



Consultants in Regional Economic Analysis

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December 1, 2008

Jackson County
c/o Danny Jordan, County Administrator
Jackson County
10 S. Oakdale, Room 214
Medford, Oregon 97501

TRANSMITTAL OF FINAL REPORT
Jackson County Pear Industry Analysis

Dear Mr. Jordan:

REMI Northwest is pleased to submit the attached draft final report of the *Jackson County Pear Industry Analysis*. The purpose of this analysis is to provide policy makers a document to assess the future prospects of the Pear Industry in Jackson County and to better explain the challenges faced by what has historically been one of this region's bellwether industries. Additionally the Analysis provides a framework for discussion regarding agricultural land-use policy refinements that will enhance this critical economic component of the region's economy.

We believe the analysis is technically grounded and presents important economic factors and policy issues for the industry. We would like to thank the major pear growers for their participation and help collecting data. This type of analysis benefits from industry professionals providing insights into key industry linkages.

Please feel free to contact me at REMI Northwest should you have any questions regarding the technical results of the analysis or if we can provide further assistance.

Very truly yours,

REMI Northwest

A handwritten signature in blue ink, appearing to read "Alec Miller", is positioned above the typed name.

Alec Miller
Senior Economist

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EXECUTIVE SUMMARY

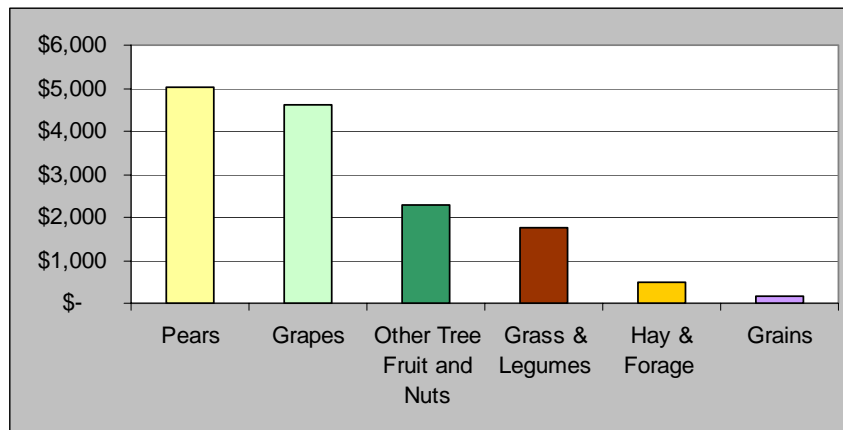
The pear industry in Jackson County is the foundation of a high-value foods cluster of businesses. The cluster has grown over the past two decades and has the potential for continued prosperity. The Rogue Valley has unique climatic advantages for growing high-value varieties of pears, grapes and other unique crops. **Future challenges to the development of the cluster include most importantly the ability of farmers to raise capital for investment in additional acreage, high-value pear and grape varieties and equipment to supply the commodities that drive the cluster.**

Based on analysis of pear farming using an agricultural investment model developed by REMI Northwest, increased access to capital through flexibility in land-use policy can be shown to increase returns on investment sufficiently to incent expansion of the industry. Benefits to the regional economy of allowing high value farmer additional flexibility in managing their land are shown in table 5 below in an economy where farmers only capital reserves are frozen in land and other fixed assets.

An industry cluster is a group of businesses with common or complementary products, production processes, core technologies, natural resource requirements, skill requirements, and/or distribution channels. High-value products include orchard crops, grapes and organic produce. Examples of businesses in this high-value cluster are Harry & David, Sabroso, Amy’s Kitchen, Valley View Winery, 15 other wineries, and any of a group of supporting industries, from irrigation supply to equipment and machinery rental. Other businesses in the cluster include Rogue Creamery, Rising Sun Farms, Dagoba Organic Chocolate, Butte Creek Mill and Gary West Meats. Skills include pruning and caring for high-value orchards and vineyards, harvest of delicate crops, work in industrial food processing settings, or making wine and juice. Much of this industry cluster has been created during the past two decades, and the prospect for further development over the coming decades is significant.

Like vineyards, pear orchards are a complex high-value agricultural business with many links to the region’s economy. Largely because the value of production is so high, the value-added industry has grown up around the pear farming business. The connection between vineyards and the wineries they supply are a good example of connectivity between businesses within an industry cluster. Pear orchards have also spawned engines of economic activity, most notably Harry & David and Sabroso. The value of pear production per acre is shown in Figure 1 in relation to the other major crops produced in Jackson County.

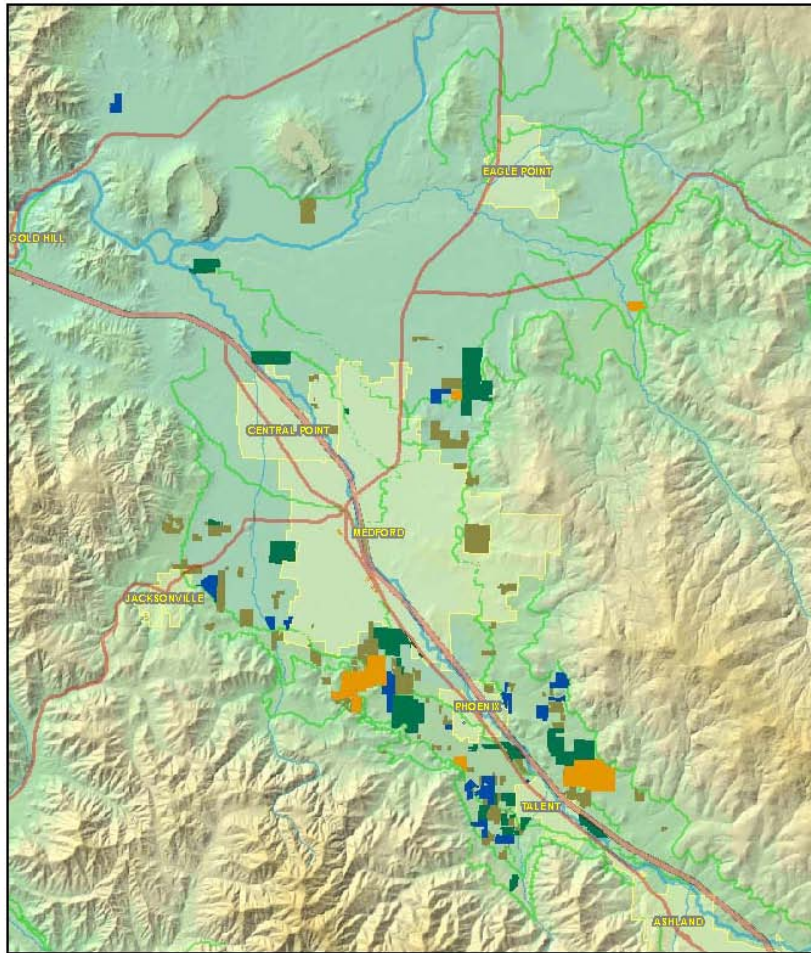
**Figure 1:
Relative Values of Agricultural Production per Acre, Jackson County**



Source: OSU Extension Service

Figure 2 depicts the distribution of pear orchards in Jackson County. The map shows concentrations of orchards around Phoenix, Talent and Medford with other orchards scattered across the valley. In addition to the 6,002 acres of pear orchard in the valley, Jackson County also has 1,062 acres of grapes and 220 acres planted in other high-value orchards.

Figure 2:
Pear Orchards in Jackson County



Pear Orchards in Jackson County, Oregon

Pear Orchards By Growers

- ASSOCIATED FRUIT COMPANY
- BEAR CREEK OPERATIONS
- NAUMES INC
- All Other Growers

Major Streams & Ditches

- Bear Creek
- Major Streams
- Ditches
- Ditches - Tunnels / Siphons



1 inch equals 3 miles

Source: Jackson County Tax Assessor

The alternatives to high-value plantings are diverse, ranging from field crops such as corn and wheat to hay and forage operations. The difference in value between pears and the most likely alternative crop – hay and forage – is shown in figure 1.

Estimates shown in Table 1 are for the contribution of the industry cluster to the economy of Jackson County.

**Table 1:
Economic Impact of High-value Agriculture and Specialty Food Sector
2009 Estimates**

	<u>High-Value Food Production</u>
Employment	7,236
Gross Regional Product	256,415,581
State Tax Revenue	39,452,221

Source: REMI Northwest

A supportive regulatory environment for the industry has the potential to help create new economic drivers such as Harry & David with significant benefits to the local and State economy. However, the state’s land-use planning program presents a paradox for industry success. The paradox for high-value farmers is as follows:

- 1. High-value agriculture requires high levels of capital investment.**
- 2. The land itself is the industries’ primary asset and source of capital.**
- 3. Current statewide land-use administrative regulations prevent farmers from accessing capital.**

Land-use regulations should be designed to support the needs of the industry for both productive land and access to capital, recognizing that high-value agriculture is different from other types of agriculture.

The pear industry is expected to require between \$125 to \$175 million in capital investment to maintain and expand productive acreage over the next 20 years. Increased flexibility targeted to address the unique capital requirements of high-value agriculture has the potential for helping the industry to continue the trajectory it has followed over the past two decades. In the case of pear orchards – the largest and original member of the high-value foods cluster – changes in technology have brought large improvements in productivity per acre, but modern orchards also require much more capital to plant and maintain. The industry is challenged by large capital requirements for replanting existing orchards, grafting more profitable varieties and maintaining orchards, and developing new orchards as well as improving crop processing to modern efficiency standards. Indeed, lack of capital has contributed to pear growers, such as Associated Fruit, Naumes Inc, and smaller independent orchards, choosing to retire trees rather than to replant pear trees as orchards age. Instead, they move land into low-value agricultural sectors, primarily hay and forage, or allow land to lie fallow.

The graph in figure 3 compares the future of the acreage utilized by the pear industry under existing conditions with a new scenario where increased flexibility is added to the regulatory environment. The analysis of existing conditions projects the level of reinvestment in pear orchards under the current state land-use regulations that prioritize

non-agricultural lands for urbanization and other high land value uses. This denies pear farmers access to their primary capital base, resulting in declining acreage. The scenarios contemplate different land-use regulatory conditions affecting access to capital for reinvestment in pear farming.

**Figure 3:
Harvest Acres of Pears- Forecast**



Source: CRIM-HV model

A modified land-use policy allowing pear farmers access to more of their capital asset base is reflected in the increased flexibility scenario. This scenario demonstrates the potential for increased high-value agricultural acreage if capital is made available and reinvested.

As businesses in the high-value food cluster grow, the skill sets of workers in the region become more diverse, and the businesses supporting the cluster become increasingly sophisticated, contributing to the efficiency of doing business. This results in a “virtuous cycle” whereby new businesses are attracted to the area and existing business revenue grows.

Because the cluster’s revenues are almost entirely from out of state, little competition within the local market exists. In fact, as Rogue Valley products become increasingly well known, the possibility of branding the Rogue Valley as a region producing high quality foods presents itself ever more clearly.

High-value agriculture businesses have a common set of needs. The most important factor in the growth and development of the high-value agriculture industry is access to capital for the purchase of acreage, equipment, planting orchards, vineyards and other capital intensive crops, construction of irrigation infrastructure, and construction of high-tech processing and production facilities. Other important factors include minimum urban impact on a variety of farming activities and a critical mass of skilled workers familiar with high-value crops.

In addition, better access to capital would allow farming operations to move away from urban areas and purchase greater acreage in rural locations, thus minimizing land-use conflict. In the process, many old low producing orchards would be replaced by new

high production orchards. An example of how flexibility could be used is by providing greater liquidity to take advantage of modern methods and higher value varieties.

If state land-use regulations are flexibly managed, the region has the opportunity to foster continued increases in the benefits provided by this industry cluster. With regulatory flexibility, high-value agriculture and related specialty food businesses in the Rogue Valley could double, given the industry growth rate over the past decades. The industry contributes over \$50 million in state tax revenue alone. To gain substantial increases in employment offered by the industry, the state will need to reverse the transformation of orchards by independent growers back to low-value farming and to find ways of allowing high-value farmers access to the capital they need to thrive.

II. PEAR INDUSTRY FUNDAMENTALS

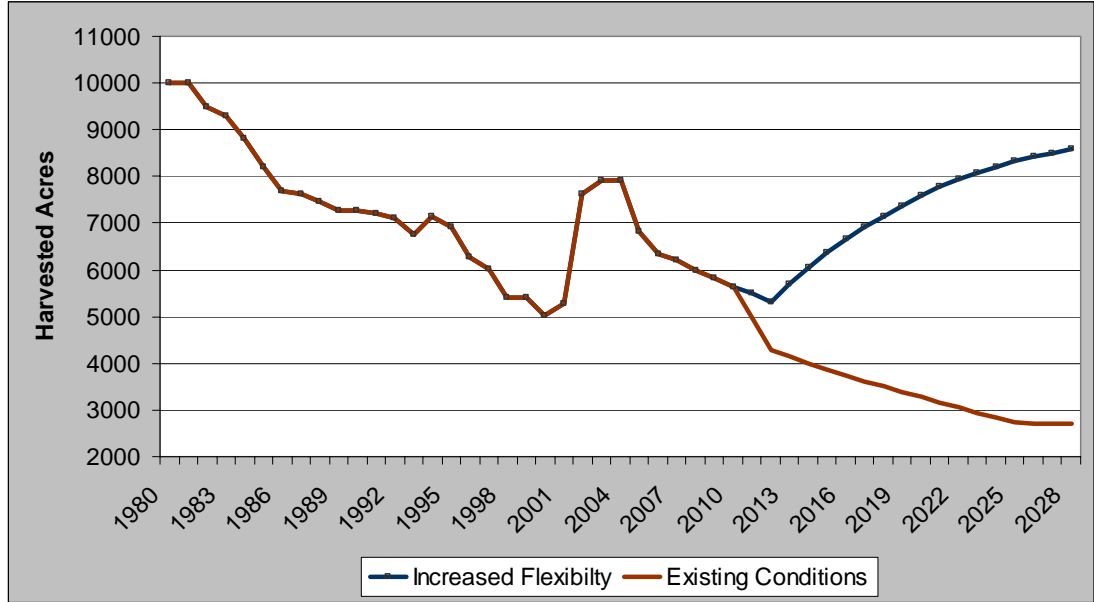
A. Current Industry Conditions

Over the last two decades, improved market channels and growing methods in Jackson County have helped the industry to prosper. Pears generate greater value per acre than any other crop in the valley, even greater value than the expanding vineyard industry. Based on data from the Jackson County Agricultural Report produced by the Oregon State University Extension Service, pears generate, on average, \$5,025 per acre. By comparison, grapes produce on average \$4,600 per acre, hay and forage produce only \$486 per acre, per year. As productivity has grown in the Orchards over the last two decades, the difference between the value of orchard production and other types of agriculture has also grown. Productivity increases are a result of heavy investment in the high revenue varieties, high density plantings and high efficiency equipment.

Increased productivity per acre has led to decreases in planted acreage during the past two decades as seen in Figure 11. But tonnage of pears brought to market has been roughly constant. At the same time, grape production has grown from 60 acres in 1990 to more than 1,000 acres in 2007. Harry & David has grown dramatically over the same time period, broadening its markets and strengthening trade channels. As the sector of the economy devoted to high-value agriculture and food manufacturing grows, pears remain an important part. Acreage devoted to grape, peach and apple production is now 21% of that devoted to pears and has the potential to grow in importance.

As productivity has risen, the industry has decreased planted acreage but largely maintained production of pears. Continued decline in acreage is likely as growers retire older, less productive, low-density orchards.

**Figure 4:
Acreage History and Forecast**



Source: Oregon Agricultural Extension Service

The acreage forecast is based upon recent trends and depicts reductions in harvested acreage until the industry stabilizes at around 2,700 acres. This is a worst case scenario in which, capital is unavailable for investment in new acreage densely planted in high-value varieties and constructing efficient, modernized production facilities. Market conditions may change this baseline forecast.

B. Industry Cluster

Employment in the food manufacturing sector in Jackson County has grown by more than 100% since 2001, according to the Oregon Employment Department. Marketing of specialty foods and beverages has also become very important. In 2007, some 39 wineries dotted the Rogue Valley, up from 36 the year before. The industry also includes four regional breweries.

The industry cluster includes not only manufacturing and agricultural jobs but also a large number of people employed in support industries. Table 2 below shows how the specialty foods cluster impacts virtually every aspect of the economy in Jackson County.

**Table 2:
Distribution of Jobs Related to High-value Foods Cluster**

Occupational Sector	Number of Jobs
Arts, des, enter, sports, media	56
Blding, grnds, pers care, serv	458
Comm, soc serv	32
Comp, math, arch, eng	108
Constr, extraction	239
Educ, train, lib	55
Farm, fish, forestry	1,056
Food prep, serving rel	246
Healthcare	108
Install, maint, repair	250
Legal	18
Life, phys, soc sci	117
Mngmnt, bus, fin	594
Production	1,019
Protective service	31
Sales, office, admin	951
Transp, mat moving	730
Other Seasonal (adjusted)	1,169
Total	7,236

The large number of jobs reported in the management, business and financial sector reflects the specialty foods sector's global and export-oriented nature, requiring management of both local and global operations. The specialty foods sector directly employs over 2,800 people. But support activities and indirectly-related employment increase the sector's jobs to more than 6,000. Seasonal peaks, particularly before Christmas, drive employment numbers over 10,000 jobs.

Expansion of high-value farm industries such as pears and grapes is capital intensive and labor intensive, resulting in high generation of a variety of State and local tax revenues. Orchards and vineyards are developed to a much higher degree than pastures and hay fields. Each tree or vine requires years of investment in nurturing the plant plus investment in irrigation, amending soils and other infrastructure.

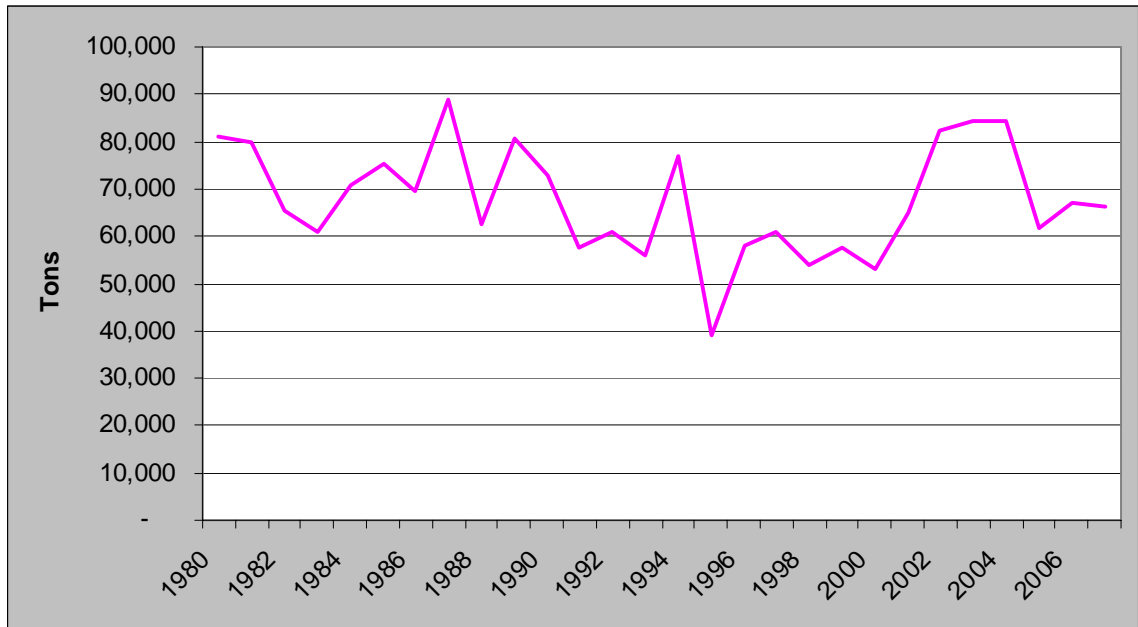
Investment in high-value agriculture is distinct from residential investments and the relatively minor agricultural investment typically associated with small ranchettes and hobby farms. For example, almost half the ranches in Oregon also include residential land where the primary source of income is non-farm employment.

C. Industry Trends

Jackson County's pear industry is much different from the industry in other regions and has changed dramatically over the past two decades. In this region, the industry is concentrated among three major growers, Harry & David, Naumes and Associated Fruit. Also, the method of growing pears has changed from low density orchards with big trees to orchards with smaller trees planted at much higher densities. Replanting and retrofitting orchards has required capital, but where it has been done, yields and profits per acre have increased. The number of farmers growing pears has declined as some have decided not to invest but have instead retired aging orchards.

A long-term decline in planted acres shown in the baseline scenario in figure 4 is largely offset by increased yields per acre from modern methods using a greater number of smaller trees per acre. While the orchards have experienced a much talked about loss in planted acres, Figure 5 shows there has been little or no decline in tonnage produced in this region. This serves as testimony to the efficiency and profit improvements that can be realized when capital is available.

Figure 5:
Jackson County Pear Production- tons of pears

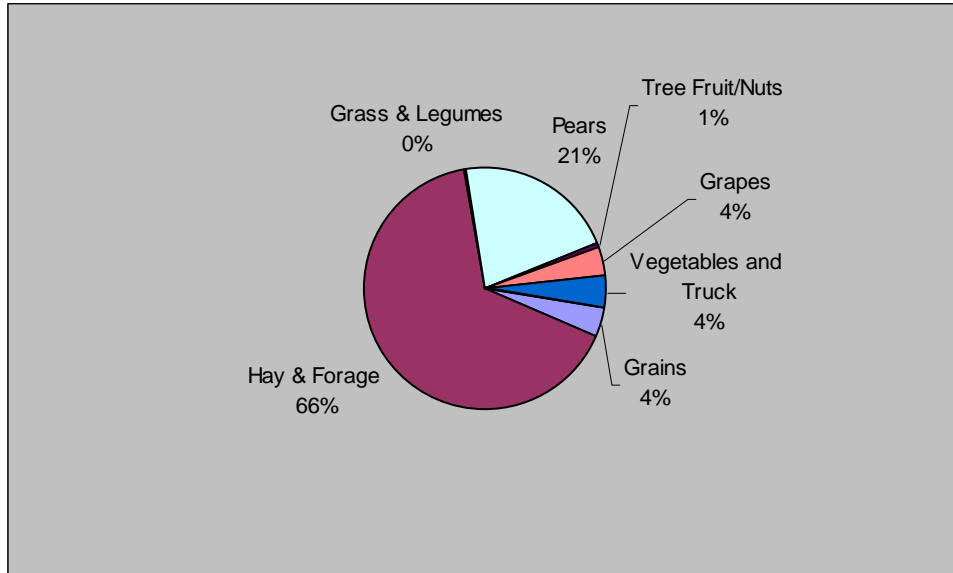


Over the last two decades, the major pear producers in the valley have been in the process of converting orchards to modern high density plantings where yields can be as high as 21 tons of pears per acre. Often this investment is funded by borrowing from banks or other lenders, decreasing returns on investment and slowing the modernization process. Traditional planting formats produce many fewer tons, less than 10 tons per acre. Only 918 acres of independently owned traditional orchard remain, although approximately 1/2 of these are leased to one of the major producers. Independent growers are expected to retire existing orchards due to the heavy capital investment required to modernize. The global market for pears is not declining, however, and whether farmers maintain, increase or decrease production in Jackson County will depend on farmers' expected return on investment and capacity of the region's land base to support additional high-value agriculture

As the industry has transitioned from old format orchards where productivity was relatively low and operations more expensive, new format orchards include varieties of pears that fetch higher prices. The industry has, at great expense, been increasingly successful in finding market-niche varieties and minimizing production of less profitable but more traditional Bartlett pears.

Figure 6 depicts the distribution of land by crop type in Jackson County:

**Figure 6:
Harvested Acres of Selected Crops**



Despite high production values, pears and other high-value crops occupy only a small portion of agricultural land in Jackson County. Figure 4 indicates that two-thirds of agricultural land in the county is devoted to low value hay and forage production (19,000 acres), while only 21% is devoted to pears and 4% to grapes. Much of the land in hay and forage production is suitable to high-value farming and could potentially be converted to more productive use. Some of the land currently in low value uses has been orchard land in the past, as much as 3,700 of 19,000 acres, or 20%.

III. INVESTMENT PARADOX

While the region’s land base is adequate to support the expansion of high-value agriculture, the industry’s inability to access its capital base prevents expanded investment.

Pear production requires a significantly higher level of capital investment than other types of agriculture. Once made, investments are also illiquid for many years exposing the pear farmer to increased risk compared to a farmer with the ability to change crops every year. For farmers with unique brands, such as Harry & David, these risks are mitigated by marketing strategies and the strength of their brands. For independent farmers, capital from operations is much more limited, and their land base represents the largest source of potential capital.

**Figure 7:
Investment Decisions in New Orchards**

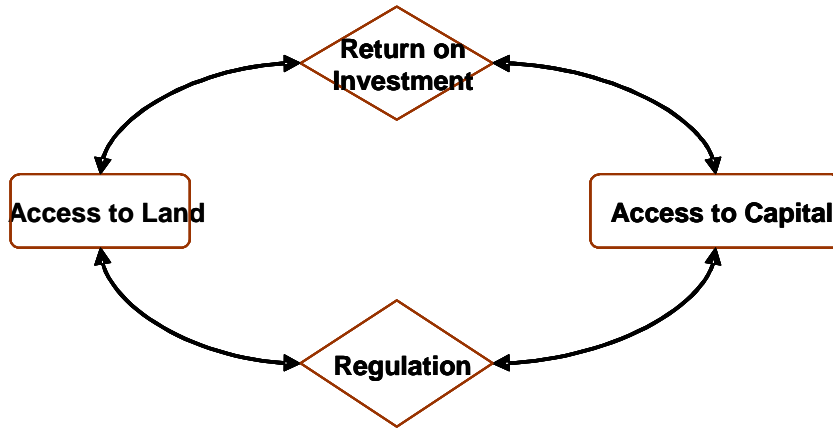


Figure 7 depicts the relationships between capital and investment and their interaction with regulation and expected return on investment. With adequate sources of investment capital and sufficient demand for pears, expected return on investment increases and the industry in Jackson County has the potential to increase harvested acreage in high-value agriculture.

Access to capital and investment decisions are mediated by the rate of return provided by the prospective investment. Because investment in orchards is ongoing throughout the life of an orchard, capital must be available consistently and even when prices may not support borrowing. The State of Oregon’s land-use system de-capitalizes high-value farmers by disallowing farmers the flexibility to operate their farms according to highest and best use of the land.

A. Orchard Investment Sensitivity Analysis

The sensitivity analysis evaluates industry sensitivity to the regulatory environment that controls access to capital. Variables associated with the paradox described above were adjusted slightly and economic impacts from associated investments over the next 20 years were evaluated.

Two scenarios are presented in which farmers have different degrees of regulatory flexibility in managing their capital asset base. Enabling the industry greater access to capital would have positive benefits to the region. The benefits can be measured by assessing the difference between the value of pear production and production of another crop on the same land.

Scenario 1: No change to existing regulatory environment. In the low-growth scenario, harvested acreage is expected to decline to 2,700 acres by 2028. In this scenario, no regulatory changes are assumed. The pear farmer’s capital asset base is not replenished, leading to retirement of existing orchards and limited establishment of new orchards.

Scenario 2: The growth scenario, 8,575 acres of orchard by 2028, assumes that pear farmers will be able to liquidate 2% of acreage every year at urban land values¹. Under this scenario, the farmer’s replenished capital asset base is assumed to support investment in four acres of new orchard for each acre which is liquidated for higher value land-uses. This scenario would convert 1,843 acres of farm land to higher value land-uses by 2028. In acres, this is the equivalent to the conversion of 90 acres of orchard land to low value hobby farms each year.

B. No Change to Existing Regulatory Environment (Scenario 1)

The baseline acreage harvest forecast provides the foundation for using the REMI model to estimate impacts to the region’s economy from current declining industry trends. The acreage harvest forecast is converted to tons of product. This can be converted to product value. Product value is used as an input to the REMI model as diminished agricultural firm sales over time. Table 2 presents the macro-economic impacts predicted by the REMI model:

**Table 3:
Current Industry REMI Projections**

Summary	2010	2015	2020	2025
State Revenues	\$ (409,000)	\$ (2,739,000)	\$ (4,372,000)	\$ (6,056,000)
Employment	\$ (74)	\$ (393)	\$ (534)	\$ (669)
Gross Regional Product	\$ (1,433,000)	\$ (9,140,000)	\$ (14,380,000)	\$ (20,330,000)

Under current industry conditions, the pear industry in Jackson County will remain a viable part of the economy of Southern Oregon, with Harry & David in the lead, but the potential of the industry will not be achieved. The analysis indicates that the capital requirements for pear farming combined with price risk do not support decisions to replant pear orchards by small independent farmers. This is consistent with the trend in which replanting is not keeping pace with the amount of retiring acreage. Increased efficiency will offset to some degree the decline in acreage because productivity will be much higher on new orchards than on the retiring orchards.

Under Scenario 1, REMI projects the region’s economy will shrink by approximately \$20 million in Gross Regional Product by 2025 and tax revenues will decline by approximately \$6 million by 2025 as labor and capital intensive orchards are replaced with grazing, forage and field crops, which do not require as many inputs from the labor force and from industry. The decline reflects planting schedules that do not fully replace production that is retired.

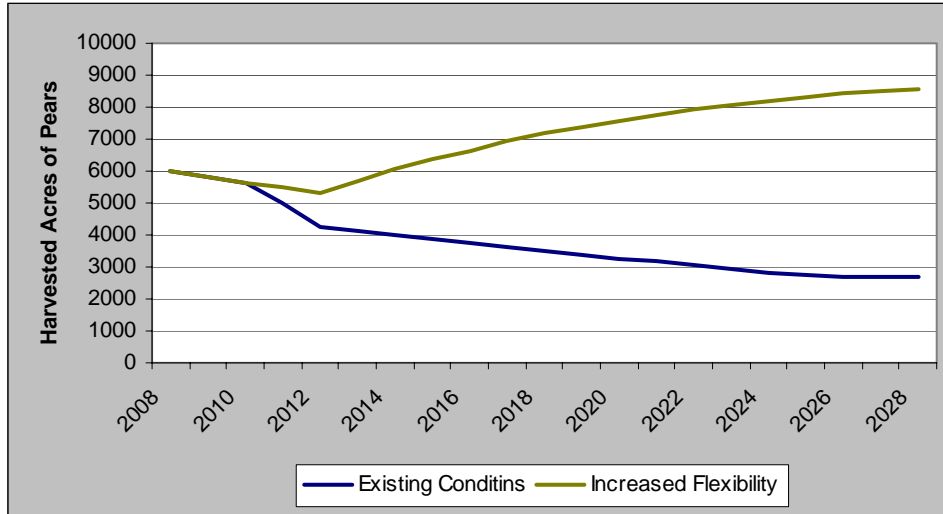
C. Regulatory Flexibility (Scenario 2)

There are a number of economic conditions and policy factors that are contributing to the long-term decline of planted pear acreage in Jackson County. This analysis considers two regulatory flexibility scenarios in which the recent contraction of the industry in the Rogue Valley is arrested or even reversed. Each scenario contemplates the impact of

¹ For scenarios 2 and 3, the rate of asset liquidation starts at 1% and 2% initially and diminishes gradually to 0.7% in 2028 when it would sunset at the end of the year.

adding increased flexibility for high-value farmers to manage their asset base under Oregon’s land-use laws, which are protective of farmland.

**Figure 8:
Number of Acres- Scenarios with Varying Flexibility**



Source: CRIM-HV model

The regulatory Flexibility sensitivity analysis contemplates changes that would increase certainty and provide a source of on-going capital for future orchard reinvestments.

In Scenario 2, the improved regulatory flexibility scenario, it is assumed that approximately 1,800 acres are sold gradually over 20 years for the land's highest-and-best-use while 7,200 acres are replanted as orchards are retired or planted new on fallow lands or lands that are converted from low value agriculture. The upper line in the graph in figure 8 shows the estimated number of acres in pears in Jackson County over 20 years if a land use planning strategy allows farmers access to capital. Actual acreage that would likely be transferred to non-agricultural use would vary from year to year depending on future land values and the capital needs of growers. This acreage is typically marginal to non-productive orchard near or adjacent to existing urban growth boundaries and land in other locations situated for better uses.

The analysis expects access to capital will increase the expected rate of return on future high-value agriculture. High rates of return and the ability to dispose of least productive orchards will lead to reinvestment and the eventual replanting of more than 4,000 acres of fallow orchard land in Jackson County while replacing lands that are transferred to non-agricultural use with new, higher productivity orchards that are more remote from urban areas.

**Table 4:
Economic Impacts of Increased Regulatory Flexibility**

	2010		2015		2020		2025	
Annual State Revenues	\$	(409,000)	\$	(192,000)	\$	891,300	\$	1,791,000
Employment	\$	(74)	\$	5	\$	145	\$	224
Gross Regional Product	\$	(1,433,000)	\$	(333,300)	\$	3,184,000	\$	6,014,000

In this scenario, it is expected that the proposed regulatory flexibility would help to provide an adequate real rate of return to incent four acres of new orchard for every acre utilized to replenish the farmer's capital asset base. Farmers could also be expected to modernize equipment and pay down heavy debts in some cases.

**Table 5:
Difference from Baseline Forecast**

	2010		2015		2020		2025	
Annual State Revenues	\$	-	\$	2,547,000	\$	5,263,300	\$	7,847,000
Employment	\$	-	\$	398	\$	678	\$	894
Gross Regional Product	\$	-	\$	8,806,700	\$	17,564,000	\$	26,344,000

When the impact of increased regulatory flexibility is compared to the baseline forecast in which no regulatory action is taken, the differences are even larger. Gains in planted acreage over the next 20 years are combined with the benefit of retaining 3,300 acres of land which is in danger or being retired due to a lack of access to capital.

IV. CONCLUSIONS

The orchard investment sensitivity analysis indicates that relatively small changes in the regulatory environment that increase pear farmers' access to capital would alter the risk profile associated with new orchard investments and increase expected return on investment. With increased access to capital, the industry is expected to reinvest and industry renewal would result.

Our analysis challenges the notion that conversion of orchard land to higher value land-uses is necessarily bad for the agricultural economy. Conversion of small percentages of orchard land to higher value land-uses affords the pear and other high value farmers access to capital to develop future orchards and vineyards.

State policies presume that urbanization of high-value agricultural land will cause a direct loss in farmed acres. However, the pear industry actually builds high-value agricultural land through substantial investments, making the exact location and soil types less important to the pear farmer than the availability of capital to make the required investments. This means that where urbanization helps the farmer raise capital, the farmer has the incentive to reinvest in orchards at other locations.

This analysis does not offer a definitive policy action plan, but it does provide economic support for the notion that the industry is expected to be sensitive to very small changes in land-use policy. Land-use policies that restrict access to needed capital for high-value agriculture investments support predominant use of agricultural land for low-value agriculture or fallow land.

Appendices

Appendix A – CRIM-HV- Methodology

The analysis presented above is based upon two models: The CRIM-HV model and the REMI model. The CRIM-HV was developed by REMI Northwest for analysis of crop profitability and risk over long periods of time. The model forecasts production and profitability based upon historical distributions of production, price and other variables that affect the industry.

Historical data for acres harvested and price are shown below in Table A-1. Historical production and price data come from the county data put together by the Oregon State University Extension Service. Information about the costs of cultivation for various crops comes from a variety of publications of the OSU Extension Service and the University of California Davis Extension Service. Prices of crops come from the OSU Extension Service and the USDA Economics, Statistics and Market Information System located at Cornell University. Historical prices reported by OSU are different than those reported by the USDA; this is likely due to farmers in different regions receiving different prices. Where possible, data specific to Oregon was used.

**Table A-1:
Price and Production of Pears in Jackson County**

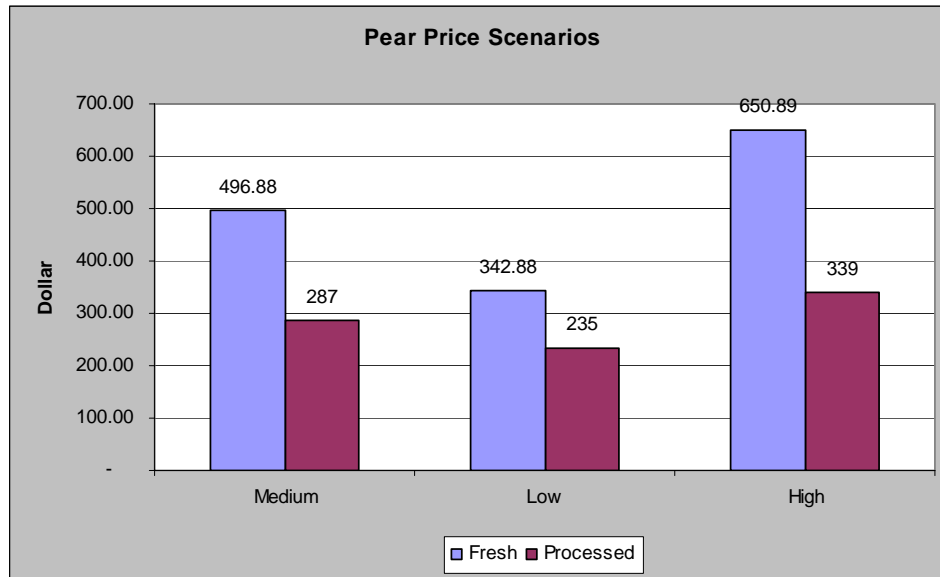
YEAR	Acres		
	All Pears Harvested	Bartlett Pears	Winter Pears
		\$ per Ton	\$ per Ton
1981	10,000	\$ 118	\$ 212
1982	9,500	\$ 120	\$ 400
1983	9,300	\$ 146	\$ 200
1984	8,830	\$ 203	\$ 278
1985	8,200	\$ 223	\$ 291
1986	7,700	\$ 240	\$ 347
1987	7,630	\$ 173	\$ 207
1988	7,460	\$ 257	\$ 333
1989	7,260	\$ 250	\$ 230
1990	7,270	\$ 233	\$ 289
1991	7,195	\$ 270	\$ 405
1992	7,125	\$ 240	\$ 375
1993	6,755	\$ 227	\$ 208
1994	7,155	\$ 196	\$ 220
1995	6,905	\$ 205	\$ 482
1996	6,269	\$ 393	\$ 797
1997	6,019	\$ 420	\$ 517
1998	5,395	\$ 346	\$ 517
1999	5,405	\$ 263	\$ 511
2000	5,025	\$ 229	\$ 450
2001	5,275	\$ 225	\$ 350
2002	7,625	\$ 286	\$ 374
2003	7,925	\$ 260	\$ 380
2004	7,925	\$ 200	\$ 400
2005	6,820	\$ 190	\$ 450
2006	6,325	\$ 190	\$ 475
2007	6,225	\$ 209	\$ 527

The relationship between risk and return can be applied to farming as to any other investment. The famous Black-Scholes equation calculates the value of various types of options given their risk profile by comparing the risk of an investment with the “risk free rate of return,” usually a T-Bill or US Treasury Bond depending on the investment timeframe. This complicated calculation can be explained simply by noting that given two investments with the same return, a rational investor will choose the safer of the two. An investor can be incented to purchase a riskier investment in some cases if he is paid to do so. The amount that an investor must be paid to take a given amount of risk is known as his or her “risk premium.”

With regard to the pear industry, long term rates of return at expected price levels generate a 0.55% real rate of return without consideration for land appreciation value. Conversion of agricultural land to its highest and best is a traditional source of capital for all agricultural operations. Without land sales or other non-agricultural income, the investor is likely to receive a return which is much less than the rate he or she would receive by investing in U.S. government securities. By way of comparison, in December of 2008 a 30-year U.S. Treasury bond is currently trading at 3.31%. Hence, without

consideration for land sales, an investment in an orchard in Jackson County yields 2.76% *less* than an investment in a U.S. government bond with a similar term. Farmers must invest heavily in niche varieties and state of the art equipment to earn returns that justify remaining in the business. While farmers who have been able to modernize orchards, methods and equipment, have expanded, particularly Harry & David with great success, others have been unable to match heavy demands for capital and have left the industry in favor of simpler low value farming operations. It is doubtful that this is the intended outcome of Oregon land use policy.

The REMI model is a macro-economic model built by Regional Economic Models Inc of Amherst, Massachusetts. REMI uses a system of simultaneous equations to solve for economic outcomes in response to events which happen to a regional economy. The REMI model is the most sophisticated model of its kind. It is used by governments and major institutions across the United States. Complete documentation for the REMI model and examples of other applications of the model are available at <http://www.remi.com>.



Appendix B – Crop Substitution

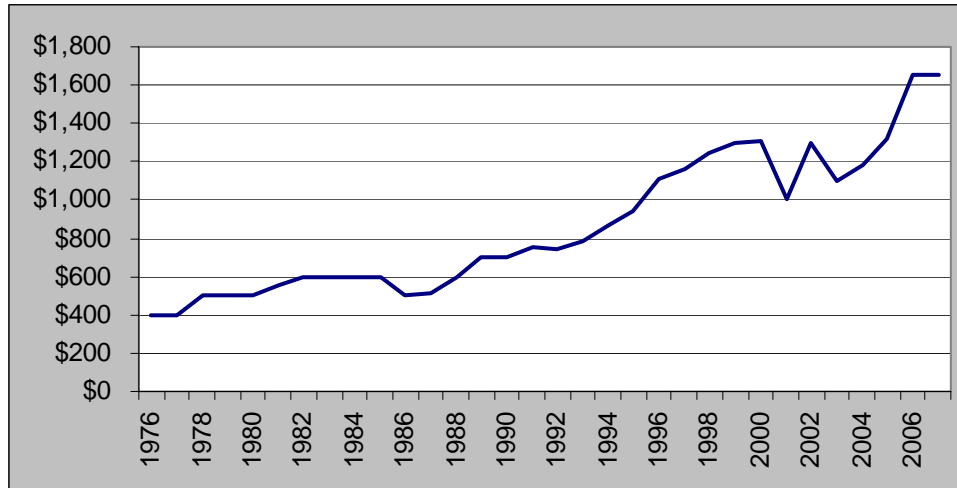
Wine Grapes

Acreage devoted to wine grape production has doubled from 530 acres to 1061 acres since 2000. If this dramatic growth continues some of the high-value farmland that goes out of production in pears may be replaced with grape production. Grapes are similar to pears in that cultivation is labor intensive, installation is expensive, and market prices are high compared to many other agricultural commodities. All of this contributes greatly to the economy and to state tax revenue in the form of income tax and other taxes.

Grapes are not necessarily planted on the same types of soils as pears, however, and may require different micro-climates than pears, depending on the specific intentions of individual farmers. Grape production should not be viewed as a “next generation” of high-value agriculture in Jackson County.

In many ways the growth of the grape industry may be dependent upon the continuation of the pear industry. For example, more than 400 miles of canals connect Jackson County agriculture with sources of water. The canals were built in the early part of the 20th century and in many cases require maintenance and capital investment. The pear industry is an important source of support for some of the irrigation districts, including Talent Irrigation District and Medford Irrigation District, which also serve vineyards. The grape industry may be able to survive or even thrive without the canals system, but the canal system may be one of the factors enabling rapid expansion of the industry.

Figure 8:
Grape Prices per Ton, Jackson County



Source: Jackson County Agriculture Report, OSU Agricultural Extension Service

The grape industry may face challenges similar to that of the pear industry. The long term price trend for wine grapes has shown very rapid growth, but like pear prices, grape prices also show considerable volatility. Vineyards in the Rogue Valley have for the most part been attached to wineries where grapes are processed and sold as finished wine. Vertical integration of the winery and the vineyard allows the pear farmer and vintner both to control price, quality and quantity, avoiding volatility of demand and price.

The price of grapes in the Rogue Valley has only recently been high enough to support independent grape farmers although the need to control quality and variety will limit the independence of such grape farmers. Because grapes can't be transported great distances from the harvest location to the location where they are crushed, higher prices in the markets of the Willamette Valley and Northern California are not available to local grape farmers.

**Figure 9:
Risk Profile of One Acre of Vineyard- Accumulated Net Returns**

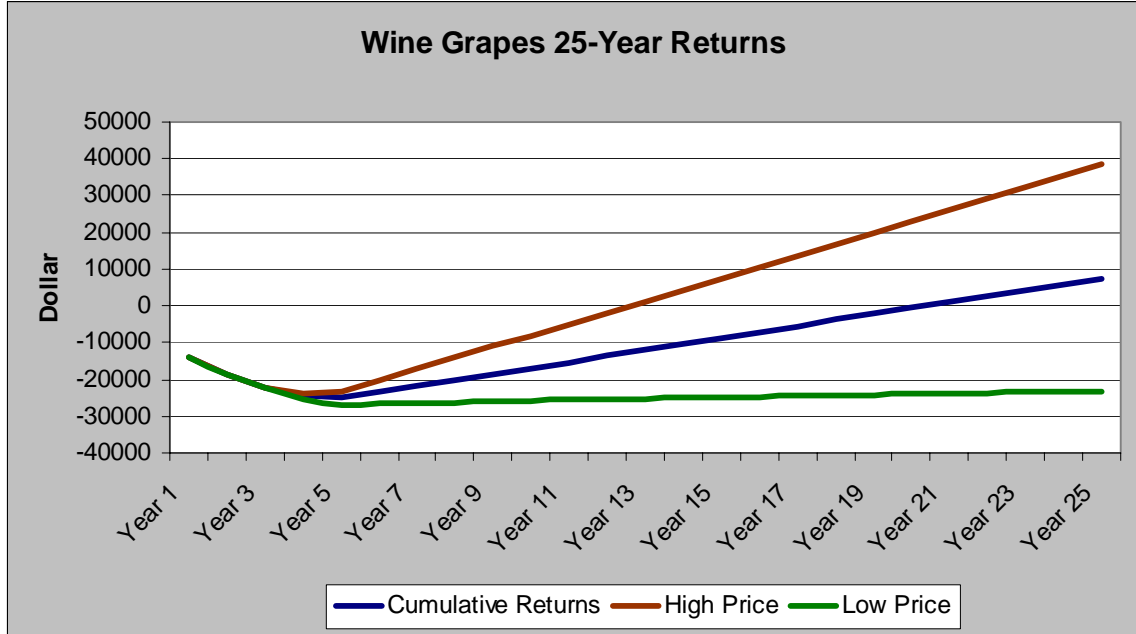


Figure 9 shows accumulated returns for establishing an acre of grapes assuming that current prices remain the median future price of grapes. Profits are possible by the 21st year for a vineyard operation without a winery. Risk is much lower for grapes than for pears in this scenario. Substantial losses of more than \$20,000 per acre are also possible if the long term price trend should be reversed.

While the pear industry relies on cold storage to facilitate crop sales, vineyards depend on wineries to purchase their crop. Closure of one or more wineries in the region would result in substantial oversupply of grapes, associated price declines and the retirement of acreage. Similarly, new or expanded winery capacity would result in increased demand for grapes and increase acreage in wineries.

Hobby Farms

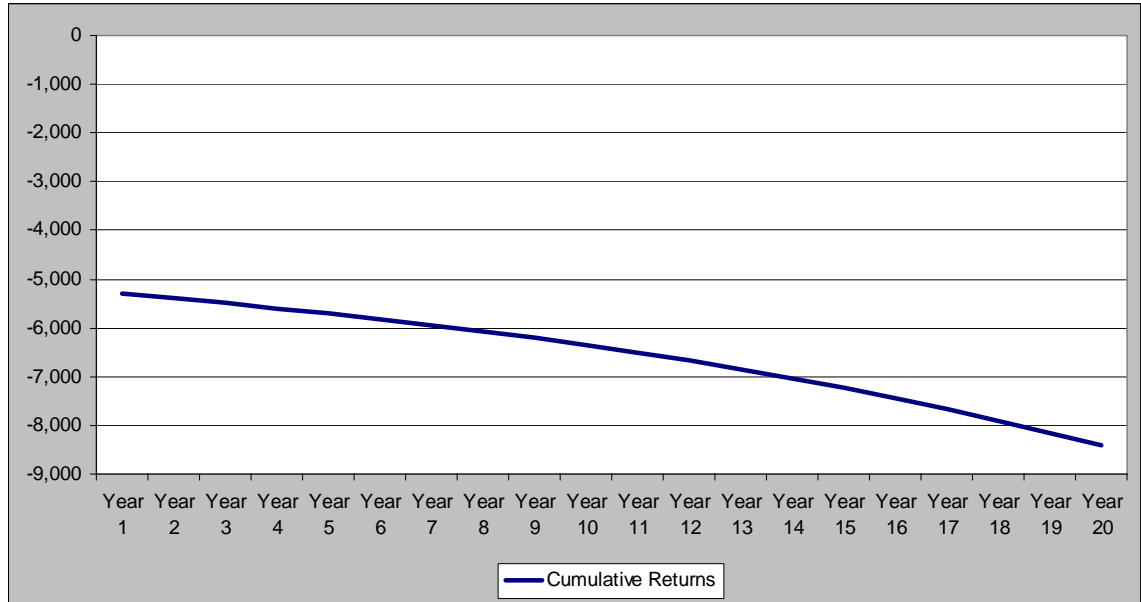
Because most orchards are not located on soils where wine grapes would thrive, retired orchards are likely to be purchased for their highest and best use according to the real estate market in Jackson County.

Other uses are limited to other types of commercial agriculture, or non-commercial agriculture where most household income is actually derived from employment off the farm, so called hobby farming. According to data from the Jackson County Assessor's office, the average value of lots over 80 acres is \$5,000 per acre, which is higher than the price that farmers can economically pay for the land if his/her only use for it is

agriculture. Land prices in recent years have been driven by the demand for residential use of this land and not its agricultural value.

A rancher may not have the same expectations for profits that a high-value farmer does because he includes the amenity value of living on his ranch in his or her purchase price for the land. Figure 10 shows a rancher's expected return on one acre of land over 20 years. It shows that by the 20th year after purchase and establishment of a ranch, the rancher may expect to lose approximately \$8,500 per acre. If he or she lives on the ranch, this would amount to approximately \$35 per acre, per month rent. Evaluated as an interest rate as a homeowner might view the purchase, the rancher's losses over 20 years amount to approximately an 8% rate of interest on the land purchase.

Figure 10: Ranching losses over 20 years, equivalent to a mortgage payment?



Commercial ranchers – the other 50% of the ranching industry in Oregon – may have economies of scale not available to hobby ranchers or may have purchased ranch land at a time when prices for land were much lower. Importantly, motivation to operate will be higher for commercial ranchers who live in parts of the state where land prices are lower than it would be for ranchers who live in the Rogue Valley, where land prices increasingly make commercial farming infeasible.

Appendix C – REMI Model

These are the distinguishing features of the REMI Policy Insight Model:

- The REMI model is a multi-year forecasting and simulation model, enabling users to evaluate policy simulations of “what if” scenarios to determine economic impacts. The model has strong dynamic properties, which means that it forecasts not only what *will* happen but also *when* it will happen.
- The Industrial Sectors Policy Insight are based on the North American Industry Classification System (NAICS). NAICS replaced the old Standard Industrial Classification (SIC) System in 1997, and was developed jointly by the US, Canada, and Mexico to allow comparable business statistics across North America².
- Policy Insight’s forecast was assembled at the county level using data from the Bureau of Economic Analysis (BEA), the Bureau of Labor Statistics (BLS), the Department of Energy, Department of Defense (DOD), the Bureau of Census and other public sources.
- The REMI model generates estimates for the *DIRECT* and *INDIRECT* impacts. Direct impacts in this case include construction demand and labor demand. Indirect impacts are supply and demand for goods and service that increase as a result increased direct project related economic stimulus.
- REMI’s dynamic model structure captures supply increases that result from increased demand stimuli, sometimes called induced impacts.
- The model structure has been developed to include “new economic geography” assumptions. Economic geography theory explains regional and urban economies in terms of competing factors of dispersion and agglomeration. Producers and consumers are assumed to benefit from access to variety, which tends to concentrate production and the location of households.

Cost Matters:

- The demand for labor, capital, and fuel depends on the relative cost of each. For example if there were an increase in the price of capital, businesses would likely substitute labor and fuel for capital.
- The population responds to price changes. Economic migrants will respond to wages, employment opportunity, local prices, and other labor market conditions.

² www.census.gov/epcd/www/naics.html

Figure 2 is a representation of REMI Policy Insight’s structure and shows the linkages within the local economy. The Output block shows how a business will produce goods to sell to other firms, consumers, investors, governments and purchasers outside the region. The Labor and Capital Demand block shows how labor and capital requirements depend both on total sales (output) and on relative costs. In the Demographic block, the Population and Labor Supply contribute to consumer spending (demand) and influence wages. Supply and demand interact in the Wage, Price, and Profit block. Production costs determine market shares locally, for the rest of the US, and for the rest of the world. Output depends on market shares and on the components of demand.

Figure 2
REMI Model Structure and Linkages
Excluding Economic Geography Linkages
 Source: REMI

REMI Model Linkages (Excluding Economic Geography Linkages)

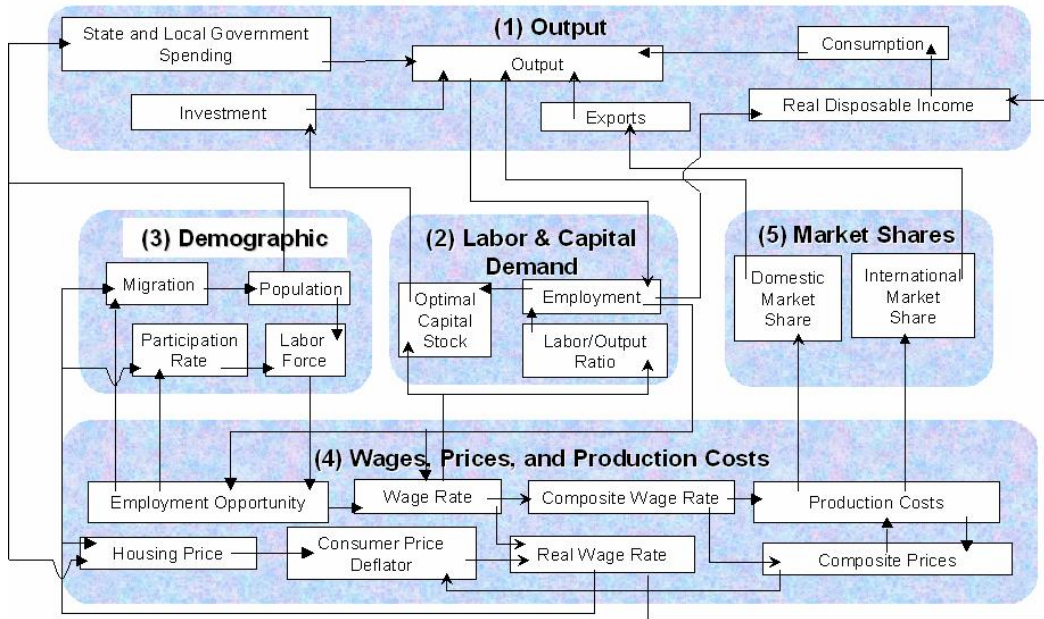
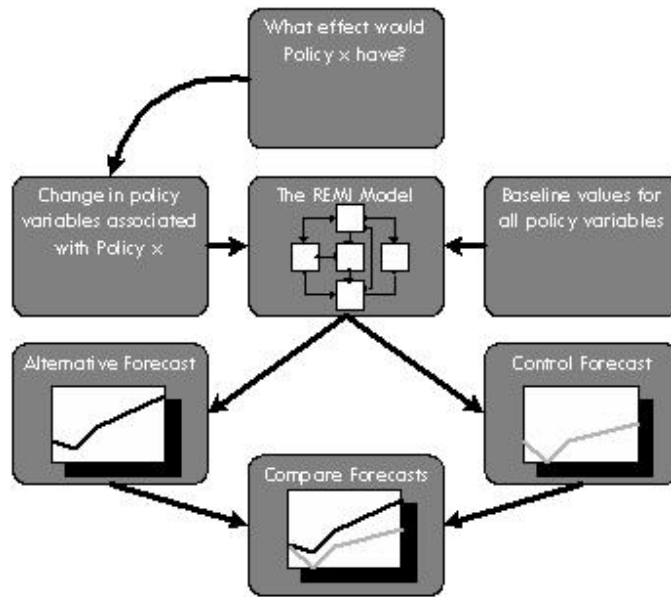


Figure 3 shows the policy simulation process for a scenario called “Policy X.” To show the effects of this scenario, the user must enter the direct effects of a specific policy scenario. An alternative forecast is then generated using these policy variable inputs. The impacts of the policy scenario are determined by comparing the baseline REMI forecast with this new alternative forecast simulation, “Policy X.” The impact to the economy is quantified by scenario subtracting results from the baseline economic forecast.

Figure 3
REMI Model Policy Simulation Process
 Source: REMI



Data Sources and Estimation Procedures

A. Primary Historical Data

BEA

The primary national, state and county data source for REMI Policy Insight is the Bureau of Economic Analysis (BEA) employment, compensation and personal income series (which includes total population). The BEA data is available for the nation and states at the summary level (94 industries) and for counties at the sector level (24 industries).

Employment

The BEA employment series for states and local areas comprises an estimate of the number of jobs, full-time plus part-time, by place of work. Full-time and part-time jobs are counted at equal weight. Employees, sole proprietors and active partners are included, but unpaid family workers and volunteers are not included. Employment can be measured either as a count of workers or as a count of jobs. In the former case, an employed worker is counted only once; in the latter case, all jobs held by the worker are counted.

The state and county employment estimates are a count of the number of jobs, so that, as with the earnings estimates, a worker's activity in each industry and location of employment is reflected in the measure.

Proprietors' employment consists of the number of sole proprietorships and the number of partners in partnerships. The description "by place of work" applies to the wage and salary portion of the series and, with relatively little error, to the entire series. The proprietors' employment portion of the series, however, is more nearly by place of residence because, for non-farm sole proprietorships, the estimates are based on IRS tax data that reflect the address from which the proprietor's individual tax return is filed, which is usually the proprietor's residence. The non-farm partnership portion of the proprietors' employment series reflects the tax-filing address of the partnership, which may be either the residence of one of the partners or the business address of the partnership.

The employment estimates are designed to be consistent with the estimates of wage and salary disbursements and proprietors' income that are part of the personal income series. The employment estimates are based on the same sets of source data as the corresponding earnings estimates and are prepared with parallel methodologies. Two forms of proprietors' income - the income of limited partnerships and the income of tax-exempt cooperatives - have no corresponding employment estimates.

Employment in industries covered by the UI programs

The estimates of about 95 percent of wage and salary employment are derived from tabulations by the state employment security agencies (ESAs) from their state employment security reports (form ES-202). These tabulations summarize the data from the quarterly UI contribution reports filed with a state ESA by employers subject to that state's UI laws. Employers usually submit reports for each operating establishment, classified by county and industry. However, in some cases, an employer may group very small establishments in a single "statewide" report without county designation. Each quarter, the various state ESAs submit the ES-202 tabulations to the Bureau of Labor Statistics (BLS), which provides the data to BEA. The tabulations present monthly employment and quarterly wages for each county in Standard Industrial Classification four-digit detail. Data for 2001 and later are provided in North American Industry Classification System (NAICS) four-digit and five-digit industry detail.

BEA adds several million administrative records received from the states and the District of Columbia to its database annually. The records are checked for major errors by several computerized edit routines. One edit routine analyzes the current quarter county data for invalid SIC four-digit codes or invalid NAICS codes, duplicate records, and records that contain no data. Another edit routine calculates expected county-level average employment and average wage estimates on a quarterly basis at the three-digit SIC level or NAICS industry group, based on percentage changes for that quarter in the previous two years. If the difference between the actual numbers and the estimated numbers exceeds established limits, the record is identified for further review. Anomalies that remain un-reconciled after reviewing comments and other supporting data are referred back to BLS for further investigation.

The basic procedure for preparing the local area estimates of wage and salary employment for each UI covered industry is to average the 12 monthly ES-202

employment observations and to allocate the higher level geographic totals (counties add up to states, and states add up to the nation) in proportion to the averaged series. However, ES-202 employment does not precisely meet the statistical and conceptual requirements for BEA's employment estimates. Consequently, the data must be adjusted to meet the requirements more closely. The necessary adjustments affect both the industrial and geographic patterns of county employment.

Employment not covered by the UI programs

Railroads — The railroad industry is covered by its own unemployment insurance program, which is administered by the Railroad Retirement Board (RRB), rather than by the state UI system. Data suitable for estimating local area employment of railroads are available from the RRB only on a place-of residence basis. Because BEA's employment estimates are designed to conform conceptually and statistically to the place-of-work earnings estimates, the RRB data are adjusted to a place-of-work basis by using journey-to-work data from the 1990 Census of Population. The national totals for all railroad companies combined are allocated to counties in proportion to the adjusted RRB series.

Private households — For this largely non-covered industry - mainly domestic servants - the national employment estimates are allocated to counties in proportion to place-of-work private household employment from the 1990 Census journey-to-work data.

Farm labor contractors — This industry is classified in agricultural services rather than in farms. The UI coverage in Arizona and California is complete enough to permit the use of the ES-202 data for both the state and county estimates, but most state UI programs only partially cover this industry. For these states, the county estimates of farm labor contractor employment are based on the geographic distribution of expenditures for contract labor reported in the Census of Agriculture.

Private elementary and secondary schools — Private elementary and secondary schools are treated as a non-covered industry because religiously affiliated elementary and secondary schools, which account for most of the employment in this industry, remain largely outside the scope of the UI program. The state estimates of private elementary and secondary school employment are primarily based on the employment reported annually by the Census Bureau's County Business Patterns (CBP).

The CBP data are tabulated from the administrative records of the social security program — old-age, survivors, disability, and hospital insurance — and are more complete for elementary and secondary schools than the data prepared under the UI program. The social security program, although exempting nonprofit religious organizations — including schools — from mandatory coverage, has elective coverage provisions that have resulted in broad participation among religiously affiliated elementary and secondary schools. In about half of the states, the UI coverage of elementary and secondary schools is complete enough to permit the use of ES-202 data as the basis for the county employment estimates. For the other states, the county estimates are based on the best available series of private elementary and secondary school employment chosen from data published by state departments of education, data from the U.S. Department of Education's 1998 survey of private elementary and secondary schools, or data from CBP, which cannot be used more generally because they are frequently suppressed at the county level to prevent disclosures.

Religious membership organizations — The Federal Unemployment Tax Act permits the states to exclude religious membership organizations from mandatory UI coverage. Although most state UI laws do have some provisions for elective coverage, less than 10 percent of the national total employment of religious membership organizations is covered by UI. Therefore, the county estimates of the employment of religious membership organizations are based on CBP data. The CBP data are adjusted by allocation to sum to the BEA national employment totals for this industry.

Military — County military employment is measured as the number of military personnel assigned to active duty units that are stationed in the area plus the number of military reserve unit members. The estimates of active duty employment for the Army, Air Force, Navy, Marine Corps, and Coast Guard are based on the annual averages of 12 monthly observations, for a given year, from reports received from each branch of service. Navy personnel assigned to ships and other mobile units and Marines assigned to Fleet Marine Force units are measured according to the units' home ports rather than their actual locations as of the reporting date. The measure of the employment of the military Reserves — including the National Guard — is confined to members of reserve units that meet regularly for training. The state estimates are based on fiscal year-ending September 30 tabulations of military reserve pay provided by the Army, Air Force, Navy, Marine Corps, and Coast Guard. For consistency with the BEA estimates of military reserve wages, the state totals of military reserve employment are allocated to counties in proportion to civilian population.

“Other” — In the local area employment series, this category consists of the number of U.S. residents employed in the United States by international organizations and by foreign embassies and consulates. The category differs from “rest-of-the-world” -- the corresponding category in the national employment estimates — in that “rest-of-the-world” also includes the net flow of international border workers — i.e., U.S. residents working across the border in Canada and foreign residents working in the United States. The border workers are not reflected in the county employment estimates. The county estimates of “other” employment are made by allocating the national totals for all years to counties in proportion to estimated 1968 administrative expenses of international and foreign organizations operating in the United States. The administrative expenses series was prepared by the BEA.

Wage and salary disbursements

Wage and salary disbursements consist of the monetary remuneration of employees, including corporate officers' salaries and bonuses, commissions, pay-in-kind, incentive payments, and tips. It reflects the amount of payments disbursed, but not necessarily earned during the year. Wage and salary disbursements are measured before deductions, such as social security contributions and union dues.

In recent years, stock options have become a point of discussion. Wage and salary disbursements include stock options of nonqualified plans at the time that they have been exercised by the individual. Stock options are reported in wage and salary disbursements. The value that is included in wages is the difference between the exercise price and the price that the stock options were granted.

All state and local area dollar estimates are in current dollars (not adjusted for inflation).

Wages and salaries for the military services The estimates of wages and salaries for the military services consist of the estimates of cash wages (including allowances) of full-time personnel of the armed services (including the Coast Guard), the estimates of cash wages of the members of the Reserves including the National Guard, and the estimates of pay-in-kind received by the full-time and reserve enlisted personnel of the armed services.

Compensation

Compensation of employees, received, is the sum of Wage and Salary Disbursements and Supplements to Wages and Salaries.

Personal income and components

Personal Income is the income that is received by all persons from all sources. It is calculated as the sum of wage and salary disbursements, supplements to wages and salaries, proprietors' income with inventory valuation and capital consumption adjustments, rental income of persons with capital consumption adjustment, personal dividend income, personal interest income, and personal current transfer receipts, less contributions for government social insurance.

The personal income of an area is the income that is received by, or on behalf of, all the individuals who live in the area; therefore, the estimates of personal income are presented by the place of residence of the income recipients.

Supplements to wages and salaries

This component of personal income consists of employer contributions for employee pension and insurance funds and of employer contributions for government social insurance.

Employer contributions for employee pension and insurance funds

This component of personal income consists of employer payments to private and government employee retirement plans, private group health and life insurance plans, privately administered workers' compensation plans, and supplemental unemployment benefit plans.

Employer contributions for government social insurance

These contributions, which are subtracted in the calculation of personal income as part of contributions for government social insurance, consist of employer payments under the following Federal and state and local government programs: Old-age, survivors, and disability insurance (OASDI); hospital insurance (HI); unemployment insurance; railroad retirement; government employee retirement; pension benefit guarantee; veterans' life insurance; publicly-administered workers' compensation; military employee programs (veterans' life and military medical insurance); and temporary disability insurance. The

contributions are excluded from personal income by definition, but, as part of supplements to wages and salaries, are included in earnings by place of work.

Proprietors' income

This component of personal income is the current-production income (including income in kind) of sole proprietorships and partnerships and of tax-exempt cooperatives. Corporate directors' fees are included in proprietors' income, but the imputed net rental income of owner-occupants of all dwellings is included in rental income of persons. Proprietors' income excludes dividends and monetary interest received by non-financial business and rental incomes received by persons not primarily engaged in the real estate business; these incomes are included in dividends, net interest, and rental income of persons, respectively.

Rental income of persons with capital consumption adjustment

Rental income is the net income of persons consisting of income from the rental of real property except for the income of persons primarily engaged in the real estate business; the imputed net rental income of the owner-occupants of non-farm dwellings; and the royalties received from patents, copyrights, and rights to natural resources. The Capital Consumption Adjustment is the difference between private consumption of fixed capital (CFC) and private capital consumption allowances. Private CFC is a charge for the using up of private fixed capital. It is based on studies of prices of used equipment and structures in resale markets. Private capital consumption allowances consist of tax-return-based depreciation charges for corporations and non-farm proprietorships and of historical-cost depreciation, calculated by BEA, for farm proprietorships, rental income of persons, and nonprofit institutions.

Personal dividend income

This component of personal income is the dividend income of persons. It consists of the payments in cash or other assets, excluding the corporation's own stock, made by corporations located in the United States or abroad to persons who are U.S. residents. It excludes that portion of dividends paid by regulated investment companies (mutual funds) related to capital gains distributions.

Personal interest income

This component of personal income is the interest income (monetary and imputed) of persons from all sources.

Personal current transfer receipts

This component of personal income is payments to persons for which no current services are performed. It consists of payments to individuals and to nonprofit institutions by Federal, state, and local governments and by businesses. Government payments to individuals include retirement and disability insurance benefits, medical payments (mainly Medicare and Medicaid), income maintenance benefits, unemployment insurance benefits, veterans' benefits, and Federal grants and loans to students. Government payments to nonprofit institutions exclude payments by the Federal Government for work under research and development contracts. Business payments to persons consists

primarily of liability payments for personal injury and of corporate gifts to nonprofit institutions.

Contributions for government social insurance

These contributions, which are subtracted in the calculation of personal income, consist of employee and self employed contributions for government social insurance and employer contributions for government social insurance. Employee and self-employed contributions for government social insurance These contributions, which are subtracted in the calculation of personal income, consist of the contributions, or payments, by employees, by the self-employed, and by other individuals who participate in the following government programs: old-age, survivors', and disability insurance (Social Security); hospital insurance; supplementary medical insurance; unemployment insurance; railroad retirement; veterans' life insurance; and temporary disability insurance. These contributions are excluded from personal income by definition, but the components of personal income upon which these contributions are based – mainly wage and salary disbursements and proprietors' income – are presented gross of the contributions.

Adjustment for residence

The adjustment for residence is the net inflow of the net labor earnings of inter area commuters. The state and county estimates of personal income are presented by the state and county of residence of the income recipients. However, the source data for most of the components of wage and salary disbursements, other labor income, and personal contributions for social insurance by employees are on a place-of-work basis. Consequently, a residence adjustment is made to convert the estimates based on these source data to a place-of-residence basis. The method of calculating place-of-work income requires two main sources. The first source is the net Residence Adjustment (RA), which is provided by the Bureau of Economic Analysis (BEA). A Resident Adjustment value for County X is simply the total outflow of workers' dollars minus the total inflow of workers' dollars for that county, where outflow dollars are wages earned in County X by residents of another county and inflow dollars are wages earned in another county by residents of County X. The second source is Journey to Work (JTW) data, which is calculated from the U.S. Census. This data is a comprehensive matrix of the number of employees and their average wages from each county to every other county.

While the Residence Adjustment calculation provides net dollar flows for each county, it does not tell us how much of a county's RA goes to and comes from specific counties. The JTW data provides these ratios and allows us to build models with accurate regional dollar flows. The decennial dollar flows in the JTW matrix are normalized to annual Residence Adjustment values to keep the flows current and accurate. With this county-level data, we can then calculate intra-regional dollar flows.

Population

BEA uses the Census Bureau's midyear population estimates. Except for college students and other seasonal populations, which are measured on April 1, the population for all years is estimated on July 1. Disclosure avoidance procedures like other statistical agencies, the Bureau of Economic Analysis (BEA) is legally required to safeguard the confidentiality of the information that it receives. In addition, like other agencies, it must

balance its responsibility to avoid disclosing confidential information with its responsibility to release and to publish as much information as possible. It balances these responsibilities by presenting the estimates for regions, states, and local areas only at the Standard Industrial Classification (SIC) two-digit level or North American Industry Classification System (NAICS) sub-sector level, even though it receives source data at the SIC three- and four digit levels or NAICS four- and five-digit industry levels. Most of the data series that BEA receives from other agencies are not confidential. The agencies summarize this data to aggregate totals by program and by state or county, so that each record, or data cell, contains data for enough individuals or establishments to preclude the identification of the data for a specific individual or establishment and, therefore, to preclude the disclosure of confidential information. However, the ES-202 tabulations that BEA receives from the Bureau of Labor Statistics (BLS) include records that would disclose confidential information. The confidential information on wages and salaries for some business firms is identifiable from the state and county estimates of wages and salaries at the SIC two digit or NAICS sub sector level that are derived from the ES-202 data.

To prevent either the direct or the indirect disclosure of the confidential information, BEA uses the BLS state and county nondisclosure file. BEA uses as many BLS nondisclosure cells as possible, but cannot use some of them for various reasons. The most important reasons are that the industry structure published by BEA does not exactly match the SIC two-digit or NAICS sub-sector detail provided by BLS and that BEA does not use ES-202 data for the farm sector. When BEA drops BLS nondisclosure cells, other cells must be selected to prevent the disclosure of confidential information. In order to determine which estimates should be suppressed, the total wages and salaries file and the wages-and-salaries-nondisclosure file are used to prepare a multidimensional matrix. This matrix is tested, and the estimates that should be suppressed are selected

BLS

The second major source of historical data used by REMI is from the Bureau of Labor Statistics (BLS). These data pertain to workers covered by State unemployment insurance (UI) laws and Federal civilian workers covered by the Unemployment Compensation for Federal Employees (UCFE) program. The data for both private sector and public sector workers are reported to the BLS by the employment security agencies of the 50 States, the District of Columbia, Puerto Rico, and the Virgin Islands as part of the Quarterly Census of Employment and Wages (QCEW) program. The QCEW, also called ES-202, was formerly known as the Covered Employment and Wages (CEW). REMI uses their annual average employment and total annual wages at the summary level for all counties and states.

Employment

In general, QCEW monthly employment data represent the number of covered workers who worked during, or received pay for, the pay period that included the 12th day of the month. Virtually all workers are reported in the State in which their jobs are physically located.

Covered private industry employment includes most corporate officials, executives, supervisory personnel, professionals, clerical workers, wage earners, piece workers, and part-time workers. It excludes proprietors, the unincorporated self-employed, unpaid family members, and certain farm and domestic workers. Persons on paid sick leave,

paid holiday, paid vacation, and the like are included. Persons on the payroll of more than one firm during the period are counted by each UI-subject employer if they meet the employment definition noted above. Workers are counted even though, in the latter months of the year, their wages may not be subject to unemployment insurance tax. The employment count excludes workers who earned no wages during the entire applicable pay period because of work stoppages, temporary layoffs, illness, or unpaid vacations.

Employment data reported for Federal civilian employees are a byproduct of the operations of State Employment Security Agencies in administering the provisions of Title XV of the Social Security Act—the program of Unemployment Compensation for Federal Employees. Federal employment data are based on reports of monthly employment and quarterly wages submitted each quarter to State agencies for all Federal installations with employees covered by the act, except for certain national security agencies, which are omitted for security reasons.

Employment of all Federal agencies for any given month is based on the number of persons who worked during or received pay for the pay period that included the 12th of the month.

Wages

Total wages. Covered employers in most states report total compensation paid during the calendar quarter, regardless of when the services were performed. A few state laws, however, specify that wages be reported for or be based on the period during which services are performed rather than the period during which compensation is paid. Under most state laws or regulations, wages include bonuses, stock options, severance pay, the cash value of meals and lodging, tips and other gratuities, and, in some states, employer contributions to certain deferred compensation plans such as 401(k) plans.

Covered employer contributions for old-age, survivors, and disability insurance (OASDI), health insurance, unemployment insurance, workers' compensation, and private pension and welfare funds are not reported as wages. Employee contributions for the same purposes, however, as well as money withheld for income taxes, union dues, and so forth, are reported even though they are deducted from the worker's gross pay.

Average wages

Average annual wages per employee for any given industry are computed by dividing total annual wages by annual average employment. A further division by 52 yields average weekly wages per employee. Annual pay data only approximate annual earnings because an individual may not be employed by the same employer all year or may work for more than one employer at a time. Average weekly or annual pay is affected by the ratio of full-time to part-time workers, as well as by the numbers of individuals in high-paying and low-paying occupations. When comparing average pay levels between States and industries, data users should take these factors into consideration. For example, industries characterized by high proportions of part-time workers will show average wage levels appreciably less than the weekly pay levels of regular full-time employees in these industries. The opposite is true of industries with low proportions of part-time workers, or industries that typically schedule heavy weekend and overtime work.

Average wage data also may be influenced by work stoppages, labor turnover, retroactive payments, seasonal factors, and bonus payments.

Disclosure restrictions

In accordance with BLS policy, data reported under a promise of confidentiality are not published and are used only for specified statistical purposes. BLS withholds publication of UI-covered employment and wage data for any industry level when necessary to protect the identity of cooperating employers. Totals at the industry level for the States and the Nation include the non-disclose-able data suppressed within the detailed tables. However, these totals cannot be used to reveal the suppressed data.

Imputed data

To reduce the effect of the exclusion of data that occurs because of late reporting by covered private and government employers, State agencies impute employment and wages for such employers and include them in each quarterly report. Corrections to data that may be entered after a report is filed will include replacement of imputations with reported data to the extent possible. Imputations are calculated at the individual establishment level, normally using historical data reported by the employer. Sometimes, trends reported by employers in the same industry or information obtained from other sources is also used. If a report remains delinquent for more than one quarter and research shows that it is still active, the data for the establishment will again be imputed.

CBP

The final source of employment and wage data is County Business Patterns (CBP). County Business Patterns is an annual series that provides sub-national economic data by industry and covers most of the country's economic activity. The series excludes data on self-employed individuals, employees of private households, railroad employees, agricultural production employees, and most government employees. This data is available at a very detailed level, and while it has many suppressions due to confidentiality requirements, its advantage is that when the data is suppressed, ranges for the establishments are supplied. This provides some basis from which to make a rough estimate of employees in that industry in the absence of any other information.

Establishments

An establishment is a single physical location at which business is conducted or services or industrial operations are performed. It is not necessarily identical with a company or enterprise (firm), which may consist of one or more establishments. When two or more activities are carried on at a single location under a single ownership, all activities generally are grouped together as a single establishment. The entire establishment is classified on the basis of its major activity and all data are included in that classification. Establishment-size designations are determined by paid employment in the mid-March pay period. The size group "1 to 4" includes establishments that did not report any paid employees in the mid-March pay period but paid wages to at least one employee at some time during the year. Establishment counts represent the number of locations with paid employees any time during the year. This series excludes governmental establishments except for wholesale liquor establishments (NAICS 4228), retail liquor stores (NAICS 44531), Federally-chartered savings institutions (NAICS 522120), Federally chartered credit unions (NAICS 522130), and hospitals (NAICS 622).

Payroll

Total payroll includes all forms of compensation, such as salaries, wages, reported tips, commissions, bonuses, vacation allowances, sick-leave pay, employee contributions to qualified pension plans, and the value of taxable fringe benefits. For corporations, it includes amounts paid to officers and executives; for unincorporated businesses, it does not include profit or other compensation of proprietors or partners. Payroll is reported before deductions for Social Security, income tax, insurance, union dues, etc. First-quarter payroll consists of payroll during the January-to-March quarter.

Mid-March Employment

Paid employment consists of full- and part-time employees, including salaried officers and executives of corporations, who are on the payroll in the pay period including March 12. Included are employees on paid sick leave, holidays, and vacations; not included are proprietors and partners of unincorporated businesses.

Data Withheld from Publication

In accordance with U.S. Code, Title 13, Section 9, no data are published that would disclose the operations of an individual employer. The number of establishments in an industry classification and the distribution of these establishments by employment-size class are not considered to be disclosures, so this information may be released even though other information is withheld from publication. Estimation of Data Suppressions in Major Regions and States The current solving methodology is to use an optimization routine to minimize a constrained quadratic loss function. In order to begin this process, we obtain initial estimates and variances from regressions which will be used in our loss function. Once there are estimates, variances, and constraints for all suppressed points within the data set, we process that year. For each year, systems of suppressions can be formed that are all linearly dependent. These systems are defined by a sector-level industry that has suppressions and a Major Region containing the states. We pass each system of suppressions through an optimization procedure that finds the solution set of estimates that minimizes the total variance of the system while still obeying all of the regional and industrial constraints. If all the final estimates are positive (with the exception of personal income data, which may have legitimate negative values), the solution set is accepted.

Estimation of Data Suppressions in Counties

There are too many suppressions in the county data to allow the optimization function to solve, so instead we are using a series of RAS methods (bi-proportional adjustment of matrices). First we estimate all of the sector-level industry employment data, making sure that the sum of the industries equals total employment for the county, and the sum of each industry across all counties in a state equals that industry's employment in that state.

We use the midpoint of the maximum and minimum values calculated from the constraints (similar to calculation for states) as starting values to use in the suppressed cells for the RAS. Next, we repeat this process for the earnings by industry data, as well as the compensation by industry data. This leaves us with sector-level data for employment and summary-level data for earnings and compensation, but no wage data by industry, and we need to disaggregate employment to the summary level. The first data to

be disaggregated to the summary level (REMI's 70 industries) is compensation. While some of this data is available from the BEA, there are still a large number of suppressions at this level. We bring in the BLS QCEW wage data at the county level. This data also has suppressions, so the first step is to estimate the missing values. This is initially done for all states and industries (making sure they add up to the nation). We use the CBP state wage data in order to start off with reasonable values for the RAS (where this data is suppressed, we estimate the value by multiplying the number of establishments in each size class by the midpoint of the employment size for that class, and then sum them together for each industry). Once the BLS wage state data is filled in to be internally consistent, we then use it as totals for estimating the suppressed BLS wage county data. For this step we start each missing county value with 1. Once complete, we change each BLS zero value to one (since BEA includes proprietors in their definition and BLS does not, it is possible to have zero values in the BLS data and non-zero values in the BEA data) and then run a final set of RAS procedures against the county BEA summary data and the county BEA sector data. This gives us complete summary-level industry data for every county in the US that is internally consistent with BEA's reported state and county data. In order to disaggregate the employment to the summary level, we use our recently estimated BEA compensation data at the state and county level. The BEA compensation data is scaled by the state compensation-to-employment ratio before it is used as a starting value for estimating employment. We change any negative values in our starting estimates to a very small value (0.1) in order to prevent negative numbers from entering into the RAS, since employment cannot be negative (although under normal circumstances there should be no negative starting values). We then run a final set of RAS procedures against the state BEA summary data and the county BEA sector data. This gives us complete summary-level industry employment data for every county in the US that is internally consistent with BEA's reported state and county data.

The wages and personal income are done with a process that is similar to the employment process, but involves some additional checks and balances. As it was with compensation, some of the summary-level BEA county data does exist. For those values that are suppressed, we use our recently estimated BEA compensation data, scaled by the state compensation to wages/personal income ratio (as appropriate), as starting values. If any of the wage starting values are less than or equal to zero, we raise them to a small positive value (0.1) as they cannot be negative. If any of the personal income starting values are equal to zero, we raise them to a small positive value (0.1) because BEA suppressed values cannot be zero. We then run a final set of RAS procedures against the county BEA summary data and the county BEA sector data. This gives us complete summary-level industry employment data for every county in the US that is internally consistent with BEA's reported state and county data. While our methodology yields the complete, detailed, and internally consistent data sets required by the model, one must keep in mind that there is always more than one possible solution, so, while we have generated "a" solution, it is not necessarily "the" solution. The government goes to great length to suppress data in such a way that the real values cannot be determined.