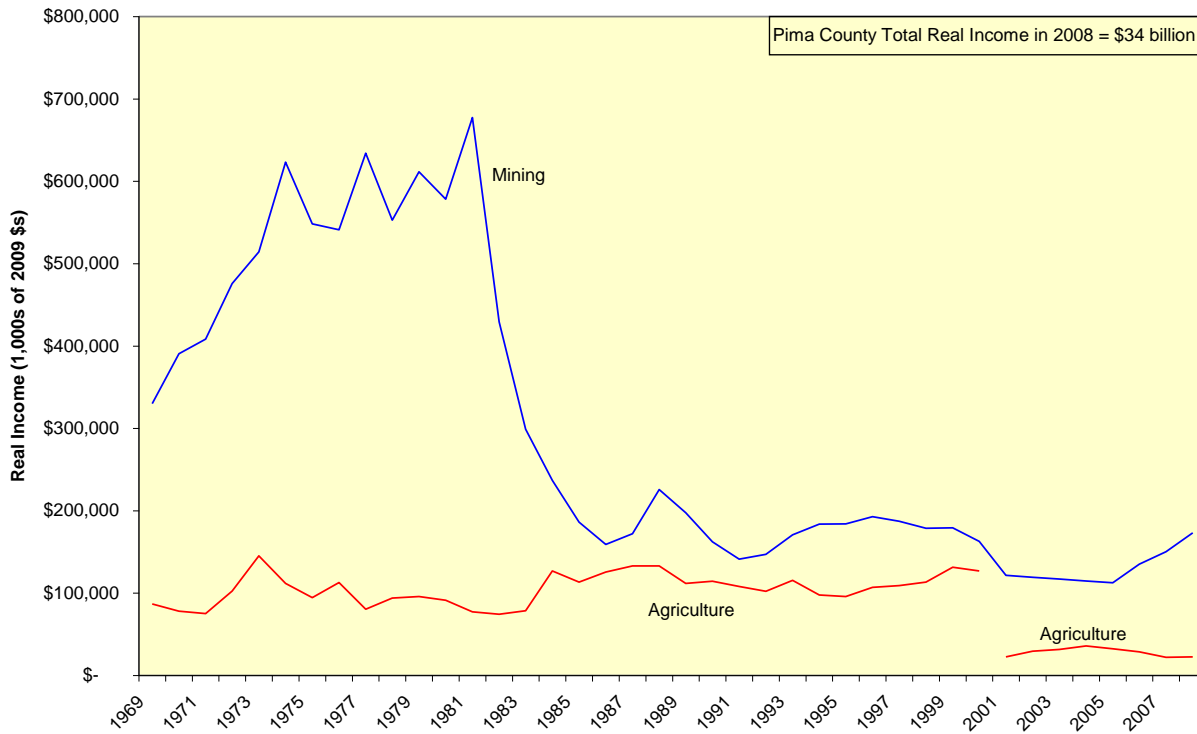
Earlier we pointed out that while the traditional export sectors have shown relatively little growth as sources of wages and salaries, the rest of the Tucson area economy showed considerable economic vitality. Here we wish to briefly explore the sectors that contributed to that vitality.

i. Mining and Agriculture

Given that Tucson is one of the nation's large metropolitan areas, it is not really surprising that the urban economic activities dominate the land-based economic activities outside of the densely settled urban areas. In the mid 1970s when mining in Pima County was at a relatively high level and the Tucson economy was in the beginning of a 40-year expansion, mining directly contributed about 6 percent of total income generated by the Pima County economy. Mining payrolls plunged in the 1980s and never really recovered while the Greater Tucson economy continued to expand steadily. As a result, the direct contribution of mining to the regional economy fell to less than one percent in 1990, to about one-half of one percent in 2000 where it has remained.²⁹ See the chart below.

²⁹ Here mining payrolls are compared to total personal income, including non-employment income. Earlier we looked at mining's contribution just to total payrolls. Compared to just those labor earnings, mining contributed about 0.8 percent.

Real Earnings In Mining and Agriculture: Pima County



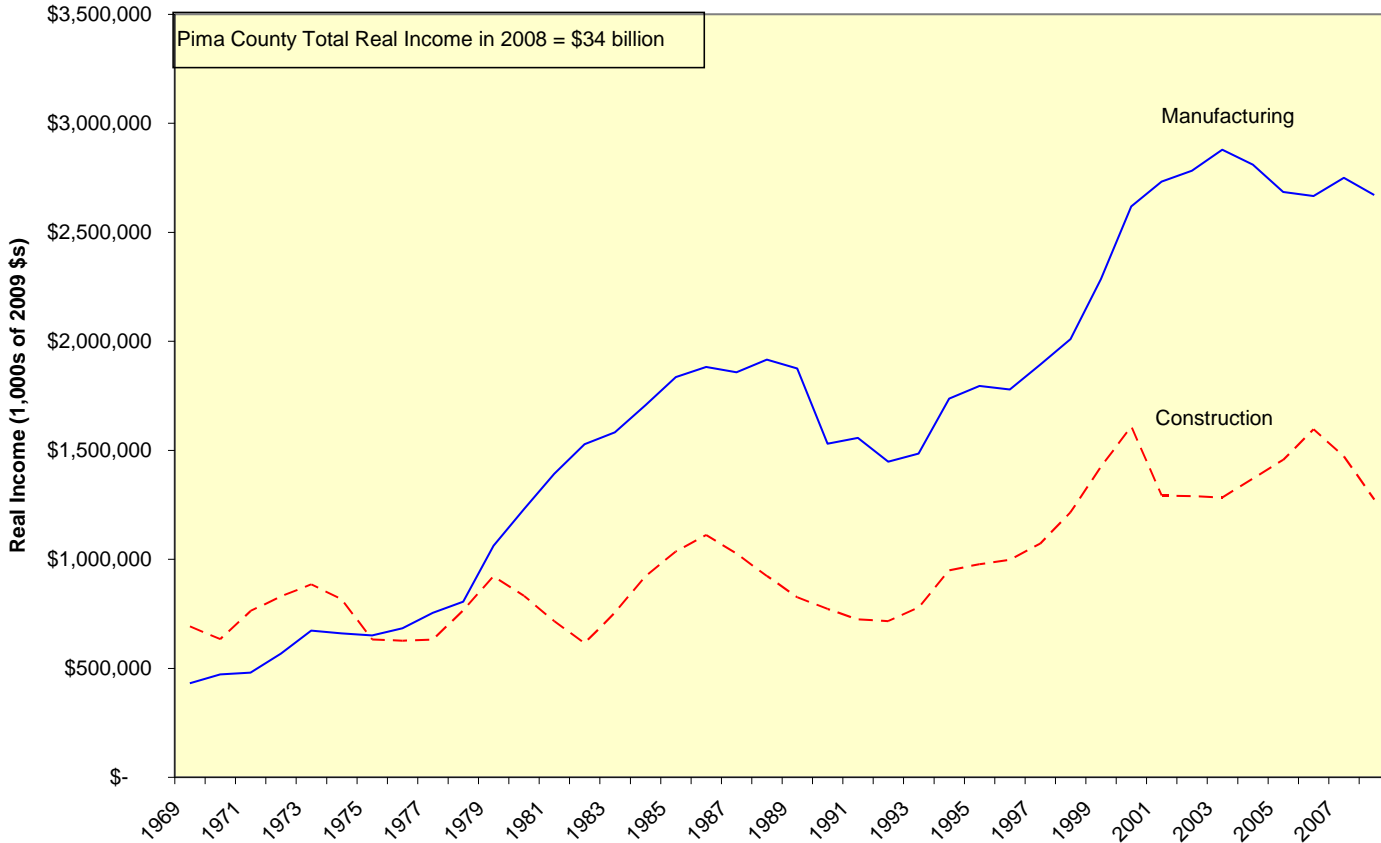
Not surprising in a county dominated by a large metropolitan area, agriculture's contribution to labor earnings appears small compared to the huge payrolls associated with all of the urban-based economic activity: about \$100 million out of total personal income of \$34 billion.³⁰

ii. Manufacturing and Construction

The payroll from manufacturing in the Greater Tucson area expanded almost seven fold after adjusting for inflation between 1970 and the early 2000s. Manufacturing typically is very sensitive to the national business cycle since Tucson sells its manufactured products into that national market (as well as into the international market). The recession of the early 1990s caused a deep drop in Tucson manufacturing from which it recovered and continued its rapid expansion. Manufacturing payroll turned downward again in 2003 and is currently feeling the effects of the Great Recession. In 2008 manufacturing was responsible directly for about 8 percent of total personal income in Pima County. See the chart below.

³⁰ Note the break in the agricultural data between 2000 and 2001. The United States changed the way it defines industries in 2000, making the comparison of agricultural income data from the period before 2001 to that after 2000 difficult.

Real Earnings in Manufacturing and Construction: Pima County

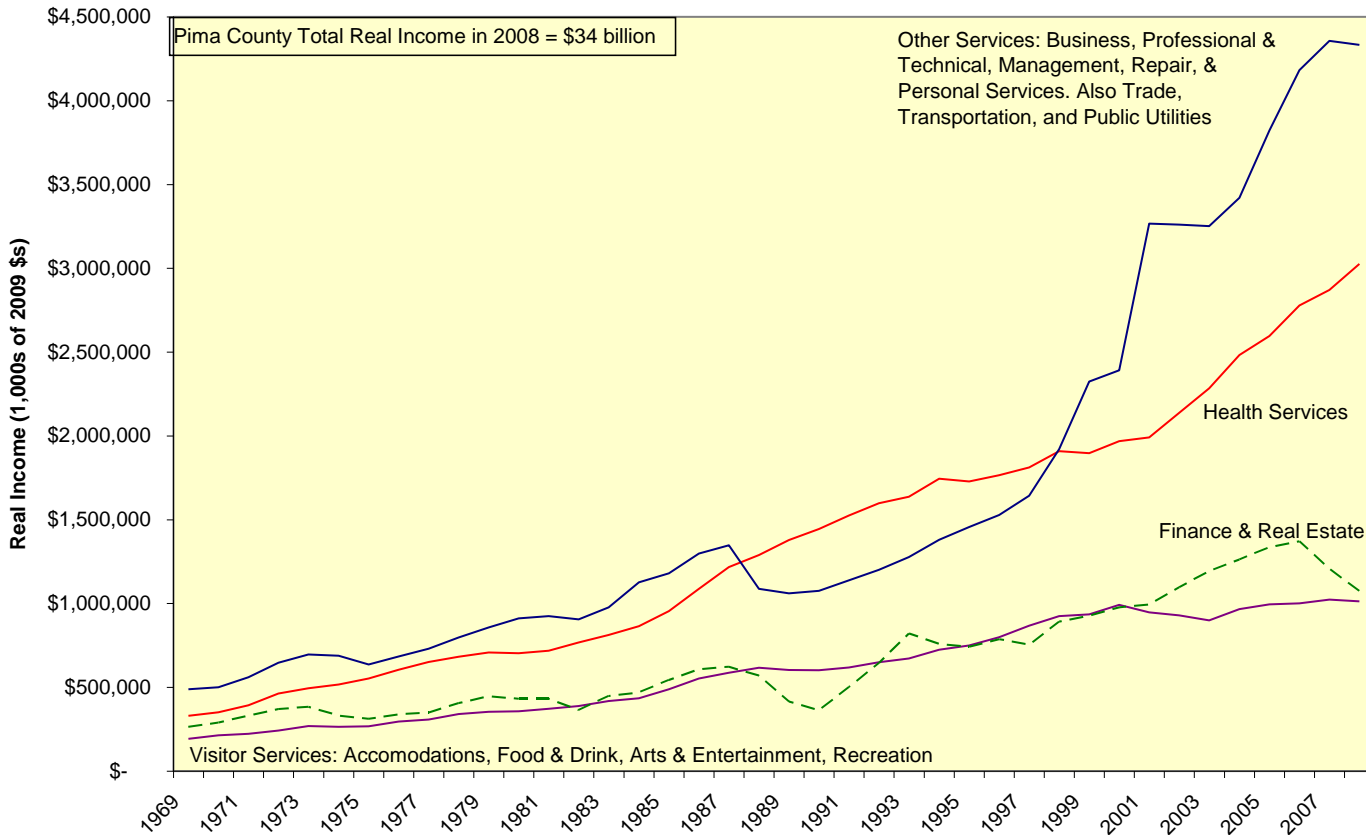


Construction activity also fluctuates with economic conditions. All of the recessions over the last 40 years can be seen in the downturns in construction payroll in Pima County. Judged by real payroll, the expansion in the construction industry does not look unusual, certainly not like a “bubble.” The payroll in construction in 2000 was the same as it was in 2006 when inflation is removed. The “bubble” was in housing prices and the supply relative to demand. In 2008 construction was directly contributing about 4 percent to the Greater Tucson area total personal income. See the chart above.

iii. The Service Sectors

The service industry sectors represent a very broad set of quite different economic activities. In that sense it is like manufacturing and retail trade, both of which produce or sell vastly different products. Service sectors include highly technical medical, engineering, management, and computer services as well as repair (plumbing, auto, carpentry) and personal (barber, beauty parlor) services. Also included are the relatively less skilled yard and home maintenance services as well as the relatively low-paid private child day care and early education services.

Real Earnings in Health Services, Visitor Services, & Trade: Pima County



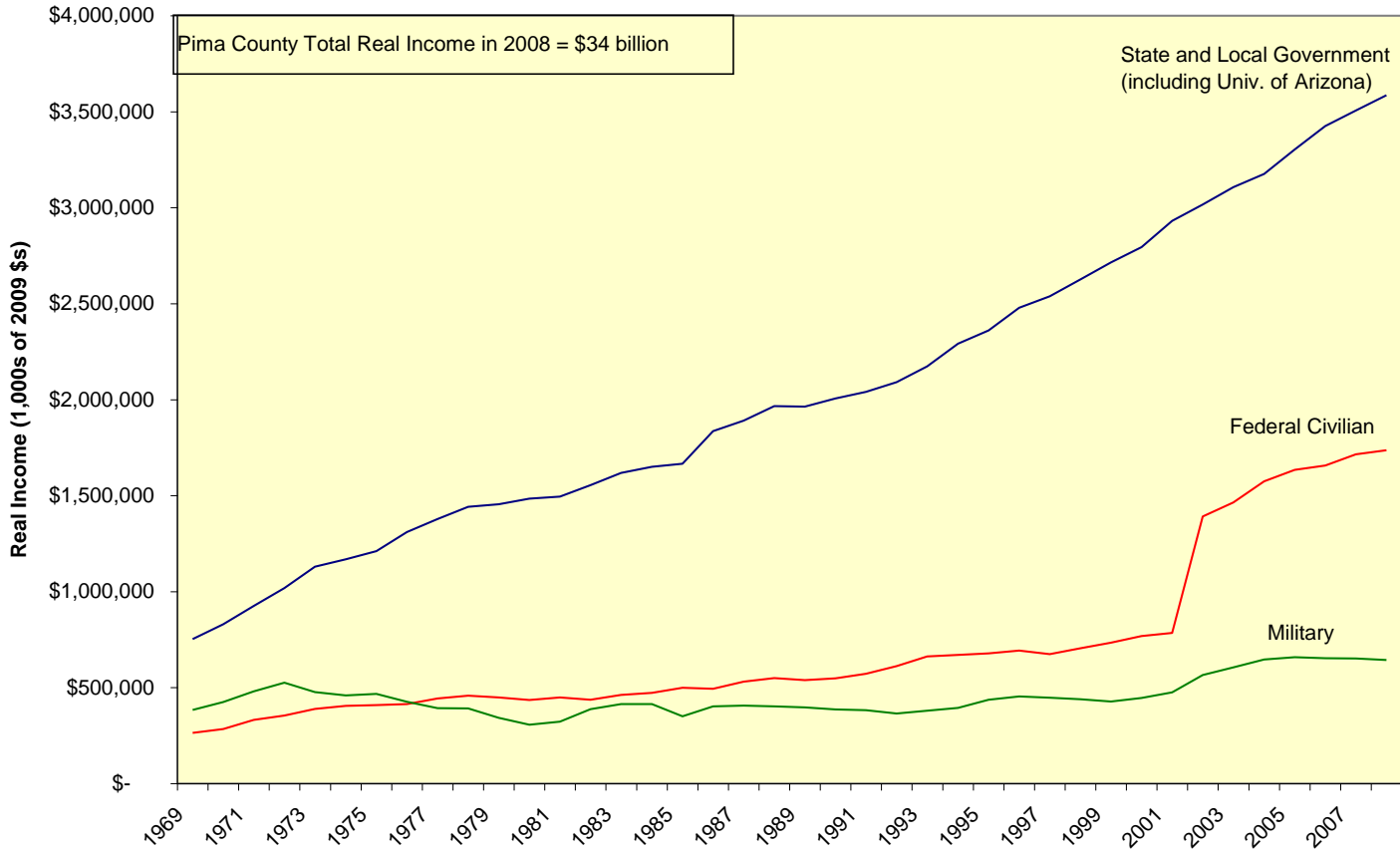
The changes in the American economy are often described in terms of a “shift to services” or the rise of a “services economy.” The growth of almost all of the services sectors in the Greater Tucson area economy over the last 40 years shows that this national trend has also transformed the regional economy around Tucson. Business services have exploded since the late 1990s. Health services have been growing rapidly since the mid-1980s. Finance and visitor services (related to “tourism”) have also shown sustained growth.³¹ The labor earnings in this set of service sectors made up about 18 percent of total personal income 40 years ago in the Greater Tucson area but now represent about 28 percent of total income. Clearly there has been a shift to services in Tucson.

iv. Government Sectors

The primary growth in the real earnings of workers in the various government sectors in the Greater Tucson area has been in state and local government payrolls, including the University of Arizona. See the figure below.

³¹ The Arizona Department of Tourism estimates that only about half of the spending impact of visitors shows up in these particular visitor services sectors. Other impacts are found in retail trade, transportation, and in all the other sectors in which visitors make expenditures. “Arizona Travel Impacts 1998-2008p,” Arizona Office of Tourism, June 2009, Dean Runyan Associates, p. iv.

Real Earnings from Government Employment: Pima County



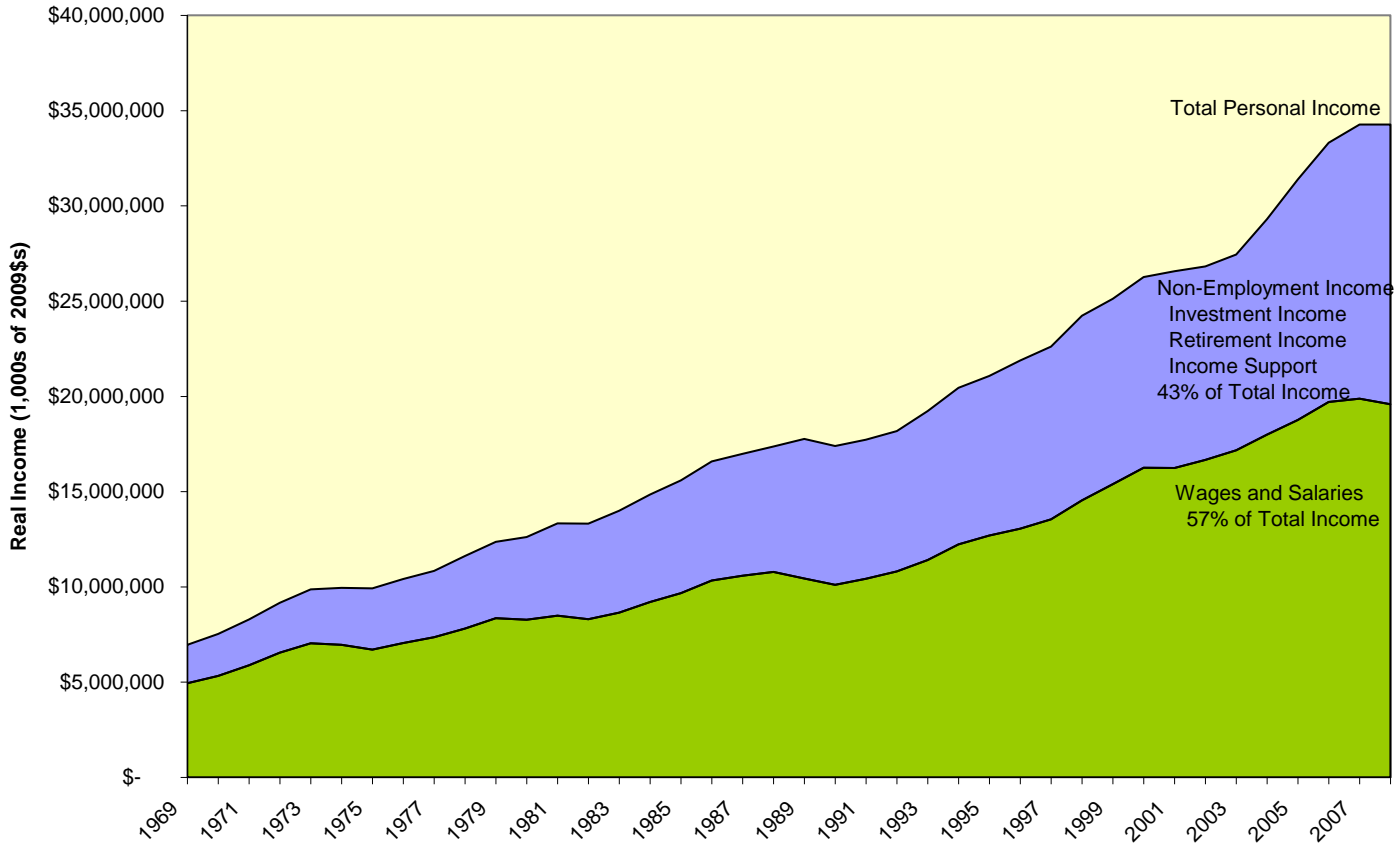
From 1970 through 2000 the payrolls of the federal government, both civilian and military, were fairly stable, averaging about \$500 million each after inflation is removed. In the early 2000s federal civilian payrolls (some of which is related to military bases) rose steeply. By 2008 federal civilian payrolls had reached \$1.7 billion and total federal payrolls were \$2.4 billion or about 7 percent of total personal income. State and local government payrolls, on the other hand, were steadily increasing, by five-fold over the last 40 years even after inflation is removed. By 2008 state and local government payrolls represented about 11 percent of total personal income. Although the expansion in the University of Arizona contributed to this growth, local government payrolls have been consistently larger than state government payrolls in the Greater Tucson area. In the first decade of the 2000s, local government payrolls in the aggregate have been over 70 percent larger than state government payrolls. Together government payrolls were directly the source of about 18 percent of total personal income in the Tucson area in 2008.

v. Non-Employment Income

As discussed above, sources of income that are not related to current involvement in the workforce make up over 40 percent of total personal income. These include investment income (dividends, interest, and rent) as well as income received from federal government retirement and income support programs. The growth in these non-employment sources of income are compared to the growth of labor earnings in the Greater Tucson economy in the figure below.

Clearly these non-employment income flows, given their sheer size and growth, have the potential to impact the regional economy. We will discuss the likely impact of these large income flows on the local economy later in this report.

Employment and Non-Employment Income: Pima County



7. The Economic Importance of Amenities in the Greater Tucson Area

The attractiveness of the Greater Tucson area as a place to live, work, and do business is relevant to local economic vitality in several different ways:

i. Attracting and Holding Businesses

Businesses have to be concerned about the availability of the workers with the skills and experience that a business needs to operate or expand operations. The *cost* of attracting the quality of workers businesses need also matters. If an area is one in which workers and their families would rather not live, firms will have to pay the equivalent of “battle pay” to attract and hold the workers they need in that area. On the other hand, if the area, because of the local social, cultural, natural, and human-created amenities, is quite attractive to workers and their families, firms will have no difficulty obtaining the quality workforce they need without paying a premium to “bribe” workers into moving to the

area or staying in the area. Firms have to be concerned about the availability and cost of the workers they need. Local amenities impact both. That is the reason the Tucson **Blueprint 's** list of Tucson's "highest ranking...economic development strengths" listed primarily local amenities: High quality institutions of higher education, cultural diversity, leisure, recreation and entertainment opportunities, the Greater Tucson Area's reputation for a high quality of life, as well as art and cultural venues..

ii. Attracting and Holding Working-Age Residents

The in-migration of working-age individuals and their families can have a stimulating impact on the local economy. In-migrating families typically bring with them capital in the form of savings, including the income they received from the sale of their previous home. In the process of setting up a household and seeking jobs, the in-migrants spend money that stimulates the local economy. Empirical estimates indicate that a working age in-migrant can have an impact that creates the equivalent of one new job. In addition, ongoing in-migration creates expanded markets for goods and services that allow increased specialization and expansion of the local business infrastructure that, in turn, allows the economy to capture and hold more of the income generated by reducing income leakage out to fund imported goods and services. In-migration can also increase the labor supply, somewhat reducing the pay levels for workers of all skills, making the area an attractive location for new firms.

Between 1990 and 2000 the Greater Tucson area was, on net, attracting about 6,200 working age in-migrants each year (age 20 to 54). This was the difference between those moving in and those leaving. With those in-migrants came another 2,600 younger in-migrants each year Total net in-migration to the Tucson area across all ages was 12,800 per year. Between 2000 and 2008, total in-migration was slightly lower, about 12,000 per year. In the 2000-2008 period these net in-migrants represented an 11.5 percent increase in the Tucson area population.³² Clearly the Tucson area has continued to be an attractive residential site for new residents.

iii. Attracting and Holding Retirees

Those reaching retirement age can partially choose their residential location independent of the employment opportunities an area may provide. Their retirement income follows them, whatever that location decision is. Retirees, therefore, can focus more on where they would *like* to live and what the amenities are that various alternative locations have to offer. Some straightforward economic considerations are still important including the local cost of living and, in particular, the local cost of housing, easy access to high quality health care, and the potential for part-time employment to supplement retirement income. But local quality of life and the myriad of local amenities are also very important. The spending of in-migrating retirees stimulates the local economy in the same way any injection of income from outside the area does. As that income circulates locally it puts others to work generating additional income. To the extent that the retirees are entirely out of the labor market, they do not fill the local jobs they themselves create.

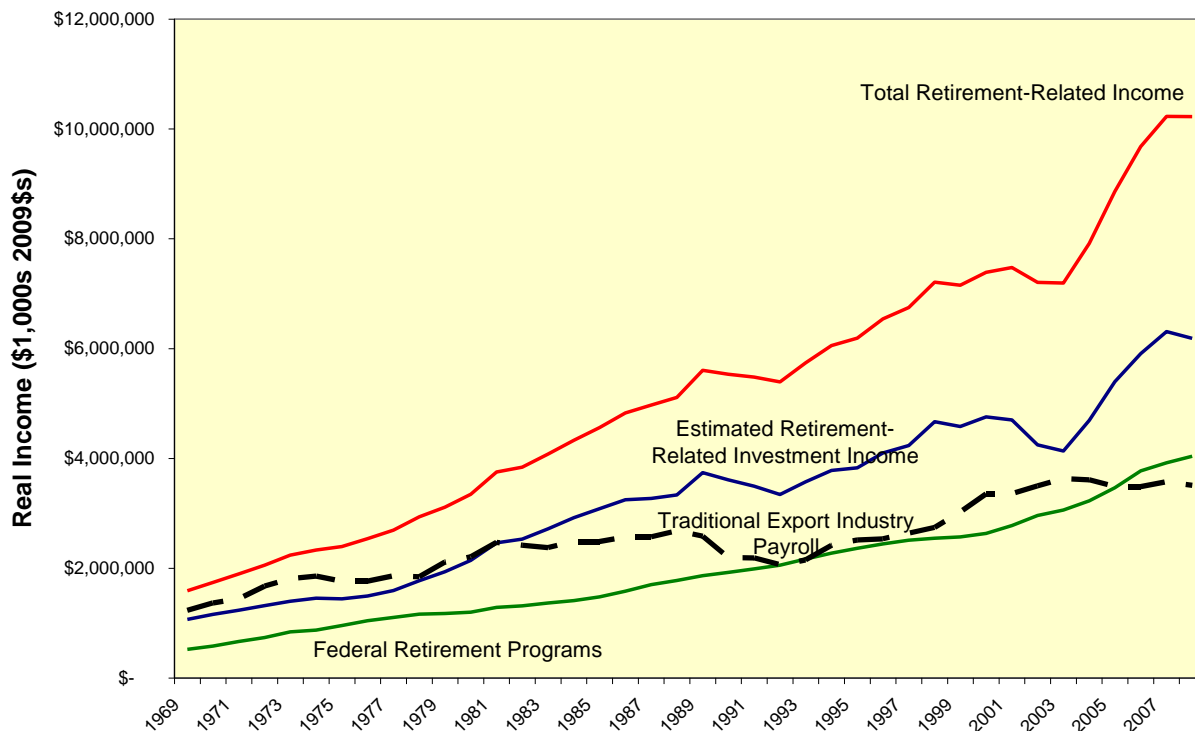
Between 1990 and 2000 Tucson had net in-migration in the age 55-plus category of 40,000 or 4,000 per year. Although the Phoenix area is usually thought of as the primary destination of retirement migration, the Tucson area actually has a higher percentage of the population over age 55. As a percent of the population, for instance, the in-migration rate of those over age 55 was 85 percent higher in the Tucson area between 1990 and 2000 than in the Phoenix area. The 2010 Census data that would allow us to make the same comparison for this last decade is not yet available. Tucson has clearly been an attractive destination for seniors. The AARP ranking of Tucson as the top retirement destination in 2009

³² 1990-2000 data from Table 2 in "Arizona Statewide Economic Study 2002: Retirement Migration in Arizona, July 2002, Tom Rex, Center for Business Research, Arizona State University; 2000-2008 data from "Cumulative Estimates of the Components of Population Change for Metropolitan and Micropolitan Statistical Areas: April 1, 2000 to July, 2008 (CBSA-EST 2008-10), U.S. Census Bureau, Population Division, March 19, 2009.

and 2010 because of its lower stress level and higher quality of life confirmed this competitive advantage. The outdoor recreational amenities of the Tucson area were highlighted by AARP.

The impact of retirement-related income on the Greater Tucson area economy is substantial. By 2008 just the Social Security, Medicare, and other federal pension programs were a larger source of income to residents of Pima County than the payrolls associated with all of manufacturing, the federal military presence, mining, and agriculture. Estimated investment income that is retirement-related has been larger than the payrolls in the traditional exports sectors since 1981. The total of these two retirement-related streams of income is three times as important as the traditional export industry payrolls. See the next figure.

Retirement-Related Real Income Compared to Traditional Export Sector Payroll: Pima County

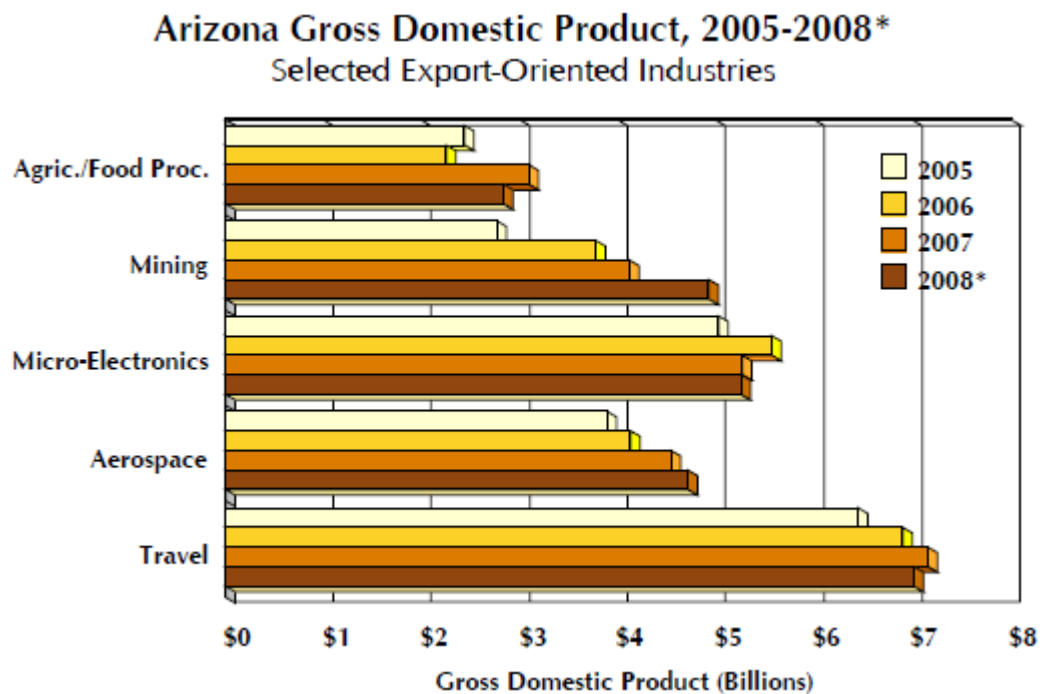


iv. Developing a Sustainable Visitor Economy around Tucson’s Amenities

High quality cultural and natural amenities also attract visitors. The “visitor economy” includes a wide variety of different types of visitors from professional and business meetings to those focused on outdoor recreation to those seeking unique cultural experiences. Of course, there are also people who come in from smaller cities and rural areas to shop, attend sports events, and/or enjoy an evening of entertainment at Tucson restaurants and theaters. Tourism can be on an “industrial scale” that attracts large volumes of visitors who tend to overrun local businesses and facilities and create a homogenous experience that could be replicated anywhere. That sort of tourism can degrade the quality of life for residents as well as visitors, undermining the attractiveness of an area. Communities, recognizing that tourism can be a threat as well as an economic benefit, have tried to become more discriminating in the type of tourism they have encouraged. A variety of different names have come to be applied to types of more focused and sustainable visitor economies that are consistent with sustaining and not degrading the unique aspects of a community: ecotourism,

community-based tourism, cultural visitors, heritage traveler, etc. The term that seems to have been adopted to represent all of these types of tourism that explicitly seek not to threaten the unique qualities that are drawing the visitors to an area is *geotourism*. It has been defined as: Tourism that sustains or enhances the geographical character of a place—its environment, culture, aesthetics, heritage, and the well-being of its residents.”³³ The development of these types of sustainable tourism and their embrace by the Travel Industry Association of America reflects the negative connotation that has come to be associated over the years with conventional “industrial scale” tourism. Instead of disrupting communities and creating mostly part-time low-paid jobs for in-migrating young people, the focus is on visitors and activities that specifically are compatible with local characteristics and that maximize local economic benefits. The cultural diversity and richness of Tucson, its low-key urban lifestyle, and its surrounding protected public lands lay the basis for a productive expansion of geotourism in the Greater Tucson region.

The travel industry is a very important part of the economies of both the state of Arizona and the Greater Tucson area. A study done for the Arizona Office of Tourism in 2010 estimated that the travel industry contributes significantly more to the total productivity of the Arizona economy than micro-electronics, mining, aerospace, or agriculture and related food processing. See the figure below.



Dean Runyan Associates, "Arizona Travel Impacts 1998-2009p,"

July 2010, prepared for the Arizona Office of Tourism, p. 16.

³³ See "Geotourism: The New Trend in Travel," Travel Industry Association of America, <http://www.tia.org/researchpubs/index.html>.

In the “snapshot” of the Greater Tucson area economy in 2008 presented above, we showed the direct real earnings generated by various economic activities in Pima County. We represented the travel industry by using the payroll in those sectors that directly serve visitors: accommodations, food and drink establishments, entertainment, and recreation. But we also pointed out that some of the impact of visitors, about 23 percent, is not included in that measure. If the remaining payroll associated with visitors to the Greater Tucson area is included, 5.5 percent of total Tucson earnings are associated with the visitor economy. In 2008 that would make the visitor economy almost seven times larger than the mining industry’s direct payroll. The travel industry would be about the same size as the construction industry, but somewhat large than the financial services industry and quite a bit larger than the transportation and public utilities combined. See the pie chart above.

The number of jobs associated with the visitor economy in the Greater Tucson area is also impressive. Almost 23,000 jobs were directly associated with visitor expenditures in Pima County in 2008, over four percent of total jobs.³⁴ The Arizona Office of Tourism estimates a modest 1.5 job multiplier associated with the indirect and induced impacts associated with visitor spending, bringing the total employment impact to almost 35,000.³⁵ If the direct jobs associated with the Pima County travel industry is compared to the Rosemont mine’s projected direct employment, 405 jobs, the existing travel industry provides almost 60 times as many jobs. See the table below.

The Relative Importance of Rosemont Mine Projected Jobs					
Source of Jobs	Direct Jobs	Multiplier Used	"Total" Jobs	Percent of Total Pima County Jobs	
				Direct	Total
Proposed Rosemont Mine	405	5.2x	2,106	0.08%	0.40%
Pima Ctny Travel Industry Jobs (2008)	22,770	1.5X	34,838	4.38%	6.69%
Total Pima County Jobs (2008)	520,444	1.0x	520,444	100.0%	100.0%

Source: Arizona Travel Impacts 1998-2008p, Arizona Office of Tourism, Dean Runyan Associates, 2009, p. 46; Metropolitan Tucson Convention & Visitors Bureau, Tucson Visitor Statistics, <http://www.visittucson.org/includes/media/docs/OvernightTucsonVisitor.pdf>

What these numbers tell us is that even if the proposed mine has just a very slight impact on the travel industry in the Greater Tucson area, the travel job losses could be much greater than the mining job gains. This will be discussed further later in this report.

³⁴ Arizona Travel Impacts 1998-2008p, Arizona Office of Tourism, Dean Runyan Associates, 2009, p. 46.

³⁵ Cited in Metropolitan Tucson Convention & Visitors Bureau, Tucson Visitor Statistics, <http://www.visittucson.org/includes/media/docs/OvernightTucsonVisitor.pdf> .

III. The Promises and Reality of Copper Mining

1. The Promise of Copper Mining

A proposed mining project is often presented by the mineral developer and perceived by residents of surrounding communities as “an offer that is too good to refuse” because it offers access to needed minerals, the production of new wealth, and high wages for local workers. We begin with a discussion of those positive economic aspects of mining and then turn to some of the often ignored negative economic characteristics of mining.

Because mineral extraction involves removing valuable minerals from the earth, a capturing of a “gift of nature,” it is commonly perceived to involve the “production” of substantial wealth. In both our history and folklore, mineral exploration, when successful, has been seen as discovering substantial “treasures.” The mining of precious metals, gold and silver, provide some of the most colorful examples from our history. In fact, some of the first Europeans to explore what is now Arizona and New Mexico were searching for the “Seven Golden Cities of Cibola.” The Coronado National Forest is named after the most famous of those early treasure seekers.

It is not just the development of precious metals that can generate considerable wealth. The copper mining city of Butte, Montana, was referred to as “the richest hill on Earth” in the early 20th century. The discovery of oil fields and later natural gas fields were the source of personal fortunes and substantial corporate profits. Coal, iron, lead, and other mineral discoveries transformed regions while generating considerable income. This view of our economic history has led to a common association of almost any mining project with the production of considerable wealth some of which is expected to benefit both workers and local residents.

In fact, mineral extraction activities pay among the highest wages available to blue collar workers. In Arizona in 2008, mineral extraction jobs paid \$67,000 per year while the average job paid \$46,000, 44 percent higher than average pay. Mineral extraction, however, includes oil and gas exploration and development, sand and gravel production, and a variety of other minerals besides metal ores and specifically copper. Estimates for copper industry payrolls for 2008 indicate that copper jobs across Arizona paid somewhat more than the average for all mineral jobs, \$69,000, almost 50 percent above Arizona average pay per job.³⁶ These high levels of mining pay in Arizona are consistent with the pattern across most of the nation.

In the greater Tucson area (Pima County), mining jobs paid significantly less, \$55,000 per year in 2008, about 30 percent above the pay across all Pima County jobs.³⁷ The economic impact study of the Rosemont Mine prepared by Arizona State University projected average pay associated with mining jobs at Rosemont during the assumed 20-years of copper

³⁶ “The Economic Impact of the Arizona Copper Industry 2008,” George F. Leaming, Western Economic Analysis Center, Marana, Arizona, 2009; also see the edition for 2009 published in 2010. Wages and salaries in the copper industry were divided by employment to obtain average pay per job. The 2009 average pay was significantly higher, \$75,000. As employment fell by 2,100 in the copper industry, it appears that the lowest paid workers were laid off first. In addition there are likely to have been pay increases for those still employed. Data from other sources are not available for 2009 at the time this report was prepared. For that reason, the 2008 copper industry average pay was used for comparison purposes.

³⁷ U.S. Department of Commerce, Regional Economic Information System: Earnings by place of work divided by employment.

production to be \$50,000 in 2008 dollars, about 20 percent above the average job in Pima County.³⁸ This is consistent with the lower mining wages that are currently being paid in Pima County.

2. The Anomaly of Mining: High Pay but Little Prosperity

Given the high wages associated with mining, one would expect communities that rely heavily on mining to be unusually prosperous. That, in general, is not the case. Across the United States mining communities, instead, are noted for high levels of unemployment, slow rates of growth of income and employment, high poverty rates, and stagnant or declining populations. In fact, our historic mining regions have become synonymous with persistent poverty, not prosperity: Appalachia (coal), the Ozarks (lead), the Four Corners (coal), and the Upper Peninsula of Michigan (copper and iron) areas are the most prominent of these.³⁹ Federal efforts have focused considerable resources at overcoming the poverty and unemployment found in these historic mining districts. In addition, the copper towns of Arizona, New Mexico, Montana, and Michigan and the Iron Range in Minnesota, the Silver Valley of Idaho, the gold mining towns of Lead and Deadwood, South Dakota, the “Uranium Capitol” of the nation in the Grants area of New Mexico, etc. are also not prosperous, vital communities. Over the last several decades some of these areas have begun to recover either as a result of hundreds of millions of dollars of Super Fund expenditure and/or as a result of the in-migration of new, relatively foot-loose residents and economic activities, but that recovery is usually not tied to ongoing mining.

The dramatic contrast between the wealth created and the high wages paid in mining and the poor economic performance of mining communities needs to be understood before expanded mineral extraction activities can be safely promoted as a local economic development strategy. Below we take a brief look at the actual performance of mineral communities over the last thirty years and then turn to an explanation for that relatively poor economic performance.

In order to explore the contemporary local impact of reliance on mining in the United States, we look at the economic performance of all US counties where mining (excluding oil and gas extraction) was the source of 20 percent or more of labor earnings at some time in the 1980s. There are about 100 such counties that could be identified out of the 3,100 counties in the US.⁴⁰ Data disclosure problems prevented the identification of some mine dependent counties.⁴¹

³⁸ “An Assessment of the Economic Impacts of the Rosemont Copper Project,” Special Report 26, a study prepared for the Arizona Department of Mining and Mineral Resources by the Seidman Research Institute, Arizona State University, November 2009, Table 4: Average direct wages and salaries divided by direct employment.

³⁹ Outside of the rural US Deep South where a long history of racial inequality has led to persistent poverty, mining and other natural resource counties are prominent among the persistently poor non-metropolitan counties. “Mining the Data: Analyzing the Economic Implications of Mining for Non-metropolitan Regions,” William R. Freudenburg and Lisa J. Wilson, *Sociological Inquiry*, 72(4), Fall 2002. Also, The Revised ERS County Typology: An Overview, 1994, Peggy J. Cook and Karen L. Mizer, Economic Research Service, Rural Development Research Report Number 89, US Department of Agriculture. Compare the mining counties with the persistent poverty counties, pp. 8 and 24.

⁴⁰ The Regional Economic Information System 1969-2000 CD-ROM (Bureau of Economic Analysis, US Department of Commerce) was the source of the data. A county was included as “mining-dependent” if the data indicated that for at least one year in the 1970-1979 or 1980-1989 period “mining” less “oil and gas” earnings were 20 percent or more of total earnings by place of work.

⁴¹ If a few firms dominated local mining, federal regulations prevent the release of the mining data for that county. This is often a problem in any given year, but is less of a problem when looking at 20 years of data since mining data often will be

The US mining-dependent counties are spread out over half of the American states but are geographically clustered in the Appalachian (Pennsylvania, West Virginia, Tennessee, Kentucky, and Virginia) and Mountain West states. The century-old copper mines of Arizona, New Mexico, Montana, Utah, and Upper Michigan are included as are the new gold mines in Nevada. The older coal mines in the southern regions of the Great Lakes states (Illinois, Indiana, and Ohio) are included as are the new open pit coal mines of Wyoming, Montana, Utah, Colorado, and New Mexico. The lead mines of the Ozarks in Missouri, the precious metal mines in the Black Hills of South Dakota and the Silver Valley of Idaho, and the iron fields of Minnesota are also included.

The question we seek to answer is whether this high degree of reliance on mining allowed these counties to out perform counties that did not specialize in mining. Economic performance was measured in terms of the growth in the total income received by residents, the aggregate labor earnings of residents of the county, per capita income, and population. In addition, the level of per capita income at the beginning and end of the periods was analyzed.

The decade of the 1980s was not good for mining-dependent counties. Aggregate labor earnings in those counties grew much more slowly than in other counties, almost 60 percent slower. During the 1990s earnings were still growing more slowly in mining-dependent counties, 25 to 30 percent slower. In the 2001-2008 period⁴², however, rising metal and coal prices led to a recovery of some mining counties after 20 years of depressed economic vitality. During that period, although mining counties saw much slower population growth, the earnings and per capital income of the residents of mining counties grew faster than in other counties for the first time in 20 years. Per capita income and residents' labor earnings grew 13 percent faster in mining-dependent counties while total income grew 9 percent faster. For the whole period 1980-2008, despite the resurgence of mining activity in the most recent period, however, aggregate earnings and per capita income still grew significantly more slowly. Mining-dependent county earnings grew over a third slower, personal income almost a quarter slower, and population and per capita income about an eighth slower. See the table below.

Given this poor economic performance in US mining-dependent counties despite the high wages paid by mining, it is not surprising to find that population growth in these counties was negative during the 1980s and significantly slower than in the rest of the nation in the 1990s. Population growth continues to be significantly slower during the 2001-2008 period too. See the table below.

available for at least one of those years and thus qualify it as "mining-dependent." The number of counties that would have been labeled mining-dependent if it were not for these data disclosure restrictions is unknown. However, our analysis identified about the same number of mining-dependent counties as other studies, about 100 counties dependent on solid minerals and another hundred dependent on oil and gas extraction. Kenneth Deavers and David Brown in a 1985 study identified a total of 199 counties in these two categories (Natural Resource Dependence, Rural Development, and Rural Poverty, Economic Research Service, US Department of Agriculture. Rural Development Research Report No. 48). A 1994 study identified only 146 mining-dependent counties (including oil and gas counties) (Peggy Cook and Karen Mizer, The Revised ERS County Typology, Economic Research Service, Rural Development Research Report Number 89, US Department of Agriculture).

⁴² In 2001 the U.S. Department of Commerce shifted its industrial categories from the Standard Industrial Classification to the North American Industrial Classification. Instead of reporting on total mining and the sub-categories of metal mining, coal mining, oil and gas, and other mining, it reported only on the sub-categories of "oil and gas extraction" and "mining except oil and gas." The 2000 and 2001 data cannot be directly compared, hence our use of the 2001-2008 period. For the 1980 to 2000 period we approximated the "mining except oil and gas" by subtracting "oil and gas" from total mining.

Ratios of Growth in Economic Vitality Indicators				
Growth in Mining Dependent/Growth in Non-Mining Dependent				
	1980-1990	1990-2000	2001-2008	1980-2008
Personal Income	0.59	0.82	1.09	0.76
Population	-0.85	0.50	0.65	0.87
Per Capita Income	0.72	0.95	1.13	0.88
Earnings	0.41	0.69	1.13	0.64

Source: US Dept. Comm., BEA, REIS Local Area Income

Despite the high wages paid in mining, the level (as opposed to the growth rate) of per capita income was also lower in the mining-dependent counties and, given the slower growth, the gap increased relative to the rest of the nation between 1980 and 2000. The gap grew to \$9,500 per person by 2000. In 2008 there was still a gap in per capita incomes in the mining counties, but the gap had narrowed to \$3,000.⁴³ See the table below.

Level of Per Capita Income: Mining Dependent and Non-Mining Dependent Counties				
	1980	1990	2000	2008
Mining-Dependent	\$8,390	\$13,754	\$20,099	\$30,240
Non-Mining Dependent	\$10,201	\$19,622	\$29,548	\$33,191
Difference	-\$1,811	-\$5,868	-\$9,449	-\$2,951

Source: US Dept. Comm., BEA, REIS Local Area Income, and author's calculations.

It is clear that over the last several decades, dependence on mining did not provide a reliable path to prosperity that allowed mining communities to perform better than other American communities. In fact, mining-dependent communities lagged significantly behind the average for the rest of the nation.

These are not new results. US Department of Agriculture analyses of mining-dependent counties have also pointed out the slower economic growth and lower per capita incomes in mining-dependent counties.⁴⁴ In addition recent report by the US Census Bureau providing *Profiles of Poor Counties* showed, when counties are classified by the type of industry that dominates the local area, mining counties had the highest poverty rates of any industrial group and that poverty rate increased systematically between 1989 and 1996.⁴⁵

⁴³ Most mining operations are located in non-metropolitan areas where average incomes, in general, are lower. If the mining-dependent counties are compared only to other non-metropolitan areas as opposed to *all* counties, both metropolitan and non-metropolitan, it is still true that the mining-dependent counties have lower per capita incomes and that they lost ground relative to other non-metropolitan counties during the 1980-2000 period. This is also true for most mining regions even if the mining-dependent counties are compared only with the other non-metropolitan counties within the same state. Of the 24 states with mining-dependent counties, only 5 (MT, MN, MI, GA, and SD) had per capita incomes above the state's non-metropolitan average in 1990 and per capita incomes in the mining communities within those five states were only 4 to 9 percent higher. In 2000 the per capita incomes of mining-dependent counties exceeded that of the state's non-metro areas in only 3 states. In 2008, despite the expansion of mining, 17 of the mining states still had non-metro per capita income above that in the mining-dependent counties. The average per capita income in the mining-dependent counties remained below the per capita income in the non-metropolitan areas for 1970, 1990, 2000, and 2008. In 1980 the per capita income in mining-dependent counties was 5 percent above the national non-metropolitan per capita income.

⁴⁴ See the studies cited in footnote 37 above.

⁴⁵ Profiles of Poor Counties: Some Empirical Evidence, Patrick Cardiff, US Census Bureau, Small Area Income and Poverty Estimates, FB3-1065, Washington, DC 20233, 1999.

<http://www.census.gov/hhes/www/saie/asapaper/Cardiff99.pdf>

Unemployment is also higher in mining-dependent counties in the US. For instance, unemployment rates in coal mining counties⁴⁶ are significantly above the average unemployment rate in the state where the county is located. Averaged over the 1990-2000 period and across all coal-mining counties, the unemployment rate in those counties was 55 percent above the state average rates. For some states such as Arizona and Virginia, the coal county unemployment rates are two to three times higher than the state unemployment rates. See the table below. Given the ongoing job losses in most coal mining counties due largely to labor-displacing technological change, these high unemployment rates might be expected. During the 1980s, for instance, the layoff rate in the mining industry was the highest of all the major industrial groups in the US and the rate of job displacement in coal mining was much higher than in mining as a whole.⁴⁷

Ratio of the Unemployment Rates in US Coal Counties to the Statewide Average Unemployment Rate, 1990-2000								
AL	AZ	CO	IL	IN	KY	MT	NM	ND
1.05	2.64	1.31	1.50	1.38	1.64	1.76	1.38	1.82
OH	PA	TX	UT	VA	WV	WY	All US Coal Counties	
1.75	1.44	1.23	1.73	2.95	1.27	1.02	1.55	

Source: US Department of Labor; author's calculations

The important point to be drawn from all of these statistical results is that these mining activities, in general, have not triggered sustained growth and development in the local regions where the mining took place. Closure of mines in the late 19th and early 20th centuries often led to “ghost towns” and abandonment of a mining region. Where mining persisted over longer periods, it did not trigger a diversification of the economy. Instead, as labor saving technologies reduced employment opportunities, the region around the mines became distressed with high unemployment and poverty rates.⁴⁸ As mining again began to expand in the 2001-2008 period, counties that depended on mining made up some of the losses over the previous twenty years, but still lagged behind other counties that were not mining-dependent and remained vulnerable to downturns in the mineral economy such as happened in 2009 and almost certainly will take place again.

3. Explanations for the Poor Economic Performance of Mining Communities

The explanation for this poor economic performance despite the local economy’s specialization in a very high wage industry lies in the instability of employment and income associated with mineral development activity. The experience of Arizona with copper mining dramatizes this. Copper industry employment in Arizona in 1974 was 28,000. By 2003 it had tumbled, with some weak efforts at recovery, to 5,900 jobs. Almost 80 percent of the copper jobs had been lost. With rising copper prices, employment recovered between 2003 and 2008 to 11,000, still only 40 percent of the 1974

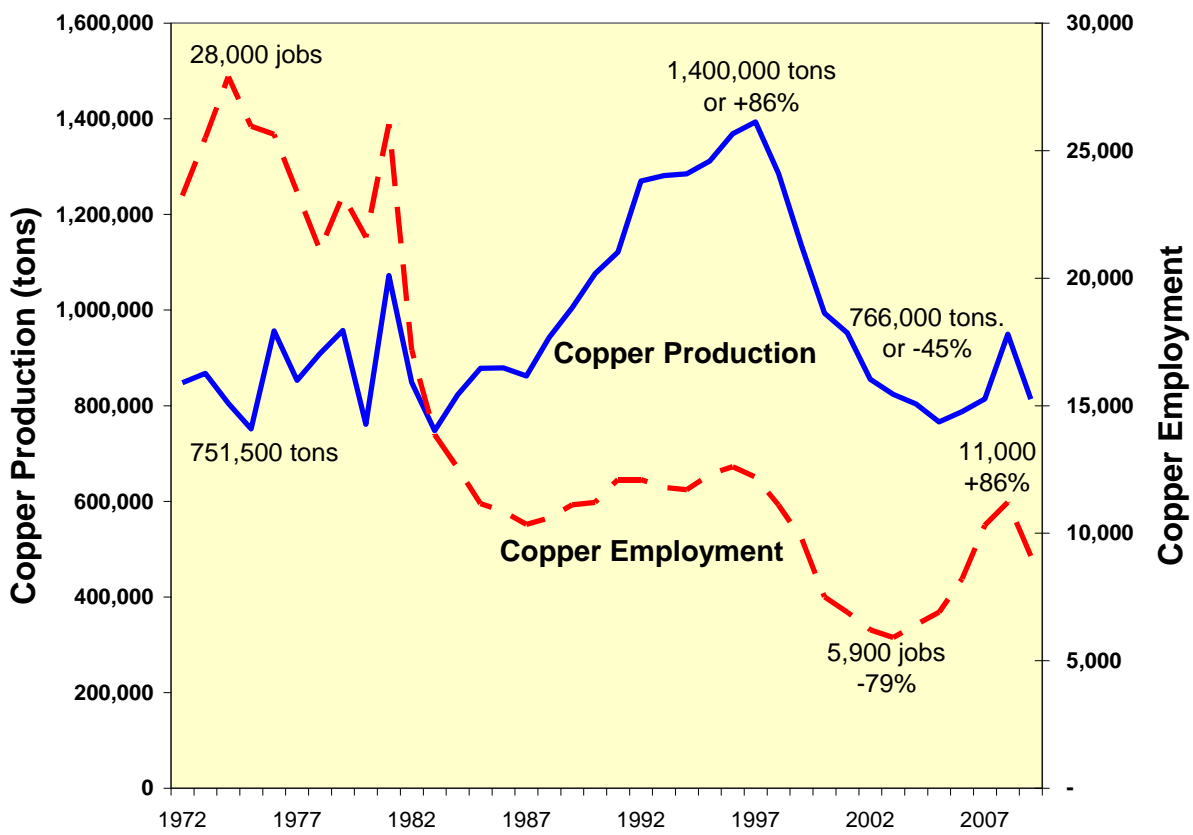
⁴⁶ A US county was categorized as being a “coal mining county” if it had 200 or more coal miners in its work force. There were 99 such counties out of America’s 3,100 counties. The Regional Economic Information System (US Bureau of Economic Analysis) was the source of the employment data; US Department of Labor the source of the unemployment data for the years 1990-2000.

⁴⁷ “The Industrial structure of job displacement, 1979-88, *Monthly Labor Review*, September 1992, pp. 17-25.

⁴⁸ A 2002 review of the literature dealing with the economic characteristics of mining-dependent rural communities in the US confirms these results. Of the 301 quantitative economic findings in scholarly studies about how mining-dependent communities fared relative to other communities, there were almost two negative impacts reported for every positive finding (1.87:1). See “Mining the Data: Analyzing the Economic Implications of Mining for Non-metropolitan Regions,” William R. Freudenburg and Lisa J. Wilson, *Sociological Inquiry* 72(4):549-75. “Rural” is used loosely here to refer to non-metropolitan areas that can have urban areas with populations of up to 50,000.

peak copper employment, but then tumbled again in 2009. Mineral development almost always has such a boom-bust aspect to it that is tied to the wide fluctuations in world commodity prices. See the figure below.

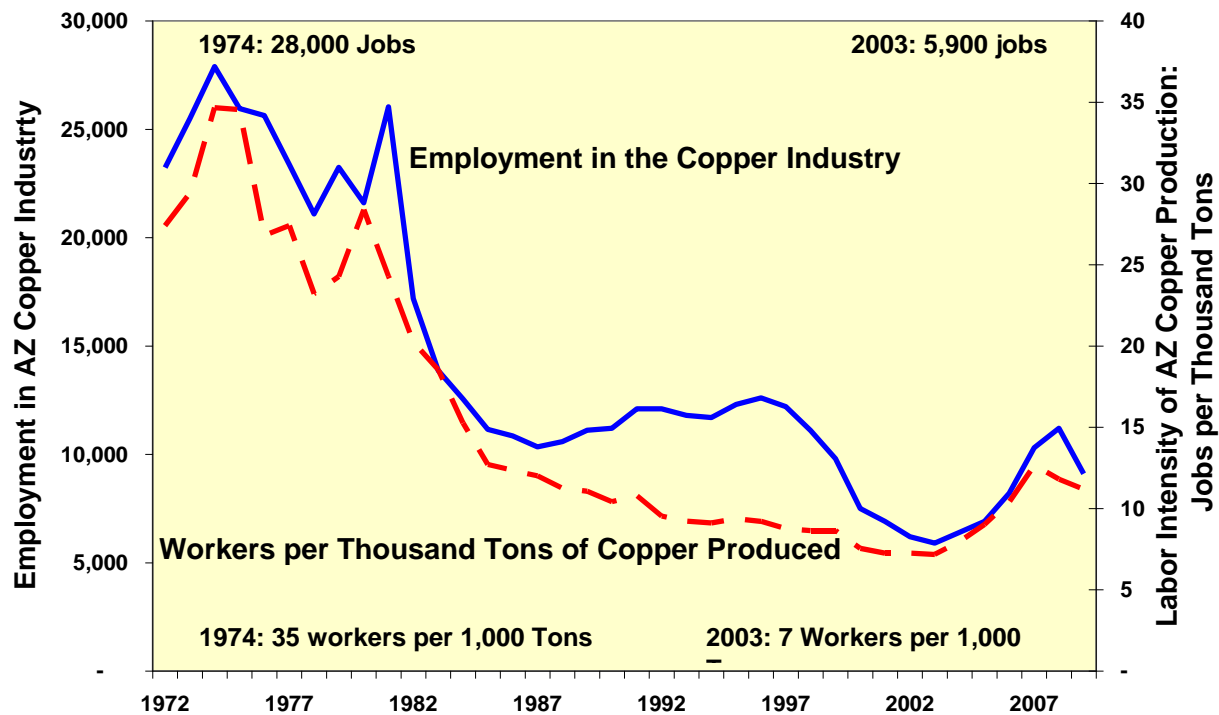
Arizona Copper Production and Employment



In addition, technological change is constantly reducing the number of jobs associated with any given level of copper production. Notice in the figure above that as production of copper in Arizona almost doubled between 1983 and 1997, employment continued to decline and then stabilized at a relatively low level. The productivity record, for instance, in copper mining over the last quarter century is indicative of the mining industry as a whole. In Arizona's copper industry, copper output per worker has increased five fold since 1974. Put the other way around, the labor requirements have been cut to a fifth of what they were in 1974, from 35 workers per 1,000 tons of copper produced to just 7 workers. See the figure below.⁴⁹

⁴⁹ Data from the Arizona Department of Mining and Mineral Resources and from the Western Economic Analysis Center annual reports on "The Economic Impact of the Arizona Copper Industry," George F. Leaming.

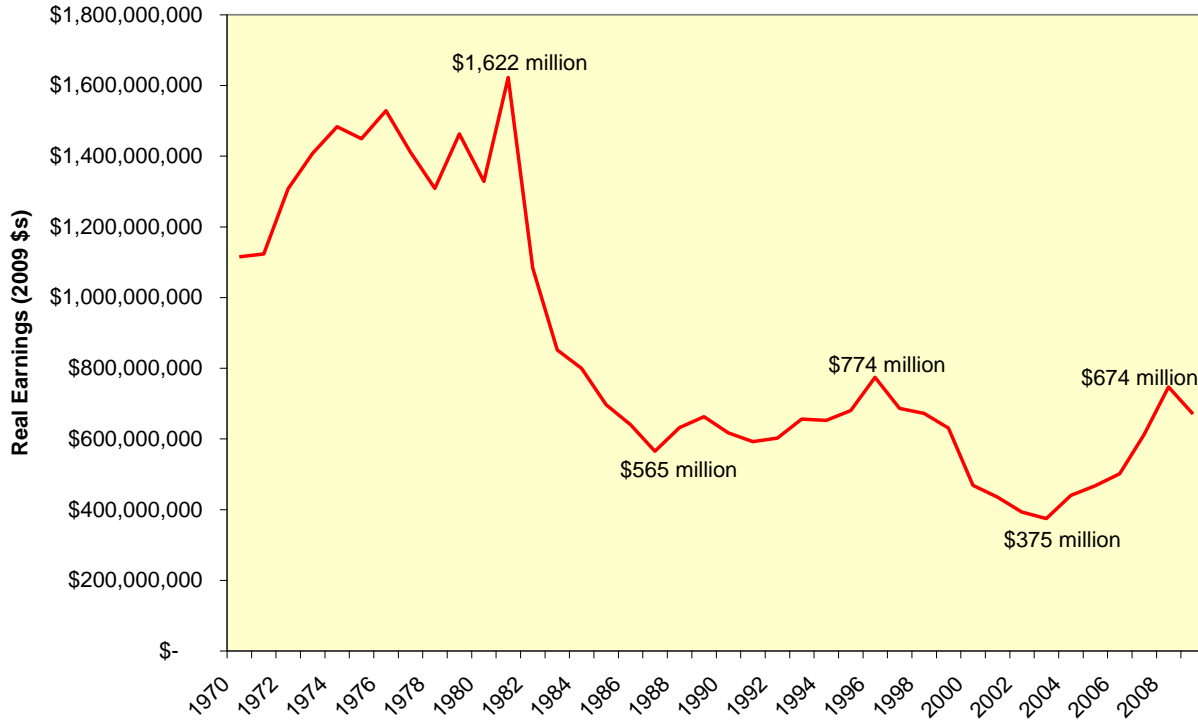
Declining Labor Intensity and Employment In Arizona Copper Industry



This labor-displacing technological change has helped copper mining companies control costs and remain competitive while processing lower and lower grade ores. The downside of this growth in labor productivity for workers and communities is that the labor required per unit of production has continued to fall, reducing the number of jobs associated with the industry. Thus even if production is stable, employment continuously falls. Only constantly expanding mineral development can maintain stable employment, and this is rarely possible over the long run in any particular area. A small part of the impact of declining employment in the copper industry has been offset by rising wages for the remaining workers. This, however, has not eliminated the substantial swings in real wages and salaries in the copper industry over the last forty years. The decline from the peak to the last trough is more than 75 percent even when measured in terms of copper payroll rather than employment. See the figure above.⁵⁰

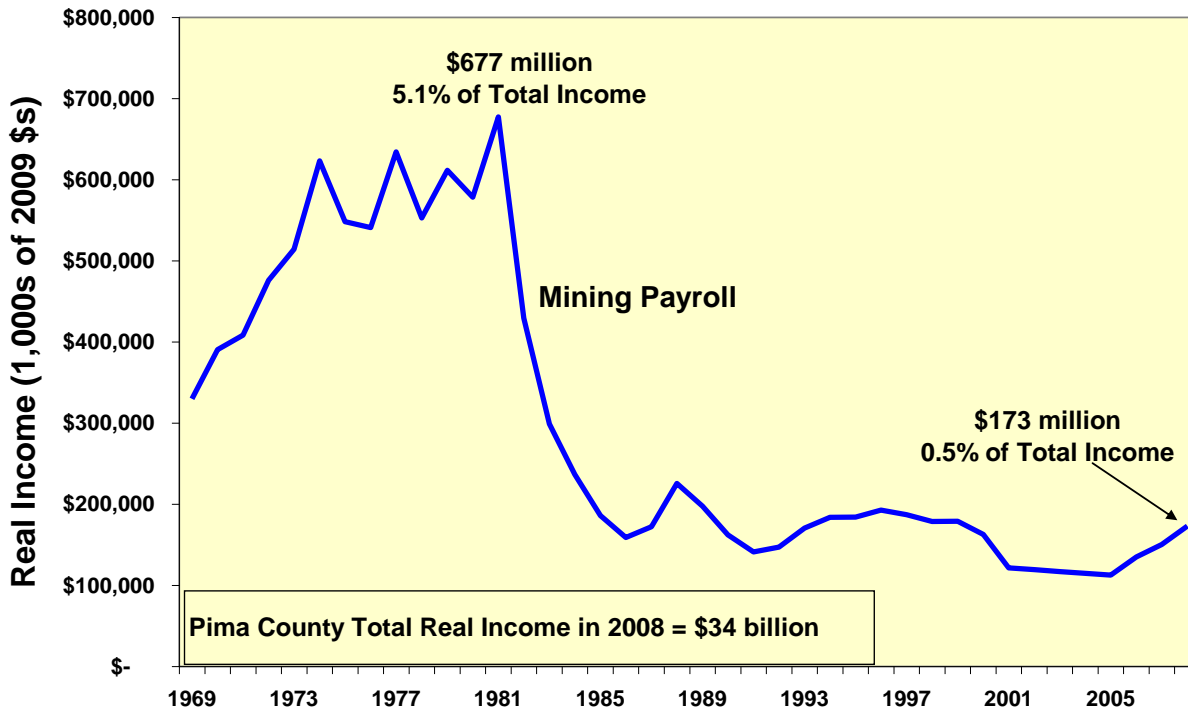
⁵⁰ This chart combines data on total wages in the Arizona copper industry from the Arizona Department of Mining and Mineral Resources through 1989. For 1990-2009 the data is from the Western Economic Analysis Center on personal income flowing directly from the Arizona copper industry. The personal income figures have been reduced by 12.6 percent to reflect just the wages and salaries portion based on the relationship between the WEAC personal income and wages and salaries for the 2004-2009 period.

Real Payroll in Arizona Copper Industry



The decline in the copper industry also had a direct impact on the Greater Tucson area. In 1974 the mining industry payroll in Pima County was \$677 million in today's dollars. By 2008 the mining industry payroll had fallen to \$173 million. Over 75 percent of the mining payroll had disappeared. Despite that decline in the income that mining was injecting into the Pima County economy, the economy expanded. As a result the contribution that the mining industry was making directly to the income received by residents fell from 5.1 to 0.5 percent. Mining was only a tenth as important as a source of income in Pima County in 2009 as it was in 1974. See the figure below.

Real Earnings In Mining : Pima County



Another source of declining employment and earnings in mining is that mineral deposits are always, ultimately, exhausted, and the industry has to shift to new geographic areas. In addition, because of the high profits that are associated with periods of high metals prices and profit squeezes when metal prices fall, there tends to be ongoing struggles between miners and mining companies over the sharing of those profits and losses. This has led to often bitter and extended strikes and lockouts that have also taken their toll on local communities, adding still another source of economic instability. Finally, mineral extraction tends to be land intensive, imposing a disruptive footprint on the natural landscape and contributing to significant environmental degradation. This makes mining-dependent areas less attractive places to live, work, and do business, depressing economic diversification and development.

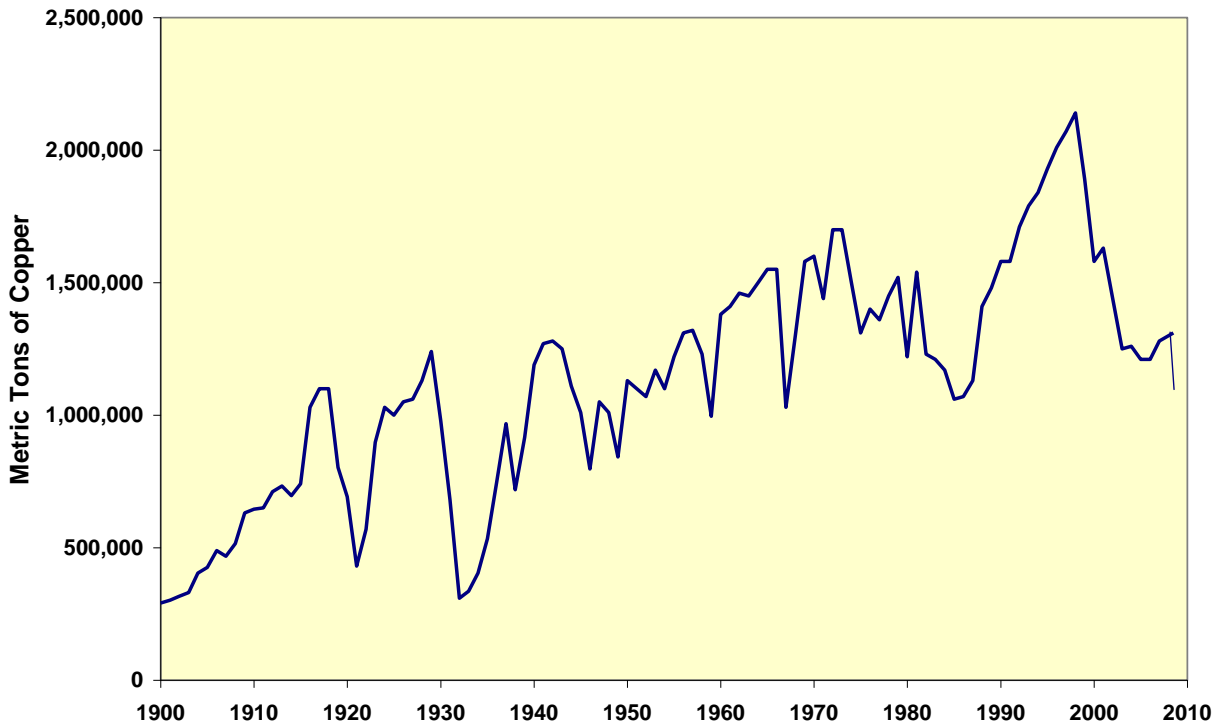
These well-known sources of economic instability in mining-dependent economies lead businesses and households to be very cautious about the investments they make in areas dependent on mining. Since workers, residents, businesses, and local governments do not know how long the employment and payrolls will last, they reduce their risk by avoiding fixed investments that may be lost if the mineral industry enters a period of decline. As a result, mineral workers commute long distances to jobs, maintaining residences at some distance from the mineral development. Businesses are hesitant to develop local commercial infrastructure and local governments are hesitant to finance public infrastructure with debt. The result is a less fully developed local economy and more income leakage out of the local economy. In short, excess dependence on mining tends to constrain local economic development, leading to the depressed economic conditions that have come to characterize many mining-dependent areas.

The policy implications of this description of the problem are straightforward.

- a. A commitment to mining is probably not a good economic development strategy because of the instability it can bring to the local economy. Diversification away from relying on mining can reduce the vulnerability of a community.

- b. In addition, avoiding additional environmental damage associated with new mining and repairing the damage associated with past mining is important in making the community an attractive place for current and new residents and businesses which promotes long-term economic development and health.
- c. Finally, projecting that a mine will operate continuously for 20 or more years with more or less constant employment and payroll (when adjusted for inflation) is unrealistic because it ignores the market cycles in copper prices and production and the ongoing deployment of labor-saving technology. For more than a century, copper production and employment have fluctuated widely disrupting communities that depend on mining. There are no twenty- to thirty-year periods when major expansions and then contractions did not take place. See the figure below.

U.S. Primary Copper Production: 1900-2009



IV. Rosemont Copper's Projections of Economic Impacts

1. Introduction

Rosemont Copper's website cites a report done by Arizona State University as the basis for Rosemont's optimistic projections about the positive impacts the proposed Rosemont copper mine will have on the local and state economies.⁵¹ The authorship of this report is unclear. Rosemont says that Arizona State University was the source of the report and the version of the report on the Rosemont website indicates that it was produced by the Seidman Research Institute at Arizona State.

However, another version of the report that appears to be identical except for the cover page indicates that Dr. Madan M. Singh, the Director of the Arizona Department of Mines and Mineral Resources (ADMMR) was the author. That version carries the seal of the State of Arizona and indicates that it is a Special Report of the Arizona Department of Mines and Mineral Resources.⁵² Dr. Singh is a mining engineer, not an economist, and is not on the faculty of Arizona State University. It is unlikely that he would have run the REMI regional economic model to estimate the local and state impacts of the proposed Rosemont Mine. That model is a complex proprietary economic model comprised of thousands of simultaneous equations that a consortium of Arizona agencies, including Arizona State University, has leased.⁵³ The reason for the ambiguity over the source and authorship of this report is unclear. It certainly does not contribute to confidence in the credibility of the report itself.

In the following review of the Rosemont economic impact report, we reach the following conclusions:

- i. The lack of detail on the application of the Regional Economic Models, Inc. (REMI) economic model to the proposed Rosemont Mine and the proprietary nature of the model makes it impossible to evaluate the reliability of the projected economic impacts. The economic modeling results are largely "black box" results.
- ii. The economic impact modeling *assumes* that the impacts of the proposed large open pit copper mine are positive. The only thing the modeling attempts to determine is the size of the already assumed positive impact. The mine is *assumed* to have no negative impacts on other commercial activities and no non-market economic costs.
- iii. The modeling assumes that the economic impacts of the proposed Rosemont Mine will be almost constant over the 20-year operational life of the mine. Actual experience with copper mining over the last forty years in Arizona indicates that this will not be true. The economic impacts, instead, are likely to be unstable and variable.
- iv. The Rosemont economic impact modeling indicates that the projected Rosemont mining jobs will pay only modestly above average wages in the Tucson area. The impact study projects that the Rosemont mining pay will be well below average pay in all mining activities and, in particular, all copper mining activities elsewhere in Arizona.
- v. The number of direct mining jobs the impact study projects for the Rosemont project will be quite modest, about 400. This represents about a 1 in 1,500 job increase in the three-county study area.

⁵¹ <http://www.rosemontcopper.com/economics.html> . "An Assessment of the Economic Impacts of the Rosemont Copper Project on the Economies of the Cochise/Pima/Santa Cruz Counties Study Area, the State of Arizona, and the United States," prepared by the L. William Seidman Research Institute, W.P. Carey School of Business, Arizona State University, November 2009.

⁵² <http://www.admmr.state.az.us/Publications/sr26RosemontImpact.pdf> .

⁵³ http://www.remi.com/index.php?page=structure&hl=en_US .

vi. The Rosemont economic impact study projects that the indirect and induced jobs triggered by the Rosemont Mine would have average pay that is implausibly high, far above actual pay levels for such jobs in the Tucson area.

vii. The “multiplier” impacts on the rest of the local and state economy of the Rosemont Mine are implausibly large. It is not clear what assumptions led to those very large impacts.

2. The Transparency of the Rosemont Economic Study Results

The REMI economic model used for the Rosemont economic impact study is a proprietary model owned by Regional Economic Models, Inc. that is leased to organizations at a cost of a hundred thousand dollars or more depending on the number of individuals and organization that will be allowed to make use of the model. For those who have not leased the model, this means that it is largely a “black box” whose particular application, assumptions, operation, and use cannot be analyzed and confirmed.

This is not a criticism of the REMI economic model itself but, rather, of its application and use which cannot be analyzed or replicated by those who have not incurred the expense of leasing the model. That distinction between the economic model itself and its use is important. Economic models of this sort are often used primarily for public relations purposes, to show how important or beneficial a particular special interest is to the overall community. The explicit intention of those using these economic models is to wrap a special interest in the public interest by demonstrating that there is actually a coincidence of interests. It is not just private businesses such as Rosemont that use these economic models in this way. Non-profit organizations and public agencies do the same. Public universities, for instance, regularly use such models to demonstrate the contribution they make to the local economy. Regional fine arts advocates often do the same. Any group that wants to enhance its public image finds these models useful for what is, in essence, a public relations effort rather than an objective economic analysis. The users of the models know that they will produce only positive results. The only question is how large they can make that positive result as they manipulate the model.

The only tests that someone who has not leased the model can apply to any particular application of a model like REMI are the consistency and plausibility of the results. In this particular application of the REMI model to the Rosemont mine, some of the results are plausible while others appear to be clearly in error.

3. A Summary of the Major Conclusions from the Rosemont Economic Impact Study

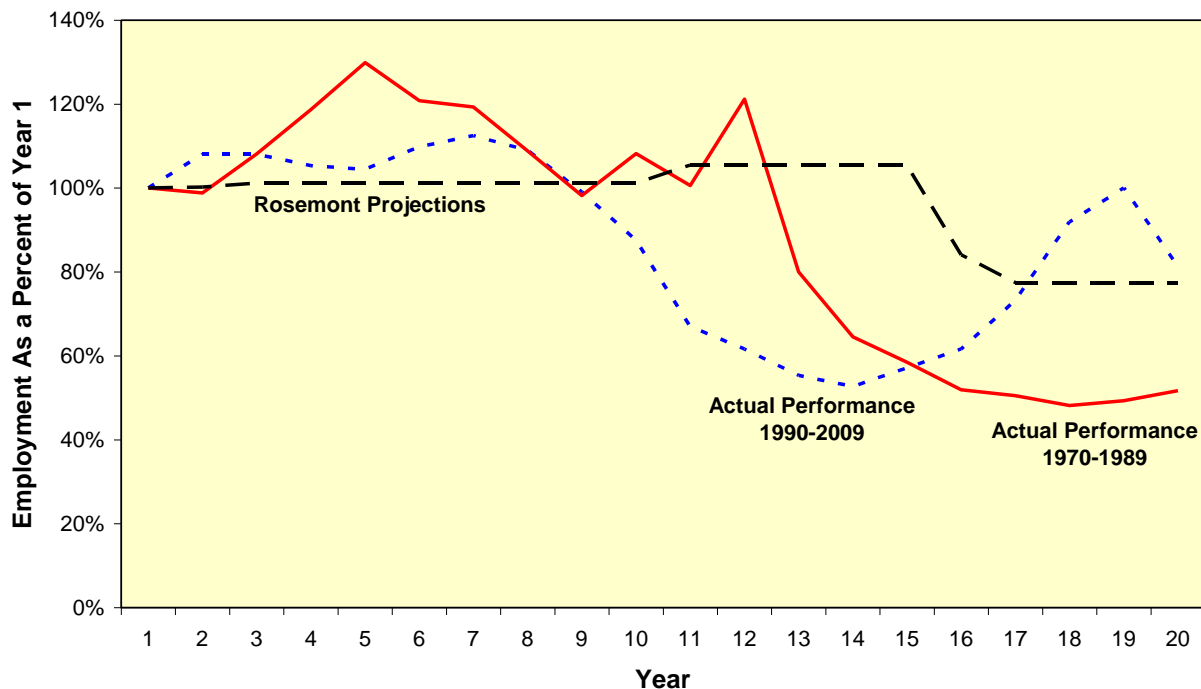
One of the most important conclusions of the Rosemont economic impact study is that all of the economic impacts associated with the proposed mine are **positive**. Jobs are created, but no other jobs are eliminated. Income and tax revenues increase, but no sources of income and tax revenues are lost and no additional services have to be funded out of the new tax resources to serve the mine or its employees. No environmental costs are discussed or quantified. Besides the investment and operations costs associated with the proposed mine, there are, according to this study, no other costs that are borne by parties not affiliated with the Rosemont operation. This is an implausible conclusion to draw about the economic impacts associated with a very large open pit copper mine.

The Rosemont economic impact study finds only positive impacts associated with the proposed mine because it focuses only on the economic impacts associate with the mine’s spending. The study also effectively “manicures” these projected spending impacts over the next two to three decades by assuming an implausibly smooth spending pattern and job and earnings impacts. If the pattern of Rosemont projected job impacts is compared to the actual pattern of Arizona copper industry jobs over the two most recent twenty-year periods, 1990-2009 and 1970-1989, the difference is dramatic. The Rosemont projection is for an almost perfectly smooth level of employment for the first 16 years and then a 20 percent phase down in preparation for closing the mine. Of course that is not what Arizona has experienced

with copper industry employment over either of the last two 20-year periods when employment rose and then plummeted by 50 percent. See the figure below.

As discussed elsewhere in this report, that past actual pattern of employment over time was not unique to Arizona or to copper mining. It is part of the cyclical pattern in mining and also reflects the ongoing deployment of labor-displacing technology in mining. In discussing the positive employment and earnings impacts projected for the Rosemont mine, these cycles of boom and bust overlain by ongoing reductions in employment also should have been discussed since they disrupt households, other businesses, and communities. That is, they are a cost associated with reliance on copper mining.

Rosemont Projected Employment Compared to the Two Most Recent 20-Year Periods of Arizona with Copper Industry Employment



4. Many High Paid Jobs?

The Rosemont economic impact study’s projected modest *level* of direct employment associated with the *operation* of the proposed mine, about 400 jobs⁵⁴, is plausible. Despite the size of the proposed mine and its projected level of production, ongoing technological change has allowed higher and higher levels of production per person employed in copper mining. This, in turn, has reduced the labor demand associated with even a relatively large copper mine to a quite modest level.

Total employment in the three-county study area was about 600,000 in 2008.⁵⁵ The 400 projected Rosemont jobs would represent about one job in 1,500 for the area. This modest level of employment has several important implications.

⁵⁴ Table 4, average employment over the production phase is 406.

⁵⁵ U.S. Department of Commerce, Regional Economic Information System, Pima, Santa Cruz, and Cochise Counties.

First, no matter what reasonable “multiplier” is applied to these 400 mining jobs to take into account indirect and induced impacts, the total impact will be quite small in the regional economic context. Second, since this is the primary public benefit of the proposed mine, this small benefit will not justify incurring significant public costs. Third, the negative impacts of fluctuating mine employment due to normal economic cycles in the international copper market will not significantly disrupt the regional economy even though the fluctuations in copper mining employment and income may disrupt families and rural communities.

The Rosemont economic impact analysis provides projections of annual payroll during the operation of the mine in addition to annual employment at the mine. The average wages and salary expenditures over the production life of the mine are projected to be \$20.2 million. For the average of 406 jobs, this is just under \$50,000 per Rosemont mining job. The average pay per job in Pima County in 2008 was about \$42,000. So the Rosemont mining jobs are projected to pay about 18 percent above average pay. That certainly is a positive feature of these jobs but it is at least partially offset by the expected instability of employment in copper mining. Interestingly, the projected \$50,000 pay level is somewhat below what the average mining job in Pima County paid in 2008, namely \$55,000 per year.⁵⁶ That average mining pay in Pima County was well below the average mining pay across the state as a whole which was about \$67,000 in 2008. Average pay specifically in copper mining across Arizona, however, was slightly higher, about \$69,000 per year.⁵⁷ That is, the pay in copper mining jobs across the state was almost 40 percent higher than projected for the Rosemont mine. This may reflect the fact that Rosemont expects to be able to take advantage of the lower level of mining pay in the Tucson area.

The Rosemont economic impact analysis also projects the wages and salaries and employment associated with the various jobs that would be created indirectly by the purchases of supplies and materials by the mine and induced by the mine workers spending their pay. That allows the calculation of the average pay per job in those “indirect and induced” jobs. These jobs include both relatively low-paid jobs such as convenience store and fast-food restaurant jobs as well as relatively well-paid jobs in equipment manufacturing and health care. Those Rosemont impact projections do not appear plausible and raise questions about the application of the REMI model. For instance the implied average pay across all of the direct and indirect jobs that the Rosemont mine is projected to create is \$60,500.⁵⁸ This is significantly higher than the projected average pay per mining job at the Rosemont, Mine, not a plausible outcome. The average pay per mining job implied by these total employment and earnings impacts is also much higher than the projected pay per Rosemont job, \$71,000 per year versus about \$50,000 per year. For some of the jobs listed, the pay per job is implausibly high, \$300,000 per year, for instance, in manufacturing jobs. See the table below.⁵⁹

⁵⁶ U.S. Department of Commerce, Regional Economic Information System. All average pay per job statements from this source are in constant 2009 dollars.

⁵⁷ The Economic Impact of the Arizona Copper Industry 2009, George F. Leaming, Western Economic Analysis Center, March 2010, payroll divided by employment, Tables 10 and 11.

⁵⁸ Earnings by place of work divided by total jobs, Appendix Tables A11 and A12. Stated in 2008 \$s.

⁵⁹ Some of these differences may be tied to the way the REMI model treats supplements to wage and salary disbursements. The National Income and Product Accounts include employer contributions to retirement and insurance. The footnote on Tables A12 suggests that REMI is using the same definition since the language is identical to that used in the U.S. Department of Commerce Regional Economic Information System from which the Pima County pay per job was calculated. It is also possible that the definition of a “job” is different. In the federal economic accounts “jobs” include both full- and part-time jobs.

Pay Levels Projected by the Rosemont Economic Impact Study Versus Actual Pima County Pay Levels 2008					
Industry Sector	Rosemont Economic Impacts during Production			Actual Pay per Job with NIPA Benefits	Percentage Difference Rosemont Projected Versus Pima County Actual with Estimated Benefits
	Jobs	Annual Earnings incl. Benefits (\$milions)	Implied Pay per Job		
Manufacturing	17	5.1	\$ 300,000	\$ 82,337	264%
Wholesale Trade	41	4.7	\$ 114,634	\$ 54,529	110%
Retail Trade	163	8.8	\$ 53,988	\$ 28,107	92%
Information	12	1.8	\$ 150,000	\$ 56,133	167%
Finance and Insurance	42	3.6	\$ 85,714	\$ 34,986	145%
Administration and Waste Services	90	3.7	\$ 41,111	\$ 26,198	57%

Source: Appendix Tables A11 and A12, Rosemont Economic Impact Analysis

5. The Impact of the Assumed Multipliers

As mentioned above, the Rosemont economic impact analysis includes the “ripple” or “multiplier” effects associated with the mine purchasing supplies, equipment, and services from local, state, and national businesses. In addition, the projected impacts include the effects of Rosemont workers spending the income they earn.

Unlike the “direct” impacts which involve the number of people who will be employed and what they will be paid, these other “indirect and induced” impacts are estimated using the REMI economic model. These additional estimated impacts are very large. The 400 direct mining jobs projected for the Rosemont Mine have an annual payroll of about \$20.2 million dollars associated with them. But after the indirect and induced impacts are taken into account, the “total” impact on employment in the three-county study area is over five times that number of jobs and almost seven times that level of payroll. At the state level, the implicit multipliers are seven times the number of jobs and almost 11 times as much personal income. By the time the analysts get to the national level, the job impacts are 10 times the original 400 direct jobs (4,169 jobs) and over 17 times as much income. See the table below.

Direct and Total Impacts Projected for the Rosemont Mine Annual Average Over 20-Year Production Period			
Geographic Area	Direct Impact	Total Impact	Implicit Multiplier
<u>3-County Local Area</u>			
Employment	406	2,106	5.2
Personal Income	\$ 20,200,000	\$ 139,800,000	6.9
Government Revenue	\$ 6,200,000	\$ 18,800,000	3.0
<u>State of Arizona</u>			
Employment	406	2,906	7.2
Personal Income	\$ 20,200,000	\$ 214,100,000	10.6
Government Revenue	\$ 6,200,000	\$ 31,900,000	5.1
<u>United States of America</u>			
Employment	406	4,169	10.3
Personal Income	\$ 20,200,000	\$ 352,300,000	17.4
Government Revenue	\$	\$ 127,500,000	

Sources: Tables 4, 5, 9, 10, 11

Note: The direct impact on personal income is wage and salary income.

The implicit multipliers are as large as they are because the proposed mine is projected to hire so few workers and has such a modest payroll. While the mine is projected to spend \$20 million per year paying its workers during the twenty-year production phase of the mine, it is also projected to spend another \$232 million per year on other things.⁶⁰ That is, only 8 cents out of every dollar spent is spent on payroll. About \$74.4 million of these non-labor operations costs are assumed to be spent in the three-county area around the mine on supplies, equipment, and services. Within the state those non-labor expenditures are projected to total \$93 million.

These results just do not seem plausible. It should be kept in mind that Tucson is not a major mining supply center. Arizona is not either. This is important because specialized equipment and services associated with copper mining, concentrating, refining, smelting, etc. usually are not obtained within the local economy. For instance, the huge haul trucks, draglines, and mechanical shovels used in mining along with the specialized concentrating and refining equipment, for instance, may not be produced in Arizona. In carrying out the economic impact analysis, the analyst has to make a judgment about what part of the equipment and supplies can actually be produced locally and, even when it is produced locally, how much equipment and supplies have to be imported to support that local production. Inaccurate representation of the capacity of the state and local economy to produce those goods and services can significantly exaggerate the local employment and income impacts. At the extreme, for example, if one were to attribute to an automobile dealership all of the employment and income associated with the manufacturing of the automobile and its parts and all of the transportation costs of getting it to the Tucson area, one would get an estimate of “total” jobs and income that greatly exaggerated the actual contribution the dealership made to the local economy.

6. Conclusions

The Rosemont “economic impact analysis” should not be interpreted as an economic analysis of the impacts of the proposed Rosemont copper project. Economic impact studies such as Rosemont’s are largely public relations exercises designed to demonstrate the positive impacts that proposed projects will have on the local economy. This allows private projects to demonstrate public economic benefits that can help justify requests to make use of public resources. By design, the “economic impacts” are always positive because external economic impacts are ignored.

Given that a large open pit copper mine is being proposed, an economic analysis that assumes no external costs simply is not plausible. In addition, even in the narrow context in which this economic impact analysis was carried out, indirect and induced employment and pay results are not plausible. The analysis also ignores the cyclical nature of the copper industry, something with which Arizona and the Tucson area have relatively recent experience.

Any reliable economic analysis of the Rosemont Mine must both accurately analyze the local job and income impacts but also consider the full range of costs associated with the proposed mine. Both the projected job and income impacts and the public costs need to be put into the larger context of the Greater Tucson economy and its long-run economic development strategy.

⁶⁰ Table 2 shows annual average expenditures of \$252.2 million to cover the non-labor costs of mining, processing, shipping, refining, smelting, and taxes. Also see table 3.

V. Economic Values Put at Risk by the Proposed Rosemont Mine

Considering Costs As Well As Benefits

As discussed in earlier sections of these comments, the economic impact study done for the Rosemont Mine focused exclusively on the financial benefits to various parties who would work for, sell materials and equipment to, or receive tax revenues from the proposed mine. Of course, if that was all there was to the proposed mine, there would be no concern about or debate over the mine: It would be a pure “blessing,” all private and public benefit, no public cost. However, rational economic decision making usually involves carefully weighing the benefits of an action and comparing those benefits to the costs and deciding whether or not the benefits, on net, justify the costs. In that typical economic situation, an analysis that suggests that there are only benefits is not very helpful.

In this section we very briefly review the most widely discussed potential public and private costs that are *external* to the Rosemont Mine in the sense that they are costs that other individuals have to carry, uncompensated by Rosemont. The point of listing these external costs is not to suggest that there are only costs associated with the proposed mine, but, rather, to make sure *all* benefits *and* costs are considered as they should be in any comprehensive and rational economic decision making

It should be pointed out that this type of critical review of the benefits and costs associated with a proposed mine is not an anti-mining perspective. Mining companies carry out exactly this type of analysis before they make investments in the development and production of mineral resources. The fact is that most known mineral deposits are left in the ground undeveloped because mineral companies have concluded that the value of the minerals once extracted, processed, and refined does not justify the costs of producing them. Some of the Rosemont ore deposits have been known for over a century but have been left undeveloped not because of environmental hostility to mining but because with previous mining technologies and mineral prices, the ore was too low grade and high cost to justify production. It was not economic. The point is that it is not “anti-mining” to leave a known mineral deposit in the ground and not mine it. That happens regularly in the mineral industry when analysis shows that the costs do not justify the costs of extraction and processing. As a result, those mineral deposits are left in the ground, un-mined.

The public and the government agencies which represent them should carry out exactly the same sort of economic analysis but from a public perspective. The Rosemont mine wishes to make use of public lands, water, air, and natural systems. The owners of those public resources, represented by various government agencies, need to analyze whether the benefits to the public will justify what will be lost to the public if these public resources are committed to the Rosemont copper project. If the conclusion is that the cost to the public outweighs the benefits to the public, it would be rational for the public to reject the Rosemont Mine’s use of those public resources. Doing so would be no more irrational or anti-mining than similar decisions that mineral companies make on a routine basis to walk away from known mineral deposits on the grounds that they are “uneconomic.”

Values Put at Risk by the Proposed Rosemont Mine

We begin with a simple list of the values that the proposed Rosemont Mine puts at risk as indicated by the ongoing dialogue within the Greater Tucson area about the mine. These are the potential costs that need to be carefully analyzed and, following a similarly critical analysis of the public benefits associated with the proposed mine, compared to those benefits:

- i. Industrialization and permanent scarring of an important part of the Greater Tucson Area's extensive network of protected lands: visual and recreation impacts.
- ii. Transformation of a scenic byway, State Highway 83, into a mine haul road dominated by oversized loads, large tractor trailers, and other mine traffic.
- iii. Industrialization of rural landscapes and communities.
- iv. Threats to air and water quality including the potential for ongoing toxic releases.
- v. Threats to water supply.
- vi. Dark skies and astronomical observation.
- vii. Wildlife habitat and wildlife corridors.
- viii. Socioeconomic impacts
- ix. Threats to cultural resources.

Threats to the Greater Tucson Area's Extensive Net Work of Public and Protected Lands

The Extent and Value of the Public Lands Encircling the Tucson Area

As discussed elsewhere in these comments, Tucson is nearly surrounded by protected lands that give this metropolitan area one of its unique qualities which is not only important to residents but is also the foundation of the Tucson area's recreation and visitor economy. Major investments have been made at the federal, state, county, and city levels to provide for and protect vast natural open spaces around the Tucson urban area. This diverse set of public lands includes National Forest and National Park lands as well as state lands, wildlife refuges, county park lands, and ranch lands that the voters of Tucson and Pima County have paid to protect from residential development. The acreage is huge, almost 2,000 square miles. Even priced at relatively low levels, the public investment value associated with these public lands is also huge, \$2.3 billion. An Appendix on Public Lands Investments attached to these comments discusses the size, diversity, and value of those lands. The table below summarizes these public lands that are so important to Tucson's unique and attractive quality of life. Note that 63 percent of the land surrounding Tucson is public land and almost a third (31 percent) is National Forest or National Park land.

Public Lands Surrounding Greater Tucson		
Jurisdiction	Area(sq mi)	Percent of Study Area
Coronado National Forest	835	27%
<i>CNF General Forest Areas</i>	667	21%
<i>CNF Wilderness Areas</i>	167	5%
Arizona State Trust Lands	595	19%
Pima County Parks & Protected Lands	162	5%
Saguaro National Park	142	5%
Santa Rita Experimental Range	79	3%
Las Cienegas National Conservation Area	77	2%
Other Federal	55	2%
Other Public	38	1%
Total Public	1,982	63%
Not Public	1,154	37%
Total Study Area	3,137	100%

Source: See Public Lands Data - Appendix B

According to the USFS Region Three National Visitor Monitoring Results (2008), there were an estimated 2.4 million visitors to the Coronado National Forest in 2007, almost 500,000 of whom visited the wilderness areas. Over 43 percent of the surveyed visitors listed eleven Pima County Zip Codes as their residences. Moreover, 48.8 percent of surveyed visitors traveled less than 25 miles to visit the National Forest and an additional 20.7 percent traveled between 25-50 miles. These data clearly show that nearly 70 percent of the visitors to the Coronado National Forest lands are residents of the Greater Tucson area.

Activities within the Coronado National Forest were also monitored in the 2008 study. The activities with the highest level of participation involved hiking or walking; viewing natural features, scenery and wildlife; and relaxing, all involving active engagement on these public lands and all dependent upon the high amenity value of the Coronado National Forest – scenic and accessible landscapes, peace and quiet; and the presence of native species.

Saguaro National Park is also contiguous to the City of Tucson. The Rincon Unit (east) of the National Park is less than 20 miles north of the Rosemont Valley where the proposed mine would be located. The backcountry and wilderness area of that Eastern Unit of the Saguaro National Park would have sweeping views over the site for the proposed Rosemont Mine and its huge open pit and expansive waste rock and tailings disposal areas.

Both the eastern and western units of the Saguaro National Park conserve outstanding tracts of the Sonoran Desert, including foothills grading into significant mountain ranges. The park is named for the Saguaro Cactus, perhaps the most striking and picturesque of the native cactus of the region, and the icon of the Southwest. The landscape consists of a rich mosaic of Sonoran Desert vegetation with striking changes in vegetation composition as the topography gains elevation from the desert floor to the mountain peaks. The park also contains an abundance of native wildlife; one threatened species, the Mexican Spotted Owl, lives in the park, and an endangered species, the Lesser Long-nosed Bat, is in residence during its migration.

Saguaro National Park is the single most popular visitor destination in the greater Tucson area, with 2,738,772 visitors in 2008. This national park is one of the most unique units within the National Park System since the park has a major American city of nearly a million residents, is right in the middle of it. The estimated spending associated with Saguaro National Park in 2008 was \$24 million. The projected employment and payroll impacts were 335 jobs and \$6.7 million in labor income.⁶¹

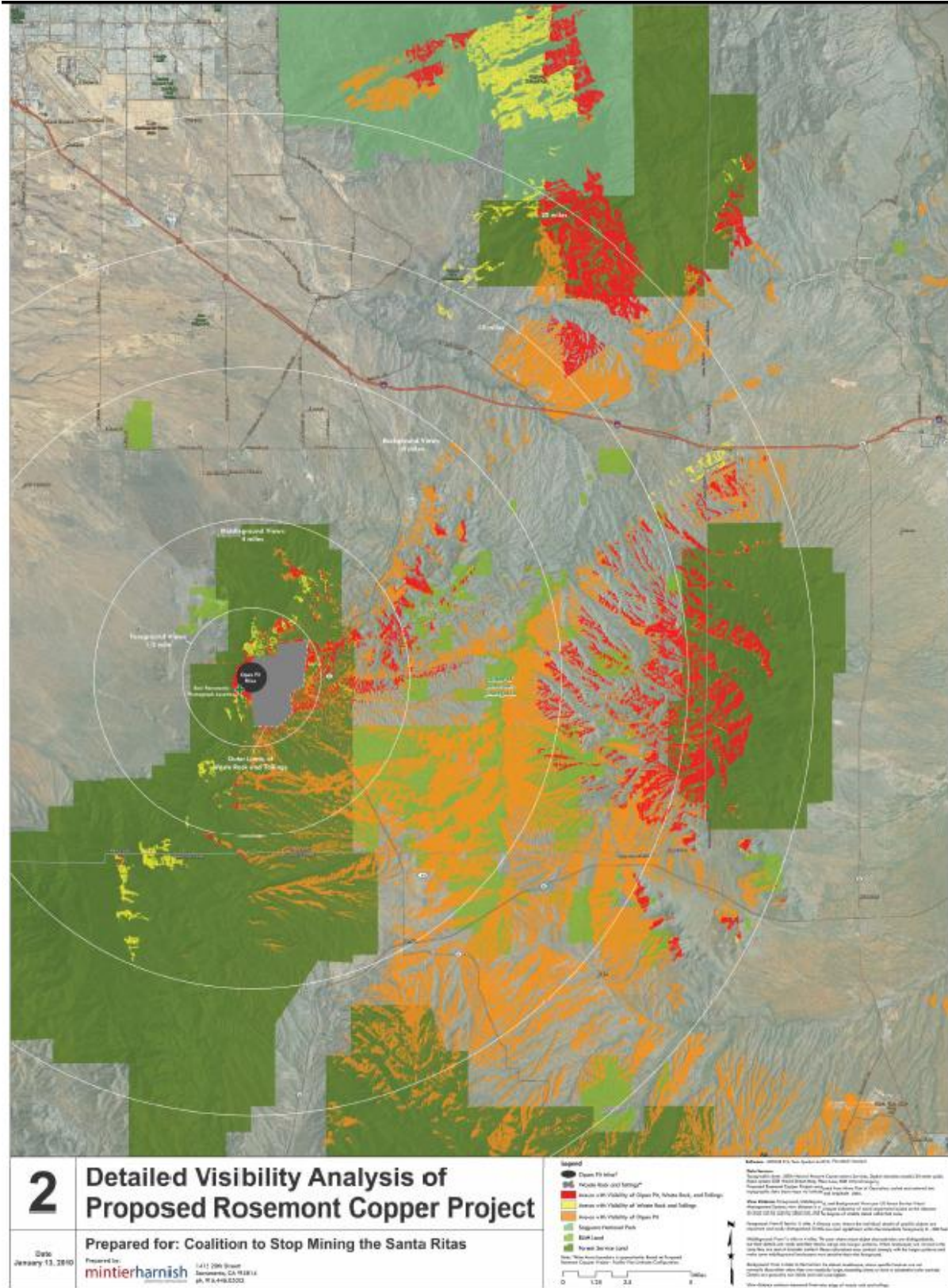
Clearly these public lands are an important part of the lives of Tucson area residents as well as the economy of the region.

Viewshed and Scenic Degradation

The proposed Rosemont Mine would impact these public lands in a variety of negative ways. Recreation uses currently taking place on or adjacent to the where the open pit, waste piles, and facilities would be located would be displaced. The Arizona Trail, whose establishment was championed by Arizona's Senators Kyl and McCain, passed through the center of the proposed mining area and had to be moved to adjacent lands over which the mine's waste piles would tower several hundred feet in the air. More importantly, because of the size and location of both the open pit and the waste piles, the disturbance land associated with the mine will be visible from a good part of the public lands to the south, east, and north. See the figure below.

⁶¹ National Park Visitor Spending and Payroll Impacts, 2008, Daniel J. Stynes, National Park Service, October 2009. These economic impact estimates are based on a "visiting *party-day*" rather than individual *person* visits which was the basis for the 2.7 million visitors figure provided in the text above for the Saguaro National Park. The difference is that each party has more than one visitor and multiple visits to the park by a party during a single trip are removed. In addition, local visitors are assumed to spend much less "new" money in the local economy than park visitors coming in from outside the area. That assumption is somewhat questionable given that those local visitors might otherwise have traveled to some other area for their recreation if those opportunities were not available locally, draining expenditures from the local economy. The role of the National Park in attracting and holding households and businesses in the local area is also ignored in those estimated park economic impacts.

Viewshed Analysis (Source: Coalition Against Mining the Santa Ritass (2010))



In the figure above, the red areas indicate locations from which the proposed mine pit as well as the waste-rock piles and tailings depositions would be visible; orange areas indicate areas with visibility of the mine pit (which removes a sizable portion of the east face of Weigles Butte nearly to the summit); and yellow areas indicate locations with visibility of the waste-rock piles and tailings deposits.

Clearly the mine will impact the view of the natural landscape from a significant part of the public lands surrounding the Great Tucson area. It will degrade that view, adding permanent scars as well as long-lasting industrial facilities.

Conflict with Pima County's *Sonoran Desert Conservation Plan*

One of the most biologically diverse counties in the United States, Pima County contains a rich diversity of vegetation, ranging from cactus-studded deserts to conifer forests, and accompanied by an equally diverse complement of animals. In 1998 the Pima County Board of Supervisors initiated discussions on land use planning and conservation, fortuitously shaping the growth debate to encompass scientific principles derived from ecology and conservation biology. By undertaking land use planning and decision-making based on scientific rather than mere political considerations, Pima County moved to the forefront of conservation-based land use decision-making in the US, and in 2001 adopted the Conservation Lands System as the foundation for the Sonoran Desert Conservation Plan (www.pima.gov/cmo/sdcp/).

The Board of Supervisors recognized at the outset that success of the Sonoran Desert Conservation Plan would depend upon broad support and involvement by the people of Pima County, and made participation by relevant public agencies, organizations and interested citizens at top priority in undertaking its conservation planning effort. In so doing, Pima County has created an informed and engaged citizenry that remains fully involved in and committed to realization of the and implementation of the plan. More than 150 scientists contributed their expertise in shaping a plan grounded in sound science, and nationally recognized peer reviewers were consulted to bring additional insights and expertise into plan formulation. Also of note was the creation of an extensive Geographic Information System that provides the geographic scientific data base that serves as the foundation of the plan.

The plan consists of five initial elements:

- Critical Habitat and Biological Corridors
- Riparian Restoration
- Mountain Parks
- Historical and Cultural Preservation
- Ranch Conservation

Graphic displays of these plan elements are shown in the Sonoran Desert Conservation Plan Appendix clearly document the geographic extent of this important plan. The location of the proposed Rosemont Mine is superimposed as a red dot on each of the graphics in order to clearly understand the scope and magnitude of the Sonoran Desert Conservation Plan in terms of the conservation context of the proposed open pit mine.

Pima County has some form of jurisdiction and/or management relationship over 5.16% of the study area, some 103,690 acres (162 square miles). The County has direct ownership of County Parks and Natural Areas containing 26,728 and 4,794 acres respectively. In addition to these County Parks and Natural Areas, Pima County holds fee simple title or conservation easements protection on over 41,000 acres of ranchlands. In the aggregate, these ranches occupy over 123,000 acres in Pima County. These open space lands have been protected by virtue of over \$ 116 million in Open Space Bond monies approved by Pima County voters since 2005. This active on-going program has resulting in land conservation transactions occurring in six of the past seven years.

Unfortunately the site of the proposed Rosemont Mine is located in such a manner as to pose significant threats to each of the five elements of the Sonoran Desert Conservation Plan. The proposed mine is in conflict with these plan elements as follows:

- Adjacent to the critical biological core area and situated within key biological corridors (per map of Critical Habitat and Biological Corridors);
- Situated in the headwaters of a stream (Davidson Creek) identified for riparian restoration and rehabilitation; it is also in the vicinity of important springs (per map of Riparian Restoration);
- Located within a strategic corridor of lands linking the Santa Rita and Rincon Mountains (containing Saguaro National Park) and proximate to a proposed New Mountain Park and a New Natural Preserve (per map of Mountain Parks);
- Situated within an area designated as an archeological sensitivity zone, as well as a Priority Archeological Complex and a Priority Archeological Site (per map of Historical and Cultural Preservation); and
- Situated proximate to a Ranch Conservation District (immediately adjacent to the Coronado) and virtually surrounded by lands identified as Ranchlands (per map of Ranch Conservation).

In sum, the proposed Rosemont Mine constitutes a significant adverse impact to the Sonoran Desert Conservation Plan; a comprehensive conservation plan years in preparation as well as supported and funded by the people of Pima County. It is thus no surprise that the Pima County Board of Supervisors is unanimous in their opposition to the proposed Rosemont Mine.

Conversion of a Scenic Highway into a Mine Haul Road

Because there is no railroad line in the immediate vicinity of the proposed mine, the copper products produced at the mine will have to be hauled by truck to either a rail head or Interstate Highway in the Tucson area or to a port in Mexico for shipment across the Pacific. The initial transportation corridor would be State Highway 83, currently a “scenic” byway. This narrow and winding highway that links the Tucson area to the Sonoita-Patagonia-Elgin area could be dominated by huge oversized trucks carrying the concentrated ore and large tractor trailers carrying the copper plate from the electro-winning process. In addition, an estimated 400 workers would have to be transported to the mine site every day. The character of this scenic highway that serves as a critical lifeline to a rural area would change dramatically as would the view from the highway as it passes the mine site. Safety and congestion could become serious problems.

Industrialization of a Natural Area and Rural Community

The proposed Rosemont mine would operate twenty-four hours a day. Blasting would take place throughout the day. Industrial lights sufficient to create a safe work site at night would illuminate the mine site all night long. Disturbed landscapes, industrial facilities, explosions with accompanying vibrations, industrial-scale traffic on Highway 83, and dust in the air could significantly change the rural ambience of the area. The escape of toxic materials into the air as well as surface and ground water could also threaten the area.

Threats to Water Quality

Copper mining has a long history of creating serious water quality problems when sulfide ores are exposed to air and water. Some of the largest and most problematic toxic waste sites in the United States are associated with copper mining sites (e.g. Butte and Anaconda, Montana, and 100 miles of the upper Clark Fork River from Butte to Missoula, Montana). Mining engineers and environmental scientists have been aware of this problem for many decades. Despite assurances that “this next mine will be the first one not to have this problem,” that usually has not been true. A review of projected water quality associated with metal mines before those mines were developed with the water quality that actually resulted from the mine indicated that despite projections that with the pollution control measures in place there would be no violation of water quality standards, “52 percent of the case study mines clearly had mining-related exceedences of standards in surface water.” The same was true of projections that ground water pollution would be

effectively controlled: "...most mines predict no impacts to groundwater quality after mitigation was in place, but in the majority of case study mines, impacts have occurred...the ameliorating effect of mitigation on groundwater quality was overestimated in the majority of the case study mines." "...76 percent of the case study mines had mining related exceedence in surface water or groundwater."⁶²

These overly optimistic projections before mining were due to several problems: i. the geochemical character of the ore was not accurately estimated; ii. the hydrological conditions at the mine were not accurately characterized; and iii. the proposed pollution control technologies did not perform as projected.⁶³

This past performance underlines the necessity of extremely careful analysis before a copper mine is permitted and the need to be very cautious and skeptical of assertions of zero emission mines.

Threats to Water Supply

Digging an open pit deep into a mountainside has the potential of interrupting existing groundwater flows and impacting existing water users. In addition, importing water from other watersheds can impact current water users, including irrigated agriculture, in the area from which water is being imported. Careful analysis of current water users and of local hydrology is required to understand the likelihood of such ground water impacts.

Dark Skies and Astronomical Observation

The combination of heavy nighttime illumination of the mine site and the suspension of particles in the air and emission of gases from mine activities and ore processing is likely to undermine the relatively dark skies currently found in this rural area. In 2007 the Arizona Arts, Sciences and Technology Academy published a report that underlined the economic contribution that astronomy, planetary sciences, and space science was making to Arizona's economic growth and its high potential to make an even greater contribution in the future. That report warned, however, that population growth and sprawl around Arizona's major cities was causing increasing nighttime light pollution despite local ordinances aimed at reducing that impact.⁶⁴ That light pollution threatened astronomical observation and the ongoing contribution that astronomical research could make to the economy. The Rosemont Mine has the potential of extending the light pollution from the Tucson area significantly further to the south.

Wildlife Habitat and Wildlife Corridors

One of the primary purposes of the public lands that surround the Greater Tucson area and the restrictions on commercial development of many of those public lands is to protect wildlife habitat. Landscapes without native wildlife are not natural areas. As development proceeds on private lands, protecting existing wildlife habitat and corridors to facilitate wildlife movement becomes more and more important. The impact of the proposed mine on the capacity of surrounding lands to support wildlife needs to be studied carefully. The impact of the mine with its blasting, noise, air and water pollution, heavy highway traffic, nighttime illumination, etc. may extend the impact on wildlife far beyond the lands actually occupied by the mine.

⁶² "Comparison of Predicted and Actual Water Quality at Hardrock Mines: The Reliability of Predictions in Environmental Impact Statements," James R. Kuipers, et. al. Kuipers & Associates and Buka Environmental, 2006, p. ES-8 and 9. It should be pointed out that this study also concluded that proximity to water resources including discharges from the mine and moderate to high acid drainage or contaminant leaching potential significantly increased the risk of water quality impact and was a good indicator of future adverse water quality impacts. (p. ES-12)

⁶³ Ibid. p. ES-13

⁶⁴ "Astronomy, Planetary Sciences, and Space Sciences Research Opportunities to Advance Arizona's Economic Growth," Chandler, Arizona 85248. <http://www.aasta.net> .

Socioeconomic Impacts

As discussed in detail elsewhere in these comments, all of the environmental impacts discussed here also represent economic impacts since they threaten to undermine one of the unique and attractive qualities associated with the Greater Tucson Area, its linked set of public lands that not only provide the natural backdrop to this urban area but also provide the outdoor recreation activities in which so many residents engage. Protecting those surrounding natural areas and open spaces are an important part of the Greater Tucson Area's economic development strategy. City, county, state, and federal governments have invested heavily to assure that these natural areas can continue to enhance citizens' well being and the region's economic vitality. In the Tucson area, environmental protection and economic development have been complements, not painful tradeoffs. It is important to keep that in mind when public land use policies are being decided.

Threats to Cultural Resources

The Rosemont Valley and surrounding hills and mountains are important cultural sites to all Native American with ancestral and tribal connections to this land. The proposed mine has the potential to disturb, degrade or destroy Native American sacred sites, ceremonial sites, and ancestral human remains. Traditional resource collecting areas for food, medicines, and traditional crafts could be lost.

Conclusions

Clearly the proposed Rosemont Mine does not represent the "pure benefit" that the Rosemont economic impact analysis suggests. Even the direct economic benefits in the form of the projected mine jobs, payroll, and tax revenues are modest in size and likely to be unstable. In addition there are a broad range of potential public costs that need to be studied carefully before any conclusion can be reached about whether there are any expected net benefits associated with the Rosemont copper project.

As our comments on the Greater Tucson Area economy point out, the Tucson area is not a failing economy in desperate need of a large open pit copper mine to "save" the regional economy. In fact, the proposed copper mine is in conflict with the primary economic engine that has energized the economy over the last several decades and is expected to continue to be the basis of economic vitality in the future, namely the unique and attractive qualities associated with Tucson's natural, cultural, and social amenities.

In order to evaluate the proposed Rosemont Mine, a comprehensive review of the "total economy" and all of the determinants of local economic well being is required. Into that economic overview both the public benefits and public costs associated with the Rosemont Mine can be set so that a rational decision can be made about whether the Rosemont Mine's request to use and damage scarce and valuable public resources makes economic and public policy sense.