REVISITING THE ECONOMIC IMPACTS OF THE WALLA WALLA WINE CLUSTER

Economic Modeling Specialists Inc. • 1187 Alturas Dr., Moscow ID 83843 • (866) 999-3674 • www.economicmodeling.com

PREFACE TO THE SECOND EDITION:

This report provides an updated analysis of EMSI's 2007 report "Economic Analysis of the Walla Walla Wine Cluster: Past, Present, and Future." While this report will largely focus on the changes that have occurred in the IPZ wine cluster and the IPZ economy, we have added analysis on certain targeted industries in the region and the associated educational focus that should be given to build on the region's comparative advantages. The IPZ wine cluster experience is also applied to the Umpqua wine region of Oregon. The Umpqua case study is outlined at the end of this report.

Because much of our data are derived from dynamic government sources, and because their historical data are adjusted from time to time, certain graphs and tables will show variations from the 2007 report. Where full survey data were not available, sample data were used as a platform for deriving a complete dataset.

Lastly, a note on what constitutes a winery: Estate wineries are those that own or hold long-term leases on vineyards, operate their own crush facility, and bottle, age, and sell the wine. For a wine to be considered an estate wine all grapes must come from the same appellation of origin. Studio wineries are primarily crush facilities that only engage in the production process. There are also seller-only operations and tasting rooms are included in this endeavor only if they are a stand-alone operation and not part of an estate or studio wine facility. The most standard winery, however, will be a production and selling operation where the grapes used are purchased from a vineyard not owned by the winery itself.

We look specifically at those operations that have obtained a license from the Washington State Liquor Control Board (WSLCB). The formal NAICS definition is as follows: “Wineries comprise establishments primarily engaged in one or more of the following: (1) growing grapes and manufacturing wines and brandies; (2) manufacturing wines and brandies from grapes and other fruits grown elsewhere; and (3) blending wines and brandies.” It is important to note that establishments bottling purchased wineries are included in our analysis though they would typically fall under NAICS 424820: wine and distilled alcoholic beverage merchant wholesalers.

ACKNOWLEDGMENTS

EMSI Senior Economists Drs. Hank Robison and Kjell Christophersen and Research Economist Tim Nadreau served as EMSI project leaders. They were assisted by EMSI research analysts and production staff Anna Brown, Lauren Prehoda, Josh Wright, and Brian Points. Nancy Reiff, IPZ Interim Coordinator and Special Projects Director, and Dr. Nicholas Velluzzi led the way in primary data collection and played critical roles in the overall design of the research. Chris Lake, Director of the Southern Oregon Wine Institute, assisted with data collection and guidance regarding the economic climate and conditions from Oregon's Umpqua wine region. Dr. Steve VanAusdle, President, Walla Walla Community College, provided critical direction from start to finish.

TABLE OF CONTENTS

Fact Sheet: The Walla Walla IPZ Wine Cluster

Current jobs in wine production and wine tourism	
Total Jobs 2011	2,061
Added since 2007	967
Added since 1997	1,966
Total earnings generated by the wine cluster in 2011	$96 million

Wine cluster jobs including multiplier effects	
Total Jobs 2011	6,003
Added since 2007	2,740
Projected total in 2020	8,913
Total regional earnings generated through direct, indirect, and induced effects	$230 million

Wine cluster and multiplier effect jobs as % of overall economy jobs	
Percent of all 1997 jobs	0.8%
Percent of all 2007 jobs	8.5%
Percent of all 2011 jobs	14.4%
Percent of all 2020 jobs (projected)	19.8%

Percent growth in overall employment 2006 to 2011	
United States	-1.5%
Washington State	1.1%
IPZ	11.3%

20-year overall percentage growth projection, IPZ 2000 to 2020	
Total	18.4%
Total absent wine cluster and related	-2.8%

Executive Summary

In 2007 EMSI collaborated on the report "Economic Analysis of the Walla Walla Wine Cluster: Past, Present, and Future." The present report updates that earlier study to 2011, focusing on the dramatic changes that have taken place in just the past four years. Moreover, additional analysis has been conducted on targeted industries in the region and the associated educational focus that should be given to build on the region's comparative advantages. Reflecting the interest in the Walla Walla wine cluster experience that extends well beyond Washington State, we present a separate analysis in an appendix to this report examining the Umpqua wine region of Oregon.

As with our 2007 study, the geographic focus for our analysis is roughly the functional economic region trade dominated by the city of Walla Walla. The region includes all of Walla Walla County, save for a small region on the western edge of the county that includes Burbank, Wallula, and surroundings (part of a functional economy centered on the Tri-Cities). The larger region also includes all of Columbia County and the northern Milton-Freewater portion of Umatilla County, Oregon. Reflecting the recognized common interests in planning for economic development within this economic region, we will refer to it as the Innovation Partnership Zone (IPZ).

While our report considers changes in the overall IPZ economy, we pay particular attention to the area's "wine cluster." This includes not just industries involved in wine production but wine tourism as well: from vineyards and wineries to hotels, fine

restaurants, recreational enterprises, and specialty retail stores. We also include jobs created as a result of what we term "wine migration"—a subgroup of quality-of-life migrants who locate in a region due to the presence of wine cluster amenities.

Since our earlier report in 2007, the IPZ region has seen considerable growth, adding some 3,400 jobs in just four years. From 1979 to 1988, however, the economy suffered a nearly 10-year period of stagnation and decline, registering an overall net loss of over 600 jobs. Growth returned in 1989, and over the next 12 years the IPZ added nearly 7,300 jobs. Beginning in 2003, however, the economy turned down again, registering by 2007 an overall five-year employment decline of just over 750 jobs.

Figure ES.1 conveys historic total employment data for the IPZ region and presents projected employment through 2020. The gray line in the figure is an estimate of the path that total IPZ area employment would have followed, and would follow through 2020, absent wine cluster employment. Without the area's wine cluster, the region would have entered a period of economic stagnation beginning approximately in 1997, and remained in that stagnant pattern more or less continuously through until at least 2020.

Figure 3.3: Projected IPZ Employment With and Without the Wine Cluster

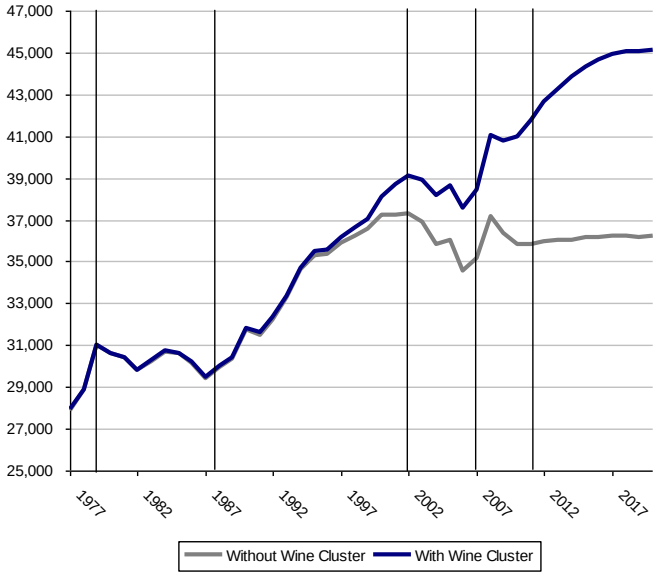


Figure ES.2 focuses on employment in the IPZ area's wine cluster alone. As chronicled in our 2007 report, following a roughly 20-year period (1977 to 1997) of very slow but steady growth, wine cluster employment took a sharp turn upward, increasing from 283 jobs in 1997 to over 3,263 jobs in 2007. The dashed series from 2007 to 2017 shows projected wine cluster employment, as outlined in our 2007 report.

As strong as wine cluster growth was up to 2007, the pace of growth actually quickened after 2007 and through to 2011 (note the steepening of the growth path between 2007 and 2011 in the figure). And note how our 2007 report's projection understated actual growth. Our current projection (2011 to 2020) builds on the additional observed data (i.e., data from 2007 to 2011). Following standard practice, we track the growth of actual wine cluster employment for the past 15 years, 1996 to 2011, and projected this forward, via a dampening algorithm, through 2020. The result of this projection: Over the next nine

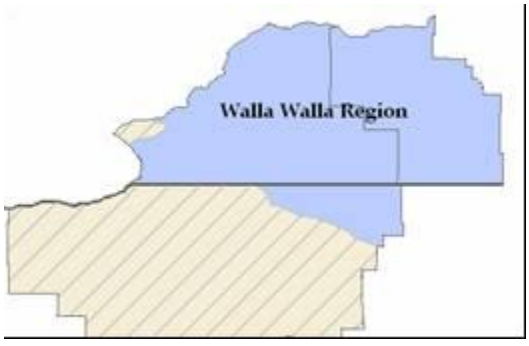
years (2011 to 2020), IPZ area wine cluster jobs will grow by nearly 48%, from the current 6,003 jobs to 8,913 jobs.

Chapter 1: State of the Economy Report

1.1 Introduction

To set the stage for the analysis, we first outline the regional economy and the relevant changes that have occurred since 2007. The functional economic area depicted in Figure 1.1 includes the ZIP codes 97862, 99324, 99328, 99329, 99348, 99359, 99360, 99361, 99362, and 99363.[1] This represents all of Walla Walla County except for the westernmost edge, all of Columbia County, and the northernmost portion of Umatilla County (Oregon).

Fig. 1.1: The Walla Walla wine region functional economic area



The western edge of Walla Walla County (Burbank, Wallula, and surroundings) is part of a separate functional economy centered on the Tri-Cities. Similarly, southern Umatilla County is part of a separate functional economy centered on Pendleton.

[1] A functional economic area is a mainly closed market for labor and consumer goods and services. For the purposes of this analysis, it is more crucial to capture the area that includes vineyards, wineries, and their auxiliary industries, and the spread of economic multiplier effects and not be constrained by political boundaries.

The remainder of Chapter 1 focuses on the Walla Walla functional economy (hereafter referred to the Walla Walla IPZ—Innovation Partnership Zone)[2] with specific emphasis on the industry sector analysis and the historical labor trends of the region. Chapter 2 will provide a comparison of the wine cluster as it stood in 2007 and how it has progressed into the present. It also summarizes industry cluster comparisons, multiplier impacts of the wine cluster, quality-of-life migrants, and the total impacts of the wine cluster in the functional economy. Chapter 3 compares the projected 2007 growth with actual growth and projects the wine clusters impacts to 2020. We will then look at the Umpqua wine cluster experience to see what changes may be reasonably anticipated were the Umpqua wine cluster to mimic the Walla Walla wine cluster.

1.2 Changes in the Current Economy

Table 1.1 displays the total employment and labor income (earnings) in the functional economy for both the 2006 and 2011. Data are displayed according to industry sectors defined by NAICS (North American Industry Classification System). The NAICS system organizes industries into groups or sectors that produce similar types of outputs, e.g., "manufacturing," "health care," "government," "agriculture," and so on.[3]

[2] An Innovation Partnership Zone (IPZ) is a unique economic development effort that brings together research, workforce training, and private sector participation in close geographic proximity to promote collaboration in a research-based effort that will lead to new technologies, marketable products, company formation, and job creation. There are currently 12 IPZs operating in the state of Washington. The zones are administered by an economic development council, port, workforce development council, city, or county.

[3] NAICS sectors are generally very different from the "industry clusters" we consider in Chapter 2. As discussed there, industry clusters are made up of industries (often in disparate NAICS sectors) that share some common interest and sometimes support each other through shared supply chain relationships and labor pools.

Table 1.1: IPZ Region Jobs and Earnings

Description	NAICS Code	2006 Jobs	2011 Jobs	% Jobs Change	2006 Total Earnings (x1000)	2011 Total Earnings (x1000)
Agriculture, Mining, and Construction	11, 21, 23	5,080	6,404	26%	$152,877	$223,578
Utilities	22	105	158	50%	$17,661	$16,516
Trade	42, 44, 45	5,407	4,691	-13%	$139,385	$146,148
Finance, Real Estate, Misc. Professional Services	51-55	3,191	4,584	44%	$133,977	$241,125
Private Education and Misc. Administrative Services	56, 61, 81	5,837	7,023	20%	$100,235	$198,201
Arts, Entertainment, Recreation, Accommodation, and Food Services	71, 72	2,668	2,785	4%	$42,509	$44,873
Government	90	6,419	6,640	3%	$330,738	$406,972
Manufacturing	31-33	3,231	3,894	21%	$181,647	$216,981
Health Care and Social Assistance	62	5,125	4,918	-4%	$208,260	$216,623
Transportation and Warehousing	48, 49	493	720	46%	$28,109	$38,062
Total		**37,560**	**41,817**	**11%**	**$1,335,400**	**$1,749,080**

Source: Economic Modeling Specialists Inc. - 6/11

As shown in Table 1.1, government still remains the single largest industrial sector in the functional economy, though the percentage change in jobs is much smaller than the average job change for the region. Even with the prevailing national economic climate, only the construction and retail trade industrial sectors saw job decline.

Moreover, only three industrial sectors saw a decline in total earnings since 2006: utilities; administrative and waste services; and arts, entertainment, and recreation. Even with the earnings decline for these NAICS sectors, the Walla Walla IPZ still saw a 33% growth in total earnings, demonstrating the resilience of the regional economy in the face of the national recession.

Table 1.2 highlights the concentration change among NAICS sectors by outlining the 2006 and 2011 location quotients (LQs). LQ is a way of quantifying how concentrated an

industry sector is in a region compared to a larger geographic area, in our case in comparison to the nation as a whole—or, in other words, how much a region is uniquely specialized in certain industries. Suppose that a certain industry accounts for 4% of all regional jobs but only .5% of all national jobs. The region's LQ for that industry would then be 8 (4 / .5 = 8), meaning that the region is 8 times more concentrated in that industry than the national average.

Location quotient tells a much different story than mere job numbers. Industries with a high LQ are typically export-oriented industries, which are important because they bring money into the region rather than simply circulating money that is already in the region, as trade- or service-based industries typically do. [4]

Table 1.2: IPZ Region Industry Location Quotients

Description	NAICS Code	2006 Jobs LQ	2011 Jobs LQ
Agriculture, Mining, and Construction	11, 21, 23	2.78	4.03
Utilities	22	0.88	1.10
Trade	42, 44, 45	1.05	0.87
Finance, Real Estate, Misc. Professional Services	51-55	0.52	0.59
Private Education and Misc. Administrative Services	56, 61, 81	1.70	1.95
Arts, Entertainment, Recreation, Accommodation, and Food Services	71, 72	0.80	0.70
Government	90	1.28	1.15
Manufacturing	31-33	1.03	1.34
Health Care and Social Assistance	62	1.34	1.07
Transportation and Warehousing	48, 49	0.36	0.51

Source: Economic Modeling Specialists Inc. - 6/11

[4] The term "export" is used from a regional perspective, so it refers to exports from the region to both foreign nations and other regions in the United States. Also note that exports can be intangibles—for example, a college town is in effect "exporting" higher education. From a regional economic perspective, such exports are treated in the same way as tangible exports such as grain or manufactured goods because they all bring money into the region from outside sources.

As seen in Table 1.2, a majority of industrial sectors in the Walla Walla functional economic area have experienced a rise in their LQ. Two causes may contribute to this rise: the region may begin to gain a comparative advantage and the industry may start to grow faster in the region than it does at the national level, or the industry may remain stable in the region as it falters nationwide. In either case, a growth in an industry's LQ demonstrates its robustness in that particular region. It appears both effects may be contributing to the LQ growth in the Walla Walla functional economy, from which one may rightly infer that the region has some insulation to national economic shocks.

Shift share is a standard regional analysis method that attempts to determine how much of regional job growth can be attributed to national trends and how much is due to unique regional factors. Table 1.3 below shows the shift share analysis for the IPZ. The first column of data shows the actual job change in the region from 2006 to 2011. The industrial mix effect and national growth effect are summed to show the expected job change for the region. The actual job change minus the expected job change is then used as a measure of the region's competitive effect.

Table 1.3: IPZ Shift Share and Industry Competitive Effect

Description	NAICS Code	Job Change	Ind Mix Effect	Nat Growth Effect	Expected Change	Competitive Effect
Agriculture, Mining, and Construction	11, 21, 23	519	-328	-1	-329	848
Utilities	22	32	6	0	6	26
Trade	42, 44, 45	63	-291	-1	-292	354
Finance, Real Estate, Misc. Professional Services	51-55	699	252	0	252	447
Private Education and Misc. Administrative Services	56, 61, 81	1027	368	0	368	661
Arts, Entertainment, Recreation, Accommodation, and Food Services	71, 72	168	115	0	115	55
Government	90	530	230	-1	229	301
Manufacturing	31-33	247	-695	-1	-696	943
Health Care and Social Assistance	62	787	624	-1	623	165
Transportation and Warehousing	48, 49	71	-33	0	-33	104
Total		**4,143**	**248**	**-5**	**243**	**3,904**

Source: Economic Modeling Specialists Inc. 6/11

The region's economy remains highly specialized in agriculture, educational services, health care & social assistance, and government. The numbers reveal the importance of traditional agriculture and the strong presence of college and government employment.

The region's higher education sector (classified above under both government and educational services) has the potential to benefit and profit from the wine industry since higher education opportunities and the cultural events associated with higher education are very important amenities that can work in conjunction with the region's "wine country" reputation to attract retirees and mobile professionals to relocate in the region. These individuals often have outside sources of income that they bring to the region, and they can also spur entrepreneurial activity as they invest their capital in new or existing local businesses. Another reason is that the wine industry's contributions to improving

regional quality of life can attract more students. Even if they are indifferent to wine per se, they can take advantage of better shopping, dining, and recreational opportunities that accompany increased tourism in the area.

1.3 Skills Gap Analysis

The health and enviable performance of the IPZ area economy reflects in no small way the strength of key industries and the workforce presence of the skills those industries need to maintain competitiveness. Assuring an adequate supply of high-demand skills is easily one of the most important tasks of economic development planning. and to that end this section presents indicative results from a skills gap analysis conducted for the IPZ area economy.

A skills gap analysis will generally entail three steps. In the first step the economy's "key industries" are identified. These are industries with high location-quotients (indicating an export-orientation), and the largest number of jobs and highest payrolls. The second step looks at key industry staffing needs, focusing on the occupations needed by industries, and skills, education and training required for occupations. The third and final step looks to the availability of area education and training, with particular focus on the existence of "gaps," i.e., instances where the demand for skills and training are unmet by local supply. Unmet demands indicate a threat to local industry competitiveness, and an opportunity for local skills and education suppliers, such as Walla Walla Community College, to fill the gap and thereby contribute to local economic health and development.

Before considering results two comments are in order. First, with the aid of EMSI's web-based tool "Career Coach," Walla Walla Community College conducts a more or less ongoing analysis to indicate gaps in their course offerings. Career Coach users enter an occupation from a fine-grained list of occupations present in the region. Career Coach returns with a list of associated local job listings, and details on the availability of local training. Where job listings are extensive but training scarce, a gap exists.

Our second comment pertains to the extensiveness of the gap analysis here presented. A fully detailed gap analysis is beyond the scope of the present project. A fully detailed analysis would draw the net of "key industries" wider, would include a feedback step where training needs based on secondary data sources are ground-checked with actual local course offerings, and would present findings with specific quantitative measures. In lieu of a fully detailed report, our analysis below will rely on a general gap classification: where the local supply of education and training appears substantial relative to demand, the availability of training is characterized as "strong." At the same time, where holes in supply are indicated, the availability of training is characterized as "moderate."

Table 1.4 presents five industries (and associated NAICS codes) identified as "key" to the economic health of the IPZ economy. These are (I) ag and food manufacturing, (II) healthcare, (III) manufacturing, transportation, and warehousing, (IV) services, and (V) professional/technical services.

Table 1.4 Key Industries of the IPZ Economy

Industry Sectors	NAICS Codes
I) Ag and Food Manufacturing	11, 311, 312
II) Healthcare and social assistance	62
III) Manufacturing, Transportation & Warehousing	31-33,* 48-49
IV) Business/Administrative/Other Services	55, 56, 81
V) Professional, Technical Services & Information	54, 51

** (Not including 311 or 312)*

Source: Economic Modeling Specialists Inc. - 6/11

Appendix C shows the high-growth/high-wage focus occupations for each of the five "key" industry sectors. These occupations compose the heart of their associated industry sectors and should be kept in mind by educators and economic development organizations as they prepare regional training programs.

Table 1.5 displays the most critical occupations in the IPZ area, determined by the number of workers within the target industry sectors. Along with this, Table 1.5 displays the number of openings according to new and replacement jobs expected to become available on an annual basis between 2011 and 2020, and whether formal training for these positions is currently available in the region.

Table 1.5: IPZ Focus Occupations

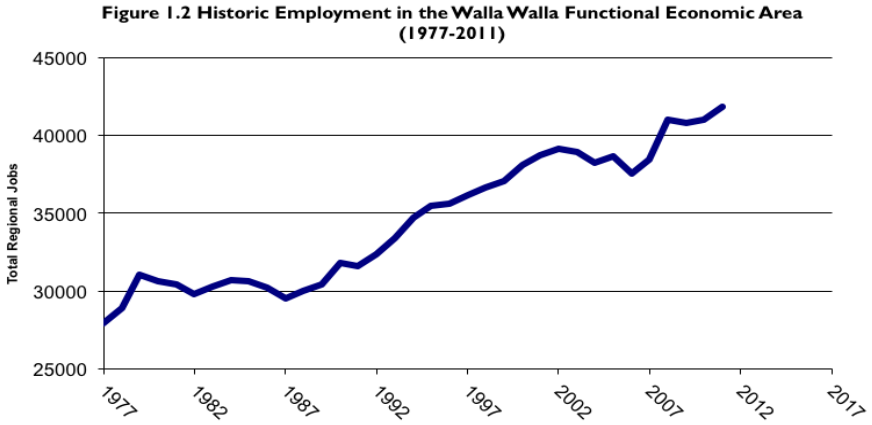
SOC Code	Description	2011 Jobs	Annual Openings	Formal Training Available in Region
29-1111	Registered nurses	768	31	Strong
11-9011	Farm, ranch, and other agricultural managers	658	27	Strong
11-9199	Managers, all other	428	21	Strong
43-3031	Bookkeeping, accounting, and auditing clerks	608	14	Strong
31-1012	Nursing aides, orderlies, and attendants	429	12	Strong
53-3032	Truck drivers, heavy and tractor-trailer	399	12	Strong
49-9042	Maintenance and repair workers, general	399	10	Moderate
13-2011	Accountants and auditors	275	10	Moderate
43-1011	First-line supervisors/managers of office and administrative support workers	278	9	Strong
43-6014	Secretaries, except legal, medical, and executive	444	8	Strong
13-1111	Management analysts	168	8	Strong
43-6013	Medical secretaries	172	5	Strong
51-1011	First-line supervisors/managers of production and operating workers	171	4	Moderate
49-9041	Industrial machinery mechanics	116	4	Moderate
45-1099	Supervisors, farming, fishing, and forestry workers	94	4	Strong

Source: Economic Modeling Specialists Inc. - 6/11

In the IPZ, most of the critical occupations are already being trained for, with the exception of a few occupations such as industrial machinery mechanics; first-line supervisors/managers of production and operating workers; accountants, and maintenance and repair workers. Even so the skill gaps for these few occupations are very small and do not pose a significant threat to regional development and expansion.

1.4 Historical Trends

Figure 1.2 shows the pattern of growth in the three-county Walla Walla IPZ from 1977 to the present. From 1979 to 1988, the region saw an actual loss of over 600 jobs, about 2% of all jobs. The loss cannot be blamed on national or Washington state trends: during the same period, national employment grew by roughly 21%, while Washington state employment grew by approximately 33%.[5]



Between 2006 and 2011, the Walla Walla IPZ was in recovery with an 11.3% increase in job growth. Though the state of Washington saw minimal job growth, 1.1%, the nation experienced a loss of 2,617,065 jobs, or 1.5% of total U.S. employment.

1.5 Conclusion

Though the Walla Walla IPZ still shows some signs of fragility related to industry diversity, the current industrial mix and growth in key export industries seems to be insulating it from external shocks. In the next chapter we will examine what effects the

[5] Growth rates are based on data from the U.S. Department of Commerce, Regional Economic Information System.

wine cluster has had in contributing to the economies increasing stability. In addition we will provide a projection of economic trends and see how the economy has fared relative to previous projections.

Chapter 2: The Wine Cluster Revisited

2.1 Introduction: Why Use Industry Clusters?

The notion of "cluster-led economic development" is based on the idea that a collection of different industries has common interests (through shared supply chains or labor pools, inter-industry trade, etc.), and actions that benefit one industry within the cluster benefit the entire cluster. Competing firms that exist in the same cluster will also benefit from collaboration, research, and other externalities that will increase the region's comparative advantage in the industry and enable the industries' to compete on national and international levels. Economic development is better served by recognizing these clusters, spreading awareness of their joint interests, and taking actions to enhance their efficiency.

For the purposes of this report, the term *wine cluster* refers to all industries involved in wine production, wine tourism, and wine-migrants—from vineyards and wineries to hotels, fine restaurants, recreational enterprises, and specialty retail stores.[6] (In this analysis, we estimate only the portion of these wine-related industries that are actually dependent on the wine industry proper.) Cluster analysis is very useful in this current project because it captures jobs that might otherwise be missed. If we simply focused on the "wine industry" sector, we would capture vineyards and wineries but would miss those other industries whose interests are closely aligned with those of the wine industry.

[6] The term *wine-migrants* refers to the subgroup of quality of life migrants who locate in a region due to the presence of a wine cluster amenities.

A note on headcounts versus full-time equivalents: The job numbers shown in the various tables of this document all report what analysts call "headcounts" (i.e., the simple count of full- and part-time jobs). Thus, a person who holds two part-time jobs appears in job statistics as two jobs. Alternatively, a person who works full-time between two employers—part of the year for one and part of year for another—will also appear in job statistics as multiple jobs. Imagine a vineyard worker who works a two-week stretch for one vineyard, then a few weeks for another, and then still another stretch for a third vineyard: He/she will appear in employment statistics as three jobs.

Headcount contrasts to "full-time equivalent," or "FTE." The American custom is to view a full-time job as 40 hours per week, 50 weeks per year—with two weeks off for vacation. According to this, a person working a 50-week year, 40 hours per week between two employers will appear as two jobs in headcount statistics, but only one job in FTE statistics.

In reality FTE statistics do not exist save in theoretical descriptions or special studies where a headcount-FTE conversion is made. Collected statistics are all-but universally of the headcount variety.

2.2 The Walla Walla Wine Cluster (Then and Now)

For the following subsections, survey data were collected to supplement the data collected in 2007.[7] The most interesting difference seen in the current data relative to the

[7] The survey effort was led by Nancy Reiff, IPZ Interim Coordinator and Special Projects Director, and Dr. Nicholas Velluzzi. Reiff and Velluzzi developed a survey instrument that was sent to area wineries.

2007 data is in the average annual growth rate in jobs for the wine cluster. From 2000, when the first auxiliary jobs appeared in the wine cluster, to 2007 the average annual growth rate for the cluster was 116 jobs per year. Using the most recent data, 2008 to 2011, the growth rate has increased to 193 jobs per year in the wine cluster. The bulk of the increase in the growth rate stems from the addition of primary sector jobs. The number of wineries has grown from 92 to 151 since 2007.

2.2.1 Regional Cluster Analysis

Table 2.1 demonstrates historic wine cluster employment in the entire functional economic area. Numbers include full- and part-time annual jobs. Note the terminology: "Winery and Vineyard Jobs" is self-explanatory,[8] though we do find it useful to distinguish between "Winery Sales" (i.e., persons working in tasting rooms) and other winery jobs (called simply "Production"). All these wineries and vineyards are unambiguous members of the wine cluster, and are labeled the "Primary" wine cluster industries.

Other types of industries are intimately involved in wine tourism, including some portion of local lodging, dining, and retail establishments that are dependent on wine tourists. We refer to these jobs as the "Auxiliary" portion of the wine cluster. Auxiliary jobs were estimated through a direct survey of leading employers in affected businesses. The sum of the primary and auxiliary jobs equal the total "direct" jobs in the wine cluster. Later

---

Timeline gaps in interview data were filled in by EMSI assuming natural growth rates and using data from the Washington State Liquor Control Board. The historic number of wineries, number of winery and vineyard jobs, and the breakdown of winery employment between sales and production were for the most part built up from information obtained through direct wine industry surveys. Auxiliary job estimates were formed on an assortment of interviews with area hospitality industry representatives.

[8] Wineries are listed as NAICS industry 312130, while vineyards appear as part of NAICS 115112.

we will add multiplier effect jobs (called "indirect" jobs) as well as "induced" jobs to arrive at the total economic effect of area wine cluster activity.

Table 2.1: Direct Wine Cluster Employment, Walla Walla Functional Economy

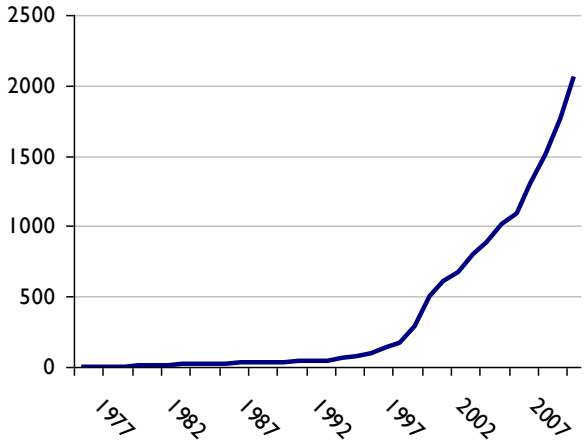
		Primary Jobs			Auxiliary Jobs				Totals		
Year	# Wineries	Winery Jobs Prod.	Winery Jobs Sales	Vineyard Jobs	Lodging	Dining	Specialty Retail	Misc.	Primary Jobs	Auxiliary Jobs	Wine Cluster Jobs
1977	1	1	0	4	0	0	0	0	5	0	5
1978	1	1	0	4	0	0	0	0	5	0	5
1979	1	1	0	4	0	0	0	0	5	0	5
1980	1	1	0	4	0	0	0	0	5	0	5
1981	2	2	0	8	0	0	0	0	10	0	10
1982	2	2	0	8	0	0	0	0	10	0	10
1983	3	3	0	12	0	0	0	0	15	0	15
1984	4	4	0	17	0	0	0	0	21	0	21
1985	4	4	1	17	0	0	0	0	22	0	22
1986	4	4	1	17	0	0	0	0	22	0	22
1987	4	4	1	17	0	0	0	0	22	0	22
1988	6	6	1	25	0	0	0	0	32	0	32
1989	6	6	1	25	0	0	0	0	32	0	32
1990	6	8	2	25	0	0	0	0	35	0	35
1991	6	8	2	25	0	0	0	0	35	0	35
1992	7	10	3	28	0	0	0	0	41	0	41
1993	7	10	3	28	0	0	0	0	41	0	41
1994	7	10	4	28	0	0	0	0	42	0	42
1995	11	15	6	45	0	0	0	0	66	0	66
1996	11	18	8	45	0	0	0	0	71	0	71
1997	14	25	13	57	0	0	0	0	95	0	95
1998	20	36	20	82	0	0	0	0	138	0	138
1999	24	44	26	98	0	0	0	0	168	0	168
2000	31	54	37	122	15	45	8	5	213	73	286
2001	42	76	56	170	60	100	13	22	302	195	497
2002	54	98	80	220	63	111	19	23	398	215	613
2003	59	107	96	244	66	123	19	24	447	232	678
2004	72	131	131	285	70	136	20	25	547	251	797
2005	78	142	156	309	74	150	29	26	607	279	886
2006	89	160	195	358	77	166	30	28	713	302	1015
2007	92	165	223	370	81	184	41	29	758	336	1094
2008	107	195	277	467	86	198	49	31	939	363	1303
2009	120	220	348	535	91	221	62	33	1103	407	1510
2010	134	246	424	636	97	242	79	35	1305	453	1758
2011	151	277	528	744	104	269	102	37	1549	512	2061

Source: Economic Modeling Specialists, Inc. · 6/11

Growth in wine cluster employment has been sharp since 2000. By 2007 the total number of wineries had grown to 92 and total direct wine cluster employment to 1,094. It is interesting to note the quickening of wine cluster growth. During this most recent period (2007 to 2011), average annual job growth has increased to 193 jobs per year. Figure 2.1

displays total direct wine cluster jobs growth since 1977, which clearly shows the increased growth rate even above the previous analysis period.

Figure 2.1 Direct wine cluster employment in the Walla Walla Functional Economy



2.2.2 Sub-Region Analysis

The three sub-regions in the functional analysis are the same as were used in the previous 2007 report. The greater Walla Walla region remains the dominant region for the cluster, though it appears the greater Milton-Freewater region, while not growing significantly in the auxiliary sectors, has had sizable growth in both the volume of wineries and in vineyard and winery jobs. The greater Dayton region has experienced some decline and further research will need to be conducted to understand why this region is not benefiting from the increasing returns to scale that appear to be present in the remainder of the cluster.

Tables 2.2, 2.3, and 2.4 break out the three-county wine cluster employment data of Table 2.1 to the three separate political sub-regions: Walla Walla County (trimmed as per Figure 1.1), Milton-Freewater, and Columbia County, respectively.

Table 2.2: Wine Cluster Employment: Greater Walla Walla

		Primary Jobs			Auxiliary Jobs				Totals		
Year	# Wineries	Winery Jobs Prod.	Winery Jobs Sales	Vineyard Jobs	Lodging	Dining	Specialty Retail	Misc.	Primary Jobs	Auxiliary Jobs	Wine Cluster Jobs
1977	1	1	0	4	0	0	0	0	5	0	5
1978	1	1	0	4	0	0	0	0	5	0	5
1979	1	1	0	4	0	0	0	0	5	0	5
1980	1	1	0	4	0	0	0	0	5	0	5
1981	2	2	0	5	0	0	0	0	7	0	7
1982	2	2	0	5	0	0	0	0	7	0	7
1983	3	3	0	7	0	0	0	0	10	0	10
1984	4	4	0	10	0	0	0	0	14	0	14
1985	4	4	1	10	0	0	0	0	15	0	15
1986	4	4	1	10	0	0	0	0	15	0	15
1987	4	4	1	10	0	0	0	0	15	0	15
1988	5	5	1	15	0	0	0	0	21	0	21
1989	5	5	1	15	0	0	0	0	21	0	21
1990	5	7	2	15	0	0	0	0	24	0	24
1991	5	7	2	15	0	0	0	0	24	0	24
1992	6	9	2	17	0	0	0	0	28	0	28
1993	6	9	2	17	0	0	0	0	28	0	28
1994	6	9	3	17	0	0	0	0	29	0	29
1995	10	14	5	27	0	0	0	0	46	0	46
1996	10	17	7	27	0	0	0	0	51	0	51
1997	13	24	12	34	0	0	0	0	70	0	70
1998	19	35	19	49	0	0	0	0	103	0	103
1999	23	43	25	59	0	0	0	0	127	0	127
2000	30	53	36	73	15	45	5	5	162	71	233
2001	41	75	55	102	60	100	9	22	232	191	423
2002	52	95	77	132	63	111	13	23	304	209	513
2003	56	103	92	146	66	123	13	24	341	226	567
2004	68	125	126	171	70	136	13	25	422	244	666
2005	74	136	151	185	74	150	20	26	472	270	742
2006	83	151	188	215	77	166	20	28	554	292	846
2007	86	156	216	222	81	184	29	29	594	324	918
2008	99	182	267	252	86	198	37	31	701	351	1051
2009	112	206	336	285	91	221	50	33	828	395	1222
2010	124	228	408	316	97	242	64	35	952	438	1390
2011	139	256	507	354	104	269	85	37	1117	495	1612

Source: Economic Modeling Specialists, Inc. · 6/11

The greater Walla Walla region is responsible for 72% of job growth (967 jobs) in the three-county wine cluster since 2007 and composes 78% of total cluster employment. Again, this is not to say that the Milton-Freewater region has not seen considerable growth. As shown in Table 2.3, since 2007 wine cluster employment in the Milton-

Freewater region has more than doubled: from 168 jobs in 2007 to 446 in 2011. In fact greater Milton-Freewater is experiencing a higher growth rate today than greater Walla Walla, which had a growth rate of 1.76 during the same 2007 to 2011 period.

Table 2.3: Wine Cluster Employment: Greater Milton-Freewater

		Primary Jobs			Auxiliary Jobs				Totals		
Year	# Wineries	Winery Jobs Prod.	Winery Jobs Sales	Vineyard Jobs	Lodging	Dining	Specialty Retail	Misc.	Primary Jobs	Auxiliary Jobs	Wine Cluster Jobs
1977	0	0	0	0	0	0	0	0	0	0	0
1978	0	0	0	0	0	0	0	0	0	0	0
1979	0	0	0	0	0	0	0	0	0	0	0
1980	0	0	0	0	0	0	0	0	0	0	0
1981	0	0	0	3	0	0	0	0	3	0	3
1982	0	0	0	3	0	0	0	0	3	0	3
1983	0	0	0	5	0	0	0	0	5	0	5
1984	0	0	0	7	0	0	0	0	7	0	7
1985	0	0	0	7	0	0	0	0	7	0	7
1986	0	0	0	7	0	0	0	0	7	0	7
1987	0	0	0	7	0	0	0	0	7	0	7
1988	1	1	0	10	0	0	0	0	11	0	11
1989	1	1	0	10	0	0	0	0	11	0	11
1990	1	1	0	10	0	0	0	0	11	0	11
1991	1	1	0	10	0	0	0	0	11	0	11
1992	1	1	1	11	0	0	0	0	13	0	13
1993	1	1	1	11	0	0	0	0	13	0	13
1994	1	1	1	11	0	0	0	0	13	0	13
1995	1	1	1	18	0	0	0	0	20	0	20
1996	1	1	1	18	0	0	0	0	20	0	20
1997	1	1	1	23	0	0	0	0	25	0	25
1998	1	1	1	33	0	0	0	0	35	0	35
1999	1	1	1	39	0	0	0	0	41	0	41
2000	0	0	0	49	0	0	2	0	49	2	50
2001	0	0	0	68	0	0	3	0	68	3	71
2002	1	2	2	88	0	0	4	0	92	4	96
2003	1	2	2	98	0	0	4	0	102	4	106
2004	2	4	3	114	0	0	4	0	121	4	125
2005	2	4	3	124	0	0	6	0	131	6	137
2006	4	7	5	143	0	0	6	0	155	6	162
2007	4	7	5	148	0	0	8	0	160	8	168
2008	6	11	9	215	0	0	10	0	235	10	245
2009	7	13	11	250	0	0	11	0	273	11	285
2010	9	16	15	320	0	0	14	0	351	14	365
2011	11	20	20	390	0	0	16	0	430	16	446

Source: Economic Modeling Specialists, Inc. · 6/11

As seen in Table 2.4, the greater Dayton region has suffered the loss of one of its wineries since 2007 and total cluster employment has fallen from 8 to 3 in that sub-region. With so few years of data and with the small volume of the wine cluster jobs in this sub-region it is not clear at this time what is contributing to the slowing, and perhaps declining, share of the cluster that greater Dayton holds.

Table 2.4: Wine Cluster Employment, Greater Dayton

		Primary Jobs			Auxiliary Jobs				Totals		
Year	# Wineries	Winery Jobs Prod.	Winery Jobs Sales	Vineyard Jobs	Lodging	Dining	Specialty Retail	Misc.	Primary Jobs	Auxiliary Jobs	Wine Cluster Jobs
2000	1	1	1	0	0	0	1	0	2	1	3
2001	1	1	1	0	0	0	1	0	2	1	3
2002	1	1	1	0	0	0	2	0	2	2	4
2003	2	2	2	0	0	0	2	0	4	2	6
2004	2	2	2	0	0	0	2	0	4	2	6
2005	2	2	2	0	0	0	3	0	4	3	7
2006	2	2	2	0	0	0	3	0	4	3	7
2007	2	2	2	0	0	0	4	0	4	4	8
2008	2	2	2	0	0	0	3	0	4	3	7
2009	1	1	1	0	0	0	1	0	2	1	3
2010	1	1	1	0	0	0	1	0	2	1	3
2011	1	1	1	0	0	0	1	0	2	1	3

Source: Economic Modeling Specialists, Inc. · 6/11

2.3 Industry Cluster Comparisons

We now compare the wine cluster to other regional clusters in an "apples-to-apples" fashion. Our original economy overview in Chapter 1 dealt with industry sectors, based on the federal government's NAICS categorization of industries using similar production processes and generally producing similar products. The comparison here, however, deals with industry *clusters*, which are groups of interdependent industries, related by common supply chains, shared labor-pools, inter-industry trade, and so on. The two categorization schemes are very different, so numbers in this chapter should not be compared to the numbers reported in Chapter 1.

Table 2.5 summarizes a cluster analysis of the 2006 three-county Walla Walla IPZ economy. Cluster categorization is based on an approach used by EMSI and others.[9] Clusters are presented in terms of total jobs in the industries included in the clusters, and

[9] See for example, Pennsylvania Department of Labor and Industry, Center for Workforce Information and Analysis: "Pennsylvania's Targeted Industry Clusters," 2004.

ranked from the largest to the smallest. The final entry, “All Other,” does not refer to a cluster, but rather catches all the industries that are not properly part of a cluster as defined here. These include mainly resident household-serving industries such as plumbers, barbers and the like, as well as local entertainment, most retail stores, and so on.

Table 2.5: Walla Walla Functional Economy Industry Clusters (2011)

Cluster Name	2011 Jobs	2011 Jobs %	2007 LQ	2011 LQ
Agriculture and food production	7698	18.4%	2.7	3.4
Government and civic organizations	5694	13.6%	1.4	1.3
Health and Life Science	5028	12.0%	1.2	1.0
Higher Education	3769	9.0%	1.5	1.2
Non-Wine Manufacturing	2759	6.6%	--	1.3
Wine	**2061**	**4.9%**	**54.1**	**50.7**
Entertainment and travel	1773	4.2%	0.8	0.4
Lumber wood and paper manufacturing	1506	3.6%	2.2	2.3
All Other	11,530	27.6%	--	--

Source: Economic Modeling Specialists, Inc. · 6/11

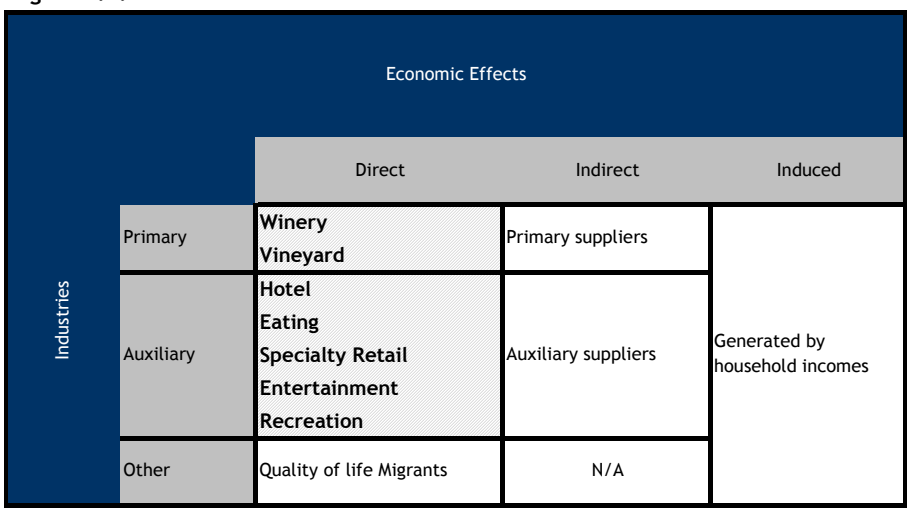
The fourth and fifth columns in Table 2.5 display the 2007 and 2011 cluster LQs. Cluster LQs, just as the industry LQs explained in Chapter 1, indicate how specialized the regional economy is in a particular cluster compared to the U.S. economy as a whole. LQs of 1.0 indicate jobs in the cluster account for the same portion regionally as they do nationally. LQs less than 1.0 indicate a cluster that is relatively underrepresented in the region, while LQs greater than 1.0 indicate relative overrepresentation (and therefore regional specialization).[10] Interpreting the change in the wine cluster LQ requires us to look outside of the IPZ. We can tell from the regional job growth and the percentage of the regional economy composed by the direct wine cluster employment that the decline in the wine cluster LQ is a result of national data. Primary wine cluster jobs have grown at a faster pace nationally than in the IPZ.

[10] A cluster that accounts for 10% of all regional jobs but 20% of all national jobs will indicate an LQ of 0.5. At the same time, a cluster that accounts for 20% of all regional jobs but 10% of all national jobs will indicate an LQ of 2.0.

2.4 Multiplier Effects and the Wine Cluster

The economic significance of the wine cluster is not limited to the jobs immediately connected with it (i.e., the direct jobs as shown in Tables 2.1-2.4). Rather, a better measurement is the sum of the direct jobs plus any additional jobs created indirectly as a result of wine sector input purchases and employee spending. This section explains these different effects, adding "indirect" and "induced" effects to the original "direct effects" detailed in Tables 2.1-2.4.

Figure 2.2: Economic Effects



Economic Modeling Specialists, Inc., 2007

2.4.1 Direct Effects

Direct effects of a cluster are related to the jobs in the cluster itself. We have already defined and totaled the "direct" wine cluster jobs (see Tables 2.1-2.4). The primary industries, vineyards and wineries, are the most obvious creators of direct jobs, but there are also the "auxiliary" industries that derive at least some income from sales to wine tourists. Auxiliary businesses include hotels and full-service dining places, followed by miscellaneous visitor-serving retail places (e.g., gas stations and convenience stores), specialty retail (e.g., chocolatiers, pastry shops, limousine services), and

entertainment/recreation providers such as art galleries, museums, golf courses, resorts, and similar arts, entertainment, recreation, and cultural enrichment industries.

There may be other effects directly caused by the wine cluster but not as a result of wine sales or sales to wine tourists. We have identified "quality-of-life migrants" as the other likely source of direct effects. This group of people is generally made up of footloose proprietors (self-employed mobile professionals) or retirees, and is recognized as an increasingly important factor in western U.S. non-metropolitan growth.[11] As a general rule, members of this group have made the decision to relocate in rural places such as Walla Walla based on the collection of appealing amenities they find there. Along with low crime, affordable housing, and quality schools, the "wine country" atmosphere and the other wine cluster amenities attract these generally well-to-do migrants. As these individuals bring in outside income from investments, self-employment, or new entrepreneurial activity, they contribute to local economic growth that we can then attribute to the wine cluster, if it was the primary attractant in bringing them to the region. Unfortunately, there is no hard data that could be used to estimate the number of in-migrants to Walla Walla who chose the area primarily for wine-related amenities, and so it is impossible at this time to estimate their economic impact. However, the data in Appendix B reveal a strong recent trend of in-migration.

[11] See for example W.B. Beyers and P.B. Nelson, 2000, "Contemporary Development Forces in the Nonmetropolitan West: New Insights from Rapidly Growing Communities," *Journal of Rural Studies*, Vol 16.

2.4.2 Indirect Effects

The economic impact of the wine cluster does not stop with the total direct wine cluster jobs. In order to estimate the full impact of the wine cluster, we must also look at the two kinds of economic "ripple effects." The first is the indirect effect. The simplest way to understand indirect effects is to imagine a new business starting or moving into an area. The business immediately begins spending money, a portion of which stays in the area with another portion leaking out to businesses outside the area. Wineries, for example, need accounting and other business services, electricity, office supplies, and a varied collection of wine-producing supplies. As a result of the local portion of this spending, local supplier businesses have a little more income to spend for their own supply needs, a portion of which also stays in the area, and so on. For all these "ripples" of the original spending, the portion that stays in the area supports local economic growth. Indirect effects are a standard part of regional analysis, and estimating them requires a specialized economic impact model.[12]

2.4.3 Induced Effects

Direct and indirect effects generate local jobs and personal income, large portions of which are spent in the area for consumer goods and services. This leads to more growth

[12] Regional scientists estimate the chain of indirect and induced economic impacts using so-called "regional input-output" models. Input-output theory dates to 19th century classical economics and before. In 1973 American economist Wassily Leontief received the Nobel Prize in Economics for his development nearly 30 years earlier of input-output in its contemporary form. Regional input-output modeling software is today available from the U.S. Department of Commerce (RIMSII Model), Regional Economic Modeling Inc. (REMI Model), the Minnesota IMPLAN Group (IMPLAN Model), Rutgers University's Center for Urban Policy Research (RECON Model), Economic Modeling Specialists Inc. (EMSI EI Model), and others. The above modeling approaches all have extensive client bases, and all rely on variations of so-called "data reduction methods" for regionalizing the U.S. National Input-Output Model. The essence of data reduction technology is found in many places: for example Miller, R.E. and P. Blair, 1985, *Input-Output Analysis: Foundations and Extensions*, Englewood Cliffs, NJ: Prentice Hall. We use the EMSI EI Model for the work completed in this study. With its sub-county data and modeling capability, its export base and cluster functionality, and its tie to economic projections, the EMSI EI Model is particularly well suited to the needs of the current project.

in local businesses that supply these goods and services, with continuing ripples of spending to those businesses' suppliers, and so on. These are called induced effects. As with indirect effects, induced effects are estimated with the aid of a regional economic model.

2.4.4 Quality-of-Life Migrants and the Wine Cluster

Residents widely believe that the Walla Walla region has recently seen more relatively high-income second-home owners as well as permanent in-migrants attracted to the region because of the amenities associated with the emerging wine sector. It is certainly true that Walla Walla continues to gain national attention for its quality of life.[13]

Recent studies indicate that such "quality-of-life migrants" may be a significant factor in Western rural and small-town economic growth.[14] Studies describe quality-of-life migrants as people who move to an area primarily for its physical, social, or cultural amenities rather than its business or job opportunities. These migrants usually fall into two broad categories: retired persons or mobile, self-employed professionals whose jobs do not depend heavily on physical location. Quality-of-life migrants can be important in rural economic development because they spend and invest their outside income in the local community and/or launch new small businesses, spurring economic growth.

[13] In 2006, Walla Walla was named first of the "Top 5 Places to Retire" by CNN Money Magazine. The article placed special emphasis on the region's wines and wine culture in explaining its selection.
[14] An excellent review of the literature and survey of the issues can be found in William B. Beyers and Peter B. Nelson, "Contemporary Development Forces in the Nonmetropolitan West: New Insights from Rapidly Growing Communities," *Journal of Rural Studies* 16 (2000): 459-474.

Hard data currently do not exist on the number of in-migrants specifically attracted by wine-related activities. Because no updates to the county-by-county migration data have occurred since the 2007 report, we trend the expected migration patterns to 2011 in order estimate the number of induced jobs related to quality-of-life migrants. Table 2.6 summarizes the analysis. The first data column shows our estimates of cumulative in-migrating households whose decisions were significantly dependent on wine cluster presence. The growth in household numbers by 2005 equals half the Census-estimated households for that year (recall that Figure 2.3 shows persons, while Table 2.6 shows households). Annual growth up to the 2005 cumulative total, and beyond to 2006 and 2007, is projected based on the growth rate of direct employment in the wine-cluster (see: Table 2.1).[15] We are assuming no notable wine-cluster quality-of-life migration prior to 1997.

Table 2.6: Estimated Households Attracted to the Region by Wine Cluster Ammenities

Year	Cumulative Households	Total Household Income (K)	Induced Jobs
2000	116	$5,800	58
2001	202	$10,100	101
2002	249	$12,450	125
2003	277	$13,850	139
2004	321	$16,050	161
2005	357	$17,850	179
2006	412	$20,600	206
2007	444	$22,200	222
2008	472	$23,587	235
2009	500	$24,982	249
2010	524	$26,214	261
2011	546	$27,283	271

Source: Economic Modeling Specialists, Inc. - 6/07

The second data column is simply the first multiplied by $50,000 per year. This yields an estimate of added personal income in the three-county functional economy due to quality-

[15] It is assumed that the quality-of-life migrant is attracted by the amenities of the wine cluster, including wineries and auxiliary activities such as restaurants, shopping, recreation activities, and such. It is further assumed that growth in direct wine-cluster employment suitably measures of growth in these amenities.

of-life migrants. Finally, the last column shows the aggregate of new regional employment created by the spending of the added personal income. We obtained these numbers by feeding the new personal income into our three-county economic impact model. In 2011, we estimate that the spending of wine-cluster-attracted migrants generated 271 jobs.[16]

2.5 Estimating Total Wine Cluster Economic Impacts

The various types of employment associated with the wine industry cluster were identified and summarized in the sections above. Now we analyze these direct, indirect, and induced jobs in the wine cluster to determine their role in total regional job growth. The conclusion is simple and striking.

Assembling the various impact components and summing them together will show the total jobs impact the wine cluster is having on the IPZ. Table 2.7 details the individual components, sums these to the total impact, and examines this as a percent of overall regional employment. The first data column is simply a repeat of the direct wine cluster employment as reported in Table 2.1. The second data column presents the sum of the indirect and induced jobs resulting from purchases and incomes of the direct sector. The third column shows the estimated number of jobs induced by the wine migrants that relocate to the IPZ (from Table 2.6). Finally, we provided the sum of direct, indirect and induced jobs due to related in-migration to show the total number of regional jobs

[16] The economic impact model takes new personal income, deducts out-of-area taxes, savings, and out-of-area consumer goods purchases. What remain are moneys spent on locally produced consumer goods and services, and local tax payments and these generate the area economic impacts.

dependent on the wine cluster. Next total regional jobs are provided and a relative analysis, based on the percentage of total jobs related to wine cluster activity, are given.

Table 2.7: Total Economic Impact of Wine Cluster Related Employment (1987-2007)

Year	Direct Jobs	Indirect and Induced Jobs	Jobs Due to Related In-Migration	Total Wine and Related Jobs	Total Regional Jobs	% Wine-Related Jobs
1991	35	62	0	97	31,588	0.3%
1992	41	74	0	115	32,363	0.4%
1993	41	74	0	115	33,391	0.3%
1994	42	75	0	117	34,725	0.3%
1995	66	117	0	183	35,469	0.5%
1996	71	126	0	197	35,574	0.6%
1997	95	169	19	283	36,178	0.8%
1998	138	245	28	411	36,637	1.1%
1999	168	300	34	502	37,064	1.4%
2000	286	509	58	853	38,097	2.2%
2001	497	885	101	1,483	38,721	3.8%
2002	613	1,092	125	1,830	39,131	4.7%
2003	678	1,207	139	2,024	38,919	5.2%
2004	797	1,419	161	2,377	38,200	6.2%
2005	886	1,577	179	2,642	38,643	6.8%
2006	1,015	1,806	206	3,027	37,560	8.1%
2007	1,094	1,947	222	3,263	38,417	8.5%
2008	1,303	2,320	235	3,858	41,021	9.4%
2009	1,510	2,690	249	4,449	40,811	10.9%
2010	1,758	3,131	261	5,150	40,969	12.6%
2011	2,061	3,671	271	6,003	41,817	14.4%

Source: Economic Modeling Specialists, Inc. - 6/07

Based on these findings, 14.4% of total IPZ employment is dependent on the wine cluster. This is a sharp increase from 8.5% of jobs that were dependent on the wine cluster in 2007. The change from 8.5% in 2007 to 14.4% today shows the dependence of the regional economy on the wine cluster has grown by roughly 70%.

Table 2.8 shows 20 years of total employment data for the three-county region. Two series are shown. The first series is simply observed total jobs from 1991 through 2011, as reported by U.S. Government sources.[17]

[17] Employment data are primarily from U.S. Dept. of Commerce, REIS, allocated to sub-county regions using principally U.S. Census Bureau Zip Code Business Patterns data. Employment data from 2001 and beyond come from EMSI's Analyst software.

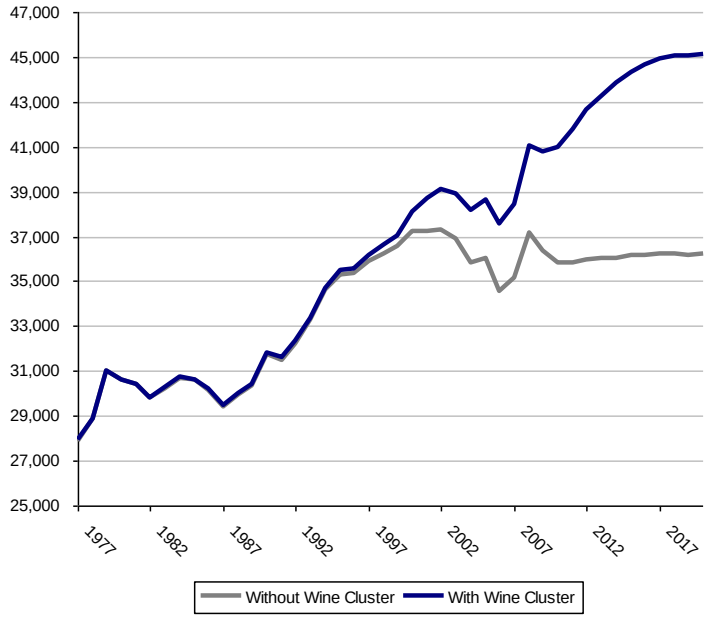
Table 2.8: Total Wine Cluster Impact on Regional Growth

Year	Total Actual Jobs	Total Jobs Without Wine Cluster	Annual Growth	Growth Without Wine Cluster
1991	31,588	31,491	-0.8%	-0.8%
1992	32,363	32,248	2.5%	2.4%
1993	33,391	33,276	3.2%	3.2%
1994	34,725	34,608	4.0%	4.0%
1995	35,469	35,286	2.1%	2.0%
1996	35,574	35,377	0.3%	0.3%
1997	36,178	35,895	1.7%	1.5%
1998	36,637	36,226	1.3%	0.9%
1999	37,064	36,562	1.2%	0.9%
2000	38,097	37,244	2.8%	1.9%
2001	38,721	37,238	1.6%	0.0%
2002	39,131	37,301	1.1%	0.2%
2003	38,919	36,895	-0.5%	-1.1%
2004	38,200	35,823	-1.8%	-2.9%
2005	38,643	36,001	1.2%	0.5%
2006	37,560	34,533	-2.8%	-4.1%
2007	38,417	35,154	2.3%	1.8%
2008	41,021	37,163	6.8%	5.7%
2009	40,811	36,362	-0.5%	-2.2%
2010	40,969	35,819	0.4%	-1.5%
2011	41,817	35,814	2.1%	0.0%

Source: Economic Modeling Specialists, Inc. · 6/11

For example, in 1991 there were 31,588 jobs in the three-county region, and by 2011 this had grown to 41,817. The second series is simply the first series less all wine cluster and related jobs: direct, indirect and induced, and the jobs accounted to the wine-migrants. The second series simulates the three-county economy absent wine cluster and related development. In 2007 wine and related employment accounted for 3,263 jobs in the IPZ region (38,417 - 35,154). Today wine and related employment accounts for 6,003 jobs, nearly double the impact of 2007. Figure 2.2 presents the two employment series graphically.

Figure2.2: Projected IPZ Employment With and Without the Wine Cluster



Though the IPZ's wine cluster accounted for less than 3% of all jobs in 2007, and in an economic base sense just over 6% of all jobs (see Appendix A), it remains the primary driving force behind recent economic growth.

To the right of the two employment columns in Table 2.8 appear a pair of percentage columns. These simply show annual growth rates.[18] In 2011 the growth rate in the economy totaled 2.1%. Without the wine cluster, growth would have been stagnant. The IPZ has grown by roughly 9% since 2007. Absent the wine cluster, the IPZ would have only seen growth of 2%, suggesting that 7% of the region's growth is directly attributable to the presence of the wine cluster.

[18] Annual growth rates are calculated as the change in jobs over a given period divided by the total jobs from the initial year.

2.6 Summary and Conclusions

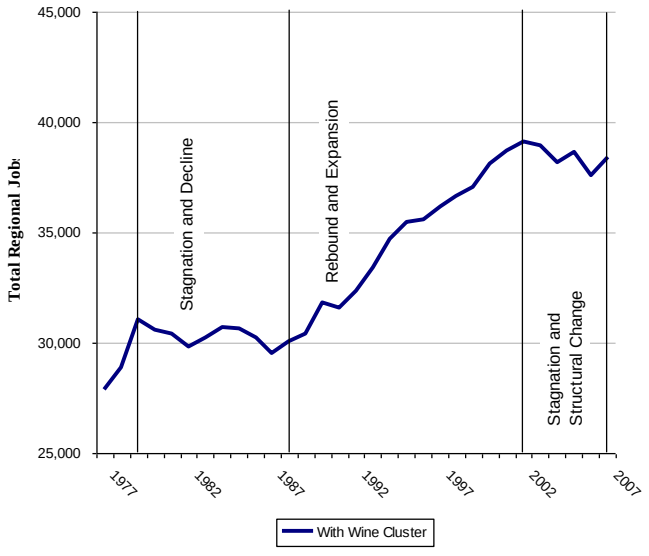
Though growth in the IPZ's wine cluster has been dramatic, it still is a relatively small sector compared to the largest ones: Government, Other Agriculture, Health, and Higher Education. The wine cluster's recent rapid growth is still something more than noteworthy, however. From 2007 to 2011, growth in the wine cluster accounts for nearly all growth in the three-county economy; without the cluster, the region would have experienced near stagnation. In the next chapter we look ahead to future years, and consider how wine cluster growth may contribute to the economy in those years.

CHAPTER 3: LOOKING FORWARD: HISTORIC AND PROJECTED IMPACTS

3.1 Review of Historic Trends

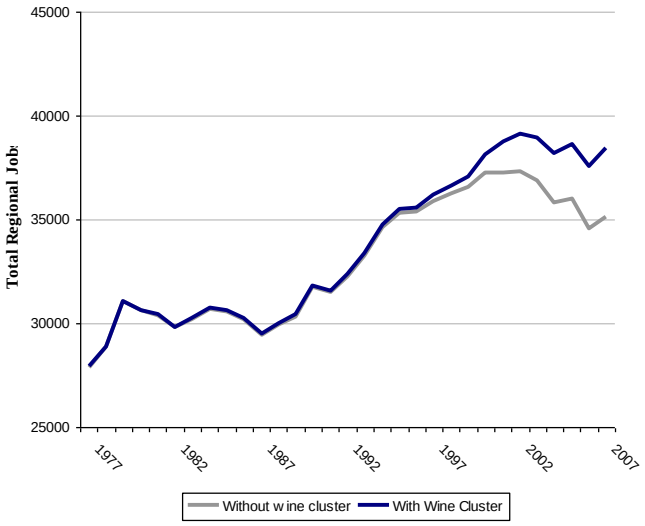
As historic background, our 2007 report included a 30-year look (1977 to 2007) at aggregate regional employment in the IPZ. Figure 3.1 is a repeat from the earlier report recognizing three distinct periods of economic change. From 1979 to 1988, the economy suffered a nearly 10-year period of slow decline, registering an overall net loss of over 600 jobs. We dubbed this the period of "Stagnation and Decline." In 1989 prosperity and growth returned, and over the next 12 years the IPZ added nearly 7,300 jobs. We dubbed this the period of "Rebound and Expansion." Beginning in 2003, however, the economy turned down again, registering by 2007 an overall five-year employment decline of just over 750 jobs. We dubbed this the period of "Stagnation and Structural Change."

Figure 3.1: Total Employment in the IPZ



Things could have been a lot worse. As an exercise in "with and without analysis," our 2007 study simulated the IPZ economy absent wine cluster jobs. Figure 3.2 superimposes the path of total IPZ employment absent wine cluster jobs (see the lightly shaded line just beneath the total employment line). Absent the dramatic development of the Walla Walla wine cluster, total employment in the IPZ in 2007 would have stood roughly where it was 15 years earlier, in 1992. Though the economy as a whole grew little from 2003 to 2007, wine cluster development saved the region from what would have otherwise been a period of decline much sharper even than the decline exhibited during the period we dubbed "Stagnation and Decline."

Figure 3.2: Historic IPZ Employment With and Without the Wine Cluster



3.2 Projected Overall Employment

Our 2007 report included a 10-year projection of future employment through 2017. The present report revises the earlier projections, and extends the projection period by three years to 2020. Figure 3.3 repeats historic data from Figure 3.2, adds new historic data to 2011, and presents our revised projections through to 2020. To facilitate analysis and presentation of our revised projections, Figure 3.4 focuses on the period 2002 to 2020.

Figure 3.3: Projected IPZ Employment With and Without the Wine Cluster

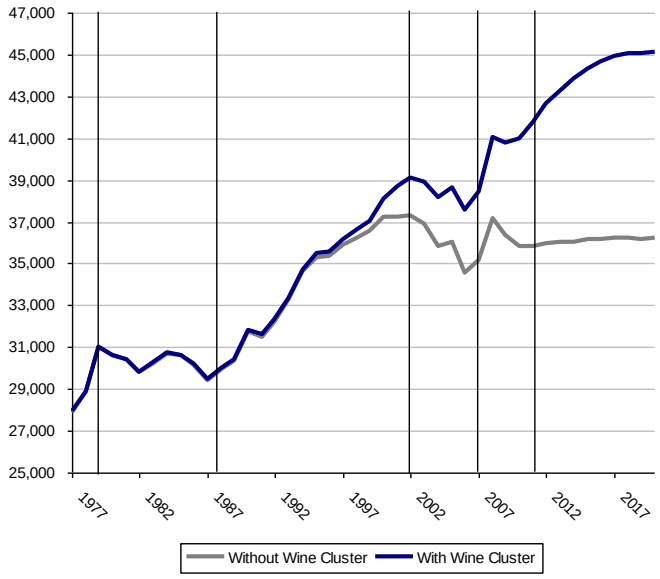
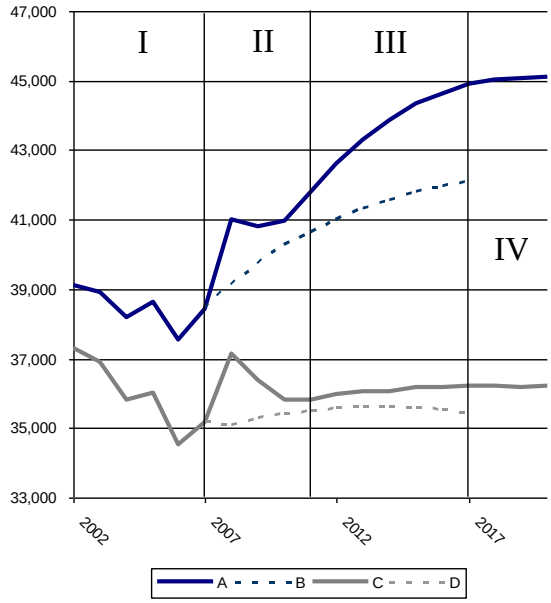


Figure 3.4 is divided into four time periods. Period I extends from 2002 to 2007 and is provided simply to show the lead-up to 2007, the year of our earlier study. Period II extends from 2007 to 2011, thus capturing the actual course of events since the previous study. Period III extends from the present, 2011, to 2017, the end of the projection period of our 2007 study. Finally, Period IV extends from 2017 to 2020, thereby capturing the extension of our projection period.

The figure provides a simultaneous display of four distinct employment series, labeled Series A, B, C and D. Series A shows total IPZ area employment, observed employment through 2011 (i.e., across Periods I and II), and the current report's best total

Figure3.4: Focus period (2002-2020)



employment projection through to 2020 (i.e., across periods III and IV). Skipping Series B for the moment, Series C shows the results of our "without analysis:" total IPZ area employment less wine cluster employment. Series B shows our projection of total IPZ area employment as reported in our 2007 study, while Series D shows the 2007 study's accompanying projection of total IPZ area employment less wine cluster employment.

Let us start now by comparing our total employment projection in the 2007 study (Series B) with the course of actual employment growth (Series A). We projected total employment in 2011 to be at 40,654 jobs, while actual employment that year came in at 41,817 jobs. We thereby underestimated employment growth across this four-year period by 1,163 jobs. A closer look at the detail underlying our projections shows that of the 1,163 jobs, 860 jobs were in the wine cluster compared to 303 jobs elsewhere in the economy (860 + 303 = 1,163). Additional focus is given to wine cluster jobs in the next section.

Looking forward to 2020, we project total employment in the IPZ area economy will grow to 45,120 jobs compared to the 41,817 jobs in 2011. This works out to an average of 370 jobs per year: a steady growth, relatively easy to plan for and accommodate. As shown by Series C in Figure 3.4, the bulk of the new growth is attributable to wine cluster growth. Absent the wine cluster, the IPZ area economy would be experiencing a protracted period of no-growth economic stagnation.

Given the understatement of jobs in the 2007 projections, there is a possibility that the total 2020 employment projections may be higher since the EMSI projection methodology is conservative in nature. Nonetheless, there is evidence that a portion of the licensed wineries is reducing or has ceased production, which suggests that continued levels of growth are already slowing.

Figure3.5: Focus period (2002-2020)

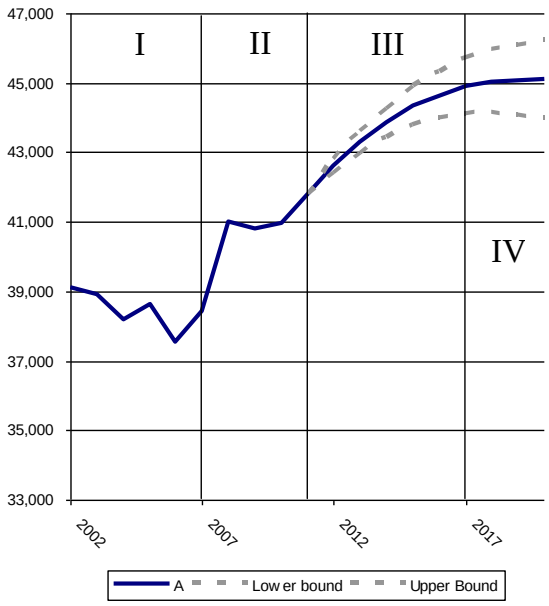
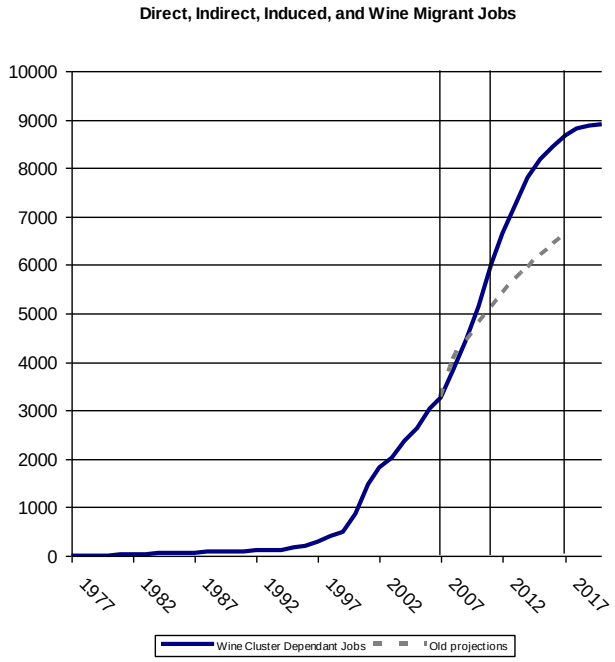


Figure 3.5 shows a potential upper and lower bounds of the EMSI projections. Using a less conservative dampening factor generates an upper bound employment estimate of

46,248 for 2020. The associated lower bound provides a 2020 employment estimate of 43,992. The upper and lower bounds deviate from the original projections at an increasing rate as a result of the greater uncertainty that arises from more lengthy time horizons.

3.3 Wine Cluster Projections

Figure 3.5 shows historic and projected jobs in the IPZ area wine cluster. As chronicled in our 2007 report, following a roughly 20-year period (1977 to 1997) of very slow but steady growth, wine cluster employment took a sharp turn upward, increasing from 283 jobs in 1997 to over 3,263 in 2007. The dashed series from 2007 to 2017 shows 2007 projections of future wine cluster employment.



As indicated in the figure, strong as wine cluster growth was up to 2007, the pace of growth actually quickened after 2007 and through to 2011 (note the steepening of the growth path between 2007 and 2011). And note how our 2007 report's projection understated actual growth. Our current projection (2011 to 2020) builds on the additional

observed data (i.e., data from 2007 to 2011). We forecast that over the next nine years (2011 to 2020), IPZ area wine cluster jobs will grow by roughly 50%, from the current 6,003 jobs to 8,913 jobs.

APPENDIX A: ECONOMIC BASE ANALYSIS

A.1. Introduction

Economic base analysis is an application of the concepts of direct, indirect, and induced jobs. When we total all wine cluster-linked jobs (the direct, indirect, and induced) and compare them to the total direct, indirect, and induced jobs generated by other major industry clusters, we have a good idea of the wine cluster's real impact on the community. The process of identifying which clusters in an area are responsible for the most indirect and induced jobs is called "economic base analysis."

A.2. Brief Explanation of Economic Base Theory & Analysis

Economic base analysis is important because it reveals the heart of a region's economy. For example, suppose a small town has a single large employer, a factory that employs 20% of the town's residents. The rest of the jobs in the town are in restaurants, grocery and retail stores, banking, and so on, but they primarily serve the town's residents or sell goods and services to the factory itself. An economic base analysis might show that the factory's indirect and induced effects amount to 50% of the town's total jobs, meaning that the factory accounts for 50% of the town's "economic base." So, if the factory were to close down, its workers would lose their jobs, and neither they nor the factory would purchase goods and services from local businesses. These supporting businesses (the grocery stores, banks, restaurants, and so on) would then lose jobs as well, as would their local suppliers, and so on. When all was said and done, the town would have 50% fewer jobs because of the factory closure, even though the factory only directly employed 20% of the town's population.

Another way of understanding economic base is by visualizing a community's industries as being of two fundamental types: (1) those that sell to non-residents and thereby bring outside income into the community, and (2) those that sell to residents and thereby intercept income already circulating within the community. Respectively, these industries are termed "basic" and "non-basic." Non-basic industries ultimately depend heavily on local basic industries (and/or their employees) for income. A community can grow by adding either basic or non-basic industry, but without basic industry (i.e., outside income) the community cannot exist, and long-term growth is not possible.[19]

To clarify even further, imagine the flow of money into and out of a region. When a visitor purchases a bottle of local wine, new money flows into the region, which means that wine production is a basic industry. When a resident purchases a shirt from a local retailer, however, that money was already present in the region as part of the resident's income. Furthermore, much of that money will now flow out of the region to the shirt's wholesaler and manufacturer, or as profits to a national retail chain. The retailer's sales to residents, therefore, are not basic industry, because they depend on money previously brought into the region by some other business (e.g., the shirt buyer's employer), which may in turn depend upon other businesses that bring in outside money. When you can trace this money back to industries that sell mainly to non-residents or non-local

[19] Without outside income, the residents of the community have no way to purchase imports of any kind. Thus, everything consumed at the community must be produced at the community. Now Robinson Crusoe and Friday could survive in their fictional tropical island situation by producing all goods and services locally, but the rest of us need items from the national and world market. Note also that the applicability of economic base theory generally varies inversely with the size of the region. Thus, the world economy imports nothing, while an economy the size of the U.S. imports a great deal but nonetheless produces the great majority of what it consumes (including practically all services). At the level of a small town, most of what it consumes is produced by outsiders, with community exports providing the funds to purchase those imports.

businesses, you have found the region's basic industries. Area residents and businesses can only purchase imports from other regions or other nations (like the shirt) to the extent that they have first exported something else (such as the bottle of wine) or otherwise obtained money from outside the region.

Historically, basic industry usually meant extractive activities, such as agriculture, timber, and mining, or finished-product manufacturing such as food processing, textiles, and wood products. Today the list will often include non-labor incomes of retired and leisure persons (e.g., recreational home owners) and tourism. The key, from the standpoint of the community economy, is to obtain the outside income needed to purchase imports.

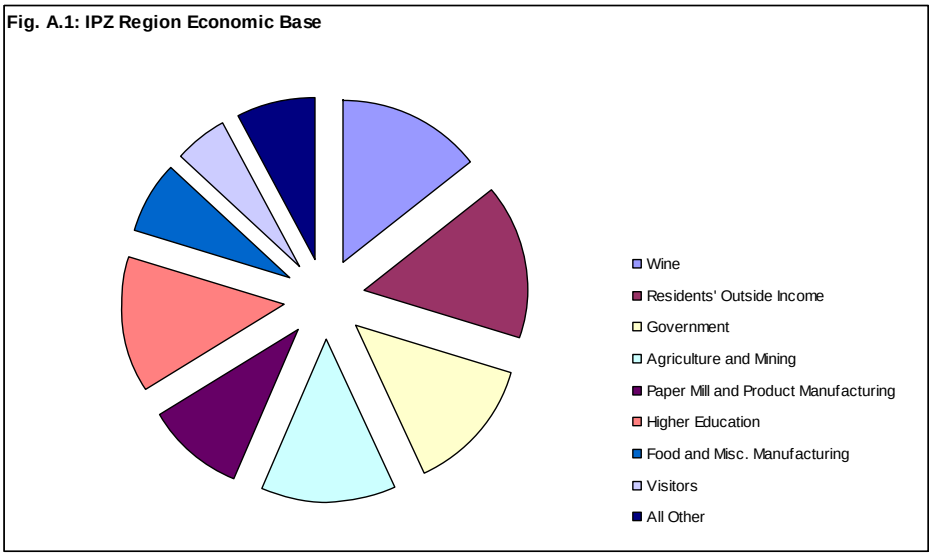
A.3. The Three-County Region's Economic Base

To portray the community economic base, total jobs and incomes are explained in terms of the basic jobs and incomes (the jobs and incomes in the industries that bring outside money to the community). The following table (Table A.1) shows the major industries that make up the IPZ region's economic base. Each category includes direct, indirect, and induced jobs and earnings that can be attributed to each. Note that these categories are again distinct from both the NAICS sectors and the industry clusters used earlier in the report. The categories below are custom groupings of all of the area's similar basic industries.

Table A.1: Economic Base: Walla Walla Functional Economy (2011)

Sector	Jobs	% of Total Jobs	Earnings (x1000)	% of Total Earnings	Earnings per Worker (x1000)
Wine	**6,003**	**14.4%**	**$222,111**	**12.7%**	**$37**
Residents' Outside Income	6,396	15.3%	$201,686	11.5%	$32
Government	5,640	13.5%	$386,972	22.1%	$69
Agriculture and Mining	5,564	13.3%	$184,936	10.6%	$33
Paper Mill and Product Manufacturing	4,054	9.7%	$175,908	10.1%	$43
Higher Education	5,670	13.6%	$291,922	16.7%	$51
Food and Misc. Manufacturing	3,074	7.4%	$101,442	5.8%	$33
Visitors	2,117	5.1%	$58,876	3.4%	$28
All Other	3,299	7.9%	$125,226	7.2%	$38
Total	**41,817**	**100%**	**$1,749,080**	**100%**	**$42**

Economic Modeling Specialists, Inc., 2011



The wine cluster thus accounts for a total of more than 6,000 jobs rather than merely the 2,061 direct jobs seen in the early part of Chapter 2. This means that every wine cluster job creates approximately three additional jobs, effectively tripling the total impact of wine cluster growth. It is worth noting, however, that wine cluster jobs and associated indirect/induced jobs do not pay extremely well—probably due to the large number of jobs in agriculture (vineyards), retail, eating and drinking places, and other tourism industries, which are normally on the lower end of the pay scale. The sector has earnings

per worker of about $17,000 per year, below government, higher education, and other manufacturing industries.

APPENDIX B: LESSONS FROM THE IPZ WINE CLUSTER

As the IPZ wine cluster continues to grow, a larger volume of would-be wine developers have looked to the Walla Walla IPZ as a guide. This appendix provides the theoretical analysis used to show how wine clusters in other regions are likely to develop if they were to adopt the Walla Walla IPZ wine cluster approach. After the theoretical analysis, we apply data from the Umpqua wine region of Oregon to the model, analyzing the potential impacts of wine cluster development in Umpqua.

B.1 Building a Model to Follow

We evaluate how total cluster employment in past years has led to the current levels of employment in the Walla Walla IPZ. In econometric analysis this technique is implemented to adjust for what is commonly considered autocorrelation. By utilizing the previous observations in generating the current data we effectively account for what are considered lag effects.

Walla Walla IPZ winery production employment from the prior period multiplied with the region's total employment in the same period is divided by the total Walla Walla cluster employment to generate the estimated production employment in the selected region. A similar system of time-lag ratios is then applied to the remaining primary and auxiliary employment sectors. Once estimates of primary and auxiliary jobs, based on the development pattern of the Walla Walla IPZ, are obtained they can be summed as in Table 2.1 to generate total direct wine cluster employment for the current year of observation in the selected region.

By using the primary and auxiliary jobs from previous periods to generate the current and future employment figures we have accounted for apportion of the cumulative causation that occurs in cluster development. This is where the symbiotic relationship of the businesses in the cluster generates mutual growth. In the case of wine, the establishment of a winery may lead to a new hotel and touring services, which in turn lead to additional wineries. These businesses continue to seek returns from the additional infrastructure of one another.

The growth rates and development process of Walla Walla is not the only factor in determining how a wine cluster in another region will develop. Elements such as climate, geography and other factors contributing to terroir, along with other regional characteristics, will contribute to the development of the cluster. Because of this we combine the approach above with stand trend methodology. Doing this allows us to mimic the Walla Walla approach with the regional-specific characteristics.

B.2 The Umpqua, Oregon case study

Based on the data provided by the Southern Oregon Wine Institute in Umpqua, Oregon, we project cluster growth according the Walla Walla experience and Umpqua regional trends. As seen in Table B.1, we expect to see wine cluster employment grow from the current 828 jobs today to 1,293 jobs in 2020, roughly 56% growth. This is slightly higher than the 49% projected growth in the Walla Walla IPZ over the same time period.

Table B.1: The Umpqua Wine Cluster Projections

		Winery Jobs			Auxiliary Jobs				Totals		
Year	# Wineries	Prod.	Sales	Vineyard Jobs	Lodging	Dining	Specialty Retail	Misc.	Primary Jobs	Auxiliary Jobs	Wine Cluster Jobs
1996	17	28	12	69	0	0	0	0	110	0	110
1997	17	30	16	69	0	0	0	0	115	0	115
1998	16	29	16	65	0	0	0	0	110	0	110
1999	18	33	20	74	0	0	0	0	126	0	126
2000	18	31	21	71	9	26	4	3	124	42	166
2001	23	42	31	93	33	55	7	12	166	107	272
2002	25	45	37	102	29	51	9	11	184	100	284
2003	27	49	44	111	30	56	9	11	204	106	310
2004	33	60	60	131	32	62	9	12	251	115	365
2005	46	84	92	182	43	89	17	16	358	165	523
2006	56	101	123	225	49	105	19	18	449	190	639
2007	63	113	153	253	56	126	28	20	519	230	749
2008	67	121	155	269	61	130	26	22	545	239	785
2009	67	121	159	269	60	130	27	22	549	239	788
2010	69	125	167	276	61	134	28	22	568	245	814
2011	70	127	172	280	62	136	29	22	579	249	828
2012	77	135	187	299	65	145	31	24	621	265	885
2013	81	143	201	317	69	154	33	25	661	281	942
2014	85	151	214	335	72	162	35	26	701	296	997
2015	89	159	228	353	76	171	37	27	739	311	1051
2016	93	167	241	370	79	179	39	29	777	326	1103
2017	97	174	253	386	82	187	41	30	813	340	1153
2018	101	182	265	402	85	194	43	31	848	353	1202
2019	105	188	277	417	88	202	45	32	882	366	1248
2020	108	195	288	431	91	208	46	33	914	379	1293

Source: Southern Oregon Wine Institute and Economic Modeling Specialists, Inc. · 6/11

APPENDIX C: INDUSTRY SECTOR ANALYSIS

The tables in the appendix show the high-growth/high-wage focus occupations for each of the five primary industry sectors. These occupations compose the heart of their associated industry sectors and should be kept in mind by educators and economic development organizations as they prepare regional training programs. It is important to note that this is not a comprehensive list of all occupations in the region. These are the central occupations that provide structural stability for the industrial pillars of the regional economy.

Table C.1 Ag and Food Manufacturing Primary Occupations

SOC Code	Description	2010 Jobs	2020 Jobs	Change	% Change	2010 Avg Hourly Earnings
11-9011	Farm, ranch, and other agricultural managers	640	779	139	22%	$25.30
45-1099	Supervisors, farming, fishing, and forestry workers	86	104	18	21%	$20.72
53-3032	Truck drivers, heavy and tractor-trailer	86	99	13	15%	$17.33
43-3031	Bookkeeping, accounting, and auditing clerks	85	96	11	13%	$16.16
49-9042	Maintenance and repair workers, general	76	85	9	12%	$18.33
51-1011	First-line supervisors/managers of production and operating workers	66	73	7	11%	$28.42
45-3011	Fishers and related fishing workers	56	62	6	11%	$34.41
49-9041	Industrial machinery mechanics	56	64	8	14%	$21.14
51-9012	Separating, filtering, clarifying, precipitating, and still machine setters, operators, and tenders	53	83	30	57%	$18.65
11-9199	Managers, all other	48	77	29	60%	$18.01
41-4012	Sales representatives, wholesale and manufacturing, except technical and scientific products	43	53	10	23%	$27.27
51-9061	Inspectors, testers, sorters, samplers, and weighers	38	40	2	5%	$13.33
19-1031	Conservation scientists	20	23	3	15%	$31.76
13-2011	Accountants and auditors	19	23	4	21%	$25.28
49-1011	First-line supervisors/managers of mechanics, installers, and repairers	18	20	2	11%	$31.05
11-3051	Industrial production managers	17	19	2	12%	$46.65
45-4022	Logging equipment operators	16	24	8	50%	$26.46

Source: Economic Modeling Specialists, Inc. - 6/11

Table C.2 Healthcare and social assistance

SOC Code	Description	2010 Jobs	2020 Jobs	Change	% Change	2010 Avg Hourly Earnings
29-1111	Registered nurses	565	737	172	30%	$32.07
31-1012	Nursing aides, orderlies, and attendants	373	444	71	19%	$12.47
29-1069	Physicians and surgeons	165	199	34	21%	$75.68
43-6013	Medical secretaries	147	179	32	22%	$16.52
29-2061	Licensed practical and licensed vocational nurses	86	100	14	16%	$20.03
31-9092	Medical assistants	74	92	18	24%	$16.22
31-9091	Dental assistants	66	92	26	39%	$16.97
11-9111	Medical and health services managers	61	74	13	21%	$43.36
29-1123	Physical therapists	55	68	13	24%	$37.76
29-2034	Radiologic technologists and technicians	52	64	12	23%	$29.30
43-3031	Bookkeeping, accounting, and auditing clerks	51	58	7	14%	$16.16
29-2021	Dental hygienists	46	64	18	39%	$38.56
43-1011	First-line supervisors/managers of office and administrative support workers	46	54	8	17%	$21.41
29-2071	Medical records and health information technicians	41	49	8	20%	$16.84
49-9042	Maintenance and repair workers, general	39	47	8	21%	$18.33
29-1071	Physician assistants	30	38	8	27%	$44.91
29-2011	Medical and clinical laboratory technologists	27	32	5	19%	$28.95
21-1022	Medical and public health social workers	26	32	6	23%	$21.70
29-1126	Respiratory therapists	23	31	8	35%	$26.68
29-2012	Medical and clinical laboratory technicians	22	25	3	14%	$18.96

Source: Economic Modeling Specialists, Inc. - 6/11

Table C.3 Manufacturing, Transportation & Warehousing

SOC Code	Description	2010 Jobs	2020 Jobs	Change	% Change	2010 Avg Hourly Earnings
53-3032	Truck drivers, heavy and tractor-trailer	186	215	29	16%	$17.33
51-1011	First-line supervisors/managers of production and operating workers	76	77	1	1%	$28.42
51-4121	Welders, cutters, solderers, and brazers	66	70	4	6%	$18.31
49-9042	Maintenance and repair workers, general	55	57	2	4%	$18.33
11-9199	Managers, all other	54	63	9	17%	$18.01
49-9041	Industrial machinery mechanics	42	50	8	19%	$21.14
51-4041	Machinists	33	36	3	9%	$18.81
41-4012	Sales representatives, wholesale and manufacturing, except technical and scientific products	32	34	2	6%	$27.27
17-2112	Industrial engineers	28	34	6	21%	$36.97
53-4019	Locomotive engineers and operators	27	36	9	33%	$20.48
53-4031	Railroad conductors and yardmasters	26	33	7	27%	$21.60
17-2141	Mechanical engineers	24	31	7	29%	$37.45
49-1011	First-line supervisors/managers of mechanics, installers, and repairers	23	24	1	4%	$31.05
17-2071	Electrical engineers	17	23	6	35%	$40.01
13-1023	Purchasing agents, except wholesale, retail, and farm products	16	19	3	19%	$26.07
53-4021	Railroad brake, signal, and switch operators	16	21	5	31%	$20.13
51-7041	Sawing machine setters, operators, and tenders, wood	13	15	2	15%	$21.16

Source: Economic Modeling Specialists, Inc. - 6/11

Table C.4 Business/Administrative/Other Services

SOC Code	Description	2010 Jobs	2020 Jobs	Change	% Change	2010 Avg Hourly Earnings
39-5012	Hairdressers, hairstylists, and cosmetologists	110	138	28	25%	$18.55
43-6014	Secretaries, except legal, medical, and executive	88	98	10	11%	$15.14
11-9199	Managers, all other	70	89	19	27%	$18.01
43-3031	Bookkeeping, accounting, and auditing clerks	63	75	12	19%	$16.16
49-9042	Maintenance and repair workers, general	38	46	8	21%	$18.33
43-6011	Executive secretaries and administrative assistants	34	43	9	26%	$19.32
39-1021	First-line supervisors/managers of personal service workers	31	38	7	23%	$15.77
31-9011	Massage therapists	24	31	7	29%	$20.61
43-1011	First-line supervisors/managers of office and administrative support workers	24	28	4	17%	$21.41
11-1021	General and operations managers	23	24	1	4%	$40.96
13-1199	Business operation specialists, all other	22	24	2	9%	$33.94
27-3031	Public relations specialists	18	21	3	17%	$24.42
13-2011	Accountants and auditors	16	20	4	25%	$25.28

Source: Economic Modeling Specialists, Inc. - 6/11

Table C.5 Professional, Technical Services & Information

SOC Code	Description	2010 Jobs	2020 Jobs	Change	% Change	2010 Avg Hourly Earnings
11-9199	Managers, all other	87	118	31	36%	$18.01
13-1111	Management analysts	118	173	55	47%	$22.40
13-2011	Accountants and auditors	109	138	29	27%	$25.28
15-1021	Computer programmers	22	28	6	27%	$25.71
15-1031	Computer software engineers, applications	22	30	8	36%	$30.02
15-1032	Computer software engineers, systems software	18	25	7	39%	$29.00
15-1051	Computer systems analysts	27	34	7	26%	$27.99
15-1071	Network and computer systems administrators	14	16	2	14%	$27.55
15-1081	Network systems and data communications analysts	41	55	14	34%	$20.84
17-1011	Architects, except landscape and naval	17	21	4	24%	$27.19
17-2051	Civil engineers	14	18	4	29%	$45.44
19-3021	Market research analysts	18	25	7	39%	$21.76
23-2011	Paralegals and legal assistants	25	34	9	36%	$21.53
27-3091	Interpreters and translators	31	40	9	29%	$15.27
43-1011	First-line supervisors/managers of office and administrative support workers	16	18	2	13%	$21.41
49-2022	Telecommunications equipment installers and repairers, except line installers	24	25	1	4%	$24.52

Source: Economic Modeling Specialists, Inc. - 6/11