THE ECONOMIC CONTRIBUTIONS OF AND POSSIBLE CLUSTER DEVELOPMENT STRATEGIES FOR MILITARY INSTALLATIONS IN THE NEVADA ECONOMY
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The Economic Contributions of and Possible Cluster Economic Development Strategies for Military Installations in the State of Nevada

EXECUTIVE SUMMARY

Study Objectives and Nevada Military Installations

- This study examines the many substantial economic contributions of military facilities on and potential cluster development strategies for military installations in the state of Nevada.

- For this study there were two major military bases and one major contracting facility in the study. The two military bases were Nellis Air Force Base in Clark County and the Fallon Naval Air Station in Churchill County. The major contracting facility is the Hawthorne Army Depot, which is contracted to Day and Zimmerman Company.

Some Basic Concepts of the State Economy and Income and Employment Multipliers

- The foundation for state economic development is those economic sectors which sell goods and services outside the state and bring new dollars to the state economy.

- Economic sectors that sell goods and services outside the state are called basic economic sectors.

- Military establishments are basic economic sectors because they bring dollars from outside the state and business decisions are made outside the state’s boundaries.

- The Minnesota IMPLAN input-output microcomputer model was used to derive the multiplier impacts of expenditures by Nevada military establishments.

Summary of Economic Activities of Nevada Military Installations

- The U.S. military in FY 2003 maintained a contingent of 17,200 personnel in the state of Nevada. Of this total, 9,081 or 51.31% of total military base personnel were active-duty, 2,075 or 11.72% of total military base personnel were civilian, and 6,544 or 36.91% of total military base personnel were Reserve or National Guard.

- The Air Force maintains the largest share of military base personnel, which was 60.75% of the state’s total. Also for the Air Force, 72.91% of their total personnel were on active duty.
In comparison, the U.S. had 2,805,747 military based personnel. Of this total 38% were active military and 39% were Reserve and National Guard. Also, the Army maintained the largest share of national military based personnel.

Total military base expenditures in the state of Nevada were $1,442 million for FY 2003. Military base expenditures in Nevada were split between a total payroll of $969.6 million (67.22% of total expenditures), contracts at $456.9 million (31.68% of total expenditures), and grants of $15.9 million (1.10% of total expenditures).

For comparison, nationally payrolls were only 38.61% of total military base expenditures while contracts were 60.39% and grants were 1.00% of national FY 2003 military base expenditures.

Of total military based payrolls in Nevada, approximately 49.32% or $478.2 million were paid to military retirees. Nationally, payments to military retirees were only 27.2% of total military payrolls.

Retired military play a more important role in the Nevada economy than the national economy. Also retired military provide the state with a skilled and excellent workforce for economic development.

For FY 2003, contract expenditures amounted to $456.9 million, service contracts amounted to $289.1 million, RDT&E (Research, Development, Test, and Evaluation) contracts were $20.0 million, construction contracts were $37.4 million and civilian function contracts were $30.6 million.

Nevada military establishments spent approximately $15.9 million on grants.

The ten largest Department of Defense contractors in the state of Nevada were awarded $254.0 million in contracts, which was 55.60% of total Nevada awarded contracts.

The Direct Economic Contributions of Military Installations in Nevada

In FY 2003, military base expenditures in the state of Nevada were $1.4 billion. However, not all of the funds are expended in Nevada. Approximately 65% or $910 million are estimated to be expended in the state.

Because there were no direct surveys of Nevada retirees, procedures outlined by Lahr (2000) were employed to estimate impacts of potential military retiree migration. If retirees migrate from Nevada because of military base closures, it was estimated that direct job loss for the state would be 1,891 jobs.
• It is assumed that spouses and children of military personnel tend to move with the assignments of their military members.

• It is assumed that civilian employees would have a lower probability of leaving Nevada in the wake of military base closures in Nevada.

• It was estimated that total direct earnings contribution of military spouses to the Nevada economy was $166.3 million.

The Economic Contributions of Nevada’s Military Bases

• Total employment and earnings impacts in the Nevada economy from military installation operations were derived from the IMPLAN microcomputer input-output program.

• From direct employment of 18,899 jobs, total employment impacts from military installation operations in the state of Nevada were estimated to be 28,069.

• This yields an employment multiplier for military installations in the state of Nevada of 1.485. This means for every one job at military installations in the state of Nevada, another 0.485 jobs are generated by indirect and induced employment impacts.

• From direct earnings of $1,008.0 million by military installations in the state of Nevada, total earnings generated from military installation operations in the state of Nevada were estimated to be $1,330.3 million.

• This yields an earnings multiplier for military installations in the state of Nevada of 1.320. This means for every dollar generated at military installations in the state of Nevada, another $0.320 of earnings is generated by indirect and induced earnings impacts.

• Average earnings of employees associated with Nevada military installations were estimated to be $53,336, which is 1.5 times greater than average Nevada wage. This shows that Nevada military installations are high paying industries that also employ the latest technology available. For state economic development, state military installations may prove to be an excellent cluster economic development strategy.

• In 2003, the activity at military installations in the state of Nevada contributed to 2.1% of the State’s jobs and 2.4% of its earnings.

• Not estimated in this study were the state’s employment and earnings impacts from squadrons visiting Nellis AFB and NAS Fallon for training. These visitors would impact the state’s economy from their expenditures in the private sector during their training.
Cluster Economic Development Opportunities with Nevada’s Military Establishments

• Results of this study have shown that Nevada military installations generate significant employment and earnings impacts on the state’s economy.

• However, Nevada military installations may provide the state an opportunity for cluster economic development.

• Cluster economic development is an approach pioneered by Michael Porter. Cluster economic development consists of four elements:

  ✓ *Factor Conditions* – A region’s endowment of factors of production, including human, physical, knowledge, capital resources, and infrastructure, which make it more conducive to success in a given industry.
  ✓ *Demand Conditions* – The nature of home demand for a given product or service, which can pressure local firms to innovate faster.
  ✓ *Related and Supporting Industries* – Networks of buyers and suppliers transacting in close proximity can foster active information exchange, collective learning, and supply-chain innovations.
  ✓ *Firm Strategy, Structure, and Rivalry* – A climate that combines both intensive competition among localized producers, with cooperation and collective action on shared needs, making it fertile for innovation and regional competitive advantage.

• Industry cluster economic development has rapidly been adopted as an economic strategy by states and localities. Military installations in the state of Nevada could become a cluster economic strategy, which would afford economic development opportunities in high technology for the state of Nevada.

• To develop a cluster strategy for the state of Nevada four stages of industrial cluster development should be followed:

  ✓ *Stage 1: Mobilization* – Building interest among different constituencies.
  ✓ *Stage 2: Diagnosis* – Assessing industry clusters and economic infrastructure that supports the cluster.
  ✓ *Stage 3: Collaborative Strategy* – Convening demand-side stakeholders and supply-side stakeholders to identify priority challenges and address shared problems.
  ✓ *Stage 4: Implementation* – Building commitment to create a cluster development effort.
**Introduction**

This study examines the many substantial economic contributions of military facilities on the economy of the state of Nevada and potential state cluster economic development strategies that incorporate Nevada military installations. It is, to date, one of the more detailed statewide analyses of the economic impacts of military installations in the state of Nevada. Also it is an initial investigation of cluster economic development procedures that could be used to incorporate Nevada military installations. To understand the economic contributions of military facilities, it is important to know the activities of each installation. Within the Nevada state boundaries, Nevada has two major military bases (Nellis Air Force Base and Fallon Naval Air Station) and one major contracting facility (Day and Zimmerman/Hawthorne Army Depot).

The primary objective of this paper is to estimate the economic contributions of and potential economic cluster development strategies for Nevada military installations. The paper is divided into four parts, which are:

1. Description of military installations studied;
2. Review of concepts of multiplier analysis;
3. Estimation of the economic impacts of Nevada military installations on the Nevada economy; and

**Nevada Military Installations**

For this study two major military bases and one major contracting facility will be examined. The two military bases are the Nellis Air Force Base in Clark County and the Fallon Naval Air Station in Churchill County. The major contracting facility is the Hawthorne Army Depot, which is contracted to the Day and Zimmerman Company.
Nellis Air Force Base

Nellis Air Force Base, a part of the United States Air Combat command, is located approximately eight miles northeast from downtown Las Vegas, Nevada. The base itself covers more than 11,000 acres while the total land area occupied by Nellis and its restricted ranges is approximately 5,000 square miles. An additional 7,700 miles of airspace north and east of the restricted ranges are also available for military operations.

Nellis is a major focal point for advanced combat aviation training. Its mission is accomplished through an array of aircraft, including fighters, bombers, refuelers, and aircraft used for transport, close-air-support, command-and-control, and combat search-and-rescue.

Today, units at Nellis AFB continue to provide training for composite strike forces that include every type of aircraft in the U.S. Air Force inventory, along with air and ground units of the Army, Navy, Marines and air units from allied nations. Nellis is also responsible for operational test and evaluation, as well as tactics development.

Also located on the Nellis Air Force Base is the Air Warfare Center. The Air Warfare Center manages advanced pilot training and integrates many of the Air Force’s test and evaluation requirements. The Air Warfare Center manages the lands on the Nevada Test and Training Range; formerly known as the Nellis Air Force Range Complex, which occupies about three million acres of land, the largest range acreage in the United States, and another five million acre military operating area, which is shared with civilian aircraft.

The Air Warfare Center was established in 1966 as the U.S. Air Force Tactical Fighter Weapons School (TFWS). The TFWS concentrated on the development of forces and weapons systems that were specifically geared to tactical air operations in conventional (non-nuclear) war and contingencies. The TFWS was renamed the Air Warfare Center in 1995.

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1 Substantial amount of text on the Nellis Air Force Base is from a web publication titled Nellis Air Force Base (2005).
Naval Air Station (N.A.S.) Fallon is located sixty miles east of the metropolitan city of Reno in the county seat of Churchill County, Nevada, which is Fallon, Nevada. The base was established in 1942 and transferred to the U.S. Navy in 1944 and has been associated with tactical training of aircrews.

During the 1980s Fallon NAS experienced rapid growth, as a state-of-the-art air traffic control facility and a new hanger was constructed. Naval Strike Warfare Center was established to be the primary authority for integrated strike warfare tactical development and training. In 1985, N.A.S. Fallon received a new training tool - the Tactical Aircrew Combat Training System or TACTS. This system provides squadrons, carrier air wings and students from Naval Strike Warfare Center with visual and graphic displays of their missions, eliminating the guesswork. Strike Fighter Squadron 127, the “Desert Bogeys” aggressors moved to N.A.S. Fallon in 1987, becoming the air station’s only permanently based squadron.

In 1995 and early 1996, a new hanger, ramp, and academic building were built to accommodate the move of the Navy Fighter Weapons School (TOPGUN) and Carrier Airborne Early Warning Weapons School (Top Dome) to Fallon. Also in 1996, a Seabee construction unit and reserve adversary strike fighter squadron relocated to Fallon.

Substantial amount of text on the N.A.S. Fallon is from a web publication titled *Naval Air Station Fallon, Nevada* (2003).
In 1928, construction began in Hawthorne, Nevada for the Naval Ammunition Depot. The facility was placed under Army command in 1977 under the Single Manager of Conventional Ammunition concept. In 1980, the operation of the Hawthorne Army Depot was contracted to Day and Zimmerman who has been the operating contractor ever since.

There are continued upgrades to facilities at Hawthorne Army Depot including the construction of the Western Area Demilitarization Facility (WADF). WADF, completed in 1982, was specifically designed to perform conventional ammunition demilitarization.

Day and Zimmerman have over twenty years of experience as the operating contractor for the Hawthorne Army Depot (HWAD). HWAD specializes in resource, recovery, and recycling (R3) operations, ammunition maintenance, surveillance, logistics, and engineering, environmental, security, and property reutilization operations. HWAD is the second largest ammunition depot in the world. HWAD encompasses over 230 square miles, has 272 miles of railroad track, and contains approximately 2,900 buildings, of which 1,400 are ammunitions storage sites.

Substantial amount of text on the Hawthorne Army Depot was from a web publication titled *Hawthorne Army Depot, Hawthorne Ammunition Depot, Hawthorne Test Range, and Hawthorne, Nevada.* (Global Security, 2003).
Some Basic Concepts of State Economics
And Income and Employment Multipliers

Figure 1 illustrates the major flows of goods, services and dollars for any economy. The foundations of a state’s economy are those businesses which sell some or all of their goods and services to buyers outside of the state. Such a business is a basic industry. The two arrows in the upper right portion of Figure 1 represent the flow of products out of and dollars into a state. To produce these goods and services for “export” outside the state, the basic industry purchases inputs from outside of the state (upper left portion of Figure 1), labor from the residents or “households” of the state (left side of Figure 1), and inputs from service industries located within the state (right side of Figure 1). The flow of labor, goods and services in the state is completed by households using their earnings to purchased goods and services from the state’s service industries (bottom of Figure 1). It is evident from the interrelationships illustrated in Figure 1 that a change in any one segment of a state’s economy will have reverberations through the entire economy of the state.

Consider, for instance, the activities of a Nevada military installation and their impacts on the secondary support businesses. The Nevada military operation can be considered a basic industry as it draws large numbers of people and money from outside the state. The military operations may hire people from the household sector such as laborers to set up and maintain these military facilities. However, most of the benefits of military operations are purchases of goods and services from Nevada businesses. These purchases include businesses such as contractors, manufacturers, hotels, bowling, restaurants, and other Nevada businesses. As earnings increase in these businesses, they will hire additional people and buy more inputs from other businesses. Thus the change in the economic base works its way throughout the entire state economy.

The total impact of a change in the economy consists of direct, indirect, and induced impacts. Direct impacts are the changes in the activities of the impacting industry, such as the operation of Nevada military installations. The impacting industry, such as the Nevada military installations, changes its purchases of inputs as a result of the direct impact. This produces indirect impacts in Nevada’s business sectors. Both the
direct and indirect impacts change the flow of dollars to the community’s households. The households alter their consumption accordingly. The effect of this change in household consumption upon businesses in a community is referred to as an induced effect.

Figure 1: Overview of Community Economic System

[Diagram showing the flow of goods, services, and dollars between households, basic industry, and service firms]
For this analysis, the area of study is statewide. A measure is needed that yields the effects created by an increase or decrease in economic activity. In economics, this measure is called the multiplier effect.

**Summary of Economic Activity on Nevada Military Installations**

From Table 1, the U.S. military in FY 2003 maintained a contingent of 17,700 personnel in the state of Nevada. Of this total, 9,081 or 51.31% of total military base personnel were active-duty, 2,075 or 11.72% of total military base personnel were civilian, and 6,544 or 36.97% of total military base personnel were Reserve or National Guard. The Air Force maintained the largest share of total military base personnel, which was 60.98% of the state’s total. For the Air Force, 72.91% of total personnel were on active duty. The Army had the second largest number of personnel with 3,665 personnel with 87.59% of Army’s total personnel as Reserve and National Guard. The Navy and Marine Corp had 3,053 personnel with 35.96% on active duty and 53.85% as Reserve and National Guard (Data from *Atlas/Data Abstract for the United States and Selected Areas* (2004) to be referred henceforth as *Data Abstract*).

<table>
<thead>
<tr>
<th>Category</th>
<th>Total</th>
<th>Active Duty</th>
<th>Civilian</th>
<th>Reserve and National Guard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Army</td>
<td>3,665</td>
<td>114</td>
<td>341</td>
<td>3,210</td>
</tr>
<tr>
<td>Navy &amp; Marine Corp</td>
<td>3,053</td>
<td>1,098</td>
<td>311</td>
<td>1,644</td>
</tr>
<tr>
<td>Air Force</td>
<td>10,793</td>
<td>7,869</td>
<td>1,234</td>
<td>1,690</td>
</tr>
<tr>
<td>Other Defense Activities</td>
<td>189</td>
<td>0</td>
<td>189</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>17,700</td>
<td>9,081</td>
<td>2,075</td>
<td>6,544</td>
</tr>
</tbody>
</table>


For comparison, the U.S. in FY 2003 had 2,805,747 as military-based personnel (Table 2). Unlike Nevada, nationally active military was approximately 38% of total personnel with Reserve and National Guard accounting for 39% of total personnel. Nationally, the Army maintained the largest share of military based personnel, which was
45.24% of the national total. The Air Force, nationally, was only 23.79% of the national total.

Table 2. National Military-Based Personnel, FY 2003.

<table>
<thead>
<tr>
<th>Category</th>
<th>Total</th>
<th>Active Duty</th>
<th>Civilian</th>
<th>Reserve and National Guard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Army</td>
<td>1,269,353</td>
<td>394,550</td>
<td>216,642</td>
<td>658,161</td>
</tr>
<tr>
<td>Navy &amp; Marine Corp</td>
<td>779,588</td>
<td>364,990</td>
<td>177,008</td>
<td>237,590</td>
</tr>
<tr>
<td>Air Force</td>
<td>672,996</td>
<td>310,971</td>
<td>153,107</td>
<td>208,918</td>
</tr>
<tr>
<td>Other Defense Activities</td>
<td>83,810</td>
<td>0</td>
<td>83,810</td>
<td>0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>2,805,747</strong></td>
<td><strong>1,070,511</strong></td>
<td><strong>630,567</strong></td>
<td><strong>1,104,669</strong></td>
</tr>
</tbody>
</table>


Tables 3, 4, and 5 (from the *Data Abstract* (2004)) show that military base expenditures in FY 2003 for the state of Nevada totaled $1,442 million. The expenditures were split between a total payroll of $969.6 million, contracts at $456.9 million, and grants of $15.9 million. As proportionate shares of total Nevada FY 2003 expenditures, payrolls were 67.22%, contracts were 31.68% and grants were 1.10% of total Nevada military base expenditures. In comparison, nationally, payrolls were only 38.61% of total national military base expenditures while contracts were 60.39%, and grants were 1.00% of national FY 2003 military base expenditures. Of the total military based payrolls in Nevada (Table 3), approximately 49.32% ($478.2 million) was paid to military retirees. Nationally, payments to military retirees were only 27.2% of total military payrolls. This shows that for the state of Nevada, retired military plays a more important role in the state economy than nationally. In Nevada, active military and civilians were 47.72% of total military payrolls or $462.7 million. Nationally, active military and civilians were 66.78 % of total national military payrolls.

<table>
<thead>
<tr>
<th>Category</th>
<th>Total</th>
<th>Active Duty</th>
<th>Civilian</th>
<th>Reserve and National Guard</th>
<th>Retired Military</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>($1,000,000)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Army</td>
<td>126.4</td>
<td>4.3</td>
<td>14.2</td>
<td>21.1</td>
<td>86.8</td>
</tr>
<tr>
<td>Navy and Marine Corp</td>
<td>201.9</td>
<td>46.4</td>
<td>15.6</td>
<td>27</td>
<td>137.3</td>
</tr>
<tr>
<td>Air Force</td>
<td>635.2</td>
<td>317.2</td>
<td>59.0</td>
<td>4.9</td>
<td>254.1</td>
</tr>
<tr>
<td>Other Defense Activities</td>
<td>6.1</td>
<td>0</td>
<td>6.1</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>969.6</td>
<td>367.9</td>
<td>94.8</td>
<td>28.7</td>
<td>478.2</td>
</tr>
</tbody>
</table>


For FY 2003, contract expenditures amounted to $456.9 million, service contracts amounted to $289.1 million, RDT&E (Research, Development, Test, and Evaluation) contracts were $20.0 million, construction contracts were $37.4 million and civil function contracts were $30.6 million. In addition to contracts, Nevada military establishments spent approximately $15.9 million on grants (Table 4). The *Data/Abstract* also shows that the ten largest Department of Defense contractors in the state of Nevada were awarded $254.0 million in contracts during FY 2003. These ten largest Department of Defense contracts were awarded 55.60% of total military contracts in Nevada.


<table>
<thead>
<tr>
<th>Category</th>
<th>Total</th>
<th>Supply &amp; Equipment Contracts</th>
<th>RDT&amp;E Contracts</th>
<th>Service Contracts</th>
<th>Construction Contracts</th>
<th>Civil Function Contracts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>($1,000,000)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Army</td>
<td>136.7</td>
<td>15.4</td>
<td>5.1</td>
<td>62.3</td>
<td>23.3</td>
<td>30.6</td>
</tr>
<tr>
<td>Navy &amp; Marines</td>
<td>143.9</td>
<td>7.5</td>
<td>3.8</td>
<td>125</td>
<td>7.7</td>
<td>0</td>
</tr>
<tr>
<td>Air Force</td>
<td>158.2</td>
<td>2.3</td>
<td>11.2</td>
<td>98.2</td>
<td>6.5</td>
<td>0</td>
</tr>
<tr>
<td>Other Defense</td>
<td>18.1</td>
<td>14.6</td>
<td>0</td>
<td>3.6</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>456.9</td>
<td>79.7</td>
<td>20.0</td>
<td>289.1</td>
<td>37.4</td>
<td>30.6</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th>CATEGORY</th>
<th>TOTAL ($1,000,000)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Army</td>
<td>13.8</td>
</tr>
<tr>
<td>Navy and Marines</td>
<td>0.6</td>
</tr>
<tr>
<td>Air Force</td>
<td>1.5</td>
</tr>
<tr>
<td>Other Defense Activities</td>
<td>0.0</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>15.9</strong></td>
</tr>
</tbody>
</table>


The Direct Economic Contributions of Military Installations in Nevada

This section enumerates the direct economic contributions of Nevada’s military installations. From the previous section, military installations contribute substantially to total jobs and payrolls in the State of Nevada. While all of the jobs would be lost if all military installations in the state were decommissioned by the Department of Defense, some of the payroll would remain. Moreover, there is substantial off-base economic activity in Nevada that is strongly tied to economic activity at the military installations. Multiplier effects explain the degree of magnitude and scope of this secondary activity. Therefore in this section, the direct economic impacts of military installation operations will be detailed.

Many family members of Nevada military-based personnel hold jobs. When faced with domestic reassignment, typically the entire family leaves to the new locale, not just the family member who is a member of the military. Hence, if Nevada’s military installations were decommissioned, in the short run the State’s economy would react as if these were permanent losses. That is, neither the hours worked nor the productivity levels achieved by these military family members would be readily restored. Therefore, production associated with their jobs would likely suffer significantly. For this section, the potential direct economic losses will be estimated that would emanate from the loss of jobs and incomes in Nevada associated with military base personnel family members.
Estimated Detail of Direct Spending at Military Installations in Nevada

This section discusses the direct economic impact of the $1.4 billion of annual military expenditures in FY 2003 (Data Abstract, 2004). There were no direct surveys of these Nevada military installations; therefore data from the Data Abstract (2004) and the IMPLAN microcomputer input-output model (Minnesota IMPLAN Group, 2000) were used to derive expenditure patterns of Nevada’s military installations. However, not all of the funds would be spent in Nevada. Approximately 65% ($910 million) of total military expenditures were spent in Nevada for FY 2003. Therefore, the $910 million value will be used to derive the total economic impacts of military installations in the state of Nevada.

Adjusting for Possible Migration of Retirees, the Reserve, and National Guard

Some of the direct spending outlined in the previous section is not associated with the presence of military installations within the state. Rather it is a function of the residence of personnel with a part-time or retired status. Clearly some retirees would move outside of Nevada, taking their incomes with them, in order to take advantage of services available to them only at military bases. Therefore some effort was made to account for the potential loss to the State of military retiree income, as well as some of the payroll received by Reserve and National Guard personnel.

There were no direct surveys of Nevada retirees to estimate what proportion would leave Nevada for another state if all military installations in Nevada were closed. The absence of data is exacerbated by the fact that most military retirees receive transfer income in some form such as social security, other retirement and pension income, as well as labor income in the case of those who remain active in the workforce. Therefore, to estimate impacts of potential retiree migration, procedures outlined by Lahr (2000) are used.

An Arizona study (The Maguire Company, 2002) estimated that approximately 25% of military retirees in Arizona rely heavily on services supplied at its bases and would leave Arizona if Arizona’s military bases were closed. There is no reason to believe that Nevada military retirees would behave differently. But the Arizona study failed to account for the loss of other income sources garnered by this 25%. Therefore,
the output of the federal government was discounted by 75% of total retirement payroll of $478.2 million ($358.7 million), so that total government payrolls were reduced from $969.6 million to $850.1 million to show Nevada’s retention of this 75%. Further, it was assumed that military retirement income amounted to only two-thirds of this group’s total income. That is, military retirees were assumed to gain a third of their income from nonmilitary sources, mostly jobs. Therefore, an amount equal to an eighth of the State’s retirement payroll ($59.8 million) was allocated to jobs held by these retirees (It was assumed that some private jobs held by military retirees would leave the state). These jobs were allocated using the distribution of aggregate earnings of employees in Nevada’s industries. If Nevada retirees depart Nevada, it is estimated that there would be a loss of 1,891 jobs from military retiree relocation.

In the case of payroll paid to the Reserve and National Guard, it was assumed that all associated jobs would leave Nevada but so would the incomes. The rationale is that “weekend Warriors” would not roam far from their homes to perform these services for their country. As a result, the job loss would be 6,544 jobs and associated $28.7 million ($4,386 per job) in payroll allocated to this group.

**Direct Economic Impacts of Military Personnel in Nevada**

It is widely perceived that spouses and children of military personnel tend to move with the assignments of their military family members. This is less true for the case of civilian personnel on these bases. Lahr (2004) found from survey results of Fort Monmouth that 20% of spouses of civilian personnel make such moves.

From a study by Wardynski (2000), spouses of military personnel tend to have a lower labor force participation rate than their civilian counterparts (66.6% versus 73.0%). Furthermore, military spouses who work earn about 70% as much as their civilian counterparts (Wardynski, 2000). Using these assumptions and the Nevada average earnings per job in 2003 of $36,776, an estimate of aggregate earning for full-time military base personnel was derived and shown in table 6.
Table 6. The Direct Economic Contribution of Military Spouses to Nevada.

<table>
<thead>
<tr>
<th></th>
<th>Military</th>
<th>Civilian</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected earnings</td>
<td>$17,144</td>
<td>$5,130</td>
<td>-----</td>
</tr>
<tr>
<td>Person count</td>
<td>9,081</td>
<td>2,075</td>
<td>11,156</td>
</tr>
<tr>
<td>Aggregate Earnings</td>
<td>$155,684,664</td>
<td>$10,644,750</td>
<td>$166,329,414</td>
</tr>
</tbody>
</table>

Table 6 reveals that the income accruing to military spouses approximately amounts to $17,100 per family. The average income attributed to a spouse of civilian employees working on military bases is just over 30% of that or approximately $5,100. This difference is due almost exclusively to the assumption of lower probability that civilian employees would leave Nevada in the wake of closings of all Nevada military installations.

With the expected average earnings contribution per capita of military families so large and the number of families of full-time military personnel in Nevada about four-times greater than civilian employees, the aggregate earnings of military spouses in Nevada are estimated to be $155,684,664. Total direct earnings contribution of military spouses to the Nevada economy is estimated to be approximately $166.3 million.

The Economic Contribution of Nevada’s Military Bases

Table 7 summarizes the contribution of Nevada’s military bases to the economy of the state of Nevada. Through direct and multiplier effects, the bases contribute to employment and earning in the economy of the state of Nevada. In 2003, the State of Nevada was home to roughly 1.3 million jobs, which garnered nearly $55.2 billion in earnings according the U.S. Department of Commerce (2004). Hence, 2003 activity at the bases contributed 2.1% of the State’s jobs and 2.4% of its earnings. To put this in a different perspective, the U.S. Department of Commerce reports that the State’s entire
durable goods manufacturing maintained 32,268 jobs with earnings of $1.9 billion in 2003.

<table>
<thead>
<tr>
<th></th>
<th>Jobs</th>
<th>Earnings (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Activity</td>
<td>26,214</td>
<td>$1,269.9</td>
</tr>
<tr>
<td>Spouses and Military</td>
<td>1,855</td>
<td>$60.4</td>
</tr>
<tr>
<td>Military Retirees</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>28,069</td>
<td>$1,330.3</td>
</tr>
</tbody>
</table>

According to Table 7, 6.5% and 4.5% of the total employment and earnings contribution of Nevada’s military bases is attributed to spouses of workers at the military bases and Nevada military retirees. This is important to note because it is also the portion of the contribution that is not defined well by the Data Abstract (2004). Hence, the relatively small share maintained by this more uncertain number lends greater credence to the magnitude of the overall contribution.

Of the 28,069 total jobs contributed to the Nevada economy by the military base activity, over 18,890 jobs or just over 67 percent were either those directly employed by the military at the bases, the spouses of military workers, or military retirees. Moreover, as the multiplier for jobs in Table 8 shows, each military job in Nevada supports an average of five tenths of another job. This relatively low multiplier effect for jobs is due to a somewhat inflated military jobs number. As shown in Table 1, 6,544 of the military jobs are those held by individuals in the Reserve or National Guard, which are not full-time positions.

The relatively high leakage of earned income out of the state is less clear, however. Table 8 shows that the $1.0 billion earned by workers affiliated with Nevada military bases were circulated within Nevada’s economy to add another $0.3 billion in Nevada-based earnings. Hence, for each dollar earned on a military base, it contributes an additional 32 cents of earnings to others working off base in Nevada.
The information on earnings and jobs in Table 8 implies average annual earnings per indirect and induced workers of $36,238. It also implies average earnings per employee associated with Nevada military bases of $53,336. This is a value higher than the average Nevada wage of $36,776. This shows that the military base industry is a high paying economic sector. As such, economic development practitioners in Nevada may want to focus on cluster economic development with Nevada military establishments. Given these military installations are high paying and use the latest in high technology, cluster economic development with Nevada military establishments might be an advantageous economic development/diversification alternative not only for current but future local and statewide economic development/diversification efforts.

Table 8: Direct and Multiplier Effects of Nevada’s Military Bases, 2003.

<table>
<thead>
<tr>
<th></th>
<th>Jobs</th>
<th>Earnings (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct Effects</td>
<td>18,899</td>
<td>$1,008.0</td>
</tr>
<tr>
<td>Multiplier Effects</td>
<td>9,170</td>
<td>$322.3</td>
</tr>
<tr>
<td>Total Impacts</td>
<td>28,069</td>
<td>$1,330.3</td>
</tr>
<tr>
<td>Multiplier</td>
<td>1.485</td>
<td>1.320</td>
</tr>
</tbody>
</table>

One area of military base activity that impacts the state’s employment and earnings would be the training activities at Nellis AFB and NAS Fallon. These training activities bring out of state personnel to Nevada who make expenditures in the private sector. Because there was no questionnaire of expenditure patterns of these trainees, the impacts of this segment of Nevada military base activity was not estimated.

Cluster Economic Development Opportunities with Nevada’s Military Establishments

As tables 6 through 8 have shown, the activities around Nevada’s military establishments generate significant economic activity. Not only is current activity of importance but the opportunities that Nevada military establishments offer for future
economic development/diversification is evident. Additionally, the number of military retirees that reside in Nevada offer the state an excellent and skilled workforce that is often not available in other states in the nation. Applying principles of cluster economic development may provide the state of Nevada an excellent vehicle to strategically plan for statewide economic development/diversification.

Industry clusters have currently become popular as an avenue for economic development with the publication of Porter’s book (1990). Porter has drawn together elements of rejuvenated theories of economic development with elements of business strategy. Porter theorized that successful industry clusters could be explained in terms of a “diamond of advantage”. This diamond consisted of four main elements:

- **Factor conditions** – A region’s endowment of factors of production, including human, physical, knowledge, capital resources, and infrastructure, which makes it more conducive to success in a given industry (e.g. – military establishments).

- **Demand conditions** – The nature of home demand for a given product or service, which can pressure local firms to innovate faster (e.g. – electronic gaming).

- **Related and supporting industries** – Networks of buyers and suppliers transacting in close proximity to foster active information exchange, collective learning, and supply-chain innovation.

- **Firm strategy, structure, and rivalry** – A climate that combines both intense competition among localized producers, with cooperation and collective action on shared needs, making it fertile for innovation and regional competitive advantage. Additionally, Porter conferred a peripheral role to government and chance in affecting the competitive advantage and development path of industry clusters.
While Porter’s work on industrial clusters resembles existing theories of regional development in many ways, it also represented meaningful extensions of those theories. In addition to incorporating elements of business strategy, Porter drew from the emerging (or reemerging) theories of entrepreneurship, “creative destruction” (Schumpeter, 1975), institutional economics (North, 1990), and the importance of social relationships and social capital (Granovetter, 1985).

From an economic development perspective, several important elements of the industry cluster framework standout and could be attributable to a potential Nevada military base cluster:

- **Endogeneity**: Successful industry clusters tend to possess dynamics, such as trust, competition, and entrepreneurship that lay the foundation for future success.

- **Agency**: Human agency, in the form of collective action, industry, and regional leadership, are crucial elements of ongoing success.

- **Strategy**: The strategic decisions of local firms in competition with one another helps in raising the bar for all parties.

The industry cluster model has rapidly become the focus of any economic development initiatives. Several states, including Arizona and Connecticut, have
initiated industry cluster strategies (Waits, 2000), while numerous cluster initiatives have focused on sub-state regions, metropolitan areas, and even rural regions. A recent publication from the Economic Development Administration (Information Design Associates and ICF Kaiser, 1997) describes the cluster strategy process as consisting of four discrete stages: mobilization, diagnosis, collaborative strategy, and implementation. The nature of cluster initiatives ranges from informational (e.g., analyzing the local, regional, or state economy) to strategic (e.g., organizing public policy relating to economic development), while most incorporate some elements of both. Also Porter (2004) recently addressed applications and difficulties of cluster development strategies for rural areas of the nation.

For a possible military base cluster development strategy, certain steps or stages should be initiated. Table 9 lists these stages that could be followed to derive a strategic cluster development strategy in Nevada that incorporates existing Nevada military bases.
Table 9. Four Stages of Industrial Cluster Strategy.

Stage 1: Mobilization – Building interest and participation among different constituencies needed to carry out the initiative.

Stage 2: Diagnosis – Assessing the industry clusters that comprise the economy and the economic infrastructure that supports cluster performance.

Stage 3: Collaborative Strategy – Convening demand-side stakeholders (companies in each cluster) and supply-side stakeholders (public and private supporting economic institutions) in working groups to identify priority challenges and action initiatives to address shared problems.

Stage 4: Implementation – Building commitment of cluster working group participants and regional stakeholders to actions and identifying or creating an organization to sustain implementation.
References


