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ECONOMIC IMPACT OF THE
PHILADELPHIA NAVAL BASE
AND SHIPYARD ON THE
PHILADELPHIA METROPOLITAN AREA

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Preface

This study analyzes the economic impact of the Philadelphia Naval Shipyard and Base on the Philadelphia metropolitan area and the states of Pennsylvania and New Jersey. The study details the consequences on the region's employment, income, sales and general economic activity from a closure of this important installation.

Early in 1990, the U.S. Department of Defense publicly acknowledged that serious consideration was being given to closing the Philadelphia Naval Shipyard and Base. As part of its response, the Commonwealth of Pennsylvania decided to develop an independent assessment of the economic importance of the Shipyard/Base to the Philadelphia area and the State of Pennsylvania. The Commonwealth contracted with the Philadelphia Industrial Development Corporation (PIDC) to oversee the development of the assessment and PIDC, in turn, employed the Pennsylvania Economy League (PEL) to conduct the research. The State of New Jersey, recognizing the significance of the Shipyard/Base to many of its residents, joined in the effort by also contracting with PEL. To assist in the analysis, PEL engaged the WEFA Group, an internationally recognized economics consulting firm.

WEFA was responsible for identifying the overall regional impact of the Shipyard/Base. This included assessing the indirect and induced consequences of Shipyard/Base activities on employment, income, sales and gross metropolitan product. PEL extended the assessment to the individual counties and states within the region; calculated the effects on local and state governmental revenues, and specified the potential impacts on displaced employees.

The study was funded jointly by the Commonwealth of Pennsylvania and the State of New Jersey.

Executive Summary

The proposal to close or to severely limit operations at the Philadelphia Naval Shipyard and Base (Complex) has serious economic implications for the Philadelphia area. The Naval Complex is one of the region's largest employers providing work for nearly 13,000 civilians in southeastern Pennsylvania, southern New Jersey and Delaware. Many of these jobs are in relatively high-paying, skilled, blue-collar positions which are a diminishing part of the region's economy. The loss of these positions would not only adversely affect the individuals who currently hold them, but would also affect the jobs and income of others throughout the region who are indirectly supported by the activity generated by the Complex and its employees.

In an effort to quantify what the Complex means to the region's economy, the Pennsylvania Economy League (PEL) with the assistance of WEFA, Inc. has calculated the direct, indirect and induced impacts the Philadelphia Naval Complex has on the Philadelphia metropolitan area. These impacts for employment, income, retail sales and general economic activity are summarized below. In addition, PEL's calculation of the revenue consequences for individual governments is also presented.

Employment:

Operations at the Philadelphia Naval Complex result in 35,000 jobs in the Philadelphia Metropolitan Statistical Area. (13,000 civilians and 6,000 military employed at the Complex itself; 2,000 employed because of goods and services purchased in the course of Complex operations, and nearly 14,000 employed because of the general spending in the region by those tied directly to the Complex.)

If the Naval Complex closes, the City of Philadelphia will lose more than 26,000 jobs. Another 5,000 jobs will be lost in South Jersey and nearly 3,000 more in Delaware County, Pennsylvania.

Closure of the Naval Complex will result in a 25 percent increase in the number of unemployed in the region.

State Effects:

More than 23,000 Pennsylvania residents will lose their jobs as a result of closing the Naval Complex. The number of unemployed increase by 5.7 percent with the unemployment rate in the state jumping from 5.9 percent to 6.2 percent.

8,700 New Jersey residents will lose their current jobs when the Naval Complex closes. The number of unemployed increase by 4.4 percent with the unemployment rate in the state jumping from 4.9 percent to 5.1 percent.

Local Effects:

Four of the region's eight counties will feel the brunt of the Naval Complex's closing, Philadelphia and Delaware counties in Pennsylvania and Camden and Gloucester counties in New Jersey.

Closure will increase the number of unemployed in Philadelphia by 30.4 percent. Philadelphia's unemployment rate will jump from its current level of 5.8 percent to 7.6 percent.

In Delaware County the number of unemployed will increase 47 percent, with the unemployment rate moving from the current 3.9 percent to 5.7 percent.

The number of unemployed in Camden County increases by 37.6 percent, with the unemployment rate moving from the current 5.1 percent to 7.0 percent.

In Gloucester County the number of unemployed goes up by 53.3 percent and the unemployment rate increases from 5.4 percent to 8.2 percent.

Effects on Minorities:

In the region, the number of minority unemployed will increase 16.2 percent. This will raise the region's current minority unemployment rate from 7.8 percent to 9.1 percent.

In Philadelphia County, the number of minority unemployed will increase 19.1 percent. This will raise the city's minority unemployment rate from 9.0 percent to 10.7 percent.

Extended Impacts on Displaced Workers

The preceding represents a snapshot view of the economy with the Naval Complex taken out. Many of these statistics will change over time as the economy reformulates itself. The following are impacts likely to be felt by the displaced workers over the first five years after the Complex closes.

Migration. Between 13 and 17 percent of the region's displaced workers will leave the PMSA to find new employment.

Workers leaving the labor force. Approximately 15 percent of the displaced workers will leave the labor force through retirement or discouragement.

Unemployment rates for displaced workers. The unemployment rate for those laid off in the Naval Complex closure will average 20 percent for the first five years following layoff.

Minority unemployment rates. The unemployment rate for displaced Black workers will average 30 percent; for displaced Hispanic workers, the unemployment rate will average 26 percent.

Unemployment duration. For those reemployed, the period of unemployment will last 4 to 6 months. However, for those in blue-collar occupations (two-thirds of the civilian employees at the Complex), unemployment is likely to last for one year.

Occupational changes. Less than half of reemployed workers are likely to be reemployed in the same general occupational category. This is particularly true for those in blue-collar, craft occupations, where the number of job openings in the Philadelphia area is expected to decrease between 1990 and 1995.

Part-time Reemployment. 10 percent of displaced workers will be reemployed only part-time in the first five years after the Complex closes.

Loss of Wages. 56 percent of reemployed blue-collar workers and 42 percent of all other reemployed workers will suffer decreases in salary income. The earnings decrease for these workers will average 15 percent for all workers, but will be much higher for displaced, blue-collar craft employees.

Loss of Benefits. In addition to lost salary income, approximately 35 percent of the displaced workers are likely to lose all their health insurance benefits.

Regional Income

The Philadelphia Naval Complex represents \$1.2 billion in wage and non-wage income to the region.

The Philadelphia Naval Complex accounts for approximately \$915 million in wage and salary income or 1.6 percent of the total in the region. (\$502 million - direct base and shipyard operations, \$47 million in income generated by Complex contracts and \$366 million - resulting from the general spending activity of Complex-related employees.) Another \$294.7 million in non-wage income is generated by Complex activity.

Closing the Naval Complex will reduce income in Philadelphia by \$541 million (2.5 percent of the city's total), in South Jersey by \$363 million (1.9 percent of the total for Burlington, Camden and Gloucester counties) and in Delaware County by \$185 million (2.0 percent of Delaware County's total).

Economic activity connected with the Philadelphia Naval Complex accounts for \$2.1 billion in gross product in the Philadelphia Metropolitan Statistical Area. This represents 1.45 percent of the region's total economic activity.

If the Naval Complex were to close, retail sales in the region would decline by \$382.8 million or 1.04 percent of the region's total retail activity.

Effects on Area State and Local Governments

State Tax Revenue:

\$37 million in state taxes will be lost if the Naval Complex closes.

Pennsylvania will lose over \$24 million (over \$11.4 million in income taxes, \$10.9 million in sales tax receipts, and \$2.4 million in business tax revenues).

New Jersey will lose nearly \$12 million in tax revenue (over \$5 million in income tax yield, \$5.6 million in state sales tax receipts, and \$1 million in business tax revenues).

Delaware will suffer a loss of nearly \$1 million in state income tax revenues.

State Expenditures:

State governments in the region can be expected to pay out between \$53 to \$69 million in unemployment insurance for non-federal employees displaced as a result of closing the Naval Complex.

Local Tax Revenue:

Approximately \$86 million in municipal tax revenues are tied to Complex activities.

Pennsylvania Municipalities

Complex-related activities account for over \$66 million in local tax revenues among Philadelphia, Bucks, Chester, Delaware and Montgomery counties in Pennsylvania. Local Governments in southeastern Pennsylvania will lose over \$48 million of these revenues if the Philadelphia Naval Complex closes.

Philadelphia will lose a total of \$43.2 million in annual tax revenues if the Naval Complex closes.

Philadelphia will lose nearly \$26 million in wage tax revenues.

Complex-related households account for \$23.6 million in real estate tax revenues in the City of Philadelphia. Closing the Complex will cost the city \$11.2 million of these revenues.

The decline in general business activity in Philadelphia brought about by the closure of the Naval Complex will cost the City of Philadelphia approximately \$6 million in business tax revenues.

Complex-related households account for \$800,000 in real estate tax revenues throughout Bucks County. Closing the Complex will cost local governments in Bucks County \$400,000 of these revenues.

Complex-related households account for \$300,000 in real estate tax revenues throughout Chester County. Closing the Complex will cost local governments in Chester County nearly \$200,000 of these revenues.

Complex-related households account for \$9 million in real estate tax revenues throughout Delaware County. Closing the Complex will cost local governments in Delaware County \$4.2 million of these revenues.

Complex-related households account for \$500,000 in real estate tax revenues throughout Montgomery County. Closing the Complex will cost local governments in Montgomery County over \$200,000 of these revenues.

New Jersey Municipalities

Complex-related households account for over \$20 million in local tax revenues among Burlington, Camden and Gloucester counties in New Jersey. Local Governments in South Jersey will lose nearly \$10 million of these revenues if the Philadelphia Naval Complex closes.

Complex-related households account for \$1.9 million in real estate tax revenues in Burlington County. Closing the Complex will cost local governments in Burlington County over \$900,000 of these revenues.

Complex-related households account for \$12.2 million in real estate tax revenues in Camden County. Closing the Complex will cost local governments in Camden County nearly \$6 million of these revenues.

Complex-related households account for \$6.3 million in real estate tax revenues in Gloucester County. Closing the Complex will cost local governments in Gloucester County approximately \$3 million of these revenues.

I. Introduction

The Philadelphia Naval Base and Shipyard Complex (Complex) operates within the Philadelphia SMSA, and is one of the SMSA's key employers and sources of economic activity. The Complex consists of two main components, the Naval Base (Base) and the Philadelphia Naval Shipyard (PNSY). Total employment at the Complex as of May 1990 was 19,245 including all military and civilian workers. The Philadelphia SMSA consists of five Pennsylvania counties (Bucks, Chester, Delaware, Montgomery, and Philadelphia) and three New Jersey counties (Burlington, Camden, and Gloucester).

The Complex was established in 1801, when the first U.S. Navy shipyard was constructed on Federal Street in Philadelphia. In 1876, the shipyard was moved to its present location at the intersection of the Schuylkill and Delaware Rivers. The PNSY was primarily involved with the construction of new vessels until 1971, when the last new ship was completed at the shipyard. The current use of the shipyard is the reconstruction and revitalization of the existing fleet.

This program, known as the Service Life Extension Program (SLEP) is the largest and most significant source of employment at the complex. In the five-year period from 1980 to 1985, SLEP resulted in work valued at \$3 billion, plus another \$1.7 billion which was paid in wages to local workers.¹

The Base currently generates 55 percent of the total Complex employment. The Base is composed of several major stations or departments which are responsible for the majority of total base employment, and numerous smaller stations. Major employers within the Base are Defense Contract Administration Services Region (DASCR) Philadelphia, employing approximately 2,000 persons, mostly civilians. The Defense Personnel Support Center (DPSC) employs approximately another 5,000 workers, also civilians.

¹Source: *Welcome Aboard: The Navy in Philadelphia* (TNIP). Blake Publishing Co. Inc., San Diego, CA.

In addition, the Naval Shipyard Systems Engineering Station (NAVSSSES) employs over 1,700 military and civilian workers. Other smaller employment centers include the Naval Regional Contracting Center, the Philadelphia Marine Corps Recruiting Station, and the Naval Damage Control Training Center and others.²

Finally, because of the large number of military living on the base, and the large number of workers employed full time there, the Complex also contains many social clubs and services, as well as several retail facilities for dependents who live, work, and shop on the Complex property.

In summary, the Complex exists as a substantial economic entity in the Philadelphia SMSA. It contains both military and civilian personnel working in occupations ranging from welder and steelworker to retail sales clerk. A full closure of the Complex would result not only in the loss of the Navy's first shipyard, but also in the loss of many related businesses which are significantly or wholly dependent on the military and civilian employees who work there.

Section II describes the data and methodology used to determine the overall regional effects on employment, income, retail sales and gross product. Section III describes the principal results of the region-wide analysis. In Section IV, regional economic effects are deaggregated to produce results for locations within the Philadelphia Metropolitan area. Section V then uses the regional and local impacts to produce revenue consequences for state and local governments. Finally, in Section VI there is a discussion of potential micro impacts from a closure of the Naval Complex in terms of unemployment, the duration of unemployment and income loss for individual workers impacted by a closure.

²Employment breakdowns listed here are sourced from TNIP.

II. Data and Methodology

In order to determine the economic impact of the Naval Complex on the Philadelphia metropolitan area, it is necessary to determine what employment is generated directly and indirectly by the Complex. This level of employment is then removed from the total in the Philadelphia SMSA model, and the metropolitan model is simulated assuming that the Complex does not exist. Because these jobs are 'lost' to the SMSA, the associated purchases that would have been made by these employees are also lost. In turn, this loss of purchases results in even greater loss of employment and income. The second loss is known as the multiplier effect, and is referred to in this report as the induced effect.

As noted, total employment is broken down into three parts. The first is direct employment. Direct employment consists of those employees who are employed by the Complex. Data on direct employment and income were provided by base and shipyard offices.

The second type of employment is referred to as indirect. These are jobs which result from the Complex's existence in that they serve the yard or yard activities, but the persons involved are not directly employed by the Complex. Examples of indirect employment are materials suppliers and handlers, truckers, food workers, etc.

The indirect effects of the potential Complex closure were captured by using input/output analysis (I/O). In order to produce output in any industry, inputs are required from many other industries. The coefficients provided in the I/O table indicate the required inputs from each of these intermediate sectors, and given ratios of output per employee for each sector, it is possible to compute the levels of employment needed to produce the intermediate output. The wages and salaries of those employees can also be computed using industry average wage rates.

The next step was to determine the induced job losses. Given the employment and income figures reported above, the WEFA Group's model of the Philadelphia SMSA was simulated after removing the employment and income indicated by the first two steps. The decrease in employment and income leads to reductions in spending by these former employees and thus additional income and jobs are lost from the area. This additional reduction in the number of jobs is the employment multiplier.

Finally, an estimate of the effect of the Complex closure was made for retail sales within the metropolitan area. An equation was added to the WEFA Group regional model for Philadelphia for total retail sales. Thus, once the simulation to determine the induced effects of the closure occurred, the specific effect on retail sales was established.

Another method of measuring the impact of the Complex closing on the Philadelphia economy is to use an output measure. The most commonly used measure is known as Gross Metropolitan Product (GMP). This measure is comparable (although not an exact analogy) to the commonly reported Gross National Product measure. While data have been released in recent years which measure gross product for states, no such measure has been calculated for areas smaller than states. The WEFA Group proceeded by estimating GMP for the Philadelphia SMSA using the available state estimates as a starting point. Following this, an estimate of the decrease in GMP that would occur with the Complex closing was made.

III. Impacts on Regional Employment and Income

The direct employment and income effects were determined from data which were supplied to The WEFA Group by the PEL. These data indicate that closing the Navy Complex would result in the direct loss of 12,966 civilian jobs; of that total, 8,600 are associated with the Navy Yard itself.

As a result of the Complex Closure, 6279 military personnel will also leave the area. This figure includes those permanently associated with the base as well as a number of 'afloat' personnel (Military personnel who are assigned to those ships currently being repaired at the yard). The current number of afloat personnel was used. While the number of afloat personnel has varied over the years, the current number is approximately equal to the average level that has existed during the past ten years.

The transfer of military personnel is not carried over into the computation of the induced effects of the Complex closure on the Philadelphia SMSA economy. By convention, military personnel stationed in a particular region are not counted in the employment statistics for that region. Consequently, their inclusion here would tend to overstate the induced effects arising from the Complex closure. For income accounting purposes, however, the salaries paid to military personnel are counted in the region's totals, and therefore were included.

The income data supplied to the PEL indicate that the yard employees earned \$250.9 million in wages and salaries, that the other civilian employees at the base received \$110.2 million in wages and salaries and that the military personnel received \$140.7 million in wages and salaries.

Once the direct employment and income effects were determined, the indirect effects could be calculated. The indirect employment figures that were generated using the I/O table are shown in Table 1. As can be seen, the direct employment effects caused a loss of 12,966 jobs, with most of these being jobs associated with the yard. The loss

of activity and associated purchases led to an additional 2,077 jobs being eliminated.

With the direct and indirect effects determined, the Philadelphia model was simulated to estimate the induced effects. That simulation showed that an additional 13,858 jobs would be removed from the economy if the Complex closed. In addition, wages and salaries would fall by \$365.9 million for this group.

Table 1

Direct, Indirect and Induced Employment and Income Effects.
(Wages are in Thousands of Nominal Dollars)

| | Employment | Wages |
|---------------------|------------|-----------|
| Direct Losses: | | |
| Shipyard | 8,600 | \$250,754 |
| Gov-Civilian (Base) | 4,366 | 110,202 |
| Gov-Military | - | 140,675 |
| Sub-total | 12,966 | \$501,631 |
| Indirect Losses: | 2,077 | \$47,324 |
| Induced Losses: | 13,858 | \$365,900 |
| Total | 28,901 | \$914,855 |

In addition to the wage and salary losses would also be losses in 'non-wage' income. Non-wage income includes proprietors' income, other labor income (benefit payments - insurance and other fringe benefits), dividends, interest and rent and transfer payments (unemployment compensation, food stamps, social security, etc.). Of course, fewer social security taxes would be paid as well. These additional income losses were shown to total \$294.7 million. This brings the total loss of income to \$1209.6 million.

The projected loss of income brings with it a decrease in spending. Using the equation added to the Philadelphia SMSA model for this study, total retail sales were estimated to drop by slightly more than 1 percent, or \$382.7 million. Please note that this loss in retail sales is already reflected in the induced losses figure reported in Table 1 above.

Lastly, an estimate of the decline in GMP as a result of the Naval Complex closure was prepared, using the methodology briefly outlined in section 3. GMP was estimated to drop by 1.5 percent or \$2090.2 million.

IV. Intra-Regional Effects

Based on the regional calculations for employment produced by WEFA, PEL developed an estimate of the number of employees at risk from a full closure of the Philadelphia Naval Complex by state and county divisions. Table 2 displays the estimate of employment loss by location within the region.

Table 2. Residence of Civilian Employees affected by Naval Complex Operations

| Location | Number of Workers | Percent of Total |
|--------------|-------------------|------------------|
| Pennsylvania | 19,594 | 67.8% |
| Philadelphia | 12,918 | 44.7% |
| Bucks | 607 | 2.1% |
| Chester | 260 | 0.9% |
| Delaware | 5,318 | 18.4% |
| Montgomery | 405 | 1.4% |
| New Jersey | 8,670 | 30.0% |
| Burlington | 867 | 3.0% |
| Camden | 4,335 | 15.0% |
| Gloucester | 2,890 | 10.0% |
| Delaware | 549 | 1.9% |
| Other | 88 | 0.3% |
| Total | 28,901 | 100.0% |

Source: Employment distributions are based on the residences of Philadelphia Naval Shipyard employees as supplied by the Philadelphia Naval Shipyard.

PEL estimated the loss by location from employment statistics provided by the Philadelphia Naval Shipyard. The Shipyard provided a count of its current work force categorized by the residential location of the employees. PEL then extended the distribution to all Naval Complex related workers. The assumption is that the distribution of

employees at the Shipyard approximates the distribution likely to be found among all Base employees and those workers whose jobs are tied to Naval Base operations.

Table 2 shows that the brunt of the employment effect from a closure of the Naval Complex would be borne by the states of Pennsylvania and New Jersey. Within Pennsylvania, the City of Philadelphia and Delaware County will suffer the greatest consequences as nearly 13,000 Philadelphia residents and over 5,000 from Delaware County could risk losing their jobs from closing of the Complex. In New Jersey, over 4,000 residents of Camden County could be affected, while the number at risk in Gloucester County is likely to be nearly 3,000.

To place these numbers in some sort of context, PEL calculated the effect on current labor force demographics in the region by assuming that at-risk employees will be added to the region's current number of unemployed. These effects are detailed in Table 3 for those locations where the largest impacts are likely to be felt.

Table 3. Changes in regional unemployment rates from a full closure of the Philadelphia Naval Complex

| PMSA | | | |
|------------------------------|-----------|--------------------------------------|----------------|
| Current Regional Labor Force | | Regional Labor Force without Complex | Percent Change |
| Employed | 2,310,200 | Employed 2,281,300 | -1.3 |
| Unemployed | 113,700 | Unemployed 142,600 | 25.4 |
| Total | 2,423,900 | Total 2,423,900 | |
| Unemployment Rate | 4.7 | Unemployment Rate | 5.9 |

City of Philadelphia

| Current Philadelphia Labor Force | | Philadelphia Labor Force without Complex | Percent Change |
|----------------------------------|---------|--|----------------|
| Employed | 685,300 | Employed 672,382 | -1.9 |
| Unemployed | 42,500 | Unemployed 55,418 | 30.4 |
| Total | 727,800 | Total 727,800 | |
| Unemployment Rate | 5.8 | Unemployment Rate | 7.6 |

Delaware County, PA

| Current Delaware County Labor Force | | Delaware County Labor Force without Complex | Percent Change |
|-------------------------------------|---------|---|----------------|
| Employed | 278,700 | Employed 273,382 | -1.9 |
| Unemployed | 11,300 | Unemployed 16,618 | 47.1 |
| Total | 290,000 | Total 290,000 | |
| Unemployment Rate | 3.9 | Unemployment Rate | 5.7 |

Camden County, NJ

| Current Camden County Labor Force | | Camden County Labor Force without Complex | Percent Change |
|-----------------------------------|---------|---|----------------|
| Employed | 220,448 | Employed 216,026 | -2.0 |
| Unemployed | 11,753 | Unemployed 15,175 | 37.6 |
| Total | 232,201 | Total 232,201 | |
| Unemployment Rate | 5.1 | Unemployment Rate | 7.0 |

Gloucester County, NJ

| Current Gloucester County Labor Force | |
|---------------------------------------|----------------|
| Employed | 97,568 |
| Unemployed | 5,537 |
| Total | 103,105 |

Unemployment Rate 5.4

State of Pennsylvania

| Current Pennsylvania Labor Force | |
|----------------------------------|------------------|
| Employed | 5,541,000 |
| Unemployed | 346,000 |
| Total | 5,887,000 |

Unemployment Rate 5.9

State of New Jersey

| Current New Jersey Labor Force | |
|--------------------------------|------------------|
| Employed | 3,849,200 |
| Unemployed | 199,000 |
| Total | 4,048,200 |

Unemployment Rate 4.9

| Gloucester County Labor Force without Complex | | Percent Change |
|---|----------------|----------------|
| Employed | 94,619 | -3.0 |
| Unemployed | 8,486 | 53.3 |
| Total | 103,105 | |

Unemployment Rate 8.2

| Pennsylvania Labor Force without Complex | | Percent Change |
|--|------------------|----------------|
| Employed | 5,521,406 | -0.4 |
| Unemployed | 365,594 | 5.7 |
| Total | 5,887,000 | |

Unemployment Rate 6.2

| New Jersey Labor Force without Complex | | Percent Change |
|--|------------------|----------------|
| Employed | 3,840,530 | -0.2 |
| Unemployed | 207,670 | 4.4 |
| Total | 4,048,200 | |

Unemployment Rate 5.1

Regional Minorities

| Current PMSA Minority Labor Force | |
|-----------------------------------|----------------|
| Employed | 483,000 |
| Unemployed | 41,000 |
| Total | 524,000 |

Unemployment Rate 7.8

Philadelphia Minorities

| Current Phila. Minority Labor Force | |
|-------------------------------------|----------------|
| Employed | 318,250 |
| Unemployed | 31,325 |
| Total | 349,575 |

Unemployment Rate 9.0

| PMSA Minority Labor Force without Complex | | Percent Change |
|---|----------------|----------------|
| Employed | 476,355 | -1.4 |
| Unemployed | 47,645 | 16.2 |
| Total | 524,000 | |

Unemployment Rate 9.1

| Phila. Minority Labor Force without Complex | | Percent Change |
|---|----------------|----------------|
| Employed | 312,270 | -1.9 |
| Unemployed | 37,305 | 19.1 |
| Total | 349,575 | |

Unemployment Rate 10.7

Source: Pennsylvania labor force statistics from Commonwealth of Pennsylvania, Department of Labor and Industry, Bureau of Research and Statistics, "Philadelphia Area: Quarterly Review of Current Employment and Prospects" First Quarter, 1990. New Jersey labor force data provided by the United States Department of Labor, Bureau of Labor Statistics, "Labstat Series Report."

There are two ways to view the impact on the region's employment from a closure of the Naval Complex. From the perspective of the number of employed residents in the area, the impact appears minimal. Only 1.3 percent of the region's currently employed work force is affected by a potential closure of the Naval Complex. Even in the hardest hit locations the number affected represents no more than 3 percent of employed residents. However, when viewed from the perspective of increasing the number of unemployed in the region, the impact on the Philadelphia area from closing the Naval Complex is devastating.

Table 3 shows that a full closure of the Naval Complex could increase the PMSA's number of unemployed by 25 percent, sending the current unemployment rate from 4.7 percent to 5.9 percent. For individual communities within the region the effect is even greater. Philadelphia's unemployment rate increases by 30 percent, the rate in Delaware County goes up by 47 percent, Camden County in New Jersey faces the prospect of a 37 percent jump in unemployed, and Gloucester County could suffer as much as 53 percent increase in unemployed.

Besides the impact on the region's employment, the Naval Complex also contributes significantly to the region's income. As stated previously, the WEFA model estimates \$915 million in wage and salary income as a result of Complex activities and approximately \$295 million in non-wage income. The potential \$1.2 billion in lost income as a result of closing the Complex represents 1.6 percent of the region's total personal income reported for 1986.³

In Table 4 the income effect is deaggregated for the eight counties within the Philadelphia metropolitan area. The deaggregation was accomplished by allocating the regional income figures to individual counties according to the proportion of the Naval shipyard work force residing in a particular county. For example, since 44.7 percent of the shipyard work force lives in Philadelphia it was estimated that 44.7 percent of the \$1.2 billion or \$541 million in income at risk from a closure of the Naval Complex would be potentially lost in Philadelphia.

Table 4 shows that four of the region's eight counties stand to lose over \$100 million in income if the Complex closes. In addition to the City of Philadelphia's potential loss of \$541 million, Delaware County could lose up to \$185 million, Camden County \$181 million and Gloucester County \$121 million. These losses make up relatively small percentages of the total personal income generated in each of these locations. The losses represent between 2 and 2.5

³William J. Stull and Janice Fanning Madden, *Post-Industrial Philadelphia: Structural Changes in the Metropolitan Economy* (Philadelphia: University of Pennsylvania Press, 1990), p. 190.

percent of total personal income in the counties.⁴ However, the consequences for the region's local governments from such a drop in income can pose significant difficulties, as discussed in Section IV.

⁴Personal income figures for individual counties can be found in Stull and Madden, pp. 192-198.

Table 4. Income Effects from a Full Closure of the Philadelphia Naval Complex
(Dollars in Millions)

| | Region | Ohio | Backs County | Chautau County | De-sware County | Montgomery County | New Jersey | New Burlington County | Camden County | Gloucester County | Delaware | | | |
|----------------------|--------|---------|--------------|----------------|-----------------|-------------------|------------|-----------------------|---------------|-------------------|----------|--|------|--|
| | | | | | | | | | | | | | | |
| Direct Wage Income | | | | | | | | | | | | | | |
| Military | | 140.7 | | | | | | | | | | | | |
| Civilian | | 351.0 | | | | | | | | | | | | |
| Total | | 501.7 | 15.5 | 4.5 | 92.0 | 7.0 | 150.5 | 15.0 | 75.2 | 30.2 | | | 9.5 | |
| Indirect Wage Income | | | | | | | | | | | | | | |
| Total | | 47.3 | 1.0 | 0.6 | 9.7 | 2.7 | 14.2 | 1.4 | 7.1 | 4.7 | | | 3.9 | |
| Induced Wage Income | | | | | | | | | | | | | | |
| Total | | 365.9 | 1.7 | 3.3 | 67.3 | 5.1 | 139.8 | 11.0 | 54.9 | 36.6 | | | 7.2 | |
| Non-Wage Income | | | | | | | | | | | | | | |
| Total | | 294.7 | 6.2 | 2.7 | 16.3 | 4.1 | 88.4 | 8.8 | 40.2 | 29.5 | | | 5.6 | |
| Total | | 1,209.0 | 25.4 | 10.9 | 184.6 | 16.8 | 362.9 | 36.3 | 181.4 | 121.0 | | | 23.0 | |
| Military | | 140.7 | | | | | | | | | | | | |
| Civilian | | 1,068.9 | | | | | | | | | | | | |
| Total | | 1,209.0 | | | | | | | | | | | | |

V. Consequences for State and Local Governments

Table 5 shows the major state and local tax revenues that are dependent on Philadelphia Naval Complex operations. The total of \$86 million understates actual governmental revenues that accrue to states and municipalities in the region because a number of minor taxes and fees that would be affected by a closure of the Complex are not listed. A precise estimate of such revenues is simply not possible.

In Table 5 state tax revenues are calculated by allocating a proportion of the relevant regional economic impact to the state on the basis of the state's share of Complex-related employment and then multiplying that figure by the state's tax rate. For example, in deriving Pennsylvania income tax dependent on Complex activities, 67.8 percent of the civilian wage and salary income, estimated by the WEFA model to be related to Complex activities, is multiplied by the current Pennsylvania state income tax rate of 2.1 percent to provide \$11.4 million in income tax revenue.⁵ Sales tax revenues are similarly calculated except that the WEFA-estimated retail sales figure of \$382.7 million is used as the basis for the calculation. The base for estimated business taxes is derived from the relationship between proprietor income and personal income reported by the State of Pennsylvania.⁶

Table 5 reports over \$37 million in state tax revenues at risk from a closure of the Philadelphia Naval Complex. Of this \$37 million, nearly \$25 million could be lost by the State of Pennsylvania, \$12 million by the State of New Jersey and \$700,000 by the State of Delaware.

⁵The proportion of Complex-related employees residing in Pennsylvania is estimated to be 67.8 percent based on figures from Philadelphia Naval Shipyard records.

⁶Commonwealth of Pennsylvania, 1987 Pennsylvania Abstract: A Statistical Fact Book, Pennsylvania State Data Center, 1987, p. 93.

Table 5. Annual Governmental Tax Revenue Impacts of the Philadelphia Naval Complex (Dollars in Millions)

| State | Income Tax | Sales Tax | Business Tax | Total |
|--------------|------------|-----------|--------------|--------|
| Pennsylvania | \$11.4 | \$10.9 | \$2.4 | \$24.7 |
| New Jersey | 5.5 | 5.6 | 1.0 | 12.1 |
| Delaware | 0.7 | 0.0 | 0.0 | 0.7 |
| Total | 17.7 | 16.5 | 3.4 | 37.6 |

| Municipality | Wage Tax | Property Tax | Business Tax | Total |
|----------------|----------|--------------|--------------|-------|
| Philadelphia | 25.6 | 23.6 | 6.0 | 55.2 |
| Delaware Cnty. | 0.0 | 8.9 | 0.0 | 8.9 |
| Bucks | 0.1 | 0.8 | 0.0 | 0.9 |
| Chester | 0.0 | 0.3 | 0.0 | 0.4 |
| Montgomery | 0.1 | 0.5 | 0.0 | 0.6 |
| New Jersey | | | | |
| Camden | 0.0 | 12.2 | 0.0 | 12.2 |
| Gloucester | 0.0 | 6.3 | 0.0 | 6.3 |
| Burlington | 0.0 | 1.9 | 0.0 | 1.9 |
| Total | 25.8 | 46.3 | 6.0 | 86.3 |

To approximate the revenue impact on local government, calculations were made for three major taxes, wage-income, property and business taxes. The procedure for estimating the wage tax effect was similar to that employed for deriving state income taxes. Philadelphia's wage tax risk was determined by multiplying 44.7 percent of the civilian wage income at the Complex by 4.96 percent, the resident tax rate; the other 55.3 percent of Naval Complex civilian wages was multiplied by 4.3125 percent, the non-resident tax rate. For income generated away from the Complex, it was assumed that 44.7 percent of these wages were taxable at the residential rate and that the rest would not be subject to the Philadelphia wage tax.

The procedure produced an estimate of \$25.6 million in Philadelphia wage tax that is dependent on Naval Complex operations. Small amounts of wage tax revenues are also at risk in Pennsylvania's suburban counties. Municipal-school district wage taxes of 1 percent are relatively common in Bucks, Chester and Montgomery counties. Based on the estimated employment from these locations, each county was expected to lose approximately \$100,000 from a closure of the Complex. No wage tax effect was calculated for Delaware County or for the three New Jersey counties because the tax is not commonly employed in these locations.

To determine real estate tax revenues that might be dependent upon Complex activities, PEL calculated the median real estate tax burden for a family with an income of \$50,000 for each of the eight counties in the region.⁷ The local real estate tax burden was then multiplied by the number of civilian and military families estimated to reside in each county.⁸

Table 5 details the estimated amount of real estate taxes paid by Complex-related families in each of the eight counties in the Philadelphia SMSA. Closure of the Complex would place at risk over \$46 million in these taxes throughout the region. Once again, Philadelphia, Delaware, Camden and Gloucester counties are most effected, depending on Complex-related operations for \$23.6 million, \$8.9 million, \$12.2 million and \$6.3 million, respectively.

If the Complex were to close, it is not likely that all these real estate tax revenues would be lost to the municipalities in the Philadelphia area. Housing would be consumed, but at a lower level due to the loss of income Complex-related families would suffer due to closure. PEL calculated the likely loss by reestimating real estate tax revenues assuming a reduced family income of \$25,000. This

⁷The procedure for determining the real estate tax burden is described in District of Columbia, Department of Finance and Revenue, "Tax Rates and Tax Burdens in the District of Columbia: a Nationwide Comparison" (1989), pp. 5-6.

⁸Based on 28,900 civilians and 2,072 military housed off the Base.

figure was then subtracted from the original real estate tax figure with the difference interpreted as the potential loss in real estate tax revenues from closing the Complex. Estimated losses are reported in Table 6 for each county in the region.

Table 6. Estimated Lost Real Estate Tax Revenues
(Dollars in Millions)

| County | Amount |
|-----------------|--------|
| Pennsylvania | |
| Philadelphia | \$11.2 |
| Delaware County | 4.2 |
| Bucks | 0.4 |
| Chester | 0.2 |
| Montgomery | 0.2 |
| New Jersey | |
| Camden | 5.8 |
| Gloucester | 3.0 |
| Burlington | 0.9 |
| Total | 22.0 |

Chapter VI: Social Costs of Closure/Realignment of the Philadelphia Naval Complex

The social costs of closing or realigning the Philadelphia Naval Complex, like the social costs of closing any private industrial plant, are manifold and not easy to measure. The private costs experienced by directly displaced workers are only one part of the social costs of displacement. Social costs include increased public expenditures on unemployment compensation, health and welfare benefits, and increased training and educational costs. There are also additional private costs that are felt throughout the labor market by individuals that experience wage reductions or fewer employment opportunities as a result of labor oversupply in certain industrial sectors. However, this chapter will focus on those aspects of the costs of worker displacement that have been most studied and are most clearly measurable, economic losses to directly displaced workers and impacts on public expenditures for programs to alleviate the effects of displacement.

Studies that attempt to measure economic costs borne by displaced workers consider impacts on wage earnings, while a variety of other costs are necessarily excluded from the calculation, such as loss of health and pension benefits, and the employment security that accompanies seniority. However, reduced earnings experienced by displaced workers upon reemployment are a significant part of the total private costs of displacement, and are likely to indicate the proportion of long term earnings potential that is lost to individuals as a result of the loss of firm-specific, occupation-specific, and industry-specific skills and investments. Earnings losses also include losses during a transitional period of unemployment, unstable employment or underemployment, that can be of long duration in many cases.

The discussion below will first address what might be the post-closure or post-realignment experiences of workers displaced as a direct, indirect, or induced result of

closure or realignment of the Naval Complex. Case studies of comparable events of worker displacement will be examined in the following section. Finally, there is a review of the literature regarding the most significant factors impacting on the economic costs experienced by displaced workers.

Estimated Effects of Closure/Realignment of the Philadelphia Naval Complex on Displaced Workers

This section will estimate the potential costs to workers in the Philadelphia region of closure or realignment of the Philadelphia Naval Complex, drawing on three sources. First, the results of the national Displaced Worker Survey will be examined to provide a perspective on the range of effects that will be likely to be experienced by displaced workers as a group. This analysis will draw on the only available national data sample on displaced workers, the Displaced Worker Survey (DWS) conducted in 1984, 1986 and 1988, as part of the U. S. Census Bureau's Current Population Survey. Second, projections will be made of unemployment durations and reemployment earnings for groups of PNSY workers based on available statistical models of employment impacts on displaced workers. Third, the prospects for reemployment for PNSY workers within the Philadelphia PMSA labor market will be assessed based on Pennsylvania Department of Labor and Industry projections of occupational growth within the region through 1995.

i. Impacts on the Average Displaced Worker

The Displaced Worker Survey conducted in 1984, 1986 and 1988 asked all respondents in the Current Population Survey conducted by the U. S. Bureau of the Census whether they or any adult member of their household lost a job or left a job during the previous five years "because of a plant closing, an employer going out of business, a layoff from which (the worker) was not recalled or other similar reasons." An affirmative response triggered a variety of supplemental questions regarding worker characteristics and post-layoff experience. Comparisons of the results of the DWS conducted in each year provided important data on the sensitivity of post layoff experiences of displaced workers to geographical

location, the state of the national economy, and characteristics of individual workers.⁹

The discussion below illustrates the range of potential impacts that might be felt by the average worker who is laid off as a direct or indirect result of closure or realignment of the Naval Complex, and had at least three years job tenure at the time of layoff. The figures presented are intended to be illustrative of the range of possible impacts on displaced workers on average. The actual effects will vary depending on the state of the national economy at the time of layoff, as well as the strength of the regional labor market in manufacturing industries and industrial sectors requiring skills that match skills of displaced workers. The impacts on particular individuals will vary widely, depending most importantly on job tenure, blue collar status, and educational level, and secondarily on other factors such as age, sex, race, and prelayoff wage, as discussed below.

Migration:

Between 13 and 17 percent of laid off workers could relocate to another city or county to find or take another job, possibly outside the Philadelphia metropolitan area. Men would be more likely to relocate than women (between 16 and 21 percent of men versus between 9 and 11 percent of women would relocate), and younger workers would be much more likely to relocate than older workers (workers 55 and over could range from 5 to 7 percent relocated). Unemployment rates and earnings losses are likely to be lower for those workers that do relocate, but these could be compensated for by other losses, including non-economic losses.

⁹Data are drawn from Paul G. Flaim and Ellen Schgal, "Displaced workers of 1979-83: how well have they fared?," *Monthly Labor Review*, June 1985; Francis W. Horvath, "The pulse of economic change: displaced workers of 1981-85," *Monthly Labor Review*, June 1987; and Diane E. Herz, "Worker displacement in a period of rapid job expansion: 1983-87," *Monthly Labor Review*, May 1990.

Workers that will leave the labor force:

Over the first five years following layoff, approximately 15 percent of laid off workers will leave the labor force through retirement or discouragement (including approximately one-third of those age 55 to 64, and approximately two-thirds of those 65 and over). Labor force exit rates for blue collar workers over the next five years are likely to range from 11 to 14 percent, while exit rates for non-managerial white collar workers are likely to be somewhat higher, at about 18 percent. Exit rates for service occupations could range from 18 to 24 percent.

Unemployment Rates:

Over the first five years following layoff, unemployment rates could range from 14 to 25 percent for all laid off workers. Unemployment rates are likely to be two to four percentage points higher for men compared to women, and significantly higher for blacks and Hispanics when compared to whites. Unemployment rates for blacks could range from 21 to 41 percent, and for Hispanics, from 18 to 34 percent. Unemployment rates for blue collar workers could range from 16 to 31 percent, significantly higher than for non-managerial white collar positions, which could range from 10 to 21 percent.

Part time Reemployment:

The proportion of reemployed workers who are likely to be reemployed only part-time over the five years following layoff could range from 5 to 14 percent, assuming the pattern in the industrial code "other transportation equipment," which includes the shipbuilding industry.

Unemployment Duration:

Median weeks unemployed for all workers over the first five years after displacement is likely to range from 18 weeks to 24 weeks.¹⁰ For workers 55 and over, the median duration of unemployment is likely to range from 29 to 32 weeks. The median unemployment duration would range from 15 weeks for workers with 13 to 15 weeks of schooling to 39 weeks for workers with 11 or fewer weeks of schooling.

Blue collar workers would be hardest hit out of all occupational categories. Workers in occupational categories such as operators, fabricators, and laborers would face median unemployment durations of between 17 and 52 weeks, depending on educational attainment. Workers in precision production, craft, and repair occupations faced durations from 15 to 26 weeks, depending on educational attainment.

Loss of Benefits:

The percentage of workers likely to lose all health insurance coverage as a result of layoff could range from 32 to 35 percent.

¹⁰This is based on a composite measure of unemployment duration, which includes all periods without work between displacement and survey date for workers employed, unemployed, and out of the labor force at the survey date. However, the actual experience of these groups may vary, since those employed at the survey date experienced durations of 13 weeks; those unemployed, 21 to 32 weeks; and those not in the labor force, 53 to 56 weeks. A different measure of unemployment duration would be average duration of unemployment between displacement and first reemployment. This statistic exhibits greater uniformity among the three groups of workers, ranging from 8 weeks for workers reemployed at survey date, to 9 weeks for those who had held a job after displacement but were unemployed at survey date, and 8 weeks for those who had held a job after displacement but were not in the labor force at the survey date. These durations are not directly comparable with the composite durations listed above because drawn from a later survey, the 1988 DWS.

Loss of Wages:

For those reemployed part time or full time, the median worker is likely to experience reemployment wages that are 13 to 15 percent below income at the time of layoff, a nominal earnings reduction. Taking into account expected wage increases that would have occurred in the absence of layoff, the real losses are likely to be higher. The workers facing the most severe earnings losses will be those with 11 or fewer years of schooling, and in blue collar occupational categories.

Considering only those workers reemployed following layoff, the percentage of workers likely to suffer nominal earnings losses, assuming the pattern of layoffs in the "other transportation equipment" industrial classification, which includes the shipbuilding industry, could range from 49 percent to 63 percent. The percentage of reemployed workers likely to suffer nominal earnings losses, assuming the pattern of layoffs in all industries, could range from 40 percent to 44 percent. (These estimates do not take into account the likely increase in earnings in the prior job, so that real earnings losses could be greater.)

Occupational changes:

Less than half of reemployed workers are likely to be reemployed in the same general occupational category. Those workers reemployed in new occupations are likely to experience more adverse effects than the median figures quoted above. The occupational groups most likely to be reemployed in a new occupational category include: handlers, equipment cleaners, helpers and laborers; machine operators, assemblers, and inspectors; and technicians and related support. The following occupational groups are the most likely to be reemployed in the service sector, where median earnings are significantly lower than in the blue collar sector: machine operators, assemblers, and inspectors; transportation and material moving occupations; and handlers, equipment cleaners, helpers, and laborers.

While nationwide the percent of displaced workers reemployed in the same industry was close to 50 percent, on a regional basis the proportion of displaced workers forced to change industries could vary significantly, since rates of decline or growth of an industry in a particular region will vary more widely than rates of national industrial decline or growth. The proportion of PNSY workers required to change occupations or industries could, as a result, be significantly higher than the national average.

One significant change observed in the more recent Displaced Worker Survey of 1988 was that movement into service industries was increasingly common among workers displaced from jobs in the following industries: transportation and public utilities, trade, and durable goods manufacturing. This trend occurred at the same time that displaced workers overall were becoming more likely to find new jobs in their former industries. This could reflect generally better conditions in some manufacturing sectors and the general economic resurgence of 1987 and 1988, combined with the increasing growth of service sector employment.

Unemployment Insurance Costs:

Almost all displaced PNSY workers would be eligible for unemployment benefits. Based on DWS data, the percentage likely to receive unemployment benefits could range from 62 to 69 percent. Based on information provided by the Pennsylvania Department of Labor and Industry regarding unemployment benefit exhaustion rates for displaced workers in defense-related industries in Pennsylvania, the percentage exhausting benefits could range from 29 to 33 percent.

Among PNSY blue collar workers, those who receive but do not exhaust unemployment benefits and fall into precision production, craft, and repair occupations (approximately 6,000 workers) are likely to receive unemployment benefits for an average of between 15 and 26 weeks. Those who receive but do not exhaust unemployment benefits and fall into operators, fabricators, and laborers occupations (approximately 1,000 workers) are likely to receive

unemployment benefits for an average of between 17 and 26 weeks. (Total actual durations of unemployment on average, however, would be significantly higher.) At weekly benefits of \$250 per person, total unemployment insurance costs for PNSY blue collar workers could range from \$22 to \$31 million.

Among PNSY white collar workers, non-PNSY Naval Complex workers, and workers laid off as an indirect or induced result of cutbacks at the Complex, those who do not exhaust benefits are likely to receive benefits for an average of between 18 and 24 weeks. Therefore, the costs of providing unemployment compensation to 2,000 white collar employees at the shipyard, 4,000 other civilian employees at the Naval Complex, 2,000 displaced "indirect" workers, and 14,000 displaced "induced" workers, could range from \$74 million to \$95 million.

The cost to support benefits to former Naval Complex federal workers will be borne by the federal government. Indirect and induced unemployment costs, however, will be borne by state unemployment insurance funds in Pennsylvania, New Jersey, and Delaware, and could range from \$53 million to \$69 million.

Medical and Psychological Effects:

Significant medical and psychological effects will be experienced by workers with long unemployment durations and low reemployment success.

ii. Impacts on Model PNSY Workers

Statistical models of the post-displacement experiences of displaced workers were employed to determine the impact of displacement on PNSY workers. Using data regarding the average characteristics of PNSY workers, it was possible to arrive at projections of the range of possible outcomes for model blue collar and white collar PNSY workers. The model blue collar worker was assumed to have the following characteristics: prelayoff weekly wage of \$511, age 41, tenure at PNSY of 13 years, 12 years of formal education, white, male, receiving unemployment compensation, not

relocated, household head, married, and reemployed in a different industry and occupation. The model white collar PNSY worker had these characteristics: prelayoff weekly wage of \$556, age 40, tenure at PNSY of 13 years, 14 years of formal education, white, male, receiving unemployment compensation, not relocated, household head, married, originally employed in a clerical occupation, and reemployed in a different industry and occupation.

The statistical models employed measured unemployment duration and wage losses as a function of various worker characteristics and data about the regional and national economy. The following assumptions were made with regard to the regional economy: average annual employment growing at a rate of 2 percent, regional unemployment rate at 5 percent, average annual change in the unemployment rate at +.2 percent, average annual change in regional employment in industrial classification 37 (which includes the shipbuilding industry) at -2.2 percent. Estimates of unemployment duration and wage losses were made assuming national recessionary conditions and also assuming a continuation of expansionary conditions.

Under the assumption of continued national economic expansion, the average PNSY blue collar worker can expect unemployment durations ranging from 21 to 43 weeks, and wage losses from the pre-displacement level of \$511 per week to a reemployment level of between \$300 and \$370 dollars per week. Under nationally recessionary conditions, this same worker could expect unemployment durations from 33 to 43 weeks, and reemployment wages ranging from \$260 to \$350 dollars per week.

The average PNSY white collar worker, under expansionary conditions, can expect unemployment durations ranging from 25 to 27 weeks, and wage losses from the pre-displacement level of \$551 per week to a reemployment level of between \$320 and \$480 dollars per week. Under nationally recessionary conditions, this same worker could expect unemployment durations from 16 to 38 weeks, and reemployment wages ranging from \$300 to \$410 dollars per week.

These projections are averages only, and do not reflect the wide range of likely variation in outcomes among individuals.

iii. Possible Experience of PNSY Workers in the Regional Labor Market

The Pennsylvania Department of Labor and Industry has compiled projections of job openings in the Philadelphia Primary Metropolitan Statistical Area (PMSA) through 1995, by occupation. These projections are based on national, statewide, and regional data and are based on projections of growth by industry and occupational structure within each industry over the period from 1984 to 1995. The methodology for these projections was developed by the U. S. Bureau of Labor Statistics (BLS). The occupational projections are based on the Occupational Employment Statistics (OES) Survey occupational classification system devised by BLS in 1983.

Projected occupational growth by OES occupational classes was compared to the existing occupational structure at PNSY, as reported by the Shipyard Controller. The Shipyard Occupational structure is organized according to the U. S. Office of Personnel Management (OPM) General Schedule system. Where possible, OPM Occupational "Groups" were matched to OES occupational categories. In some cases, OPM "Series" were matched to OES categories.

Table 7 presents a comparison between projected average annual growth of various occupational categories in the Philadelphia PMSA with the approximate number of PNSY workers with similar occupational characteristics. In some cases, and particularly for blue collar occupations, it was possible to match OES occupational categories exactly with OPM categories. In other cases, broad occupational groupings were matched. The comparisons are suggestive of the relative difficulty that various types of workers will experience in locating new jobs comparable to their old jobs, in the event of PNSY closure or realignment.

The table clearly indicates that there are a few occupational categories where a particularly large proportion of laid off workers are unlikely to locate new jobs in the region in similar occupational categories. Based on an examination of the ratio of PNSY workers in particular occupational categories and projected annual growth in those occupations, the workers most likely to change occupations include: electrical installation and maintenance workers; insulation workers; plumbers and pipefitters; electrical and communications equipment mechanics; marine machinery mechanics; riggers; precision metal workers; boilermakers; machinists; sheet metal workers; shipfitters; metal processors; welders; and equipment operators. These categories of workers combined account for 5,378 workers or 60 percent of total PNSY employment. These are among the workers most likely to experience severe losses as a result of displacement.

Case Studies

The following case study of the Boston Naval Shipyard closing is included to provide background concerning the type of impacts resulting from and public responses necessitated by the closing of a Naval Shipyard. The degree of economic losses experienced by workers displaced in this case are not intended as projections of impacts likely in the event of a PNSY closure. The actual impacts on workers involved in a particular layoff event will always depend on local and national economic conditions at the time of layoff and worker characteristics. Another important factor in the case of a Naval Shipyard closing will be the extent to which reemployment opportunities are made available within the Department of Defense or other federal agencies, and the extent to which job search, relocation, or retraining assistance is made available through public or private programs.

Table 7. Comparison of MYSY 1990 Employment to Projected Labor Demand in the Philadelphia Area by Occupation

| Projections of Annual Average Job Openings in Philadelphia Area Due to Employment Growth by OCS Occupational Classification | Philadelphia Naval Shipyard Employment as of February 1990 by Federal General Schedule Occupational Classifications | MYSY Employment Over (Under) Demand Due to Growth | Ratio of MYSY Employment To Annual Demand Due to Growth |
|--|---|---|---|
| Managerial and related occupations | 2,873 | 430 (2,443) | 0.150 |
| Engineers, architects and surveyors | 374 | 400 25 | 1.067 |
| Natural, computer and math scientists | 413 | 21 (392) | 0.051 |
| Social scientists | 35 | 2 (33) | 0.057 |
| Lawyers and judges | 202 | 3 (209) | 0.011 |
| Teachers, librarians and counselors | 348 | 4 (344) | 0.005 |
| Health diagnostic and treatment occupations | 1,507 | 7 (1,500) | 0.005 |
| Writers, artists, entertainers, athletes | 199 | 23 (186) | 0.035 |
| Technician occupations | 1,306 | 423 (883) | 0.316 |
| Personnel management and kind related Accounting and budget Business and industry Total | 99 125 216 440 | 99 125 216 440 | 0.051 0.057 0.011 0.005 |
| Physical sciences Mathematics and statistics Total | 18 3 21 | 18 3 21 | 0.051 0.057 0.011 |
| Economic General attorney Library and archives Education Total | 35 202 348 1 348 | 35 202 348 1 348 | 0.051 0.057 0.011 0.005 0.005 |
| Medical, hospital dental and public health Information and arts Engineering tech, electronics tech, food serv tech, eng and arch Paralegal, legal clerk, claims clerical Plant and animal work Total | 199 199 399 9 3 1,306 | 199 199 399 9 3 883 | 0.035 0.035 0.316 0.005 0.005 0.316 |
| Admin support (including clerical) Service occupations All other service occupations Construction trades Carpenters Electricians Insulation workers Painters and paperhangers Plumbers, pipefitters & steamfitters Mechanics, installers and repairers Communications equip mechanics, install Electrical & electronic equip mech instl Machinery and related mech install and Machine maint mechanics, marine equip Vehicle and mobile equip mech install | 2,195 4,671 318 631 233 113 1 30 39 (49) (3) 164 1 463 | (1,588) (1,673) (242) (621) (65) 592 228 274 307 30 277 22 114 674 674 (378) | 0.277 0.041 0.233 0.016 0.651 6.239 293.000 10.133 18.442 -0.233 -92.333 0.890 615.000 0.184 |

| | | | | | |
|--|--------|----------------------------------|-----|-------|----------|
| Other mech install and repair | 172 | Instrument work | 15 | | |
| | | Subcontract, bottling | 1-6 | | |
| | | Equipment cleaning | 2 | 183 | (38) |
| | | Total | | 318 | 318,000 |
| Diggers | 1 | Rigging | | 318 | 318,000 |
| Precision production occupations | | | | | |
| Exclusion mech workers | (165) | Sawing tool work | 57 | | |
| | | Metal Working | 62 | | |
| | | Total | 119 | 309 | -0,231 |
| Rollers | (8) | Roller-making | 222 | 230 | -27,750 |
| Markinists | (89) | Marking | 366 | 455 | -4,112 |
| Sheet metal workers | 10 | Sheet metal mechanic | 260 | 250 | 26,000 |
| Skifitters | (1) | Skifitting | 395 | 395 | -335,000 |
| Precision textile, apparel and furnish | 2 | Fabric and leather work | 10 | 15 | |
| Mach operators, set-up oper, oper and tend | | | | | |
| All other metal and plastic mach sec 9 | (9) | Plastic materials work | 63 | 58 | -12,600 |
| Printing binding and related | 24 | Printing | 2 | (2) | 0,000 |
| Other hand workers including assemblers | (295) | Total processing | 51 | | |
| | | Packing and processing | 46 | | |
| | | Total | 97 | 392 | -0,329 |
| Welders and cutters | (11) | Welding | 516 | 649 | -19,335 |
| Plant and system occupations | (2) | Industrial equipment operation | 152 | | |
| | | Amunition and armaments | 1 | | |
| | | Total | 157 | 157 | -78,500 |
| Transportation and mobile equip oper | | | | | |
| Ship pilot | 2 | Transportation/mobile equip oper | 117 | | |
| | | Ship pilot | 2 | | |
| | | Total | 119 | (426) | 0,218 |
| General services and support work | 107 | | | | |
| Warehousing and stock handling | 234 | | | | |
| Total | 341 | | | (34) | 0,907 |
| Helpers, laborers and material mov, and | 365 | | | | |
| Total, PEAS EMPLOYMENT | 17,392 | | | 8,913 | (8,479) |
| | | | | | 0,512 |

| | | | | | |
|---|--------|--|--|-------|---------|
| Transportation and mobile equip oper | 547 | | | | |
| General services and support work | 107 | | | | |
| Warehousing and stock handling | 234 | | | | |
| Total | 341 | | | (34) | 0,907 |
| Helpers, laborers and material mov, and | 365 | | | | |
| Total, PEAS EMPLOYMENT | 17,392 | | | 8,913 | (8,479) |
| | | | | | 0,512 |

i. The Boston Naval Shipyard

A decision to close the Boston Naval Shipyard in April 1973 resulted in the displacement of over 5,000 civilian employees of the Shipyard over the following two years. A survey of the 5,327 people who were employed at the Shipyard as of January 1, 1973 was conducted in June 1975 by the Massachusetts Joint Commission on Federal Base Conversion.¹¹ 1218 responses were received. The average time since layoff at the time of survey was 19.6 months, and the average tenure of the employees prior to layoff was 18.6 years.

With regard to post-layoff outcomes at the time of survey, the work force breaks down as follows:

25 percent were transferred by the Department of Defense or placed immediately in private industry and were not eligible for unemployment compensation.

5 percent were maintained in employment at the Shipyard as part of the Planning Group, and never collected unemployment benefits.

5 percent were reemployed without collecting any unemployment benefits, although they were eligible for benefits at some time.

23 percent were reemployed after having collected unemployment benefits for some time.

35 percent were still receiving unemployment benefits.

5 percent were unemployed after exhausting available unemployment benefits.

¹¹Massachusetts Joint Commission on Federal Base Conversion, "The 1973 Military Base Closures in Massachusetts: What Happened to the Employees," Boston, MA, 1976.

2 percent had received unemployment benefits, were unemployed at survey date, and were not receiving unemployment benefits for some reason other than exhaustion of available benefits.

These figures suggest that 53 percent of workers had found jobs immediately after layoff, or some time after layoff prior to the survey. The survey also showed that 52 percent of workers were still employed at the time of survey, and 22 percent of them had federal jobs, presumably because they had been kept on at the Shipyard or transferred by the Department. Thus the high reemployment rate of Shipyard workers overall was due in significant part to efforts of the Department of Defense to transfer and reemploy former Shipyard employees.

The survey also revealed that 45 percent of former Shipyard employees were receiving retirement benefits at the time of survey, which was very close to the 48 percent that had been projected by the Department of Defense based on the number of workers estimated eligible for retirement benefits. These individuals were not necessarily out of the labor force, especially those under 55, for whom benefits were not sufficient to compensate for the loss of full time employment.

Average duration of unemployment benefits was 36.1 weeks. This figure is higher than would be expected for displaced workers today under similar circumstances, since the maximum number of weeks available under the unemployment compensation program ranged from 39 to 65 between 1973 and 1975 in Massachusetts, compared to 26 weeks currently in Pennsylvania.

Hourly wages of workers reemployed at the time of survey were \$5.43 on average, an estimated 10.3 percent less in real terms, or 10.3 percent less than the workers would have been earning had the Shipyard remained open, assuming wage increases at the Shipyard are proportional to increases in the cost of living. At least 53 percent of those working lost at least 29 percent of prior income in real terms.

The average wage of those working in federal jobs was \$6.94, while average wages for those not reemployed by the federal government was \$5.22. Almost half of all workers reemployed outside the federal government experienced a loss of income of 10 percent or more in nominal terms, while only 14 percent of workers reemployed with the federal government experienced comparable losses.

These figures suggest that the role of the Department of Defense in finding new employment for shipyard workers was of major importance in determining post-displacement wage levels. Such would most likely be true in the circumstances surrounding a Naval Shipyard closing today. The figures also suggest the importance of utilizing firm- and industrial-specific human capital to prevent large post displacement wage losses.

The Navy's experience with reductions in the work force at Naval Shipyards nationally in the 1980s suggests that significant work force reductions can be accomplished without layoffs. The civilian work force at PNSY has declined from 11,535 as of September 30, 1983 to about 9,000 today. A reduction of over 5,000 personnel was accomplished at the nation's public shipyards between February and December of 1985, primarily through attrition and the release of temporary employees. Another 653 employees were reassigned to other positions or were downgraded in position to meet force reduction targets. Only 59 employees lost employment as a result of these targeted force reductions.¹² This suggests that a gradual reduction in personnel can be accomplished at public shipyards with fairly modest levels of separation, and that the quantity of worker displacement and the severity of the effects on the workers will depend on Navy choices regarding the speed of the closure/realignment timetable and personnel reassignments. However, the fiscal environment of the 1990s, and the pressure to achieve real reduction in the defense budget, is likely to make personnel reassignment and transfer of displaced Shipyard workers within the federal government more difficult than in recent decades.

¹²U. S. General Accounting Office, *Navy Manpower*, Washington, D. C., November 24, 1986.

Still, wage losses for PNSY workers will be determined significantly by the extent to which the federal government is able or willing to provide opportunities for federal jobs in related areas to displaced PNSY workers. For workers at the Boston Shipyard, these opportunities were available through the Department of Defense's Priority Placement System which gave displaced workers preference for any vacant jobs throughout the Department. This program placed 1,219 former Shipyard employees, or 24 percent of total workers laid off. The Department also offered employees opportunities to transfer to other federal agencies.

Also of assistance to Boston Shipyard workers was the fact that retirement income was made available by the Department to over 2,200 Shipyard workers, or 45 percent of those laid off. Eligibility was granted to those with 20 years service over 50 years old, to those with 25 years of service, and to those over 55 years old. Employees were also reimbursed for relocation expenses, to facilitate transfers.

The Department's Office of Economic Adjustment administered and coordinated the federal response. The federal Department of Labor, through the Defense Employees Reemployment Program (DERP), provided funding for retraining assistance which was utilized by 800 workers. This program provided a \$2600 voucher to each participant which could be used to pay for on the job training, institutional training, income supplements for workers reemployed at low salaries, and job search and relocation assistance.

The state Division of Employment Security provided on-site teams to take unemployment insurance and retraining applications, and administered DERP and the Public Service Jobs program which provided direct public employment to 200 workers. The state decided to exempt retirement income from unemployment eligibility consideration for two years following layoff. City agencies helped place affected residents in training and the Public Service Jobs program. The City's Economic Development and Industrial Corporation established an industrial park at the former Shipyard site, which employed 25 former yard employees.

ii. Other Case Studies

Case studies of individual plant closings have concluded that age and high job tenure is associated with low rates of reemployment and high private costs of displacement.¹³ High levels of formal education is associated with higher reemployment rates. One of the earlier studies of defense establishment closings reported that the average length of unemployment for displaced defense workers was 14.3 weeks for men and 23.4 weeks for women.¹⁴ Skill and income levels were also found to be important in determining unemployment rates. Workers with the lowest earnings levels were generally found to have the highest unemployment rates, possibly reflecting the readjustment difficulties of particular occupational groups with below average incomes.

Local labor market conditions were also found to be important in most case studies. The extent to which a particular closing had a large percentage effect on the regional unemployment rate was found to be a significant factor in affecting reemployment rates of displaced workers. The ability of a local labor market to absorb displaced workers depended not only on the initial regional unemployment rate, but also the size and diversity of the local economy. More diversified economies exhibited greater ability to absorb displaced workers.¹⁵ Mass layoffs that have a significant effect on regional unemployment rates can result in "labor market congestion" that can itself prolong the unemployment of displaced workers.

¹³For discussion of past case studies, see Jeanne Prial Gordus, Paul Jarley, and Louis A. Ferman, *Plant Closings and Economic Dislocation*, (Kalamazoo, Michigan: W. E. Upjohn Institute for Employment Research, 1981), pp. 67-90.

¹⁴Robert Brandwein, "Employment Experience of Discharged Defense Workers," *Monthly Labor Review*, October 1965, p. 1213.

¹⁵Herbert S. Parnes, *Research on Labor Mobility: An Appraisal of Research Findings in the United States*, (Westport, CT: Greenwood Press, 1956), p. 139.

Organized information about the job market and job search assistance significantly lowered economic losses from displacement, regardless of the strength of the local labor market, according to one study.¹⁶ Generally, case studies of plant closings in the 1960s and 1970s suggested that age, job tenure, sex, race, education and skill level were the most significant factors affecting reemployment earnings after displacement, and duration of unemployment.

Key Factors Affecting Outcomes for Displaced Workers

Numerous studies analyzing recently available data samples on the post-displacement experiences of displaced workers have addressed the question of which factors most influence the duration of joblessness and financial losses resulting from displacement. These studies have focused both on the characteristics of individuals and the conditions of local economies and labor markets in which layoff events take place. The discussion below addresses the characteristics of workers and labor markets which have been found most significant in affecting the outcome of worker displacement. The conclusions suggest that in the event of displacement, assistance efforts should be targeted on blue collar workers, workers with high job tenure, workers with low levels of general education, workers with specific non-transferable skills, and workers with skills for which local or national demand is in decline. Given the highly specialized skills of PNSY blue collar workers, and the decline of manufacturing industries in the Philadelphia economy, the literature summarized below strongly suggests that PNSY blue collar workers will be more adversely affected by displacement than the average displaced worker in the nation. As a result, the real impacts of PNSY closure or realignment on PNSY workers could be more severe than the projected impacts outlined above, which are based on national average outcomes for displaced workers.

¹⁶Yolanda Henderson, "Defense Outbacks in the New England Economy" *New England Economic Review*, (July/Aug. 1990).

Conditions in Regional Labor Markets

Available evidence suggests that the private costs of layoffs are particularly burdensome in the context of simultaneous economic weakness regionally. Howland and Peterson find that local labor market conditions are among the most influential factors affecting post-displacement experience.¹⁷ For blue collar workers, their study finds that the most influential variables affecting post-displacement outcomes are growth in the industry from which the worker is displaced, and race. For white collar manufacturing workers, they find that the most influential factors are the local unemployment rate, the recent change in the local unemployment rate, and years of formal education.

These factors are significant because they to some extent capture labor supply relative to demand, while total employment growth and manufacturing employment growth capture changes in labor demand only. For blue collar workers, change in employment for the industry of displacement, without reference to changes in labor supply available to that industry, could reflect relevant labor market conditions because declines in manufacturing employment are more influential in affecting equilibrium wages than changes in labor supply. Arguably, this is because labor supply is relatively static for a particular industrial sector in light of the high proportion of blue collar skills that are industry-specific. White collar workers, on the other hand, have more general skills and their reemployment experiences will be more influenced by labor market conditions generally, as measured by level and growth of the unemployment rate. This suggests that few conclusions about the outcomes of displacement for PNSY workers can be drawn from facts about growth in total employment or even growth in manufacturing sector employment in the Philadelphia PMSA.

¹⁷Marie Howland and George Peterson, "Labor Market Conditions and the Reemployment of Displaced Workers," *Industrial and Labor Relations Review*, October 1988.

Another study finds that reemployment success is more sensitive to local conditions in the worker's industry of displacement than to the total local economy; changes in employment in the 2 digit industry of displacement are more significant in affecting reemployment wages and unemployment durations than total employment growth in the regional economy.¹⁸ Another study, however, found that as local area unemployment increases, losses increase significantly for all categories of workers except blue collar females.¹⁹ The same authors also found that area unemployment rate at the time of displacement was one of the most consistently significant variables affecting unemployment duration for all groups male and female, white collar and blue collar.²⁰

National Economic Conditions

National economic conditions have a significant impact on reemployment experiences of displaced workers. Reemployment rates of displaced workers surveyed as part of the Current Population Survey vary by more than 10 percentage points between the 1984 survey that surveyed workers displaced during the recessionary years of 1979-83 and the 1988 survey that surveyed workers displaced during the expansionary years of 1983-87. Other studies confirm that the state of the national economy in the year laid off has a significant effect on reemployment wages and unemployment durations.²¹

¹⁸Marie Howland, *Plant Closings and Worker Displacement: The Regional Issues*, (Kalamazoo, Michigan: The W. E. Upjohn Institute for Employment Research, 1988), pp. 115-149.

¹⁹Michael Podgursky and Paul Swain, "Job Displacement and Earnings Loss: Evidence from the Displaced Worker Survey," *Industrial and Labor Relations Review*, October 1987, pp. 17-29. (1987b)

²⁰Michael Podgursky and Paul Swain, "Duration of Joblessness Following Displacement," *Industrial Relations*, Fall 1987, pp. 213-226. (1987a)

²¹Howland and Peterson (1988) and Howland (1988).

Analyses of displacement in the 1960s and 1970s show that men who lost jobs between 1969 and 1978, when there were two recessions and the unemployment rate ranged from 5 to 8.5 percent, were more likely to be reemployed part time or in different occupations than men who lost jobs during the period from 1966 to 1969 when the economy was expanding and unemployment was under 4 percent nationally. The workers displaced in the former recessionary period lost an average of 6 percent of their former wages upon reemployment, while workers displaced during the expansionary period suffered no wage loss on average after displacement.²²

Prelayoff Wages

Howland and Peterson find that the greater the prelayoff wage, the greater the financial losses to displaced workers, due to greater wage differentials between former and reemployment wages.²³ Podgursky and Swaim found that prior earnings are a good predictor of post displacement earnings, but proportionate losses rise as prior earnings rise. Proportionate losses are greater for blue collar than for white collar men, suggesting a greater loss in specific capital investments for blue collar workers. In another study, Podgursky and Swaim found that prelayoff wages were not well correlated with duration of unemployment, for all groups with the exception of white collar and service sector females, who experienced shorter durations as prelayoff wages increase.²⁴ Another study, however, finds that higher prelayoff wages are correlated with shorter unemployment durations for all groups. This suggests that the impact of prelayoff wages may be positive

²²David Shapiro and Steven H. Sandell, "Age Discrimination in Wages and Displaced Older Men," *Southern Economic Review*, July 1985, pp. 90-102.

²³Howland and Peterson (1988).

²⁴Podgursky and Swaim (1987a) and (1987b).

or negative depending on the nature of the labor market and worker characteristics.²⁵

Financial losses due to displacement should be higher for workers with high prelayoff wages to the extent that these wages represent nonproductive rents due to unionization or discrimination; or firm-, occupation-, or industry-specific human capital or skills that cannot be utilized upon reemployment. Losses should be smaller for workers with high prelayoff wages to the extent that wages represent occupation- or industry-specific capital that can be utilized upon reemployment, or general human capital.

Job Tenure

The relationship between greater job tenure and greater earnings losses upon displacement is one of the most significant and consistently reported in the literature on worker displacement.²⁶

Podgursky and Swaim found that greater tenure increases earnings loss most significantly for blue collar men, reflecting the degree to which blue collar experience results in industry-specific skills. They also found that job tenure is positively related to unemployment duration for blue collar males and white collar and service females.²⁷ Madden finds that earnings losses associated with displacement are greater for those with higher job tenure, but that the effect is most significant for women.²⁸ Howland finds that years worked at a job prior to layoff has

²⁵John T. Addison and Pedro Portugal, "The Effect of Advance Notification of Plant Closings on Unemployment," *Industrial and Labor Relations Review*, Vol 41., No 1., pp. 3-16.

²⁶Daniel S. Hamermesh, "What Do We Know About Worker Displacement in the U. S.?", *Industrial Relations*, Winter 1989, p 58.

²⁷Podgursky and Swaim (1987a) and (1987b).

²⁸Janice Fanning Madden, "The Distribution of Economic Losses Among Displaced Workers: Measurement Methods Matter," *The Journal of Human Resources*, Vol 23, No. 1., pp. 92-107.

a significant effect on unemployment duration and reemployment earnings.²⁹

Addison and Portugal criticize the claim that high tenure means high wage losses with the observation that high job tenure is positively correlated with high post displacement wages.³⁰ However, this only indicates that work experience results in both general and specific skills, including both skills that are specific to an occupation, specific to an industry, as well as general skills. This observation does not, however, imply that workers with higher tenure should not experience higher losses as a proportion of former earnings. Hamermesh shows that while tenure has a positive effect on post displacement earnings for most groups, this effect is not significant in the case of blue collar males, indicating the high specificity of their skills.³¹

Prior Occupation

Most studies conclude that blue collar workers suffer larger than average financial losses from displacement. Howland finds that blue collar workers experience longer unemployment durations, but not larger earnings losses.³² Podgursky and Swain found, however, that male craft workers experienced smaller earnings losses than other blue collar workers, suggesting a greater transferability of their skills to other sectors of the economy. They also found that male craft employees experienced shorter unemployment durations, while the same effect was not in evidence in the case of female blue collar craft employees.³³ Madden finds that earnings losses associated with displacement are

²⁹Howland (1988).

³⁰John T. Addison and Pedro Portugal, "Job Displacement, Relative Wage Changes, and Duration of Unemployment," *Journal of Labor Economics*, 1989, Vol. 7, No. 3., pp. 281-302.

³¹Hamermesh (1989).

³²Howland (1988).

³³Podgursky and Swain (1987a) and (1987b).

significantly greater for men formerly employed in professional/managerial occupations, and significantly smaller for men in clerical positions. For women, losses are significantly smaller for workers formerly in sales and clerical positions. For both sexes, according to Madden, "blue collar workers experience the greatest losses."³⁴

Post Displacement Occupation and Industry

Another consistent conclusion of studies of worker displacement is that those workers who change occupations or industries may suffer greater losses than otherwise identical workers. However, this conclusion could be qualified by the possibility that these differences reflect differences in search behavior among workers. For instance, Podgursky and Swain found that whether or not a displaced worker remains in the same 3 digit industry and occupation is particularly significant for blue collar men, reflecting the specificity of their skills. Madden finds that women who changed industry upon reemployment also experienced larger earnings losses than women who did not.³⁵

Many displaced blue collar workers are likely to be reemployed in the service sector. The overall transformation of the regional economy from a goods-producing economy to a service producing economy has resulted in some negative impacts which have been noticed in metropolitan areas throughout the country, such as lower wages and purchasing power at the lower end of the wage scale; increasingly unstable employment manifested in the prevalence of part-time employment, high turnover, and greater susceptibility to cyclical swings; and barriers to upward mobility for workers formerly employed in manufacturing sectors. All of these are drawbacks to reemployment in the service sector which cannot be easily

³⁴Madden (1987).

³⁵Podgursky and Swain (1987a) and (1987b), and Madden (1987).

accounted for by comparing wages before and after displacement.³⁶

Race

There is no clear consensus in the literature regarding the issue of whether being a member of a minority group has significant effect on losses associated with displacement. The fact that minorities on average experience greater losses following displacement, therefore, is most likely the result of the fact that minority workers are more likely to have other characteristics which correlate with financial losses, such as educational level and blue collar status.

Sex

There is not clear consensus on the effect of sex on post displacement experience.

Education

All studies that address the effects of formal education on post displacement experience conclude that greater formal education reduced the losses associated with displacement, both in terms of unemployment duration and wage losses. These effects could be at least partly due to differences in the job search behavior of different workers, because educational level could relate to access to and ability to process labor market information.³⁷ This suggests that impacts on less educated workers can be significantly mitigated through job search assistance and labor market information assistance.

Howland and Peterson find that additional formal education reduced losses, but the returns to education are stronger for white collar workers, consistent with the theory that white collar wages are more closely determined through general skills gained through education. Podgursky

³⁶Barry Bluestone and Bennett Harrison, *The Deindustrialization of America*, (New York: Basic Books, 1982), p. 94.

³⁷Hamermesh (1989).

and Swaim argue that the relatively high proportion of displaced workers that seek employment in new industries and occupations implies that educational attainment will be a major factor in determining unemployment durations and reemployment wages. Their studies show that additional educational attainment reduced unemployment durations, increased the probability of full time reemployment, reduced losses in earnings, and increased the probability of replacing group health insurance through reemployment. This study also found that education had a greater impact on reemployment earnings in the case of white collar workers. However, there was also a significant improvement in blue collar earnings resulting from education.³⁸

Age

There is no consensus in the literature on the significance of age in predicting losses from displacement. The fact that old people on average experience greater losses is most likely to reflect job tenure and educational levels rather than the intrinsic effects of age. However, there is some disagreement on this issue.

Shapiro and Sandell find that the relationship between age and wage does not differ dramatically before and after displacement in the case of workers between the ages of 45 and 65. However, workers over the age of 65 appear to suffer wage penalties from displacement. The study finds an estimated effect of job tenure on wages of 0.5 percent per year of tenure. This figure suggests that a large part of wage losses experienced by workers of all ages after displacement can be explained as a result of the loss of job tenure, and the associated non transferable investments that cannot be utilized after displacement. However, in the case of workers 65 and over, there remains a significant residue of observed wage loss after displacement that cannot be explained as a result of loss in job tenure and specific skills, and must therefore be due to some other factor such as increased cost to employers of hiring older workers, age

³⁸Howland and Peterson (1988), and Michael Podgursky and Paul Swaim, "Do more-educated workers fare better following job loss?," *Monthly Labor Review*, August 1989, p. 43.

discrimination, or accelerated human capital depreciation not taken into account in pre layoff wages.³⁹

Love and Torrence find that workers 55 and older experience unemployment durations 28.8 percent longer than that experienced by workers under 55. By limiting their sample to only those workers who were reemployed after displacement, and including therefore only those workers who were "committed to staying in the labor force and finding full-time reemployment," it was found that age is again a significant predictor of unemployment durations, and that unemployment spells were 38.7 percent longer for workers in the category of ages 55 and older. (The median duration for workers in this subsample was 8 weeks and, for older workers, 11 weeks.) Love and Torrence also found that age has a significant effect on reemployment earnings; workers 55 and older received wages 16.5 percent less than younger workers, reflecting the fact that workers were more likely to be reemployed on a part-time basis. However, the effect of age on wage losses is insignificant when only workers reemployed full time are included in the sample.⁴⁰

These results are explicable in terms of the different job search behavior of older individuals. Because older individuals have the option of receiving retirement benefits such as pensions and social security, it is likely that their reservation wages will be higher in relation to the distribution of wage offers they face when compared to workers without retirement options. This will result in longer durations than younger workers without necessarily higher reemployment earnings levels (and possibly lower levels, depending on the level of retirement benefits available), which is consistent with the above empirical results. The availability of generous retirement benefits could be a significant factor preventing displaced older workers from suffering wage losses that are directly explicable as a result of their age. However, older workers

³⁹Shapiro and Sandell (1985).

⁴⁰Douglas O. Love and William D. Torrence, "The Impact of Worker Age on Unemployment and Earnings After Plant Closings," *The Journal of Gerontology*, Vol. 44, No. 5, pp. S190-S195.

are likely to require targeted assistance because age is correlated with job tenure, which is a major factor associated with wage loss after displacement.

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