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April 5, 2013

To: Anna Maenner

From: Steven Deller

A handwritten signature in black ink, appearing to read 'S. Deller', written over a white background.

**Re: Winery-Vineyard Economic Impacts**

This memo represents the formal report of the impact of the Wisconsin winery and vineyard cluster on the Wisconsin economy. This study is based on the survey data spearheaded by Michael Laird with the USDA. An earlier draft of this analysis was shared with Perry Brown, Michael Laird, Tim Rehbein, Dave Williams and Rebecca Hardut for feedback and comments. Any errors are solely my responsibility.

The method employed involves using the survey data on business expenditures (labor and input supplies) to develop an “expenditure profile” or a simple “cost of production” for the “average” or typical winery and/or vineyard. I then assume that all wineries and vineyards have a comparable expenditure profile. Because we know how many wineries and vineyards are present in Wisconsin I can derive an aggregate expenditure pattern. This aggregate expenditure profile is then introduced to the economic model of the Wisconsin economy to derive the economic impacts.

Before moving onto a reporting of the impact analysis, there are three issues or concerns that must preface the analysis.

- (1) The relatively large number of respondents that view their “business” as a hobby (48.9%)
- (2) The low response rates on the expenditure profile questions.
- (3) The large variance (standard deviations) around the sample means.

If there is a weakness to this study it is captured in issue number three. Because the survey blended small scale “hobby” operations with large scale operations the distribution (variance or standard deviation) around the average expenditure pattern is large. From a purely statistical

perspective the averages upon which the economic impacts are based could be suspect. Ideally, we could break the sample into two groups (“hobby” and larger scale commercial operations) and compute separate expenditure patterns. Unfortunately, the low response rate to the expenditure profile questions prevents us from breaking the data into subgroups: we simply do not have enough survey data. Despite this limitation the final impact analysis appears to be reasonable and an excellent starting point for further discussion about the winery and vineyard industrial cluster.

A second limitation to the study, beyond the restrictions on the survey data outline above, is that we are limited to the production or expenditure side of the industry; we do not consider the tourism effects generated by the winery and vineyard cluster. For example, we do not consider the effects of the “wine and cheese tours” that are growing in popularity.

Consider first wineries, then vineyards, in terms of their relative sizes and expenditure pattern.

	Mean	Standard Deviation	Minimum	Max
Winery FTEs	3.88	6.58	0	42
Winery Hours Worked	1,889.75	1,317.55	11	3,000
Winery Capacity in Gallons	13,176.66	36,630.70	10	250,000
Winery gallons fermented in 2011	11,843.68	34,284.63	100	217,000

Notice how the standard deviation around the mean of Winery FTEs (full time equivalents jobs), the standard deviation is nearly twice the size of the mean. This tells us we have almost a bimodal distribution: very small and rather large firms with the sample dominated by smaller firms. The expenditure profile that the economic impact analysis is based on is:

#### Wisconsin Wineries Expenditure Profile 2011

	Mean	Standard Deviation	Share of Expenditures
Input Costs in dollars- Raw Materials	51,771	121,702	20.2%
Input Costs in dollars- bottling supplies	40,654	93,008	15.8%
Input Costs in dollars- equipment	11,873	22,888	4.6%
Input Costs in dollars - wine additives and yeast	2,409	4,717	0.9%
Input Costs in dollars-labor	41,989	45,120	16.4%
Input Costs in dollars-marketing	12,070	19,563	4.7%
Input Costs in dollars-non-grape fruit or juice purchased	23,182	48,722	9.0%
Overhead Costs in dollars-office expenses	4,248	5,120	1.7%
Overhead Costs in dollars-management administrative	46,926	84,941	18.3%
Overhead Costs in dollars-property insurance	4,119	6,935	1.6%
Overhead Costs in dollars-property taxes	8,272	13,658	3.2%
Overhead Costs in dollars-utilities	9,247	12,408	3.6%

Assuming that this average is a “reasonable” approximation we can use the total number of wineries to generate the scenario for impact assessment. From this the four biggest expenditure categories are: (1) raw materials (grapes) at 20.2% of total expenditures, (2) management and administration at 18.3%, (3) labor at 16.4% and (4) bottling supplies at 15.8%.

Now consider the simple descriptive data for vineyards:

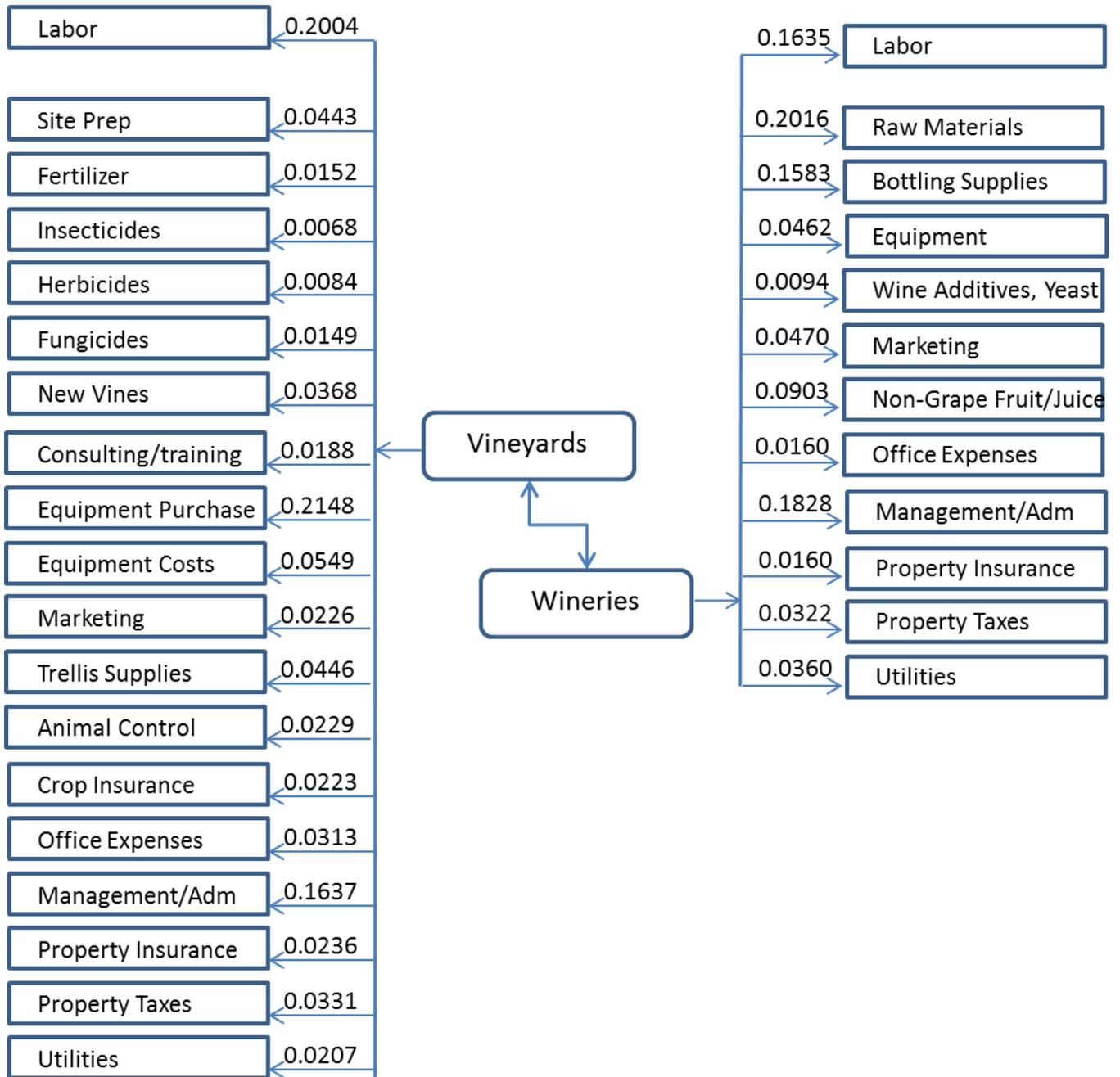
	Mean	Standard Deviation	Minimum	Max
Acres in Vineyard	3.64	4.83	0.01	25.00
Vineyard FTEs	1.39	0.97	0.10	4.50
Total Hours worked by staff	923.07	1161.13	40.00	4860.00

The variance of the data seems to be a little bit tighter than with the wineries. This makes me a little bit more comfortable with the expenditure profiles upon which the impacts are based.

#### Wisconsin Vineyard Expenditure Profile 2011

	Mean	Standard Deviation	Share of Expenditures
Input cost -dollars spent on site prep	1,457.18	1,547.71	4.4%
Input cost -dollars spent on fertilizer	498.36	927.38	1.5%
Input cost -dollars spent on insecticides	222.04	346.54	0.7%
Input cost -dollars spent on herbicides	277.17	356.56	0.8%
Input cost -dollars spent on fungicides	490.16	739.47	1.5%
Input cost -dollars spent on new vines	1,208.59	1,512.12	3.7%
Input cost -dollars spent on consulting/training	617.77	925.79	1.9%
Input cost -dollars spent on equipment purchase	7,063.65	9,231.05	21.5%
Input cost -dollars spent on equipment costs	1,804.59	2,735.75	5.5%
Input cost -dollars spent on marketing	744.36	833.68	2.3%
Input cost -dollars spent on trellis supplies	1,466.90	2,728.05	4.5%
Input cost -dollars spent on animal control	753.34	906.98	2.3%
Input cost -dollars spent on labor	6,588.15	16,666.38	20.0%
Input cost -dollars spent on crop insurance	733.33	585.95	2.2%
Overhead cost -dollars spent on office expenses	1,028.95	2,811.96	3.1%
Overhead cost -dollars spent on management/administrativ	5,381.25	12,401.15	16.4%
Overhead cost -dollars spent on property insurance	776.60	1,750.30	2.4%
Overhead cost -dollars spent on property taxes	1,088.95	1,414.85	3.3%
Overhead cost -dollars spent on utilities	679.19	1,055.80	2.1%

Here the biggest three expenditures are (1) equipment purchases with 21.5%, (2) labor at 20.0%, and (3) management/administration at 16.4%. I also put together a more simplistic expenditure profile that might be helpful in thinking about the expenditure profiles. One could think of this as a very simple cost of production analysis. These are based on a simple linear production function: for every dollar of expenditures  $X_{\phi}$  is spend on a given input.



The economic impacts are constructed using an input-output model of the Wisconsin economy. This approach to economic modeling documents how various sectors of the economy (e.g., industries and households) are linked to each other. We use these linkages to examine how the winery-vineyard industry is connected to and impacts other parts of the economy. This is the same methodological approach that has been previously used to document the contribution of agriculture to the Wisconsin economy (Deller and Williams 2009), the contribution of milk production to the Wisconsin economy (Deller 2007), the impact of foreign exports on Wisconsin (Deller 2010), and the contribution of bio-fuel production to local communities (Fortenbery and Deller 2006), among other applications such as the impact of the closure of the GM plant in Janesville.<sup>1</sup>

One can think of an input-output model as a large "spreadsheet of the economy" with the columns of the "spreadsheet" representing buyers (demand) and rows of the "spreadsheet" representing sellers (supply). An individual cell of this "spreadsheet" captures the level of interaction (demand and supply) between any set of industries or consumers with any other set of industries or consumers. The winery-vineyard industry is both a consumer (buyer or demand) and a producer (seller or supply). As outlined above in the expenditure profiles wineries buy inputs such as grapes, electricity, bottling materials, among others (reading down a column of the spreadsheet) and sells products such as wine to wholesalers and retailers and perhaps directly to consumers (reading across the row of the spreadsheet). A key assumption to the model is that supply must equal demand. Under this condition we can trace small changes in any one industry throughout the whole of the economy. Like dropping a pebble in a pond, small changes in any one part of the economy causes ripples affecting the whole of the economy. These ripples are referred to as economic multipliers. The relative size of the multipliers captures the degree of any given industry's interconnections to the whole of the economy.

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<sup>1</sup> Deller, Steven C. 2007. "The Economic Impact of Milk Production on the Wisconsin Economy." Department of Agricultural and Applied Economics Staff Paper No. 506. University of Wisconsin – Madison/Extension. (March). <http://www.aae.wisc.edu/pubs/sps/pdf/stpap506.pdf>

Deller, Steven C. 2010. "Economic Impact of Foreign Exports on the Wisconsin Economy." Department of Agricultural and Applied Economics Staff Paper No. 546 University of Wisconsin – Madison/Extension (November). <http://www.aae.wisc.edu/pubs/sps/pdf/stpap546.pdf>

Deller, Steven C. and Williams, David. 2009. "The Contribution of Agriculture to the Wisconsin Economy." Department of Agricultural and Applied Economics Staff Paper No. 541. University of Wisconsin-Madison/Extension. (August). <http://www.aae.wisc.edu/pubs/sps/pdf/stpap541.pdf>

Fortenbery, T. Randall and Deller, Steven C. 2006. "Understanding Community Impacts: A Tool for Evaluating Externalities from Local Bio-Fuels Production." Department of Agricultural and Applied Economics Staff Paper No. 505. University of Wisconsin – Madison/Extension. (December). <http://www.aae.wisc.edu/pubs/sps/pdf/stpap505.pdf>

These multipliers are composed of three parts: (1) direct, (2) indirect, and (3) induced with the three added together yielding the total. The direct effect is the industry itself before any multiplier effect is considered. For this study, the direct effects include wineries and vineyards. Indirect effects are associated with non-labor related expenditures. For example, vineyards may buy processed manure from dairy farmers for soil treatments which require those dairy farmers in turn to make additional purchases. Or the winery purchases electricity to run certain equipment which requires utility companies to produce that electricity. Another example would be the purchasing of equipment. In order to supply all these inputs to the winery-vineyard industry requires firms to make purchases in turn. These purchases create ripples in the economy. The induced effects are associated with labor spending wages in the local economy. This could be the farmer or hired labor going to the movies or purchasing new clothing, or taking the family out to dinner at a local restaurant. Consider the restaurant example, here the restaurant must pay for the utilities to run the ovens (indirect effect) and the wait-staff in turn spends their wages in the local economy (induced effect).

The size of the multiplier will vary by the nature of the local economy and the level of connections the industry of interest has with the local economy. These hinge on what economists call "leakages" from the local economy. Generally, the more the industry or any connected industries must import into the region the greater the leakages and the smaller the multiplier effect. To see this consider the following example visualized in

Figure 1: A simple multiplier illustration

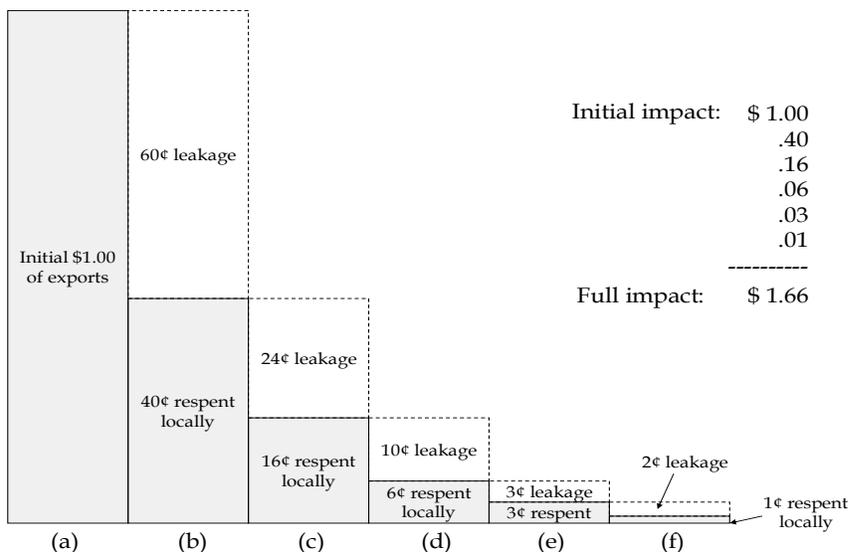


Figure 1. Suppose the vineyard farmer purchases a new piece of equipment from a local dealership and for illustrative purposes that piece of equipment costs one dollar. The question is how much of that purchase remains in the local economy to be recirculated. In this simple example, the local dealer for that piece of equipment had a 40 percent margin or mark-up. That means that 60 percent or 60 cents immediately leaks out or leaves the local economy and goes to the manufacturing of that piece of equipment. This means that the local dealer has 40 cents to spend in the local economy. Suppose the dealership takes that 40 cents and pays their electric utility bill which is 40 cents of revenues to the local electricity company. Of that 40 cents 24 cents is spent by the electricity company on coal from Montana; this is a leakage from the local economy. Here the electricity company has 16 cents to spend in the local economy. Such a cycle continues till all the initial spending by the beef farmer leaks out of the economy.

In this simply illustration, the multiplier is 1.66 (the initial dollar of spending, plus all the rounds of respending: 40¢ + 16¢ + 6¢ + 3¢ + 1¢) or for every dollar spent by the winery or vineyard industry generates or supports an addition 66 cents in economic activity.

While there are no rigorous rules for the size of the multipliers, experience suggests that multipliers are generally less than two. Multipliers that are larger than three are generally viewed with suspicion and care must be taken. For this analysis we used the Wisconsin model using data for 2011. Thus these are state level results.

A summary of the impacts are:

**Economic Impact of the Wisconsin Wineries and Vineyard Industry Cluster**

	Employment	Labor Income (\$000)	Total Income (\$000)	Industry Sales (\$000)	Total S&L Govt Rev (\$000)
Wineries	607	\$ 29,137	\$ 45,527	\$ 139,449	\$ 8,409
Vineyards	99	\$ 4,303	\$ 6,188	\$ 12,064	\$ 478
Combined	706	\$ 33,440	\$ 51,715	\$ 151,513	\$ 8,887

The industry supports just over 700 jobs state-wide, generates \$33.4 million in labor income (wages, salaries and proprietor income), \$51.7 million in total income (labor income plus other sources of income such as transfer payments (e.g., social security), interest income, dividends, rental income, etc.), \$151.5 million in industrial sales, and about \$8.9 million in state and local government tax revenues.

The overall employment multiplier for the Wisconsin winery and vineyard industry cluster is 2.328, for labor income the multiplier is 2.664, for total income 2.638 and for industry sales 1.627. Notice that because the wineries and vineyards have different expenditure patters their respective multiplier will also be different.

**Wisconsin Wineries and Vineyard Economic Multipliers**

	Employment	Labor Income	Total Income	Industry Sales
Wineries	2.419	2.873	2.737	1.605
Vineyards	1.891	1.785	2.082	1.927
Combined	2.328	2.664	2.638	1.627

Suppose that the winery and vineyard cluster expanded production that required 100 additional workers. Based on industry averages, this would represents about \$30.7 million in

additional industry sales to the industry (the average worker in the overall industry supports about \$307,300 in revenue or industry sales), \$4.1 million in labor income (the average job supports about \$41,400 in labor income), \$6.5 million in total income (the average job supports about \$64,700 in total income). We can then apply the appropriate multiplier to each of these metrics of the industry increase:

	Increase		Multiplier		Impact
Employment	100	X	2.328	=	233
Labor Income (\$000)	4,142	X	2.664	=	11,035
Total Income (\$000)	6,471	X	2.638	=	17,068
Industry Sales (\$000)	30,734	X	1.627	=	50,005

In this example, if the industry increased employment by 100 jobs and correspondingly \$4.1 million in labor income, \$6.5 million in total income, and \$30.7 million in sales, the total impact would be 233 jobs (the original 100 jobs plus an additional 133 jobs via the multiplier effect), \$11 million in labor income, \$17.1 million in total income and finally \$50 million in industrial sales or business revenue.

This economic activity generated by the winery and vineyard cluster also yields tax revenues to the state and local governments. In aggregate, the industry generates about \$8.9 million in state and local government revenues.

Economic Impacts of Wisconsin Wine Industry Cluster (2011)

	Wineries	Vineyards	Combined
Sales Taxes (\$000)	\$ 2,894	\$ 129	\$ 3,023
Property Taxes (\$000)	\$ 3,779	\$ 170	\$ 3,949
Income Taxes (\$000)	\$ 700	\$ 104	\$ 804
Other (\$000)	\$ 1,036	\$ 75	\$ 1,111
Total S&L Govt Rev (\$000)	\$ 8,409	\$ 478	\$ 8,887

In the final table, I decompose the impacts across the types of impacts (direct, indirect, induced and total) as well as the total impact across industries.

Economic Impacts of Wisconsin Wine Industry Cluster (2011)

	Employment	Labor Income (\$000)	Total Income (\$000)	Industry Sales (\$000)
<b><u>Wineries</u></b>				
Direct Effect	251 \$	10,141 \$	16,633 \$	86,861
Indirect Effect	196 \$	12,791 \$	17,854 \$	33,564
Induced Effect	161 \$	6,205 \$	11,039 \$	19,024
Total Effect	607 \$	29,137 \$	45,527 \$	139,449
Multiplier	2.419	2.873	2.737	1.605
Agriculture	27 \$	2,615 \$	2,290 \$	4,225
Mining	0 \$	19 \$	51 \$	67
Construction	7 \$	391 \$	437 \$	740
Manufacturing	279 \$	12,145 \$	19,350 \$	95,950
TIPU	27 \$	1,540 \$	2,679 \$	4,990
Trade	68 \$	3,302 \$	5,574 \$	7,837
Service	195 \$	8,872 \$	14,852 \$	25,057
Government	4 \$	254 \$	294 \$	583
<b><u>Vineyards</u></b>				
Direct Effect	52 \$	2,411 \$	2,973 \$	6,261
Indirect Effect	14 \$	653 \$	1,011 \$	2,004
Induced Effect	32 \$	1,239 \$	2,205 \$	3,799
Total Effect	99 \$	4,303 \$	6,188 \$	12,064
Multiplier	1.891	1.785	2.082	1.927
Agriculture	25 \$	804 \$	681 \$	1,120
Mining	0 \$	3 \$	8 \$	11
Construction	1 \$	50 \$	57 \$	96
Manufacturing	7 \$	518 \$	915 \$	3,406
TIPU	2 \$	128 \$	300 \$	524
Trade	13 \$	418 \$	681 \$	971
Service	48 \$	2,263 \$	3,378 \$	5,565
Government	2 \$	120 \$	167 \$	371
<b><u>Combined</u></b>				
Direct Effect	303 \$	12,552 \$	19,606 \$	93,122
Indirect Effect	210 \$	13,444 \$	18,865 \$	35,568
Induced Effect	193 \$	7,445 \$	13,244 \$	22,823
Total Effect	706 \$	33,440 \$	51,715 \$	151,513
Multiplier	2.328	2.664	2.638	1.627
Agriculture	52 \$	3,419 \$	2,971 \$	5,345
Mining	0 \$	22 \$	59 \$	78
Construction	8 \$	440 \$	495 \$	836
Manufacturing	286 \$	12,663 \$	20,265 \$	99,356
TIPU	29 \$	1,668 \$	2,979 \$	5,514
Trade	81 \$	3,720 \$	6,255 \$	8,809
Service	242 \$	11,135 \$	18,230 \$	30,621
Government	6 \$	374 \$	461 \$	954