Estimating the Impacts of SRS Revenue Sharing On O&C County Economies
Methods and Assumptions Appendix

Introduction

The Association of O&C Counties asked Forest Econ Inc. to estimate the economic effects of losing federal Secure Rural Schools (SRS) county payments[1] that had been authorized to offset reductions in federal timber harvest revenue sharing. We estimate the total job and income effects on individual county economies. Our analytical mechanism adapts county-level input-output models (I/O models) built for the BLM[2] and ODF[3] to the specific question of estimating these payment losses. We also built two regional I/O models to estimate the job and income aspects of trade losses between counties and regional trade centers. This appendix addresses the methods employed and necessary assumptions to clarify and simplify a complex analysis.

Reduced payments to counties

The last federal payments to O&C counties authorized by PL 106-393 to compensate the Counties for Northwest Forest Plan reductions in federal timber harvest receipt sharing occurred in 2006. There has been discussion of a possible extension authorizing 2007 payments. Extension of SRS would allow Counties to program the cuts over a longer budget cycle and would allow the overall economy to gradually adjust to the changes in local government spending. Whether it occurs this year or next, terminating these payments should cause significant reductions in most county governments' revenues.

Terminating these SRS payments just initiates cycles of economic impacts. Direct reductions in county jobs and income would have additional multiplier impacts in the sectors where counties traditionally spent their budgets and where county employees have spent their incomes. The I/O models mathematically estimate these indirect and induced impacts. We use county-level I/O models because results are extremely variable by county. Many resource-based counties that have had relatively large payments, are poorly diversified. In those cases their loss of SRS payments will have much larger relative impacts on county government and its services.

Although renewal of the authorizing legislation and extension of SRS payments is a matter of on-going Congressional debate, at the date of modeling we must assume that they will be terminated at some point. We assume further that the economic changes caused by the termination are rapid. By the impact projection year of 2008, the indirect and induced effects should be visible throughout the county economy and at higher levels of the regional trade hierarchy. This implies that while the 2007 payments are being spent, county governments will already be developing budgets based on the eventual loss of this revenue stream.

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1 Secure Rural Schools and Community Self-Determination Act of 2000 (PL 106-393).

2 Forest Econ Inc. 2006. Input-Output models for western Oregon county economies. Funded by BLM WOPR project

3 Economic Analysis Systems. 2006. Input-Output models for Coos/Curry and Tillamook county economies. Projects funded by Oregon Dept of Forestry

Even if the SRS funds are extended for several years, county governments in Oregon will eventually be faced with the issue of permanent loss of this type of federal revenue. These federal funds work through the local economy much like export sales, bringing in new money from outside the economy that stimulates a wide variety of economic activities. When an outside income source is lost, the economies of the O&C counties in Western Oregon will have to adjust to a permanent loss of jobs, income and industrial output. Local option taxation may help mitigate local government financial impacts, but it will not replace the lost jobs and income that have been supported for many years by federal timber harvests and county payments.

Table 1 shows the magnitude of total federal payments to counties by their sources: US Forest Service (USFS), Bureau of Land Management (BLM) O&C county payments (O&C), BLM Coos Bay Wagon Road payments (CBWR), and Payments in Lieu of Taxes (PILT) administered by the US Department of Interior.

Table 1. Annual Federal SRS and PILT County Payments by Source ($ 1000's)

#	County	USFS	O&C	CBWR	PILT	Total
1	Benton	503.0	3,262.2	0.0	4.0	3,769.2
2	Clackamas	7,198.0	6,443.1	0.0	103.4	13,744.5
3	Columbia	0	2,391.5	0.0	0.0	2,391.5
4	Coos	805.8	6,849.5	857.5	13.4	8,526.2
5	Curry	5,598.1	4,237.4	0.0	117.1	9,952.6
6	Douglas	22,661.6	29,081.2	155.0	187.8	52,085.6
7	Jackson	6,427.6	18,191.7	0.0	91.1	24,710.4
8	Josephine	3,062.8	14,024.0	0.0	69.3	17,156.1
9	Klamath	17,201.6	2,716.6	0.0	427.3	20,345.5
10	Lane	34,167.8	17,727.3	0.0	271.1	52,166.2
11	Lincoln	5,295.4	417.9	0.0	36.5	5,749.8
12	Linn	11,392.9	3,064.8	0.0	94.2	14,551.9
13	Marion	4,282.7	1,695.0	0.0	40.4	6,018.1
14	Multnomah	1,068.7	1,265.4	0.0	15.0	2,349.1
15	Polk	0	2,507.6	0.0	0.0	2,507.6
16	Tillamook	2,830.6	650.1	0.0	18.4	3,499.1
17	Washington	0	731.4	0.0	3.7	735.1
18	Yamhill	785.7	835.9	0.0	5.1	1,626.7
	Totals	123,282.3	116,092.6	1,012.5	1,497.9	241,885.3

County government responses to reduced county payments would certainly vary by county. Each county has unique budget priorities and varying abilities to substitute alternative revenue sources. For example, Jackson County has already announced that its 15 public library branches will have to close April 6, 2007 due to reduced funding.[4] Other counties that we interviewed may reduce rural law enforcement and road maintenance. Local option income and property taxes have been proposed in Lane and Curry County.

[4] www.jackson.co.or.us

Unfortunately, our abstract models cannot predict the outcomes of political responses. We are forced to make simplifying impact distributions assumptions that may not be totally realistic for any one county. First, we assume that revised county budgets will maintain the same distribution of expenditures as existed in 2005. Second, we assume that any proportional changes in county government spending will have stabilized by the 2008 projection year.

The reduction in county payments is slightly more complicated as there are multiple titles in the SRS authorizing legislation and portions of several federal payments (e.g. PILT) would continue through the impact year of 2008. Estimating the net federal payments reduction requires several additional assumptions.

Two assumptions relate to the constancy of county spending patterns. First, all three titles of the SRS payments are treated as identical reductions of county budgets even though some are dedicated funds. That presumes that the pattern of county spending in various sectors during 2006 is already reflected in the I/O trade coefficients that are estimated as of that date. Second, we assume that the PILT payments would remain static throughout the projection horizon.

Three assumptions relate to the behavior of the three public forest management agencies that share revenues with county government. First, we assume that the O & C timber operations and revenue payments function identically in 2008 as they did in 2006. Second, the national forests would have the same average harvest values as they did in 2005 and 2006 and would continue to distribute 25% to counties as dedicated road and school funds. Their distribution formula is based on the county in which volume is actually cut and we base this volume on ODF reports.[5] Finally, that even though the BLM is currently revising their timber management plans to potentially increase their harvests, that their actions would not create new revenue sharing until well after 2008, and that their revenue sharing would continue to be 50% of current harvest levels. Their distribution formula would be the proportionally the same as the SRS distribution.[6]

Table 2 shows the expected net change in county government revenue sharing after SRS payments terminate and the background level of federal revenue sharing reverts to a timber receipts basis. In aggregate the remaining timber harvest sharing receipts are only 7.3% of the 2006 county payments. This table reveals the first indication of potentially high variance between the county impacts. Even in counties with the highest post-SRS federal payments (Douglas, Klamath, Lane) they still have very high absolute amounts of SRS termination losses. The actual impacts pattern depends as well on the various unique structures of these county economies.

[5] Oregon Department of Forestry. 2005. Timber harvest report-West 2005

[6] calculated by Mason Bruce & Girard for the BLM WOPR project

Table 2. Net annual Federal County Payments after SRS Termination ($ 1000's)

#	County	Cut Share	PILT	Total	Δ pmts
1	Benton	180.9	4.0	185.0	-3,584.3
2	Clackamas	1,037.8	103.4	1,141.2	-12,603.3
3	Columbia	132.6	0.0	132.6	-2,258.9
4	Coos	453.5	13.4	466.9	-8,059.3
5	Curry	1,729.4	117.1	1,846.4	-8,106.1
6	Douglas	2,546.7	187.8	2,734.6	-49,351.1
7	Jackson	1,451.8	91.1	1,542.9	-23,167.5
8	Josephine	2,006.3	69.3	2,075.6	-15,080.5
9	Klamath	2,731.5	427.3	3,158.8	-17,186.7
10	Lane	3,675.7	271.1	3,946.8	-48,219.4
11	Lincoln	320.6	36.5	357.1	-5,392.7
12	Linn	527.3	94.2	621.5	-13,930.4
13	Marion	543.4	40.4	583.9	-5,434.3
14	Multnomah	70.2	15.0	85.2	-2,263.9
15	Polk	139.1	0.0	139.1	-2,368.5
16	Tillamook	130.3	18.4	148.7	-3,350.4
17	Washington	40.6	3.7	44.3	-690.8
18	Yamhill	46.4	5.1	51.5	-1,575.2
	Total	17,764.2	1,497.9	19,262.0	-222,623.2

Isolating Other Economic Changes

Our charge is to isolate the SRS termination effect from other patterns of changes in future O&C county economic conditions. In representing individual county economies, our initial reference point is a matrix of quantitative indicators of initial county economies. Where economic indicators are actually drawn from other years we normalize to a representative base year of 2005. Only indicators from recent economic histories are utilized as these economies are presumed to have already equilibrated from sometimes large historic changes. The current state of many of these O&C county economies have clearly been shaped by timber industry contractions caused by federal timber policy changes during the 1990's. We assume that adjustments to that perturbation have already occurred prior to our base year.

We chose a representative socio-economic projection future of 2008. That is the year following the termination of the possible one year extension of SRS payments. In addition, 2008 is soon enough that we may assume that other probable changes in the regional economy would be minimal. This stabilization assumption includes averaging conditions within a business cycle, a stable housing market at pre-boom levels, and that continuing growth in other sectors would not interrupt the degree of interdependence reflected in input-output transaction coefficients measured in 2005 and 2006.

The real differences between the state of each O&C county economy in 2006 and 2008 will only be partially be partially driven by SRS payment losses. To highlight SRS termination induced impacts, we are ignoring three other significant imminent perturbations that could cause simultaneous economic impacts on the wood products sectors of these counties. These are impending changes in BLM timber

management on O&C lands that could increase some federal harvests[7] The current timetable for adoption of the Western Oregon Plan Revision (WOPR) estimates final plan adoption in 2008. Timber sales programmed in the WOPR could begin as early as 2009 and county payments based on those sales would begin in 2010 at the earliest. Litigation or administrative delays could alter this timetable significantly. There are also an expected increase in private timber harvests[8]; and a continued contraction in the region's large plywood and veneer industry.[9] We calculated how these changes might interact with a simpler representation of the SRS losses in another set of impact studies for the BLM.[10]

Quantification of County Economies

Most of the eighteen county I/O models that we used were originally built for investigation of timber policy and wood products changes for BLM and the ODF. Their basic structures describe all the relevant sectors of each county economy that would also be affected by local government funding changes. However, they also have much higher degrees of selective precision added to the wood products sectors. This does not affect the transactions of the government sector impacts with other sectors and only adds higher precision to those few instances where government sectors have trade interactions with wood products sectors.

There are model features that do increase the credibility of these models over typical automated I/O models. They use formulas to scale national transaction coefficients down to representative county proportions. In building these models we abstracted the same critical I/O input data from published source data, but this is recalibrated from our own active field surveys. In many cases assumptions or ad hoc adjustments are necessary to make data from different sources consistent.

This section describes many of the relevant steps in our process that make our models more locally credible than typical county-level I/O models. Our general approach contains four analytical phases that may vary considerably by type of activity and locus of occurrence. Three of these phases are described in more detail because they are applicable to this use of the models.

Phase 1: We collect secondary economic indicator data for the county level from a combination of published and on-line data sources. I/O model construction requires enormous amounts of consistent secondary data from numerous sources.

Bulk economic data for county-level models is found in published and online federal data sources, including the U.S. Department of Commerce, Bureau of Labor Statistics (BLS), Bureau of Economic Analysis (BEA), U.S. Census Bureau, and the U.S. Department of Agriculture's Census of Agriculture and National Agricultural Statistical Service (NASS) websites. There is also state specific economic data from Oregon Department of Agriculture, Portland State University (Population Research Center), Oregon State University (Cooperative Extension Service), and Oregon Labor Market Information System (OLMIS).

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7 BLM Western Oregon Project draft EIS projected release in July 2007

8 USFS 2003 GTR----

9 Adams, Darius and Greg Latta. 2006.

10 Forest Econ Inc. 2007. Impacts of Expected Changes in BLM timber management in western Oregon. Studies done for the W. Oregon DEIS. Expected publication April 2007

BLS and BEA data found in REIS[11], are used for initial estimates of employment and earnings data and for employment/output ratios[12]. BEA data are used for population and income variables at the county level. Portland State University population estimates are used for more recent years and for projections. Agriculture and logging are not covered by unemployment insurance, so data from the Oregon Department of Agriculture and OSU Cooperative Extension Service, and REIS is used to develop totals for agricultural sales, earnings, and employment.

These and other data sources form a large database for each separate county model. County databases include employment, wage and salary earnings, total industry output, unearned income, seasonal home spending, population, households, commuting patterns, wage rates, residency, employment status, tax rates, and savings and consumption rates (marginal and average propensity to consume locally). There are sector activity indices for up to 528 economic sectors. Actual model assumptions and construction methods follow in the last chapter.

The data matrix is recalibrated from field survey data for key sectors such as local government, wood products and major manufacturers (see phase 3). Background sectors that do not play a major role in the models are controlled to Oregon Labor Market Information System (OLMIS) data with some upward adjustment to allow for proprietors earnings.

Data on unearned income, including transfer payments and property income (dividends, interest, and rent), comes from the BEA's REIS database. Data on seasonal homes in the study area is found on the U.S. Census Bureau website, with estimates of seasonal home spending from data from large-sample studies in other states.[13] Population and household data comes from the U.S. Census Bureau website with more current data from Portland State University[14].

We use county-level sector specific wage rates found in the Oregon Labor Market Information System (OLMIS) and are used to develop wage and salary earnings estimates. Estimates of proprietor's earnings, profits, and employment/output ratios are based on county-level coefficients from REIS.

Initial commuting patterns are based on journey-to-work data from the U.S. Census Bureau/BEA website.[15] Population/labor ratios are developed from BEA employment data and U.S. Census Bureau population data. Data on the population of working and non-working families, population in the armed services, and resident population come from the U.S. Census Bureau website. Taxation, savings, and consumption rates for counties in the study area are based on national rates in BEA.

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11 Bureau of Economic Analysis (BEA), Regional Economic Information System (REIS), online at: *http://www.bea.gov/bea/regional/reis*.

12 County Business Patterns and ZIP Code Business Patterns files online at U.S. Census Bureau.

13 Stynes, D. J., Zheng, J. and Stewart, S. (1995). *Seasonal homes in Michigan.* East Lansing, MI: Department of Park, Recreation and Tourism Resources, Michigan State University.

14 Population Research Center, Portland State University 2007. Website listed below: *http://www.pdx.edu/prc*

15 REIS journey-to-work website *http://www.bea.gov/bea/regional/reis/jtw*.

Phase 2: Cooperators and other contractors provided essential baseline timber market data for the sector that would receive the most closely linked direct impacts of changes in federal forest policy. In most cases, we were able to compare similar data from multiple sources and refine it with our field calibration surveys. We received primary source records of USFS and BLM harvests, budget allocations and practices as well as historical payments to counties[16]. USFS and BLM payments were put in context to all county budget sources.[17] We used secondary state historical data to establish the relative public forest harvest contributions.[18] Spatial log flows are proportioned based on an earlier flow survey.[19] For loggers, we gathered logger data[20], found discrepancies in association estimates[21] and logger safety records[22], so we augmented these estimates from federal proprietor data[23]. Industrial production data came from numerous surveys and models. These estimates were tested and augmented by FEI field surveys. We used two sources of log using mill location and activities[24,25] that were later adjusted to compromise with other estimates. [26]

Phase 3: Dr. Dan Green, regional economist, and Maryann Green, resource sociologist, both of Economic Analysis Systems (EAS) conducted field surveys to collect detailed data on socio-economic conditions. This included 6 trips totaling 43 contact days to geographic clusters of potentially affected counties in western Oregon. Field interviews are augmented by follow-up telephone surveys. In each county, they contacted county government leaders, wood products industry employers, and businessmen in leading or potentially sensitive economic sectors. They made several hundred individual contacts. Their objective was to test the accuracy of secondary data, and add detail to quantitative descriptions of each county's total economy and selective precision for expected critical sectors. They found numerous instances of inaccurate secondary data (e.g. loggers jobs and income) or where important economic information indicators that are not covered by published or on-line statistics (e.g. suppressed data). They shared field survey results with county representatives to ensure that revised data are generally acknowledged as accurate and representative.

There are many instances where data sources disagree, particularly at county-level resolution. In such cases, we select the most credible sources based on either: correlations with other indicators, behavior in neighboring counties, or our own experience with such data.

Although the SRS impacts have few indirect linkages to these I/O models' extra precision in the wood products sector, that precision does serve to paint a more accurate picture of the county economy. Wood products industries are a major component of the economic base of western Oregon, so accuracy in this sector is important to model performance. There were several significant adjustments to the wood products sector that update and revise published statistics in these sectors. The calibration adjustments contain the following:

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16 BLM records, Association of O&C Counties Tabulation 10/5/2006, and USFS ASR payments to counties by national forest tabulation 12/22/2006
17 Kevin Davis, Association of O&C Counties
18 Gary Lettman, Oregon Department of Forestry forest economist
19 Jason Brandt, Montana Bureau of Business and Economic Research
20 Oregon Dept of Labor
21 Oregon Association of Loggers
22 Oregon Dept of Logger Safety
23 US Dept of Commerce
24 Oregon State University
25 Ehringer, Paul. 2006. Western Oregon Wood Products Mill survey
26 Western Oregon Model ibid

Logging and log hauling subsectors
Wood products manufacturing subsectors (Sawmill, Plywood, Pulp and paper, Board production)

The most important calibration is in logging. Loggers are highly paid skilled workers who are typically under-reported in most secondary statistics. They are mobile independent groups, and many are self-employed proprietors. This can exempt them from state insurance and unemployment a major source of secondary data. This is such a common problem that EAS and FEI developed standard approaches to augment secondary data. The first step collects reported data[27] that is compared to both regional logger association registrations[28] and state logger safety administration numbers.[29] EAS field surveys interview industrial sources in all counties. The aggregate estimates are cross-checked against ratios of loggers per MBF harvested. Logger earnings estimates are expansions to larger jobs estimates by averages from published Oregon statistics cross-checked against federal reports in IRS census reports.[30] Average earnings are higher ($37,957/logger/year) than average Oregon wages even accounting for the some unskilled jobs and partial year employment.

Under-reported logging in O&C Counties is significant. Table 3 shows almost twice the jobs and income in the logging subsector than would normally be reported. Due to high logger mobility, these statistics are based on where loggers are based, rather than where they might be harvesting in a particular year.

Table 3: Reported and Estimated W. Oregon Logging Statistics

	Loggers		Earnings/yr $1000's	
County	Listed	Actual	Listed	Estimated
Benton	300	416	10,806.6	15,000.0
Clackamas	Suppressed	531	suppressed	22,355.1
Columbia	237	323	9,152.6	12,473.9
Coos	648	985	26,819.5	40,767.2
Curry	104	263	3,122.0	8,679.0
Douglas	1,021	1,671	35,040.0	60,156.0
Jackson	773	1,214	34,186.9	53,690.4
Josephine	318	384	14,426.8	17,420.9
Klamath	213	281	8,257.4	10,893.5
Lane	782	1,512	26,242.2	50,739.7
Lincoln	131	260	4,761.3	9,450.0
Linn	481	630	18,468.9	24,190.1
Marion	suppressed	461	suppressed	18,993.2
Multnomah	15	207	204.2	2,818.3
Polk	229	247	8,367.3	9,024.9
Tillamook	277	291	10,505.9	11,036.8
Washington	160	430	5,739.8	15,425.8
Yamhill	191	427	6,657.5	14,883.5
Total W Oregon	6,152	11,073	233,989.1	420,293.8

27 Oregon Dept of Labor
28 Oregon Association of Logging Contractors
29 Mike Luray, Oregon OSHA personal communications
30 US Dept of Census

Remaining wood products manufacturing calibrations are less relevant and are only generally described. We use them as they give each county economy a slightly different profile than would be shown by secondary statistics alone. Trucking is augmented to correspond to the level of activity in logging and a newly discovered extent of cross-hauling. Sawmilling is adjusted for newer capacities and closures found in the survey process. Likewise, pulp paper and board employment and capacity have been adjusted. Finally, there is ongoing rapid change in plywood and veneer including reduced peeling and increased layups of imported veneers. In product values and earnings, published estimates are updated by new local estimates based on the volume of production and current wholesale product market values. The extensive secondary wood processing sector statistics remain at published levels as they were found to less tied to local primary wood manufacturing activity than originally hypothesized.

Government employment, payroll and budget data is probably the most accurate data available from secondary sources. Government agencies are required by "sunshine laws" to have open budgeting processes, and make an effort to accurately report data on employment, payroll and spending. We calibrated county government employment and payroll to Oregon labor market data (OLMIS), which we believe provides an accurate representation of local government operations. We confirmed this observation by collecting survey data for local units of government in several Oregon counties. The entire local government sector (county government, schools and other special purpose districts) is reported as one sector.

Model Development Process

Typical Input/Output (I/O) models, such as IMPLAN[31], are automated process models that scale national level sectoral economic relationships to fixed structure county data bases. They use fixed sectoral definitions and are infrequently field calibrated. Dr. Green, our EAS cooperator, uses a field survey calibration of county economic data bases and builds unique selective precision spreadsheet Input/Output model. The EAS modeling process is based on a unique resource economy representation technique.[32] The methodology was developed for USDA-Forest Service spatially-sensitive community impact analyses where canned I/O models obscure or misrepresent impacts.

Local government becomes a discrete sector in the EAS input-output (IO) models. Spending pattern differences vary across the spectrum for local units of government. The production function or IO coefficients for local schools districts, is quite different than a county road department. For example, schools and libraries are much more labor intensive than commissioners offices, while road departments or the sheriff's departments use more fuel and equipment. School districts do not make major purchases of gravel or construction services, but road departments spend a significant portion of their budget on these items.

We have no way of predicting which county operations will be cut, or how much, so our projections use average spending patterns of local government. When revised budgets are adopted that specify the new spending patterns, we could more accurately estimate impacts. For example, we would know with some certainty how much construction spending would be trimmed; how much sand and gravel would not be

[31] Minnesota IMPLAN Group www.implan.com

[32] Robison, M. Henry. 1997. Community Input/Output Models for Rural Area Analysis. *Annals of Regional Science*. Vol 31(3) pp 325-351

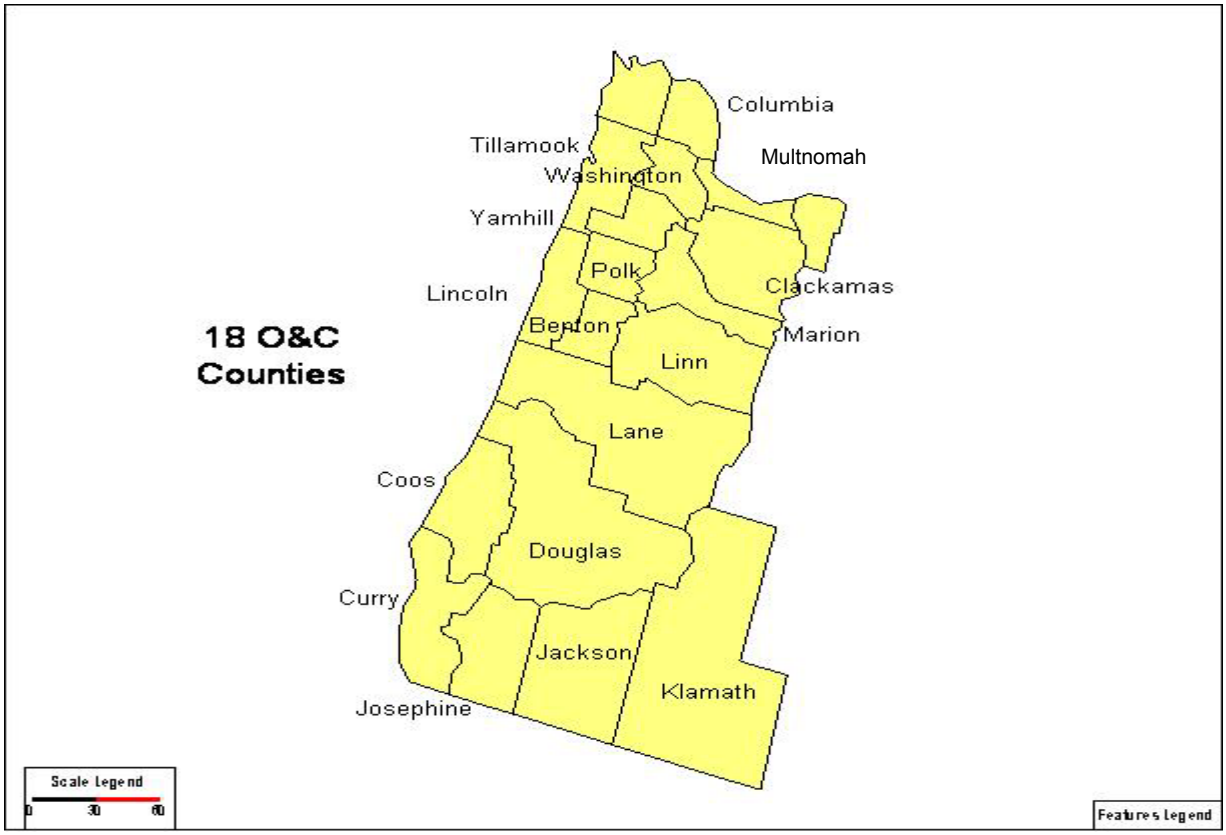
purchased; how large payroll cuts would be; and other variables in county spending patterns. In that case instead of an average spending pattern we would use a spending pattern that reflected actual budget cuts.

Establish Model Geography and Resolution

Changes in SRS payments could have economic influences of varying degrees throughout western Oregon. In representing impacts, the spatial scale of analysis becomes a critical choice. We chose county-level models as the most appropriate geographic scale to model county budget impacts associated with loss of federal funds. Actual budget cuts may affect some communities disproportionately, particularly the county seat. Given the size of budget impacts, they will be widely distributed in most counties.

We chose a county level of resolution so that most of impacts of local government budget cuts would be captured. Figure 1 shows the modeled counties in our analytical region.

Figure 1. WOPR O&C Counties Analyzed with I/O



Develop County-Level Databases

A database for each of the models is first assembled from published, on-line data sources, and survey data collected in 2006. The county databases include employment, wage and salary earnings, total industry output, unearned income, seasonal home spending, population, households, commuting patterns, wage rates, residency, employment status, tax rates, and savings and consumption rates (marginal and average propensity to consume locally). Initial employment data are from BEA (REIS) data. This is adjusted to reflect survey data for key sectors such as wood products and major manufacturers. Background sectors

that do not play a major role in the models are controlled to Oregon Labor Market Information System (OLMIS) data with some upward adjustment to allow for proprietors earnings.

County-level output data are estimated based on earnings/output ratios obtained from BEA. Data on unearned income, including transfer payments and property income (dividends, interest, and rent), are obtained from the BEA REIS database. Data on seasonal homes in the study area is obtained from the U.S. Census Bureau website, and estimates of seasonal home spending are developed from data from large-sample studies in other states.[33] Population and household data are from the U.S. Census Bureau website.

County-level wage rates obtained from the Oregon Labor Market Information System (OLMIS) are used to develop wage and salary earnings estimates. Estimates of proprietor's earnings, profits, and employment/output ratios are based upon county level coefficients from REIS data.

Initial commuting patterns are developed from journey-to-work data from the U.S. Census Bureau website. Population/labor ratios are calculated based on BEA employment data and U.S. Census Bureau population data. Data on the population of working and non-working families, population in the armed services, and resident population are obtained from the U.S. Census Bureau website. Taxation, savings, and consumption rates for counties in the study area are based upon national rates obtained from BEA.

Construct Preliminary County Models

A preliminary county model for the model areas is constructed from the secondary data sources. Its content and structure are similar to that used by IMPLAN (Impact Modeling for Planning and Analysis). Employment and earnings totals in the models are controlled to REIS totals for each county. Industrial output by industry for each of the county models is derived using employment/output ratios obtained from the respective county models.

Initial exports estimates for each county model are based on mechanical techniques (supply-demand pool, location quotients and regional purchase coefficients). These are modified in most sectors based on survey data obtained in a county survey. Calculated location quotients, regional purchase coefficients, and supply-demand pool ratios represent each industrial sector. The larger of these estimates serves as a provisional estimate of exports. The EAS approach uses a "selective precision" approach.[34] With this approach, ground-truthing focuses on calibrating the coefficients of a select number of sectors that are expected to play a significant role in the analysis.

The following factors used in constructing the county models were derived from national data:

- Endogenous business investment
- Household share of investment
- Average propensity to consume
- Marginal propensity to consume
- Average propensity to save
- Average federal income tax rates

[33] Stynes et al. 1991.
[34] Richardson. 1972.

- Average state and local income tax rates
- Average state and local government propensity to consume locally

Developing the county models also allows for adjusting absentee claims on profits on an industry-by-industry basis. For this study, overall profits (generated by place of work) are classified as either claimed in-county or absentee based on the type and size of the industry. Most businesses in western Oregon are locally owned so profits are retained in the county. Large industries such as Intel or Walmart were assumed to be owned primarily by absentee owners with profits allowed to leak out of the county.

Each of the county models is constructed using a combination of spreadsheet programs along with a mathematical software program, GAUSS[35], which handles complex mathematical operations. Once a preliminary database and model are constructed using this software, the model can be adjusted and "rerun" with several spreadsheet macros. After a preliminary model is constructed, various worksheets in the model can be "pulled out" of the model for analyzing and displaying aspects of the local economy. These include detailed estimates of employment and earnings in each industrial sector of the economy (with up to 528 sectors shown). Export base analysis is integrated in the preliminary model, which displays what percent of total export income is derived from each sector of the economy.

Major I/O Model Assumptions

To represent county economies with I/O we make the following general assumptions. They underlie the resulting structure of our county economic models:

- The future economic structure of counties in the study area, including the economic base, wage rates, productivity, commuting patterns, local consumption patterns, and labor markets, will be similar to the existing structure.
- Commuting patterns will remain similar to current patterns
- Future spending patterns will remain similar to current trade patterns throughout the planning period.
- Wage rates adjusted for inflation will be stable

Calibrating County Models

The 2006 field survey provides multiple adjustments to the initial databases for each county model. Most important are those collected for the "selective precision" approach.[36] In general, data and relationships for sectors that play an important role in the local economy and that are a key component of the economic base were adjusted with ground-truthed data as appropriate. Adjustments also included deleting industrial sectors that are no longer present in the local economy (because of inherent lags in reporting changes in economic activity) and adjusting levels of employment to reflect recent changes in an industrial sector. Employment and earnings totals were adjusted to reflect field data, and regional output was adjusted using employment/output ratios.

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35 Aptech Systems Software. GAUSS mathematical and statistical system

36 Jensen 1980

Modify Export Base in Key Economic Sectors

Economic base analysis is initially used to determine the proportion of output (or sales) of each sector of the local economy that is exported. Analysis of the economic base of an area identifies the industries that bring money into the region, which are critical to the economic growth and sustainability of a region.

For the county models, location quotient analysis, and supply-demand pool analysis are used to develop non-survey based estimates of exports. Supply-demand pool analysis evaluates whether local production of goods and services meets local demand, as indicated by national input-output technical coefficients; if the local supply falls short of demand, then the deficiency is assumed to be imported into the region. Location-quotient analysis compares the ratio of output of an industry in the local economy to output of the same industry in a reference economy (e.g., national economy). Economic studies of other communities have shown that these mechanical techniques tend to overstate the re-spending in the local economy[37,38] ; consequently, the lower estimates of spending in the local economy derived by supply-demand pool analysis and location-quotient analysis were used as a default value.

Use of mechanical techniques typically results in local absorption of the output of a variety of local industries that export all of their output (i.e., an extreme case of underestimating exports). Most of these industries, however, are typically in "background sectors," which are sectors that do not play a significant role in this type of analysis. Because these sectors do not have a significant role in the analysis, changes to exports in these sectors by overriding the data are not judged to be significant.

Export sales are adjusted based on survey data for all key sectors in the analysis and other sectors such as wood products and agriculture that are principal components of the economic base.

Sensitivity Analyses and Adjustments

Preliminary runs of the models using a range of input variables are undertaken to determine whether the model's projections of impacts were reasonable. This procedure focuses on the wood products sector of the county model. Multipliers from the model are also compared to multipliers developed by the BEA RIMS multipliers and for IMPLAN models of the area and to a county model (Western Oregon).

Limitations of County Resolution Modeling

Counties are not closed economic units and trade flows do not respect political boundaries. County-level I/O models artificially presume that political boundaries are coincident with economic boundaries. This greatly enhances data availability and the organization of sectors. In reality, this limiting assumption is rarely true. This is particularly the case for counties with a resource-oriented economic base. For example, Klamath County is a wood products and agriculture county.

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37 Richardson. 1972. ibid

38 Leontief. 1986

In these counties there is rarely a self-sufficient local trade center or a closed labor market area. It is typical for large portions of both industrial and consumer purchases to be made up the trade hierarchy in logistically adjacent counties that have major trade centers. A direct impact within the affected county may have small local job and income multipliers. Much of the multiplier occurs in the trade center, where a wider range of goods and services are available.

This is particularly problematic in the commuter counties surrounding Portland, Salem, Eugene and Corvallis. Out-commuters to these regional centers typically spend a larger share of their income outside their county of residence. Adjustment to the models to account for this variable were made based on professional judgment, but detailed consumer spending surveys were not available throughout the area.

This can cause two types of impact understatements in individual county modeling. First, some impacts that migrate to the next higher trade center in a neighboring county would be unestimated. Second, some impacts to trade centers within that county would be understated because, reduced trade from the next lower tier of trade nodes outside of the county would be missing.

Regional Models

Individual county models do not capture impacts of spending outside the county. We model trade leakage to regional centers using two new regional impact models that EAS built for this analysis. One regional model covers most of southwest Oregon and includes Coos, Curry, Douglas, Lane, Jackson, Josephine and Klamath Counties. The regional trade centers for this model are Eugene-Springfield and Medford. EAS also built a regional model for the Portland trade region. It includes twenty counties in northwest Oregon and southeast Washington. This area corresponds to the US Department of Commerce's definition of the Portland Economic Area.[39] The Portland Metro area is the primary trade center for this model, which includes many lower order trade centers such as Salem, Corvallis, and Beaverton. The Portland Economic Area also serves as a financial, trade transportation hub for an area that extends well into Idaho.

[39] http://www.bea.gov/bea/regional/docs/econlist.cfm