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THE DISTRIBUTION OF BENEFITS FROM THE 1968 UPLAND COTTON PROGRAM

Roger P. Hill*

While attempting to quantify and examine the distribution of payments from the 1968 Upland Cotton Program, some comparisons will be made of the distributive aspects of previous cotton programs.

Economists have long been concerned with the impact of government farm programs, but have focused much of their attention on resource use and aggregate returns under alternative programs. At the same time, it has been recognized that farm programs, through income transfers, had certain distributive impacts. One of the first and most comprehensive studies of the distribution of benefits from certain farm programs was conducted by James T. Bonnen [2].

Even though it was generally conceded that the benefits from farm programs accrued primarily to landowners, and in most cases the larger landowners, there was little or no quantification of the benefit distribution prior to Bonnen's work. By Bonnen's own admission, the estimation of the benefits was at times crude and the judgment as to an acceptable level of concentration was and remains a normative one. Bonnen's work did much, however, to sharpen the public debate on the distributive aspects of government farm programs and also served as a reminder to the agricultural economics profession that there are important questions in the fields of public policy other than those of resource allocation.

A major change in the basic cotton program occurred with the passage of the Food and Agriculture Act of 1965. Prior to 1965, cotton prices were supported at levels well above world prices and a subsidy payment was made to domestic textile mills. Beginning essentially with the 1966 crop, domestic cotton prices were allowed to drop to near world levels and participating producers were offered direct price support payments, diversion payments and the

conventional price support loans. Here was a significant change in agricultural policy — the cotton program benefits no longer came through the market system but came directly from the U.S. Treasury with program costs shifted from the consumer to the taxpayer. This shift in program costs from consumers to taxpayers and the change in payment recipient made a major part of the total program costs apparent, not only to certain Congressmen but to the general public as well. This is reflected in current and continuing debate on a payments limitation scheme. With this major change in cotton legislation, it seemed appropriate to reappraise the distributive impact of certain cotton program benefits.

While the direct payments (price support and diversion) do not necessarily represent the total benefits from the cotton program, they may account for a higher portion of total benefits than is generally recognized. Aside from direct payments, the principal benefit would be a price support loan or a market price above that which would have prevailed in the absence of the program. If the domestic loan rate was set at "modestly below world prices," as the law intended, then that is the approximate price that would have prevailed in the absence of the program. Although there does not appear to be a "single world price," casual observation would suggest that the 19.69 cents average loan rate for the 1968 crop did not exceed the export or world price by a wide margin. Total payments do not differ from the total benefits by a substantial amount. The conclusion one draws, however, depends on one's assumption regarding the relationship between the loan rate and a "world price."

PROCEDURE

Although income, asset or benefit distribution can be presented in several forms, the conventional

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Lorenz curve has been used in this analysis. A Lorenz curve is a plotting of the cumulative percent of the benefits against the cumulative percent of units receiving these benefits (Fig. 1). If all units (farms in this particular case) received the same benefits, then the Lorenz curve would coincide with the diagonal in Figure 1. Such a Lorenz curve would depict perfect equality. If a single farm received 100 percent of the benefits, the horizontal and vertical lines at the bottom and right would form the Lorenz curve. Curves drawn to actual data invariably fall below the diagonal but above the lines of complete inequality. By utilizing the Lorenz curve, we can show what percentage of the benefits are received by the lower 10 percent of the farms, the upper one percent of the farms, etc.

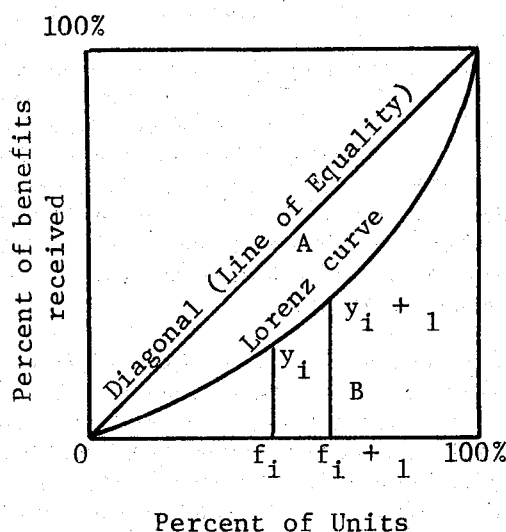


FIGURE 1. ILLUSTRATION OF LORENZ CURVE AND COMPUTATION OF GINI CONCENTRATION RATIO

In addition to presenting the data in Lorenz curve form, a single measure of the concentration of the benefits was computed. The Gini Index of Concentration (hereafter referred to as the Gini ratio) is an average measure of concentration derived from the Lorenz curve and is defined as the proportion of the total area under the diagonal that is between the diagonal and the Lorenz curve. Based on the work of Herman P. Miller [3] and James Morgan [4] and using the notation in Figure 1, the Gini ratio can be expressed as follows:

$$\text{Gini ratio} = \frac{A}{A+B} = \frac{\text{Area between curve and diagonal}}{\text{Area under diagonal}}$$

Since the cumulative percents on each axis adds to 100, the area in the entire square is 1 and the area under the diagonal is $\frac{1}{2}$. Therefore, the expression above can be rewritten as follows:

$$\begin{aligned} \text{Gini ratio} &= \frac{\frac{1}{2} - \text{Area under curve}}{\frac{1}{2}} \\ &= 1 - 2 (\text{area under curve}) \end{aligned}$$

Assuming the curve between any two points is approximated by a straight line, the area for any segment can be expressed as follows:

$$(f_i + 1 - f_i) \frac{(y_i + y_{i+1})}{2}$$

Summed over all intervals, the area under the curve is

$$\sum_{i=1}^k (f_i + 1 - f_i) \frac{(y_i + y_{i+1})}{2}$$

Substituting the expression for the Gini ratio above, one obtains the formula that was used in computing the Gini ratio.

$$\begin{aligned} \text{Gini ratio} &= 1 - 2 \sum_{i=1}^k (f_i + 1 - f_i) \frac{(y_i + y_{i+1})}{2} \\ &= 1 - \sum_{i=1}^k (f_i + 1 - f_i) (y_i + y_{i+1}) \end{aligned}$$

A Gini ratio of one indicates perfect inequality and a ratio of zero perfect equality. Thus, the smaller the Gini ratio, the greater the degree of equality in distribution of benefits.

In addition to the Lorenz curves and Gini ratios, an additional tabular analysis will show the cumulative percentage of benefits going to farmers with allotments under various acreage sizes and over various sizes.

DATA

Rather detailed distributional data are required for constructing Lorenz curves. Fortunately, the Agricultural Stabilization and Conservation Service of the U. S. Department of Agriculture had such data in published form for 1968 [1]. For each cotton producing state, the number of participating farms, the price support payment and the diversion payments were available by size of allotment. The total payment was obtained by simply adding together the price support

and diversion payments. These data presumably reflect the payments accruing to different size allotment holders after release and reapportionment of allotments. Since both price support and diversion payments are in dollar values, the data are easily aggregated into regional and national totals. Time does not permit a detailed consideration of the net versus gross benefit question. It appears that the diversion payments are, in fact, gross benefits while the price support payments are very close to being net benefits.

TOTAL BENEFITS GENERATED

The data in Table 1 will provide some perspective on the magnitude of the direct government payments and their contribution to producer income by state and region. In 1968 there were 460,162 allotment holders who participated in the Upland Cotton Program (Table 1). Producers' gross income from cotton was slightly over \$2.2 billion, \$1.42 billion from the sale of lint and seed and over \$783 million from direct government payments. The magnitude of the payments is about midway between the different levels of benefits estimated by Bonnen for the 1964 program.

The regional pattern of direct payments is about as expected with the Delta (Arkansas, Illinois, Kentucky, Louisiana, Missouri, and Tennessee) and the Southwest (Oklahoma and Texas) both receiving almost double the payments of the other two regions (Column 5, Table 1). The Western region (Arizona, California, New Mexico, and Nevada), with 13,096 participating farms, received only slightly less payments than the Southeast region (Georgia, Alabama, Florida, North Carolina, South Carolina, and Virginia), with 175,485 participating farms (\$122 million compared to \$130 million). Texas received more than twice the direct payments (\$254 million) as the next state (Mississippi - \$102 million). Only four states, Texas, Mississippi, California, and Arkansas, received more than \$50 million in cotton payments. Six additional states, Georgia, Alabama, South Carolina, Louisiana, Tennessee, and Arizona, received between 25 and 50 million in cotton payments.

Direct payments exceeded 47 percent of the total income from cotton in the Southeast, compared to 38 percent in the Southwest, 34 percent in the Delta and only 26 percent in the West (Column 7, Table 1). Only in the minor cotton states of Virginia and Illinois did payments exceed the value of lint and seed. Of the major cotton producing states, Georgia received the highest percentage of total cotton income from government payments (49.2 percent) and California the lowest (25.1 percent). For the U.S., as a whole, 35.5 percent of the total income from cot-

ton was in the form of direct government payments.

As expected, average payments per farm were lowest in the Southeast (\$739) and highest in the West (\$9,288) (Column 8, Table 1). The average for the U.S. was \$1,703 per farm ranging from \$248 in Virginia to \$18,062 in Nevada. For major cotton producing states, the range was from \$382 in North Carolina to \$17,938 in Arizona. Arkansas, Texas and all of the states in the West received more than \$2,000 per farm on the average.

On a per acre basis, the average payment was \$72 for the U. S., ranging from \$51 in Oklahoma to \$124 in Arizona. The average payments per acre were lowest in the Southwest, followed by the Delta and the Southeast, and highest in the West (Column 9, Table 1).

THE DISTRIBUTION OF THE BENEFITS

Lorenz curves were computed separately for price support payments, diversion payments and total payments, but only the total payment Lorenz Curve is presented here. Columns 1-4 of Table 2 represent the lower half of the Lorenz curve and Columns 5-9 the upper end of the curve.

It is clearly evident from Table 2 that the distribution of total payments is highly skewed in the U. S. with one-half of the participating farms receiving 90 percent of the total payments. On a regional basis, the top one-half of the farms receive from 85 percent of the payments in the Southeast to 94 percent in the West.

On the lower end of the Lorenz curve, payments generally tend to become more concentrated as one moves west from the Southeast region to the Western region. This pattern is completely consistent up through the lower 20 percent of the farmers and at the lower one-half of farmers' level. At the lower one-third farmers' level, the pattern is completely lost as the Southwest is the least concentrated, followed by the Delta, the Southeast, and the West.

At the upper end of the distribution, a different pattern is evident. The Southwest region generally has the lowest level of concentration, followed by the Southeast, the Delta and the West, in that order. This pattern is completely consistent from the top 20 percent farmers' level and up. In general, the Delta and the West tend to fall together as a group and have a significantly less equal distribution of payments than the Southeast and Southwest regions.

The variation between states in percent of payments received by the different percentiles of farms

TABLE 1. UPLAND COTTON PROGRAM BENEFITS, AVERAGE PER FARM AND PER ACRE BY STATES, 1968

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Participating Farms (no.)	Acreage Planted (1,000 ac.)	Harvested Acreage (1,000 ac.)	Value of Production ^a (1,000 dol)	Total Direct Payments (1,000 dol)	Total Income from cotton (4) + (5) (1,000 dol)	Direct Payment As % of Income From Cotton	Average Payment Per Farm (dollars)	Average Payment Planted At (dollars)
Georgia	34,831	410	395	34,756	34,756	68,397	49.2	966	82
Alabama	59,013	555	525	54,794	49,426	104,220	47.4	838	89
Florida	2,513	13.4	12.5	1,380	1,066	2,466	43.6	424	80
North Carolina	41,725	200	189	16,621	15,934	32,555	48.9	382	80
South Carolina	35,163	354	340	36,235	29,116	65,351	44.6	828	82
Virginia	2,240	8.1	6	404	556	960	57.9	248	69
SOUTHEAST	175,485	1,540.5	1,468	144,190	129,739	273,929	47.4	739	84
Arkansas	30,245	1,045	980	145,628	69,853	215,481	32.4	2,310	67
Illinois	66	2.0	.3	32	127	159	79.9	1,924	64
Kentucky	318	5.5	3.6	618	407	1,025	39.7	1,280	74
Louisiana	17,682	423	410	73,452	31,711	105,163	30.2	1,793	75
Mississippi	52,650	1,155	1,105	207,541	101,665	309,206	32.9	1,931	88
Missouri	12,244	318	190	29,866	18,987	48,853	38.9	1,551	60
Tennessee	37,089	394	360	46,021	33,899	79,920	42.4	914	86
DELTA	150,294	3,342.5	3,049	503,158	256,649	759,807	33.8	1,708	77
Oklahoma	20,398	421	380	30,198	21,306	51,504	41.4	1,045	51
Texas	100,889	4,426	4,101	411,303	254,214	665,517	38.2	2,520	57
SOUTHWEST	121,287	4,847	4,481	441,501	275,520	717,021	38.4	2,272	57
Arizona	2,055	268	268	93,247	36,863	130,110	28.3	17,938	124
California	6,985	695	687	218,741	73,307	292,048	25.1	10,495	105
New Mexico	4,040	148	139	23,853	11,172	35,025	31.9	2,765	69
Nevada	16	2.5	2.4	651	289	940	30.7	18,062	120
WEST	13,096	1,114	1,096	336,492	121,631	458,123	26.5	9,288	109
U.S.	460,162	10,844	10,094	1,425,341	783,539	2,208,880	35.5	1,703	72

SOURCES: Columns 1 and 5 from "1968 Feed Grain, Wheat and Cotton Programs, Frequency Distribution of Participating Farms," USDA, ASCS, Dec. 1968. Columns 2, 3, and 4 from "Cotton Situation," CS-241, May, 1969. Columns computed from Columns 1-5.

^aIncludes the value of lint and seed. Data are adjusted where appropriate to eliminate the extra long staple American Egyptian cotton.

TABLE 2. DISTRIBUTION OF 1968 UPLAND COTTON TOTAL PROGRAM PAYMENTS: PROPORTION OF U. S., REGIONAL AND STATE PAYMENTS RECEIVED BY VARIOUS PERCENTILES OF FARMER BENEFICIARIES^a

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
STATE	Percent of Total Benefits Received by the									Gini Concentrate Ratio
	Lower 10% of Farmers	Lower 20% of Farmers	Lower 33% of Farmers	Lower 50% of Farmers	Top 50% of Farmers	Top 33% of Farmers	Top 20% of Farmers	Top 10% of Farmers	Top 1% of Farmers	
Alabama	1.8	3.6	8.0	18	82	72	64	52	17	.562
Florida	1.3	2.7	4.4	13	88	76	66	55	21	.627
Georgia	1.1	2.3	7.9	15	85	78	67	53	14	.604
North Carolina	2.3	4.6	7.6	12	88	75	64	55	22	.601
South Carolina	1.3	2.5	4.7	13	87	79	71	58	12	.645
Virginia	3.5	6.9	11.4	17	83	74	57	44	18	.517
SOUTHEAST	1.5	3.0	5.0	15	85	76	68	56	18	.613
Arkansas	.7	2.9	5.8	10	90	83	73	58	19	.667
Illinois	.5	2.5	5.1	10	90	80	67	41	6	.601
Kentucky	1.2	2.5	4.8	13	87	79	66	45	9	.597
Louisiana	.9	3.5	7.5	13	87	81	72	57	18	.645
Mississippi	.9	1.8	5.0	10	90	86	79	69	25	.725
Missouri	1.4	4.2	9.0	16	84	73	60	43	14	.540
Tennessee	2.3	4.6	10.2	22	78	68	56	43	12	.483
DELTA	1.1	2.4	6.6	12	88	82	73	60	22	.663
Oklahoma	.9	3.6	8.1	17	83	72	57	37	10	.509
Texas	.6	2.3	5.6	12	88	76	61	42	12	.572
SOUTHWEST	.6	2.3	5.7	12	88	77	61	43	12	.580
Arizona	.4	1.1	3.0	8	92	81	67	50	12	.648
California	.7	1.6	3.0	6	94	86	75	62	28	.723
New Mexico	.8	2.8	6.0	13	87	76	60	43	11	.568
WEST	.5	1.4	2.9	6	94	87	76	62	25	.724
UNITED STATES ^b	.8	1.6	5.0	10	90	84	74	60	12	.683

SOURCE: "1968 Feed Grain, Wheat, and Cotton Programs, Frequency Distribution of Participating Farms, by Size Allotment of Base," ASCS, USDA, Dec. 1968.

^aThis table presents portions of a Lorenz curve relating the cumulated percentage distribution of total program payments to the cumulated percentage of farmers receiving those benefits. Columns 1 through 4 summarize the relationship cumulated up from the lower (benefit per farmer) end of the curve, and Columns 5 through 9 summarize this relationship cumulated down from the top (highest benefit per recipient) end of the curve.

^bA limited number of observations prevented the computation of a meaningful Lorenz curve for Kansas and Nevada. U. S. totals, however, include data from all cotton producing states.

changes considerably as one moves from the lower to the upper end of the Lorenz curve. On the lower end of the curve, one-third of the farms received from 3 percent of the payments in Arizona and California to over 11 percent in Virginia. On the upper end of the curve, the top 10 percent of the farms received from 37 percent of the payments in Oklahoma to 69 percent in Mississippi. The top one percent of the beneficiaries received 28 percent of the payments in California and 25 percent in Mississippi.

The observation on general patterns of payment distribution are generally confirmed by the Gini concentration ratios (Column 10, Table 2). The Gini ratio is lowest in the Southwest (.580) followed by the Southeast (.613), the Delta (.663) and the West (.724). The Gini ratio for the U. S. is .683. Of the three largest cotton producing states, Texas has a relatively low Gini ratio of .572, while Mississippi and California are notable for their unequal distribution of payments (Gini ratios of .725 and .723, respectively).¹

The data in Table 3 show the distribution of payments by allotment size. Nationally, almost one-half of the total payments go to allotments of less than 100 acres (Column 6, Table 3). This varies considerably by region, however, with 71 percent of the payments in the Southeast going to allotments of less than 100 acres, compared to only 21 percent in the West. The larger allotments, over 500 acres, received over one-third of the payments in the West, compared to only 2.4 percent in the Southeast. In general, the Southeast is at one extreme and the West at the other, with the Delta and Southwest somewhere in between. These differences in percent of payments by allotment size reflect differences in the average size allotments, yields per acre, and the small farm provisions of the cotton program.

There is some question as to the relevance of any comparison between the Gini ratios computed from direct payments in 1968 and the Gini ratio computed from Bonnen's 1964 estimate of total program benefits. The comparison is completely valid only if the 1968 direct payments represent the total program benefits and if Bonnen's 1964 estimates were unbiased and fully accounted for all benefits. Although neither criterion may be completely met, the margin of error would appear to be relatively small. In any

case some comparisons will be made, the validity of which will be left to the judgment of the reader.

The data in Table 4 allow us to make some observations on the concentration of the payments under the 1968 cotton program compared to benefit estimates of earlier programs. Column 1 of Table 4 shows the Gini ratio computed on the basis of price support payments in 1968. For all major cotton states, the Gini ratio was larger in 1968 than in 1964. The Gini ratio also increased in all regions and nationally from .653 to .725 between 1964 and 1968. This would appear to be a significant change in the level of concentration in price support payments in 1968, compared to total benefits in 1964.

Diversion payments are considerably less concentrated than are price support payments (Gini ratio of .497 compared to .725 nationally). The Gini ratio based on diversion payment did not equal or exceed the Gini ratio based on price support payments in any state. The two ratios were more nearly the same in Texas and Arizona. Part of this phenomenon can be accounted for by the program provisions, including small farm payments. Additional analysis is needed in this area.

The Gini ratio based on total payments (both price support and diversion) is shown in Column 3 of Table 4. Of major cotton growing states, only Missouri and Tennessee have a smaller Gini ratio in 1968 than that computed for 1964. All other states show increased concentration (higher Gini ratios in 1968 than in 1964).

The most relevant comparison of concentration appears to be between the 1968 total payment and the 1964 benefits. On this basis, there appears to have been a significant increase in the concentration of the benefits. The increase in concentration is even more significant if the comparison is between the 1964 estimate and the 1968 price support payment.

In any case, one must conclude that the payments from the 1968 cotton program are quite unequally distributed. It also appears to the author that the distribution has become more unequal over time, since all of the measures previously mentioned indicate more concentration in 1968 than in 1964.

¹One of the interesting characteristics of the Gini ratio is that the regional ratio can be higher than any of the component states (e.g., see the Southwest and Western regions in Table 2). This phenomenon was encountered by Bonnen in his earlier work, and apparently can be accounted for by the difference in the range of the data upon which the state Lorenz curves are based.

TABLE 3. DISTRIBUTION OF 1968 UPLAND COTTON TOTAL PROGRAM PAYMENTS: PROPORTION OF U. S., REGIONAL AND STATE ACCRUING TO FARMERS WITH ACREAGE ALLOTMENTS UNDER OR OVER VARIOUS SPECIFIED SIZES

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Percent of Benefits Accruing to Allotments										
	Under 5 Acres	Under 10.1 Acres	Under 15 Acres	Under 30 Acres	Under 50 Acres	Under 100 Acres	Under 200 Acres	Over 200 Acres	Over 350 Acres	Over 500 Acres	Over 1,000 Acres
Georgia	2.1	21	24	37	50	69	88	12	4	1.7	0.0
Alabama	5.1	34	37	49	58	73	86	14	5	2.5	.6
Florida	5.4	32	39	51	60	80	92	8	0	0.0	0.0
North Carolina	11.3	41	44	54	64	77	89	11	5	3.3	1.3
South Carolina	4.0	24	27	38	50	68	86	14	5	2.9	.4
Virginia	21.8	56	63	73	79	87	97	3	0	0.0	0.0
SOUTHEAST	4.9	29	33	44	55	71	87	13	5	2.4	.5
Arkansas	.8	7	10	20	29	43	61	39	25	17.2	6.7
Illinois	.5	6	9	16	31	42	82	18	0	0.0	0.0
Kentucky	3.8	18	21	34	49	74	94	6	0	0.0	0.0
Louisiana	1.2	15	17	27	36	51	68	32	16	9.0	2.2
Mississippi	2.0	14	16	24	31	41	56	44	27	17.1	5.5
Missouri	2.0	13	17	32	48	69	85	15	9	5.5	1.7
Tennessee	6.2	37	41	58	70	84	94	6	2	1.0	.2
DELTA	2.1	15	18	28	37	51	66	34	21	13.1	4.4
Oklahoma	.5	5	9	25	44	72	91	9	3	1.3	0.0
Texas	.2	2	3	8	18	43	70	30	14	8.4	3.4
SOUTHWEST	.3	2	3	9	20	45	72	28	13	7.9	3.1
Arizona	.1	1	1	2	5	12	29	71	50	38.7	20.4
California	.1	2	3	5	9	20	36	64	50	41.7	28.5
New Mexico	1.0	6	8	18	33	59	81	19	9	6.1	1.5
Nevada	.0	0	0	0	1	6	43	57	46	32.6	32.6
WEST	.2	2	3	6	10	21	38	62	46	37.5	23.5
UNITED STATES	1.6	11	13	21	30	47	67	33	19	13.3	6.3

SOURCE: "1968 Feed Grain, Wheat, and Cotton Programs, Frequency Distribution of Participating Farms, by Size of Allotment of Base," ASCS, USDA Dec. 1968.

TABLE 4. UPLAND COTTON PROGRAM PAYMENTS AND BENEFITS: SUMMARY OF GINI CONCENTRATION RATIOS FOR UNITED STATES, REGIONS AND STATES IN 1964 AND 1968

	1968 Gini Ratios Based on			1964 Price
	Price Support Payments	Diversion Payments	Total Payments	Support Benefit [2]
Alabama	.633	.391	.562	.546
Florida	.727	.426	.627	.483
Georgia	.676	.412	.604	.531
North Carolina	.723	.383	.601	.577
South Carolina	.716	.453	.645	.594
Virginia	.593	.382	.517	.401
SOUTHEAST	.691	.423	.613	.571
Arkansas	.694	.499	.667	.652
Illinois	.624	.464	.601	.650
Kentucky	.650	.317	.597	.613
Louisiana	.692	.417	.645	.628
Mississippi	.776	.475	.725	.701
Missouri	.583	.238	.540	.565
Tennessee	.556	.262	.483	.515
DELTA	.714	.411	.663	.657
Oklahoma	.537	.407	.509	.446
Texas	.581	.535	.572	.530
SOUTHWEST	.591	.533	.580	.542
Arizona	.648	.645	.648	.628
California	.731	.640	.723	.686
New Mexico	.590	.401	.568	.565
WEST	.730	.673	.724	.682
UNITED STATES	.725	.497	.683	.653

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