The Economic Impact of the

California Prison Industry Authority

on the

California Economy for FY 2008/09

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Executive Summary

This study is an update of three previous studies by Goldman et al. (1998), Goldman and Pradhan (2002), and Price et al. (2008). The results of this study provide information as to the economic, household income, and employment impacts of California Prison Industry Authority (CALPIA) on the economy of the State of California.

California Prison Industry Authority

- The California Prison Industry Authority was created in 1982 as a semi-autonomous state agency to operate California prison industries in a manner similar to private industry.
- The CALPIA is a self-supporting government agency. CALPIA sales increased by 50.9 percent from 1996/97 fiscal year to 2008/09 fiscal year. This increase occurred in spite of the limitation that CALPIA can only sell to the public sector.
- CALPIA for fiscal year 2008/09 had the largest sales ($234.2 million) of any state's prison industry in the United States.
- CALPIA has approximately 619 civilian employees as well as about 6,010 inmates in California's adult correctional institutions.
- CALPIA customers are limited to government entities, except as specified by law. The California Department of Corrections and Rehabilitation (CDCR) is CALPIA's largest customer.

Scope and Magnitude of CALPIA Production

- In fiscal year 2008/09, the CALPIA had sales of $234.2 million.
- In addition to sales, CALPIA had in-state selling and administrative expenditures and capital expenditures totaling $40.8 million and $7.7 million respectively during fiscal year 2008/2009. Selling and administrative expenditures include all in-state personnel and purchasing expenses for its central office plus distribution and transportation costs.
- Inmates work approximately 30 to 35 hours a week and receive wages of $0.35 to $0.90 per hour. CALPIA inmates contribute up to 40 percent of their wages to pay court-ordered restitution and fees. These contributions help crime victims as well as reducing court processing costs.

Economic Impacts of CALPIA on the California Economy

- CALPIA sales and in-state expenditures for fiscal year 2008/09 totaled $282.8 million.
- From these sales and purchases, total impacts of CALPIA activities on the economy of the state of California was $497.1 million in sales, total household income impact of $132.7 million, and total employment impact of 2,394.
- If CALPIA activities did not exist in the state of California, total economic activity in the state of California would decline by $295.5 million in sales, state household income would decline by $75.6 million, with 1,170.5 jobs lost statewide.

INTRODUCTION

The California Prison Industry Authority was created by statute in 1982 as a semi-autonomous state agency to operate California prison industries in a manner similar to private industry. The California Prison Industry Authority (CALPIA) trains inmate-workers to produce a variety of goods and services in factories at correctional institutions throughout California. These production activities provide a variety of uses to the state including: (1) training of inmates who acquire work habits and skills; (2) the supervision of inmates in a secure environment; and (3) the provision of goods and services to the state of California public sector agencies. Each of these services has an economic dimension in terms of contributing value added to the state economy. In this report, the contributions of CALPIA to the state of California's economy are estimated.

CALPIA is a self-supporting government agency. CALPIA sales increased by 50.9 percent from 1996/97 fiscal year to 2008/09 fiscal year, giving them the largest sales ($234.2 million) of any state's prison industry in the U.S. This sales increase is noteworthy given that CALPIA can only sell to the public sector. CALPIA has approximately 619 civilian employees as well as approximately 6,010 inmates in California's adult correctional institutions, operating over 60 service, manufacturing, and agricultural industries at 22 prisons throughout California. CALPIA uses its revenues to cover its costs such as purchasing raw materials, providing inmate supervision, inmate payroll, transporting and distributing its products, acquiring capital, and supporting the central office.

The Prison Industry Board was established in 1983 to oversee operations of CALPIA. The Board sets general policy for CALPIA, appointing a General Manager, monitoring existing operations, and deciding which new industries to enter. The Board serves as a public hearing body charged with ensuring that the operations of CALPIA are self-sufficient. The Board actively solicits public input in its decisions with regard to expanding existing or developing new prison industries (California Prison Industry Authority, 2008).

CALPIA customers are limited to government entities, except as specified by law. The California Department of Corrections and Rehabilitation is CALPIA's largest customer, purchasing more than half of CALPIA's total annual production of goods and services. This study estimates California's economic, employment, and household income impacts arising from the production of goods and services by inmates working in CALPIA. This analysis will derive the total and sectoral output, employment and income impacts of CALPIA on the economy of the state of California.

As a producer of goods and services, CALPIA is linked to the state economy in several ways. Most importantly, CALPIA purchases intermediate inputs (materials) for further processing in its factories. This study utilizes economic models of the state of California that translates these intermediate input purchases into sales by place of production so that the multiplier effects of CALPIA on the state economy can be estimated.

SCOPE AND MAGNITUDE OF CALPIA PRODUCTION

In fiscal year 2008/09, the CALPIA had sales of $234.2 million. In Table 1, the goods and services that were produced by the CALPIA and their contributions toward sales are shown. Other Goods and Services, of which optical products ($21.5 million) and furniture ($19.5 million) are the largest portion, represents the largest product category with $112.5 million in sales. It is followed by Processed Foods at $32.7 million in sales, Fabric Products at $31.0 million and Agriculture Products at $30.7 million.

CALPIA selling and administrative expenses for the state are shown in Table 1 totaling $40.8 million. These expenses do not include any costs related to the production of CALPIA goods and services. The CALPIA employs approximately 619 civilians in addition to about 6,010 inmates who produce these goods and services. Inmates work approximately 30 to 35 hours a week and received wages of $0.35 to $0.90 per hour. CALPIA inmates contribute an average of 40 percent of their wages if ordered by the court to pay restitution and fees. These contributions help crime victims as well as reducing court processing costs (California Prison Industry Authority, 2008a).

Table 1. Goods and Services Produced by the CALPIA for Fiscal Year 2008/2009.

Sector	CALPIA Sales 2008/09 $	Sector	CALPIA Sales 2008/09 $
		Continued:	
Crops	1,341,100		
Dairy/ Farm	15,193,773	Metal Products	3,908,571
Poultry	6,746,286	License Plates	10,904,074
Egg Processing	7,441,017	Metal Signs	1,324,069
Agriculture Sub-total	30,722,176	Metal Products Sub-total	16,136,714
Meat Cutting	10,792,831	Modular Construction	25,328,947
Bakery	3,442,818	Shoe Factory	5,450,382
Coffee Roasting	2,305,585	Cleaning Products	6,157,438
Food & Beverage Pkg	16,120,041	General Fabrication	17,226,231
		Furniture	19,547,224
Processed Foods Sub-total	32,661,275	Optical	21,488,391
		Dental Lab	607,289
Knitting Mill	1,785,709	Digital Services	5,766
Fabric Products	26,587,532	Laundry	16,665,143
Mattress Factory	2,598,543	Silk Screen	54,242
Fabric Products Sub-total	30,971,784	Other Goods and Services Sub-total	112,531,053
Printing	7,573,647	**Total Sales***	234,232,998
Bindery	3,636,349		
Paper Product Sub-total	11,209,996	**Capital Expenditures**	7,735,749
		CALPIA Selling and Administrative Expenditures*	40,819,994

*CALPIA total sales include all expenditures related to production of CALPIA goods and services. CALPIA selling and administrative expenditures include all in-state personnel and purchasing expenditures for its central office plus distribution and transportation costs.

ECONOMIC CONTEXT FOR CORRECTIONAL INDUSTRIES

The economic analysis in this study takes into account the fact that prison industries hire individuals who otherwise would make no contribution to the economy of the state of California during incarceration. CALPIA inmates have zero "opportunity cost" to the economy to make products that are sold to state agencies. An important part of the economic contribution of CALPIA production is that it captures within California all the value-added (i.e. income) in the final manufacturing stage of its products. In the absence of prison industries in California, many of the products now sold by CALPIA would be manufactured outside the state, representing a loss of material sales to California's economy. While California vendors would receive wholesale margins for handling the goods, the margin would be less than the value-added at the final manufacturing stage since CALPIA currently captures both the value-added and the equivalent of the wholesale margin from the sales.

Part of the value-added at CALPIA goes into wage payments to employees who spend most of their income in the California economy. CALPIA's value-added also goes into the operation of CALPIA's program which provides inmates with job skills and develops good work habits, helping to reduce recidivism.

METHODOLOGY

This study will estimate the economic impacts of the California Prison Authority on the economy of the state of California. Basic multipliers and the economic models used for this study will be discussed in this section.

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

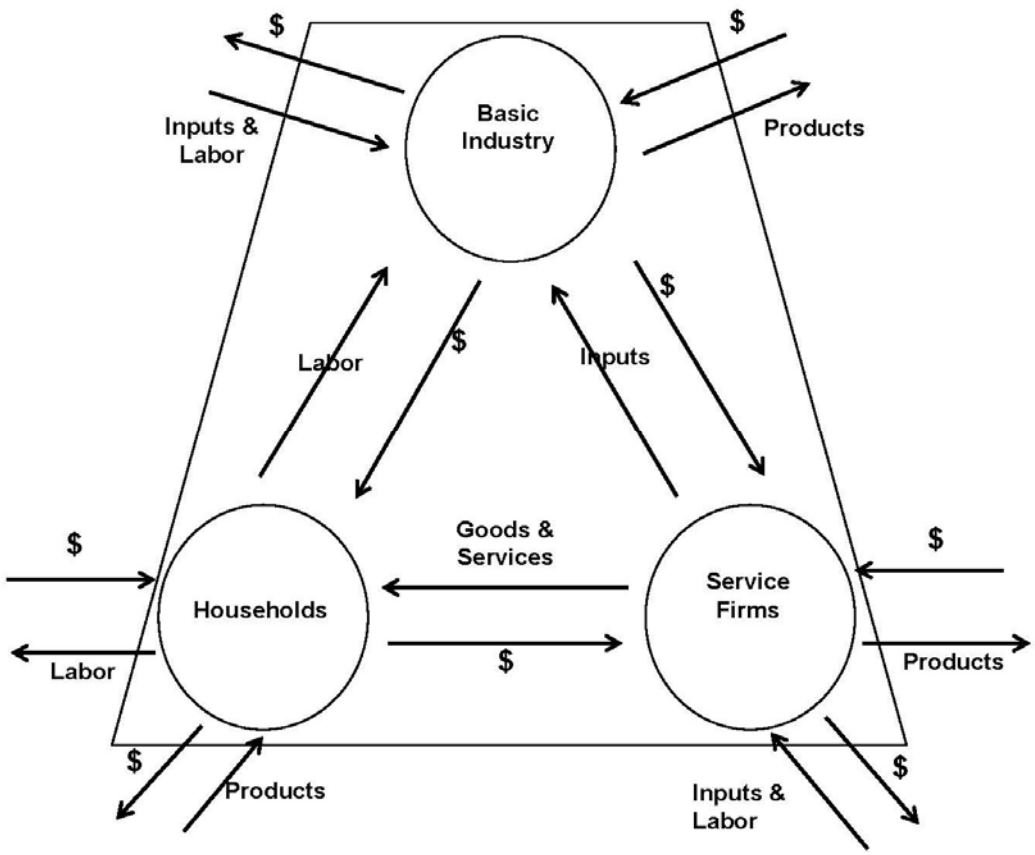
Figure 1 illustrates the major dollar flows of goods and services in any economy. The foundation of a state's economy is comprised of those businesses which sell some or all of their goods and services to buyers outside of the state. Such a business is a basic industry. Sales outside the study region are indicated by the line around the "Basic Industry", "Service Firms", and "Households" circles. The flow of products out of or arrows showing goods and services flowing out of the state, and dollars into or arrows showing dollars flowing into the state, depict export industries in the upper right portion of Figure 1. To produce these goods and services for "export" outside the state, the basic industry purchases inputs from outside of the state (upper left portion of Figure 1), labor from the residents or "households" of the state (left side of Figure 1), and inputs from service industries located within the state (right side of Figure 1). The flow of labor, goods and services in the state is completed by households using their earnings to purchase goods and services from the state's service industries (bottom of Figure 1). It is evident from the interrelationships illustrated in Figure 1 that a change in any one segment of a state's economy will have reverberations throughout the entire economic system of the state.

Consider, for instance, the CALPIA, and its impacts on the state economy. CALPIA's activities can be considered a service industry as it makes sales primarily to state agencies. These dollars, or where "$" represents expenditures, may hire people from the local household sector such as laborers in the CALPIA. However, most of the local economic linkages are from the CALPIA's purchasing goods from the service sectors. These include service and retail businesses. As earnings increase in these businesses; they will hire additional people and buy more inputs from other businesses. Thus the change in the economic activity of the CALPIA works its way throughout the entire local economy.

The total impact of a change in the economy consists of direct, indirect and induced impacts. Direct impacts are the changes in the sales for activities of the impacting industry, such as the operations by the CALPIA. The impacting business, such as the CALPIA, changes its purchases of inputs as a result of the direct impact. This produces an indirect impact in the state's business sectors. Both the direct and indirect impacts change the flow of dollars to the state's households. The state households alter their consumption accordingly. The effect of this change in state household consumption upon businesses in a county is referred to as an induced impact.

A measure is needed that yields the effects created by an increase or decrease in economic activity. In economics, this measure is called the multiplier effect.

Figure 1. Overview of Community Economic System.



Method of Analysis and Sources of Data

The IMPLAN 440-sector input-output (I-O) model of the California economy was used to estimate the economic impacts of the CALPIA.[1] An I-O model measures the multiplier effects of economic activities through a complex set of accounts that track the circular flow of expenditure and income in the economy. The data in the I-O model consist of three major categories of economic transactions: (1) interindustry sales and purchases of intermediate inputs, (2) final payments by industries to in-state labor, in-state owners of capital, various levels of government, and out-of-state producers and owners of capital, and (3) commodity purchases by households and governments plus inventory changes, investment and exports. These three categories contain all the data necessary to estimate multiplier effects in the economy.

The California I-O accounts used in this study were prepared by IMPLAN (Minnesota IMPLAN Group, 2010a), which is updated every year. These accounts are based on numerous federal government data series including County Business Patterns, the Employment Security (ES202) series, the quinquennial national I-O accounts, and the Regional Economic Information System (REIS). The REIS data are derived from economic censuses (Manufactures, Retail, Agriculture, Governments, etc.) conducted by the U.S. Bureau of the Census, the Gross State Product series, and various other statistical series.

The I-O accounts record California's transactions with the state, the rest of the nation, and the rest of the world. This information is essential for accurately estimating economic multipliers since the size of the multiplier is determined by the pattern of trade. The impact of replacing purchases from the CALPIA with purchases from the private sector is determined by the potential of the private sector within the state to substitute for the CALPIA in producing the products. This potential is represented by the regional purchase coefficient (RPC), which estimates the proportion of the state's demand for specific products and services that will be met within the state. Sectoral RPC's are derived from the IMPLAN software (Minnesota IMPLAN Group, Inc, 2010b). Using (1.0-(RPC)), the proportion of demand in the private sector in the state that will be met by business located

[1] Appendix A provides an overview of the IMPLAN microcomputer input-output model.

outside the state of California are estimated. If the state has greater capacity to supply the demand for goods or services in a particular sector, the RPC will be close to one, and the sectoral impact of removing the CALPIA will be small. On the other hand, if alternative suppliers of the goods or services are not readily available in the state, the regional RPC will be close to zero, and removing the CALPIA will have a much larger negative economic impact on the state's economy.

In this study, the impact of CALPIA is analyzed under two scenarios. In the first scenario, the economic impacts of CALPIA products and services on the economy of California are estimated. This includes its impact on state product, income and employment. In the second scenario, the impact if the CALPIA was removed and the same goods and services were purchased from the private sector is calculated. Both analyses are based on sales figures of CALPIA's goods and services for fiscal year 2008/09 that were provided by the CALPIA.

Economic impacts are measured in terms of (1) total California output/sales impacts (direct, indirect and induced effects), (2) total California income impacts (only indirect and induced effects), and (3) total employment impacts (only indirect and induced effects). The *direct effect* occurs when the CALPIA produces and sells goods and services. The *indirect effect* occurs when the CALPIA purchases materials and supplies from distributors and manufacturers in the state. The *induced effect* occurs as workers in in-state industries that supply materials to CALPIA receive incomes that are then spent on consumer goods and services produced in the region. Together, these three effects make up the total effect. An input-output model measures these direct, indirect, and induced effects to assess their total impact on the economy.

This model does not include the induced effects of CALPIA sales on the economy's total sales, since prisoners do not spend their income in the local economy as a resident would. In addition, the direct effects of CALPIA sales on income and employment are not included since it is not possible to know how much inmate income is spent in the community. Inmates earned approximately $6.5 million in fiscal year 2008/09, but it is unknown how much of their earnings were spent in the local community. Therefore, although inmate spending produces some positive impacts for California, these impacts are not quantified in

this report. However, since the CALPIA does employ people to oversee the production and distribution of these goods and services, the CALPIA central office expenses plus distribution and transportation costs of products are included in the estimation of total impacts (direct, indirect, and induced impacts) of CALPIA selling and administrative expenses.

ECONOMIC IMPACTS OF CALPIA ON THE CALIFORNIA ECONOMY

In this section, the output, employment, and household income impacts of CALPIA on the California economy are presented. The CALPIA operates in twenty-two (22) prisons throughout California. The state impacts reflect those output, employment, and household income impacts arising from production of goods and services in those facilities.

The analysis in this study examines two scenarios. The first is the impact of CALPIA sales in the state of California. This is equivalent to asking the question: "What would be the impact if instead of purchasing goods and services from CALPIA, the public sector were to purchase them all from sources outside of the region?" This reflects the most common way of analyzing the economic impact of an industry.

The second scenario is to look at the impact of removing CALPIA and purchasing the same goods and services from the most likely private sources, either within or outside the borders of the state of California. This is equivalent to asking the question: "If the CALPIA were to vanish, where would the same goods and services be purchased, and what would this impact be?" In this case, some of the goods and services will be purchased within the state, while some will be purchased from out-of-state businesses. Because some of the goods and services will continue to be purchased by the private sector within the state, the impact of eliminating CALPIA sales will be smaller than the total impact of the first scenario. The larger the proportion of products produced outside the state, the greater will be the negative impact of removing the CALPIA.

Economic Impacts of CALPIA in the State of California

In Table 2, the first column of figures shows the state sales for each sector in the 2008/2009 fiscal year. The second through fourth column figures show the multiplier effects of CALPIA sales as discussed in the previous section. The impacts of CALPIA's capital expenditures and selling and administrative expenditures are included at the bottom of the table to account for the expenditures and employment impacts of the CALPIA. Total direct CALPIA sales are $234.2 million. Since CALPIA purchases inputs from private firms, total multiplier

effects (direct and indirect) are a total of $366.0 million of cumulative sales in the state. The indirect and induced impact of household income within California is $69.1 million, creating 1,251 jobs. CALPIA's capital expenditures ($7.7 million) generate $17.0 million in sales, $3.0 million in household income, and 97 jobs. Additionally, CALPIA's selling and administrative expenditures ($40.8 million) generate $114.1 million in sales, $60.6 million in household income, and 1,046 jobs. Total impacts of CALPIA activities on the California economy is $497.1 million in sales, $132.7 million in household income, and 2,394 in jobs.

Table 2. California State CALPIA Impacts.

Sector	CALPIA Sales & Expenditures 2006/07 $	Impacts on California State		
		Sales $	Income $	Employment # of Jobs
Crops	1,341,000	2,635,112	480,686	11
Dairy/Farm	15,193,773	25,946,407	3,350,950	68
Poultry	6,746,286	12,732,490	1,674,948	31
Egg Processing	7,441,017	14,043,684	1,847,435	34
Modular Construction	25,328,947	40,761,026	9,097,148	165
Meat Cutting	10,792,831	21,191,608	3,218,476	81
Bakery	3,442,818	5,963,683	1,265,825	22
Coffee Roasting	2,305,585	4,686,887	1,119,060	21
Knitting Mill	1,785,709	2,202,804	259,831	5
Fabric Products	26,587,532	40,158,239	7,113,735	122
Shoe Factory	5,450,382	5,407,512	1,706,639	30
Printing	7,573,647	10,905,671	2,318,053	41
Bindery	3,636,349	5,016,116	1,331,407	24
Cleaning Products	6,157,438	10,539,203	1,666,106	25
Food Packaging	16,120,041	24,491,810	4,260,129	71
General Fabrication	17,226,231	29,030,915	5,562,896	93
Metal Products	3,908,571	6,545,368	1,123,867	18
Metal Signs	1,324,069	1,977,831	463,881	8
License Plates	10,904,074	16,557,377	3,392,071	59
Furniture	19,547,224	26,664,643	5,129,657	94
Mattress Factory	2,598,543	4,360,718	836,457	14
Optical	21,488,391	31,580,280	6,756,625	116
Dental Lab	607,289	918,722	191,810	3
Digital Services	5,766	10,113	2,436	0
Laundry	16,665,143	21,595,827	4,939,420	94
Silk Screen	54,242	78,106	16,602	0
Total Sales	234,232,898	366,002,152	69,126,150	1,251
Capital Expenditures*	7,735,749	17,025,840	3,000,930	97
CALPIA Selling and Administrative Expenditures*	40,819,994	114,092,780	60,576,063	1,046
TOTAL	282,788,641	497,120,772	132,703,143	2,394

*CALPIA total sales include all costs related to production of CALPIA goods and services. CALPIA selling and administrative

expenditures include all in-state personnel and purchasing expenses for its central office plus distribution and transportation costs.

The Impact of Removing CALPIA in California

Table 3 shows the impacts of discontinuing CALPIA production throughout California and purchasing the same goods and services from the private sector. In this table, an additional column is included to show the percent decline in sales in each sector due to purchases made outside the state. The interpretation of the final three columns is similar to that of the final three columns in Table 2. A negative value in those columns represents a loss for the state economy. Total state sales will decline because a proportion of the goods and services that were once produced by CALPIA will be purchased outside of the state.

The extent to which out-of-state purchases will substitute for CALPIA production of the products determines the impact of removing CALPIA on the state. On the low end, for the RPC's only 6.47 percent of purchases would be redirected to out-of-state producers in laundry and digital services, while this proportion increases to 96.47 percent in shoe manufacturing. From Table 3, positive values for employment and income columns (such as in laundry, bakery, modular construction and dairy, to name the major sectors affected) represent a gain for the economy. In sectors such as shoe factory, fabric products, knitting mill and metal products, a very high percent of these products would be purchased outside California. Therefore, if the products were purchased from the private sector outside California, there would be losses in state output, income and employment. However, recall that these sector-specific impacts do not account for the fact that the CALPIA employs people to oversee the production and distribution of these goods and services, nor the impact of the rest of CALPIA's operating expenditures.

Table 3 shows that the total reduction in direct sales (the amount purchased outside of the state) would be almost $133.7 million. This represents a 57 percent loss in direct purchases of these goods and services within the state. This direct sales reduction would have direct and indirect effects on state sales, leading to a loss in total California sales of $164.4 million. Income would decrease by $12.0 million, and employment in the private sector would decrease by 27.5 jobs. The impacts of CALPIA operating and personnel expenditures are $114.1 million in state sales, $60.6 million in income, and 1,046 jobs. Additionally, CALPIA's capital expenditures will be eliminated, resulting in a sales loss of $17.0 million, a

household income loss of $3.0 million and the elimination of 97 jobs. Once these impacts are accounted for, total losses to California's economy totals $295.5 million in sales, $75.6 million in income, and 1,170.5 jobs.

Table 3. California State Impacts if CALPIA Vanishes.

Sector	Change in Sales 2008/09 $	Purchases Outside of the State %	Impacts on California State		
			Sales $	Income $	Employment # of Jobs
Crops	-600,659	44.79%	-1,180,317	-215,308	-4.9
Dairy/Farm	-5,336,357	35.12%	-6,999,765	-633,825	37.2
Poultry	-2,859,555	42.39%	-4,288,654	-249,533	-7.2
Egg Processing	-3,154,031	42.39%	-5,952,710	-275,230	-8.0
Modular Construction	-10,167,546	40.14%	-7,878,598	1,807,486	41.8
Meat Cutting	-6,607,641	61.22%	-11,649,166	-1,515,034	-41.2
Bakery	-546,348	15.87%	454,563	535,330	12.9
Coffee Roasting	-1,114,202	48.33%	-1,723,408	-422,879	-8.1
Knitting Mill	-1,436,131	80.42%	-1,590,722	-108,882	-1.4
Fabric Products	-24,862,772	93.51%	-37,048,352	-6,252,112	-107.2
Shoe Factory	-5,257,782	96.47%	-5,023,827	-1,588,862	-27.3
Printing	-4,171,171	55.07%	-4,298,775	-121,744	-3.2
Bindery	-1,578,099	43.40%	-714,443	548,950	6.4
Cleaning Products	-2,051,270	33.31%	-2,335,536	-154,851	-5.3
Food Packaging	-10,836,053	67.22%	-14,557,884	-1,811,948	-30.1
General Fabrication	-10,891,629	63.23%	-16,544,045	-2,181,711	-37.3
Metal Products	-3,498,445	89.51%	-5,798,453	-942,232	-15.3
Metal Signs	-699,294	52.81%	-647,837	46,138	0.2
License Plates	-6,666,751	61.14%	-8,234,594	-1,823,558	-36.0
Furniture	-12,738,242	65.17%	-14,240,995	-1,098,366	-9.5
Mattress Factory	-1,330,215	51.19%	-1,749,868	-216,304	-2.9
Optical	-15,939,917	74.18%	-20,598,255	-3,120,674	-65.5
Dental Lab	-293,035	48.25%	-291,264	3,653	-0.4
Digital Services	-28	0.49%	3,202	1,743	0.1
Laundry	-1,077,735	6.47%	8,492,295	7,778,755	284.4
Silk Screen	-29,874	55.08%	33,490	9,446	0.3
Total Sales	-133,744,781		-164,363,918	-12,001,552	-27.5
Capital Expenditures*	-7,735,749	100%	-17,025,840	-3,000,930	-97
CALPIA Selling and Administrative Expenditures*	-40,819,994	100%	-114,092,780	-60,576,063	-1,046
TOTAL	-182,300,524		-295,482,538	-75,578,545	-1,170.5

*CALPIA total sales include all costs related to production of CALPIA goods and services. CALPIA selling and administrative

expenditures include all in-state personnel and purchasing expenses for its central office plus distribution and transportation costs.

CONCLUSIONS

The CALPIA is a self-supporting government agency and has the largest sales of any prison industry in the nation. In fiscal year 2008/09, CALPIA had sales of $234.2 million. In addition, CALPIA had in-state selling and administrative expenditures of $40.8 million and capital expenditures totaling $7.7 million during 2008/2009. From these direct expenditures, CALPIA total economic, household income, and employment impacts on the state of California economy are estimated to be $497.1 million, $132.7 million, and 2,394 jobs, respectively. Conversely, if CALPIA activities did not exist in the state of California, total output, household income, and employment would decline by $295.5 million, $75.6 million, and 1,170.5 jobs, respectively. Not only are there economic, household income, and employment impacts from activities of CALPIA, there are potential cost savings to the state of California from reduced recidivism of CALPIA parolees. The recidivism rate of CALPIA parolees in one year is approximately 31 percent compared to CDCR-wide rate of approximately 42 percent. Estimates of potential cost savings to the state of California from reduced recidivism range from $8.4 million to $9.2 million (California Prison Industry Authority, 2008b). Not only are there realized costs savings from reduced recidivism, California parolees who participated in CALPIA have a higher propensity to become contributing members to society once reintroduced to the state of California.

APPENDIX A

Overview of the Implan Microcomputer Input-Output Model

OVERVIEW OF IMPLAN MICROCOMPUTER INPUT-OUTPUT MODEL

The economic impacts and secondary benefits of economic activity by CALPIA operations presented in this report are estimated by employing a microcomputer input-output model and data from IMPLAN (Olson and Lindall, 2010). IMPLAN, which stands for IMpact analysis and PLANning, has been used by economists and other academics in the United States.

IMPLAN was originally developed by the U.S. Forest Service in cooperation with the Federal Emergency Management Agency and the U.S. Department of Interior, Bureau of Land Management to assist the U.S. Forest Service in land and resource management planning. Later, the Minnesota IMPLAN Group was formed and began work on the IMPLAN database in 1987 at the University of Minnesota. In 1993, the Minnesota IMPLAN Group, Inc. was incorporated to privatize the development of the IMPLAN database and software which continues today.

Input-output analysis is designed to analyze the economic transactions among industries in an economy (Miernyk, 1965). These models are based on the pioneering work of Wassily Leontief during the 1930s (1966). Database input-output analysis captures the indirect and induced interrelated circular behavior of the economy. For example, an increase in products by CALPIA requires more equipment, more labor, and more supplies, which in turn requires more labor to produce the supplies and so on. By simultaneously accounting for structural interaction between sectors and industries, input-output analysis gives expression to the general economic equilibrium system. The analysis utilizes assumptions based on linear and fixed coefficients with limited substitution among inputs and outputs. The analysis assumes that average and margined input-output coefficients are equal. Nonetheless, the framework has been widely accepted and used by economists and policymakers. Input-output analysis is useful when carefully executed and interpreted in defining the structure of a state, the interdependencies among industries, and forecasting economic outcomes. The input-output model coefficients describe the structural

interdependencies of an economy. From the coefficients, various predictive estimates can be computed that can be useful in analyzing economic changes in a state, region, or county. Multipliers indicate the relationship between some observed change in the economy and the total change in economic activity created through the economy.

Two types of multipliers are generated by IMPLAN (Olson and Lindall, 2010). Type I multipliers measure the impact in terms of direct and indirect effects. Direct impacts are changes in the activities of a given economic sector or firm, such as operations of CALPIA. The given economic sector changes its purchases of inputs when there are changes in production level and those changes are characterized as direct impacts. The direct purchases of the selected economic sector from other local economic sectors cause these sectors to change their purchase levels or activities. These additional purchases between local economic sectors caused by the direct purchases of the selected economic sector are called indirect impacts. However, the total impact of a change in the economy consists of the direct, indirect, and induced changes. Both the direct and indirect impacts change the flow of dollars to the state, region, or county's households. Subsequently, the households alter their consumption. The effect of changes in household consumption on businesses in a state's economy is referred to as an induced effect. The Type II multiplier includes the direct, indirect, and induced effects and will be larger than the Type I multiplier.

Additional information on the data, methodology and software requirements of input-output models and IMPLAN analysis can be found in publications by Docksen et al. (1997), Alward et al. (1989), Minnesota IMPLAN Group (Minnesota IMPLAN Group, Inc., 2004), and Olson and Lindall (2010). Applications of county input-output models are developed in a referenced study by Goldman (1996).

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