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Secondary Damages in Interstate Water Compact Litigation

ABSTRACT

Secondary economic damages have not generally been considered compensable in damage litigation. The reluctance to award secondary damages falls in part on the economics profession, since economists have found it difficult to measure these damages, and even to agree on their meaning. This paper addresses both the meaning and measurement of secondary damages in the context of a recent U.S. Supreme Court case where one state successfully sought secondary damages resulting from failure to deliver water under an interstate water compact. This paper describes the case and considers whether this decision should be treated as a precedent for other damage cases.

INTRODUCTION

Economists and the legal world have long recognized that shifts in resource allocation and use can cause measurable direct damages to affected individuals, organizations, or government entities. Measuring such direct damages as the basis for compensation or restitution is a relatively straightforward process following standard "with vs. without" estimation procedures. Direct damage is calculated as the reduction in net economic returns, or profit, accruing to a specific industry or sector of the economy resulting from a reduction in resources allocated to that industry or sector.

If we assume that irrigation water supplies are scarce within a region, net returns to irrigated agriculture within the region will decrease when the water supply level is reduced, because irrigated production will be less with the smaller water supply. Such a situation will arise when an upstream region fails to release a contractually agreed upon volume of water to a downstream region for agricultural use. In this situation, the

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direct economic damage to irrigated agriculture within the downstream region is measured as the lost profits the additional water would have generated in agricultural production if the agreed upon volume of water had been released by the upstream region. When one or more economic sectors in a region are directly affected by an economic event, it is common for other sectors in the region to experience indirect spin-off effects through the web of purchase and sales transactions in the local economy. In this example, the spin-off or secondary, regional impact that will ripple through the local economy is a function of the direct economic damage level. With a decrease in water supplies, irrigated agriculture purchases fewer inputs (including labor) within the region, which decreases industry profits in other industries, as well as household income. Economists and policy-makers recognize these secondary (or indirect) economic impacts, and estimates of these are commonly used to influence public policy and affect spending on public projects. However, contrary to the routine use of direct economic effects as measures of economic damage, secondary economic impacts have rarely been recognized in court cases seeking recovery of damages.

While economists widely accept the concept of secondary economic impacts, they are difficult to measure with accuracy.[1] Moreover, policy-makers and politicians have frequently misused secondary economic impact measures by leaving the impression that their total magnitude is an accurate estimate of secondary damages and a theoretically valid estimate of secondary regional damages.[2] This difficulty and confusion has led some

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1. *See* Joel R. Hamilton & Richard L. Gardner, *Value Added and Secondary Benefits in Regional Project Evaluation: Irrigation Development in the Snake River Basin*, ANNALS REG'L SCI., Mar. 1986, at 1, 1-11.

2. The correct secondary damage measure for an economic policy or event that causes a reduction in regional welfare is a function of the direct damage estimate after the direct damages have been *adjusted downward* to account for the fraction of idled capital and labor that is eventually re-employed within the region over time, often at a lower economic return. Not all idled factors of production in the directly damaged industry are permanently idled. Accordingly, the returns these re-employed factors generate in other industries within the region offset some of anticipated secondary economic losses. The difference between the return the idled factors of production (primarily labor and capital) generated in their prior use, less the return the re-employed factors earn within the region, is the appropriate value to use in the secondary damage calculation. The sum of the lost factor return for those factors that are permanently idled (no longer used within the region) plus the decrease in the economic return accruing to those factors that find re-employment within the region is the theoretically appropriate measure to use to estimate secondary damages. It is these permanent net economic losses and how they ripple through the regional economy that ultimately determine regional secondary damages through changes in aggregate regional purchasing patterns.

critics of secondary damages to dismiss them entirely (thus incorrectly measure secondary damages at zero), while enthusiasts equate secondary impacts with secondary damages and thus overstate damages. Either way, decisions are made with incorrect information. The authors of this paper believe that, with careful estimation and adjustment, secondary economic impacts in a state or regional economy can be accurately evaluated and properly translated into a measure of regional welfare damage that can be used as a component of comprehensive economic damage quantification.

The U.S. Supreme Court awarded secondary damages to Kansas based on Colorado's historic failure to deliver the amounts of water due to Kansas under the Arkansas River Compact.[3] This paper describes the case, and considers whether this decision can become a precedent for other damage litigation. The following discussion will focus on secondary economic impacts as measures of "damage" to the Kansas state economy resulting from Compact violations by Colorado. However, the concepts and processes followed could also be focused on the "benefits" accrued by Colorado through the period of Compact violations.[4]

This paper has two major purposes. First, it describes an important court case in which secondary impacts were accepted as a way to measure secondary damage to a plaintiff. Second, it provides guidance for an appropriate methodology to measure such secondary damages. While this paper concludes that there is only a narrow range of cases for which

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3. *See* Arthur L. Littleworth, Special Master Third Report at 65–71, 120, Kansas v. Colorado, 533 U.S. 1 (2001), *available at* www.supremecourtus.gov/SpecMastRpt/ORG105-8-2000.pdf [hereinafter Third Report]; *see* Kansas v. Colorado, 533 U.S. 1 (2001) (no exception filed by Colorado to the Special Master's recommendation on secondary damages); *see* Kansas v. Colorado, 543 U.S. 86, 91–92 (2004) (confirming adoption by the Court of the Special Master's recommendation on secondary damages, among others, in the Third Report). The U.S. Supreme Court hears cases between states in its original jurisdiction, pursuant to Article III, Section 2, Clauses 1 & 2. Since enactment of the Judiciary Act of 1789, this jurisdiction has been exclusive. *See* Judiciary Act of 1789, § 13, 1 Stat. 73 (1789) and 28 U.S.C. § 1251(a) (2000); *see also* Mississippi v. Louisiana, 506 U.S. 73, 78 (1992). The Court often assigns such cases to be heard by Special Masters, who then file a report with the Court. The Special Master's report contains recommendations, which become final only if adopted by the Court. The States may file exceptions to the Special Master's recommendations. *See, e.g.*, Kansas v. Colorado, 533 U.S. 1, 5–6 (2001). The Supreme Court first affirmed its ability to award damages for breach of an interstate water compact in *Texas v. New Mexico*, 482 U.S. 124, 128 (1987).

4. Kansas argued that Colorado's benefits from overusing the water of the Arkansas River could be used as a measure of the damages to be paid to Kansas as a result of Colorado's violation of the interstate compact. The Special Master ruled that the damages paid to Kansas should be based on losses to Kansas, not benefits to Colorado. Third Report, *supra* note 3, at 119 (Kansas filed no exception).

secondary damages might be relevant, that narrow range could include at least other interstate water compact cases and perhaps other cases as well.

I. THE CONCEPTS OF SECONDARY IMPACTS AND SECONDARY DAMAGES

Direct economic damages are the consequences to the directly affected individuals, businesses, and other entities from some action or event.[5] The measure of these direct economic damages is the net income lost because of the action or event. The estimation of direct damages is a relatively straightforward application of economic and accounting principles.

Secondary economic impacts result as the direct economic effects ripple through the rest of the regional economy.[6] These secondary impacts occur when the directly affected sector(s) would ordinarily buy inputs from other regional businesses (backward linkages) or produce outputs that serve as raw materials for other regional industries (forward linkages). A new irrigation project will cause agriculture to buy more from backward-linked fertilizer, machinery, and insurance sectors, and may allow expansion of forward-linked livestock and food-processing sectors. Damages to an existing irrigation sector would have opposite effects — business losses in both forward- and backward-linked sectors. The measure of these secondary impacts is often conceptualized as lost "value added": the lost wages, rents, and profits that would have accrued to the labor, land, and capital elsewhere in the regional economy, if not for the primary shock.

Available estimation tools, including most notably, input-output (I-O) models,[7] allow estimation of the backward-linked secondary impacts of a project or event on regional economic activity and on regional value added. While forward-linked impacts are theoretically real and measurable, damage estimation for *Kansas v. Colorado*, as in most other studies, focused only on the assessment of backward-linked economic effects. Forward-linked impacts are usually ignored in impact analysis because they are

5. *Cf.* 22 AM. JUR. 2D *Damages* § 38 (2003) (defining "general damages" as the "direct, natural, logical, and necessary consequences of the injury").

6. *See* Joel R. Hamilton et al., *Economic Impacts, Value Added, and Benefits in Regional Project Analysis,* 73 AM. J. AGRIC. ECON. 334, 334–44 (1991) [hereinafter Hamilton I]; *see also* Joel R. Hamilton et al., *Interregional Spillovers in Regional Impact Assessment: New Mexico, Texas, and the Supreme Court,* 25 GROWTH & CHANGE 75, 75–89 (1994) [hereinafter Hamilton II].

7. *See generally* RONALD E. MILLER & PETER D. BLAIR, INPUT-OUTPUT ANALYSIS: FOUNDATIONS AND EXTENSIONS (1985).

much more speculative and difficult to model and quantify.[8] With the tools now available, estimation of the backward-linked secondary economic impacts to an affected economic region is relatively straightforward.

It is more difficult, but very important, to distinguish between the initial secondary economic impact of an induced economic change and the actual change in economic welfare, the net secondary effect. Two respected commentaries have noted that secondary impacts expressed as a function of the change in value added are not valid measures of direct damages or benefits, primarily because a portion of the direct value-added economic impacts are, in part, transitory.[9] Mobile capital and labor (significant value added components) will be re-employed over time in next-best alternatives. It is only the long-term net economic welfare effect that is an appropriate measure of the damage or benefit from an economic event. While the precipitating event may indeed directly affect many sectors, rippling along the web of purchase and sales transactions to impact other businesses in the regional economy, these secondary impacts are not permanent, to the extent that the regional economy adjusts over time. In time, displaced labor will find alternative employment inside or outside the region. Similarly, capital will either move to other uses, or be depreciated. Even land, although immobile, nearly always has some alternative uses.

Economists call the value of a resource in its next-best alternative use its "opportunity cost."[10] Theoretically, the opportunity cost could range from near zero to 100 percent of the total secondary economic effect. It will depend upon the local economic conditions, which resources are affected and their mobility, and the permanent or temporary nature of the economic change being considered. In simple terms, the way to compute secondary damages, or the net effect, is to subtract opportunity costs from the total secondary impacts after the displaced resources have been reemployed.[11]

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8. *See* JOHN E. KEITH & TERRENCE F. GLOVER, SECONDARY IMPACTS AND BENEFITS OF WATER REALLOCATION IN THE SNAKE RIVER BASIN OF IDAHO (1988) (report to the Snake River Studies Advisory Committee, Idaho Water Resources Research Institute); *see* Jan Oosterhaven, *On the Plausibility of the Supply-Driven Input-Output Model*, 28 J. REG'L. SCI. 203, 203–17 (1988); *see also* Jan Oosterhaven, *The Supply-Driven Input-Output Model: A New Interpretation but Still Implausible*, 29 J. REG'L. SCI. 459, 459–65 (1989); Hamilton I, *supra* note 6.

9. *See* Robert A. Young & S. Lee Gray, *Input-Output Models, Economic Surplus, and the Evaluation of State or Regional Water Plans*, 21 WATER RESOURCES RES. 1819, 1819–23 (1985); *see* Charles W. Howe, *Project Benefits and Costs from National and Regional Viewpoints: Methodological Issues and Case Study of the Colorado-Big Thompson Project*, 27 NAT. RESOURCES J. 5, 5–20 (1987).

10. *See* EDWARD J. MISHAN, COST-BENEFIT ANALYSIS 65 (1976).

11. *See* Hamilton I, *supra* note 6, at 334–44.

However the process of measurement of the net economic effects can be fraught with difficulty and controversy.

II. DAMAGES IN *KANSAS V. COLORADO*

Kansas and Colorado have contested the interstate allocation of Arkansas River water for more than a century. The Arkansas River rises in central Colorado and flows through Kansas, Oklahoma, and Arkansas. Irrigation started in southeastern Colorado and southwestern Kansas in the 1800s, diverting water from the Arkansas River and more recently from linked aquifers.[12] Litigation filed by Kansas in 1901 alleged that Colorado was using unfair amounts of water.[13] More litigation ensued.[14] Eventually, the Arkansas River Compact was negotiated and approved by the States of Colorado and Kansas in 1948 and by Congress in 1949.[15] The adoption of the Compact was only a prelude to more litigation over compact non-compliance.[16] In the current case (filed by Kansas in 1985), the U.S. Supreme Court confirmed the finding of the Special Master that "[post-Compact] pumping in Colorado ha[d] caused material depletions of the usable Stateline flows of the Arkansas River, in violation of the Arkansas River Compact."[17] The Court remanded the case to the Special Master to determine the amount of the Compact violation in acre-feet and the remedy for that violation.[18]

A. Direct Damages

Secondary, or indirect, economic effects are always caused by the direct effects stimulated by the phenomenon being considered. On remand, Kansas's experts presented direct economic damage estimates based on

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12. *See* Arthur L. Littleworth, Special Master Report Volume 1, 1–10, 35–40, Kansas v. Colorado, 514 U.S. 673 (1995); *see* Kansas v. Colorado, 514 U.S. 673, 675–678 (1995) (first report of the Special Master).

13. *See* Kansas v. Colorado, 185 U.S. 125 (1902); 206 U.S. 46 (1907).

14. *See* Colorado v. Kansas, 320 U.S. 383 (1943).

15. Arkansas River Compact, COLO. REV. STAT. § 37-69-101 (1973); KAN. STAT. ANN. § 82a-520; Act of Congress of May 31, 1949, 63 Stat. 145.

16. As Justice Frankfurter pointed out, "[A] compact is after all a legal document. Though the circumstances of its drafting are likely to assure great care and deliberation, all avoidance of disputes as to scope and meaning is not within human gift." West Virginia ex rel. Dyer v. Sims, 341 U.S. 23, 28 (1951).

17. Kansas v. Colorado, 514 U.S. 673, 694 (1995).

18. *Id.*

three separate categories of income losses resulting from depletions of usable stateline flows.[19] These were:

1. *Groundwater Pumping to Replace Depleted Surface Water Deliveries*

Many Kansas farmers in the Arkansas River canal service areas had developed wells to supplement surface water supplies from the river. Some of the initial wells were shallow, pumping from the alluvial aquifer recharged directly by seepage from the river. But the shallow aquifer was soon dewatered, so that essentially all the pumping of groundwater was through deeper wells developed to pump from the Ogallala aquifer. An underlying assumption of the analysis was that farmers who had wells with access to groundwater for irrigation could and would utilize those wells to supplement surface water supplies when necessary. It was also assumed, for farms with wells, that groundwater pumping fully satisfied all crop demands not met by surface water. Hence, any depletion of these farmers' available surface water supplies below their full crop water requirements was assumed to have resulted in additional groundwater pumping. The states stipulated that, as a result of the 420,071 acre-feet of shortfall at the stateline during the period 1950–94, 154,526 acre-feet of water was pumped to make up losses on farms with wells and that the deliveries to farms without wells fell short by 72,036 acre-feet.[20]

Well-pumping costs were composed of capital investment expenses as well as the variable costs of well operation. The general procedure for allocating the investment costs of wells, pumps, and motors was to establish their capital investment cost and the appropriate depreciable life of each item. Annual interest and capital depreciation costs were allocated to a per-unit value based on the average annual hours of use. The fixed costs of ownership were then combined with the variable cost components of well operation. The variable cost items consisted of repairs, fuel (electricity or natural gas), lubricants, maintenance, and labor. Federal income taxes that would have been paid on the lost income were estimated and deducted from the direct damages.[21]

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19. *See* NORMAN K. WHITTLESEY ET AL., EVALUATION OF KANSAS'S CLAIM FOR MONEY DAMAGES FOR ITS LOSSES FROM COLORADO'S VIOLATIONS OF THE ARKANSAS RIVER COMPACT, 1950-94 (1998) (expert report presented by Kansas as Kan. Exhs. 892 & 1001, in *Kansas v. Colorado*, 533 U.S. 1 (2001)).

20. Third Report, *supra* note 3, at 9.

21. *See id.* at 17–36.

2. Increased Regional Pumping Costs Due to Aquifer Drawdown

A result of the depletions in the Arkansas River due to Colorado violations of the Arkansas River Compact was to place a heavier burden on the groundwater supplies in Kansas because of the increased pumping described above. The surface water depletions also diminished the aquifer recharge from surface water flows, including from the Arkansas River itself, canal losses, reservoir seepage, and on-farm losses.[22] The regional loss of groundwater totaled 324,866 acre-feet. These effects on the aquifer resulted in a permanent additional reduction in the static water level for the major water supply that drives the local economy in southwestern Kansas. All affected users of the aquifer have been required to pump water from greater depths since 1950 due to the unwarranted use of water in Colorado. This increased pumping depth has resulted in higher costs of water acquisition, a direct income effect on Kansas water users. This drawdown effect is essentially permanent and the increased costs of pumping will continue indefinitely.

It was determined that the increased pumping depth imposed on all water users in the impacted region affected the variable costs of pumping, mainly energy and maintenance, but did not affect the fixed costs of well ownership. These were the direct costs that drove the secondary economic impacts resulting from the aquifer drawdown. Historic drawdown effects were considered by the court for the period 1950–94, and future drawdown effects were considered for the next 50 years.[23]

3. Crop Production Losses

Surface water depletions affected two types of surface water users in the ditch service areas. The first was that group of farmers who had wells that could be used to replace the surface water depletions, and whose costs were described above in the first category of direct effects. It was stipulated that those farmers were able to replace all on-farm water depletions at the average total cost of pumping and therefore did not incur a crop production loss. The second type was that group of farmers who did not have wells to replace the diminished surface water deliveries. Their water supplies were much less certain, so they chose crops that could be grown with variable water supplies or "crops that could wait for water." Their entire irrigable acreage was cropped each year with a combination of alfalfa, wheat, and

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22. *Id.* at 9.
23. *Id.* at 37–38.

sorghum, each capable of providing some usable yield regardless of the surface water supply. It was determined that there was always sufficient water to establish the crops and to provide some yield but never sufficient water to provide a maximum attainable yield. Hence, the marginal increments of water depletion (measured in terms of crop consumptive use) always affected crop yield in a linear fashion between the extremes of crop establishment and maximum yield. Annual changes in crop yield and value, minus the marginal costs of irrigation and harvest, became the measure of direct damage to these farmers.[24] In addition, there were direct effects on farm-program payments over time caused by the diminished crop yields.

Kansas's direct damages were estimated as the sum of the income losses associated with crop production losses and the increased ground-water pumping costs. Kansas used standard economic and accounting procedures to estimate the present value (with interest) of direct damages. Kansas's estimate of the direct damages, including interest, as presented at trial, was about $60 million in 1998 dollars.[25] The direct damage estimate was subsequently adjusted to derive the secondary economic damage estimate.

B. Secondary Damages

To estimate the secondary economic damages to the rest of the Kansas regional economy, Kansas used I-O methodology, as implemented in the IMPLAN (impact analysis for planning) database and software package.[26] This allowed construction of a model of the Kansas regional economy, which was used to trace the $60 million in direct damages through the web of regional purchases and sales to estimate the backward-linked secondary impacts to the Kansas economy. These included the effects of reduced spending for production inputs and consumption items because farmers and laborers had less income and profits to spend. This approach also recognized that Kansas farmers increased spending on wells, pumps, and the power to run them. While caused by water shortage and

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24. *Id.* at 47–48.

25. Ultimately the award of prejudgment interest to Kansas was reduced by the Supreme Court from the amount presented by Kansas at trial, based on the Court's balancing of the equities and its view that some, but not all, prejudgment interest should be allowed. *See* Kansas v. Colorado, 533 U.S. 1, 9–16 (2001). The final amount paid to Kansas by Colorado was about $35 million. This included stipulated compensation for 1995–96 violations and prejudgment interest, including adjustments for inflation, pursuant to the determinations of the Court. The payment also included secondary damages determined as described below.

26. Minnesota IMPLAN Group, Inc., 1999.

groundwater decline, the additional well costs actually stimulated the local economy, and partially offset some of the negative secondary impacts. Kansas's experts estimated that the 1998 present value of these net secondary impacts totaled $18.5 million.

Kansas recognized that the $18.5 million estimate of backward-linked secondary impacts would be an overestimate of secondary damages because much of the lost wages, rents, and profits were from labor, capital, and land that were most likely reemployed elsewhere in the economy following their displacement.

Kansas adopted a procedure proposed earlier by Howe,[27] and used by Howe as an expert witness in a similar interstate water compact enforcement case, *Texas v. New Mexico*, on the Pecos River.[28] In that case, Howe stated his opinion that 80 percent of the secondary impacts would be offset by the opportunity costs of the displaced resources reemployed in their next-best alternative.[29] This would leave 20 percent of the impacts as net damages. Howe based the 80-percent opportunity cost figure on his own earlier work, which in turn cited the work of Robert H. Haveman and John V. Krutilla.[30] Using the 80-percent opportunity cost figure, Kansas experts reduced their [$18.5 million] estimate of secondary impacts down to a $3.7 million secondary damages claim.

Colorado moved to exclude all evidence by the Kansas experts on the secondary damages issue, claiming that the testimony and exhibits of Kansas experts did not meet the tests for expert testimony (the "junk science rules") set forth in *Daubert v. Merrell Dow Pharmaceuticals, Inc.*[31] and *Kumho Tire Co., Ltd. v. Carmichael*.[32] *Daubert* and *Kumho* had set standards for the admissibility of scientific and technical expert testimony based on a flexible list of reliability factors.[33] Specifically, Colorado argued that Kansas's use

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27. Howe, *supra* note 9.

28. Economic Damages to Texas from Braches of the Pecos River Compact: 1950 to 1986, Kansas Exhibit 950, Kansas v. Colorado, 533 U.S. 1 (2001) (Original No. 65) (this expert report was submitted in *Texas v. New Mexico*, 494 U.S. 111 (1990)) [hereinafter Howe 1989]. The Texas damages claim was ultimately settled, resulting in a Stipulated Judgment in the amount of $14 million. Texas v. New Mexico, 494 U.S. 111 (1990).

29. Howe 1989, *supra* note 28, at 15–19.

30. *Id.*; ROBERT H. HAVEMAN & JOHN V. KRUTILLA WITH ROBERT M. STEINBERG, UNEMPLOYMENT, IDLE CAPACITY, AND THE EVALUATION OF PUBLIC EXPENDITURES: NATIONAL AND REGIONAL ANALYSIS (1968).

31. Daubert v. Merrell Dow Pharmaceuticals, Inc., 509 U.S. 579 (1993).

32. Kumho Tire Co., Ltd. v. Carmichael, 526 U.S. 137 (1999).

33. 1 GEORGE E. DIX ET AL., MCCORMICK ON EVIDENCE § 203, at 832 n.46 (Kenneth S. Broun ed., West Publishing Co., 6th ed. 2006).

of IMPLAN was not "sufficiently reliable to calculate secondary economic impacts going backwards for a period of 45 years, and forward for 50 years."[34] Colorado also asserted that Kansas's use of an 80-percent figure for opportunity cost had insufficient empirical foundation.

Colorado's objection to the secondary damage evidence was overruled by the Special Master.[35] Testimony by Kansas's experts noted that Professor Wassily Leontief developed I-O methodology in the 1930s and 1940s, a contribution for which he later was awarded the Nobel Prize in Economics (1973). Hence there was no question of the professional acceptance of the basic theoretical framework. The development of computing power in recent decades has made I-O methodology accessible and reliable enough to allow its widespread use. The IMPLAN database and software package is a state-of-the-art package for conducting I-O analysis, and Kansas's experts documented a wide range of cases where this methodology was used to estimate secondary impacts in the context of project impact analyses, regional studies, and policy analyses.[36] While Kansas's experts acknowledged that the 80-percent opportunity cost figure would benefit from additional empirical verification, they pointed to several other studies where opportunity costs of 80 percent or less were used—meaning that 20 percent or more of secondary impacts were considered net benefits. In the end, the Special Master overruled Colorado's *Daubert* objection, noting, "There can be little doubt that evidence resulting from an input-output model analysis, and from IMPLAN in particular, meet the admissibility standards of *Daubert* and *Kumho*."[37]

More important, the Special Master accepted the concept that secondary damages are compensable:

> I find that the weight of evidence supports the Kansas claim
> for secondary economic damages. They may have to be
> recalculated, depending upon any revisions to the underlying
> [direct] damages, but the methodology used by the Kansas

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34. Third Report, *supra* note 3, app. at 82 (Order Overruling Colorado's Objection to the Admissibility of Expert Testimony Regarding Secondary Economic Damages).

35. *Id.* at 84.

36. Philip Wandschneider et al., *Analytic and Measurement Issues in Regulatory Benefits-Cost Analysis: A Case Study of Regulations to Reduce Grass Seed Field Burning in Eastern Washington Burning*, NORTHWEST J. BUS. & ECON. (1998); *see* NORMAN K. WHITTLESEY, HENRY ROBISON & JOEL HAMILTON, ECONOMIC EFFECTS OF IRRIGATED LAND RETIREMENT IN THE PECOS RIVER BASIN (1993) (prepared for the New Mexico Interstate Stream Commission); Hamilton II, *supra* note 6.

37. Third Report, *supra* note 3, app. at 82 (Order Overruling Colorado's Objection to the Admissibility of Expert Testimony Regarding Secondary Economic Damages).

experts should be employed in making any such final damage estimates.[38]

The trial in front of the Special Master on the remedy for past compact violations was completed in January 2000. In 2001 the Supreme Court issued its opinion approving a damage quantification that accepted the Special Master's recommendation that secondary damages should be included.[39] Thus secondary damages were judged to be compensable in this case, and the methodology of I-O analysis, as implemented by IMPLAN, was held to be an acceptable way to estimate these damages.

During and following trial, the methodology for estimating direct damages and the procedures for computing interest on damages continued to evolve. Ultimately, Colorado paid a total of $34.6 million damages to Kansas, a sum that included about $2 million in secondary damages.

III. PRECEDENT OR SPECIAL CASE?

There is little precedent in past litigation for claims of secondary damages, or for the use of I-O methodology such as IMPLAN for damage estimation in such cases. We have found only two other cases that might be construed as precedents.

Secondary damages played a part in the similar *Texas v. New Mexico* litigation over the Pecos River Compact. Both Whittlesey and Hamilton, authors of this paper, were experts for New Mexico, the defendant in that case.[40] The issue was initially raised in the Pecos River case by Texas, the plaintiff in that case, to measure the secondary benefits that New Mexico had captured while using water that should have been delivered to Texas.[41] New Mexico used similar procedures to estimate the secondary damages to Texas.[42] Thus both sides in that case accepted the idea of secondary benefits and damages, both sides accepted the use of I-O methodology to estimate these impacts, and both sides accepted the 80-percent opportunity

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38. *Id.* at 71.

39. *See* Kansas v. Colorado, 533 U.S. 1 (2001). Although Colorado vigorously opposed secondary damages during trial before the Special Master, Colorado did not file an exception challenging the award of secondary damages. The Court later confirmed that it had adopted the Special Master's Third Report in all respects not specifically modified by the Court. Kansas v. Colorado, 543 U.S. 86, 91–92 (2004).

40. The authors of this paper were either experts or counsel for Kansas, the plaintiff in Kansas v. Colorado, 543 U.S. 86, 91–92 (2004).

41. Howe 1989, *supra* note 28, at 15–19.

42. *See* Hamilton, *supra* note 1.

cost rule for converting impacts to net costs or benefits. The *Texas v. New Mexico* case was settled for $14 million during damage valuation hearings in front of a Special Master.[43] Because there was a settlement in that case, rather than a ruling after trial, *Texas v. New Mexico* does not provide a formal precedent for other cases regarding secondary damages.

Another case that appears to have awarded some form of secondary damages involved pollution damage to fisheries on the James River and Chesapeake Bay. *Pruitt v. Allied Chemical*[44] was brought by a group of fishermen and related businesses that claimed damages after Allied Chemical released the chemical Kepone into the James River. In that case the U.S. District Court awarded direct damages to the commercial fishermen; it awarded indirect (secondary) damages to the boat, marina, tackle, and bait shop owners; and it denied indirect damages to the plaintiff seafood wholesalers, retailers, processors, distributors, and restaurants that claimed to have lost profits because of the lost seafood supplies. *Pruitt*'s cause of action was in tort law, interstate compact enforcement cases, on the other hand, sound in contract law.[45]

Several factors explain the scarcity of precedent for the award of secondary economic damages in litigation:

(1)   Secondary damage claims apply most cleanly to cases where the plaintiff or defendant in a damage case is a state, or a regional or municipal entity.

It is generally held that secondary impacts are small or absent given a national economic development (NED) accounting perspective. The U.S. Water Resources Council directed that secondary impacts not be included in NED analyses of federally funded water resources projects unless there is massive national level unemployment of labor and capital.[46] The logic is that resources employed by a new water project are generally bid away from other productive employment elsewhere in the national economy.[47] While the Water Resources Council guidelines were intended to apply prospectively to new federally funded water projects, in practice the guidelines are used much more broadly as guides for economic analysis,

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43. *See* Texas v. New Mexico, 494 U.S. 111 (1990).

44. *See* Pruitt v. Allied Chemical Corp., 523 F. Supp. 975, 980 (E.D. Va. 1981).

45. "A Compact is, after all, a contract." Texas v. New Mexico, 482 U.S. 124, 128 (1987).

46. Water and Related Land Resources Planning Principles, Standards and Procedures: Repeal of Regulations, 48 Fed. Reg. 10250, 10254–55 (March 10, 1983) (repealing 18 C.F.R. pts. 711, 713, 714, and 716).

47. *Id.* at 10255, 10257.

and provide a reasonable guide for the retrospective analysis of damage cases. This rationale generally precludes the United States from claiming national-level secondary damages.

The Water Resources guidelines do allow secondary impacts to be included in the regional economic development (RED) accounting for project analysis, although the regional opportunity cost of labor and other inputs must still be accounted for.[48] This implies that damage claims where a participant is a state, a large municipality, or other sovereign entity (such as an Indian tribe) are realistic possibilities. The entity would have to be of sufficient size to encompass the web of sales and purchases that propagate secondary damages (e.g., a "functional economic area"[49]), and sovereign enough to claim the damages. Such claims are infrequent given these prerequisites, hence the lack of precedent.

Individual claims of secondary damages would be more speculative and harder to quantify than regional damages. An individual would typically have to establish that the damage to the primary affected firm or sector was the "proximate cause" of his secondary damages, which would be difficult to show unless a strong contractual relationship linked the two. A vertically integrated industry might be an example where one segment of the industry was affected directly leaving other sectors to be affected indirectly. Generally any individual claim would be speculative because calculated secondary effects to a specific business firm are more uncertain, more case-specific, and more subject to change over time than the aggregate secondary effects on a region, which are quite stable over time.[50] Such a claim would almost have to be based on the existence of a contractual or strong historical relationship between the primarily impacted firm and the secondarily impacted firm, and almost certainly could not be modeled with a methodology such as IMPLAN. However, a large vertically integrated firm might incur internalized secondary effects from shocks to any given level of its operations.

Pruitt v. Allied Chemical apparently recognized these variations in proximity to the initial shock. Of the plaintiffs in that case, the fishermen

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48. *Id.* at 10254–55.

49. KARL A. FOX & KRISHNA T. KUMAR, *The Functional Economic Area: Delineation and Implications for Economic Analysis and Policy, in* URBAN-REGIONAL ECONOMICS, SOCIAL SYSTEM ACCOUNTS, AND ECO-BEHAVIORAL SCIENCE, SELECTED WRITINGS BY KARL A. FOX, 23–51 (James R. Prescott, Paul van Moeseke, and Jati K. Sengupta eds., 1994).

50. RONALD E. MILLER, *STABILITY OF SUPPLY COEFFICIENTS AND CONSISTENCY OF SUPPLY-DRIVEN AND DEMAND-DRIVEN INPUT-OUTPUT MODELS: A COMMENT,* 21 ENV'T & PLANNING A 8, 1113–20 (1989).

were awarded direct damages. The boat, marina, tackle, and bait-shop owners who supplied inputs to the fishermen (that is, the backward-linked economic sectors) were awarded indirect (secondary) damages. The seafood wholesalers, retailers, processors, distributors, and restaurants that handled the caught fish (the forward-linked economic sectors) received no indirect (secondary) damage compensation. While I-O methods were not used in *Pruitt* (the claims were based instead on historic business relationships among specific firms), the findings in that case are consistent with the then-current state of analytic methodology. As noted earlier, forward linkages are more difficult to model with confidence than backward linkages.[51]

It might be possible to pursue a case of damages to individuals as a class action, but the class of affected parties could be very large, the extent of damage to each would be difficult to establish, and the secondary damages to many parties would be small, making such an approach unlikely.[52]

(2)   Actions brought by one state against another under the original jurisdiction of the U.S. Supreme Court must also satisfy the restrictions imposed by the 11th Amendment.

The 11th Amendment to the U.S. Constitution provides: "The judicial power of the United States shall not be construed to extend to any suit in law or equity, commenced or prosecuted against one of the United States by Citizens of another State." This Amendment has been held to restrict states from suing other states for claims that are really aggregations of claims of its individual citizens.[53] However, under a legal doctrine known as "*parens patriae*," states are allowed to bring suit in their capacity as legal guardians for their citizens.[54] *Kansas v. Colorado* presented the challenging

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51. *See* Hamilton I & II, *supra*, note 6; ROBERT A. YOUNG & CHARLES W. HOWE., HANDBOOK FOR THE ECONOMIC EVALUATION OF APPLICATION FOR APPROPRIATION OF SURFACE AND GROUNDWATER IN THE STATE OF IDAHO, REP. TO THE SNAKE RIVER STUDIES ADVISORY COMM., IDAHO WATER RES. RESEARCH INST. (1988).

52. *Cf.* Amchen Prods., Inc. v. Windsor, 521 U.S. 591, 615, 623 (1997) (noting two requirements to qualify for class certification under FED. R. CIV. P. 23(b)(3): "Common questions must predominate over any questions affecting only individual members; and class resolution must be superior to other available methods for the fair and efficient adjudication of the controversy") (internal quotations omitted).

53. *See, e.g.,* New Hampshire v. Louisiana, 108 U.S. 76, 91 (1883) *cited in* Kansas v. Colorado, 533 U.S. 1, 7–8 (2001).

54. R.H. Abrams, *Is Kansas Entitled to Money Damages for the Breach of the Arkansas River Compact*, 6 J. A.B.A.J. 317 (2001).

and "rarefied" issue of how *parens patriae* relates to the 11th Amendment.[55] The damages proven by Kansas were mainly suffered by members of her citizenry, rather than by the state itself. Typically, damages collected in *parens patriae* suits are held by the state for the benefit of all her citizens, not just the few who are affected.[56] In *Kansas v. Colorado* the Court held that the 11th Amendment was not a bar to recovery.[57] The fact that Kansas relied on the losses of its water users was no impediment, nor was any significance attached to the fact that some of these water users were actually residents and citizens of Colorado. Kansas was not recovering any damages owed to its water users, but was recovering damages owed to itself. The losses of the water users were merely the measure of those damages; payment would go to the state—to use as it saw fit—not to the farmers and other affected individuals.[58] The paucity of secondary damages precedent may be due in part to the few cases that can similarly satisfy the requirements of the 11th Amendment.

(3)   The theoretical and methodological foundations for making a claim of secondary damages are quite recent.

The methodology of I-O analysis, which was originally applied to the United States as a whole, dates to the work of Wassily W. Leontief beginning in the 1930s[59] and has only been applied to regions such as states (initiating the discipline of regional science) since the 1950s.[60] However, until the mid-1980s the use of regional I-O methodology in applied studies faced a dilemma, with accurate but prohibitively expensive survey models

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55.   *Id.*

56.   *Id.*

57.   As Justice Stevens wrote for the Court, which was unanimous on this point: "The governing principle is that in order to invoke our original jurisdiction, the State must show a direct interest of its own and not merely seek recovery for the benefit of individuals who are the real parties in interest. Kansas has unquestionably made such a showing. Indeed, the present proceeding is but one of several in which Kansas' own interest in preventing upstream diversions from the Arkansas River has justified an exercise of our original jurisdiction." Kansas v. Colorado, 533 U.S. 1, 8 (2001) (internal quotations omitted).

58.   Kansas Exhibit 891, Kansas v. Colorado, 533 U.S. 1 (2001) ("It is wholly consistent with that view that the State should recover any damages that may be awarded, money it would be free to spend in the way it determines is in the public interest.").

59.   Wassily W. Leontief, *Quantitative Input and Output Relations in the Economic System of the United States*, 18 REV. ECON. STAT. 105 (1936).

60.   Frederick T. Moore & James W. Petersen, *Regional Analysis: An Interindustry Model of Utah*, 37 REV. ECON. STAT. 4, 368 (1955).

on one hand, and non-survey models of dubious accuracy on the other.[61] It has only been in the last decade, with advances in both computing power and non-survey I-O techniques, that readily available and generally accepted I-O modeling methods have been available for routine regional impact analysis.

While IMPLAN-generated models were used to estimate secondary damages in *Kansas v. Colorado*, it is not the only choice, or necessarily always the best choice, for this kind of analysis. Other regional I-O modeling systems more or less comparable to IMPLAN might be used,[62] or so might, for that matter, modeling frameworks that are not strictly regional I-O models per se, perhaps including the growing array of "computable general equilibrium" models.[63]

The setting for the present paper is the calculation of damages in a dispute over interstate water use. However, the principles might just as easily apply to any exercise in applied benefit/cost analysis, such as alternative transportation projects, natural resource policies, or any other public (or private) issue where significant secondary effects are likely.

IV. SUMMARY AND CONCLUSIONS

We have described the lawsuit of *Kansas v. Colorado*, in which Kansas claimed and was awarded both direct and secondary damages caused by Colorado's under-delivery of Arkansas River water. There are few precedents where secondary damages have been awarded because such suits generally have to be filed by states or municipalities, must surmount the 11th Amendment, and must be able to quantify the impact in a way that only recent advances in economic modeling methods make possible. Now that estimates of secondary damages can be generated that meet the tests of methodological rigor and acceptable accuracy, we assert that secondary economic damages should be accepted, in appropriate cases, on a level with direct economic damages.

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61.   Rodney C. Jensen, *Construction and Use of Regional Input-Output Models: Progress and Prospects*, 13 INT'L REG'L SCI. REV. 1, 9 (1990).

62.   Two currently available regional I-O alternatives to IMPLAN are Economic Modeling Specialists, Inc.'s EI (economic impact) Model, http://www.economicmodeling.com/ and the Rutgers University, Center for Urban Policy Research R/Econ Model, http://www.policy.rutgers.edu/cupr/recon/.

63.   *See* PETER BERCK ET AL., *The Use of Computable General Equilibrium Models to Assess Water Policies, in* THE ECONOMICS AND MANAGEMENT OF WATER AND DRAINAGE IN AGRICULTURE 212 (Ariel Dinar & David Zilberman, eds., 1991).

Lawyers and economists should seriously consider the implications of secondary damages in future litigation as states continue to sue each other over water rights issues. The concept of secondary damages may also apply more generally in some other natural resource damage cases, and perhaps even more widely. Meanwhile, it is important that economists continue to refine the theory and methods required to properly estimate these secondary damages.