



earnings in north carolina: an analysis of the industrial mix and local effects

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by **Robert Crow** and **Peter Stroup**

The impressive growth of economic activity in the State of North Carolina since World War II has been accompanied by a rather disappointing performance in per capita personal income. It now seems apparent that the rapid rate of closure between North Carolina and the rest of the United States in per capita personal income has declined in recent years. Further, economic projections indicate that North Carolina will likely continue to experience little growth in per capita income relative to the nation.¹

Per capita personal income is perhaps the most widely accepted and applied social indicator of the quality of life in a region. While per capita income is primarily an economic indicator, both economic and non-economic variables may affect its level. For example, high dependency ratios reflect a relatively lower percentage of the population in working ages and tend to depress per capita income. The labor force participation rate and the unemployment rate account for that part of the working age population actually employed. Together these factors determine the proportion of society employed in the economy. Earnings received in exchange for labor service account annually for more than four-fifths of total personal income in North Carolina, the remainder being composed of proprietors' income, property income, and transfer payments.

While the factors mentioned above are influenced by social, cultural, and institutional forces which constantly change over time, a firm understanding of the current position of the economy is prerequisite to any successful intervention. To this end, the factors currently accounting for the difference in average earnings between North Carolina and the nation as a whole will be examined. This difference is defined as the **earnings gap**. The earnings gap may be considered a product of two distinct effects.

First is the **industrial mix effect**, which accounts for that part of the earnings gap attributable to the differences in the distribution of United States and North Carolina workers among sectors of the respective economies. If the North Carolina economy contained a disproportionately large amount of low-

paying industries, there would be an earnings gap even if all North Carolina employees received the average United States earnings for their respective industries. The second effect is the **local effect**, which accounts for the proportion of the earnings gap accounted for by employees in a North Carolina industry receiving earnings different than the national average for the same industry. Through a modified share analysis, the relative contributions of the two effects to the North Carolina earnings gap may be analytically separated and individually examined.

Define:

- \bar{w}_i^{US} = mean weekly earnings for United States workers in industry i
- \bar{w}_i^{NC} = mean weekly earnings for North Carolina workers in industry i
- ϕ_i^{US} = percent of all United States workers employed in industry i
- ϕ_i^{NC} = percent of all North Carolina workers employed in industry i
- w_i^{US} = average weekly earnings of all United States workers
- w_i^{NC} = average weekly earnings of all North Carolina workers

The earnings gap is by definition $w_i^{US} - w_i^{NC}$, which may be mathematically manipulated to the equivalent form of:

$$(1) \sum_i (\bar{w}_i^{US} - w_i^{US}) (\phi_i^{NC} - \phi_i^{US}) + \sum_i (w_i^{US} - w_i^{NC}) \phi_i^{NC} = \text{earnings gap}$$

Equation (1) is the formulation of the earnings gap to be used in this analysis.

The first term of equation (1), $\sum_i (\bar{w}_i^{US} - w_i^{US}) (\phi_i^{NC} - \phi_i^{US})$, is identifiable as the industrial mix effect and measures the portion of the earnings gap attributable to the relative prevalence of specific industries in the two economies. The industrial mix term is independent of the North Carolina earnings structure, demonstrated by the absence of factor w_i^{NC} . The magnitude of the industrial mix term is determined by the difference between the United States and the North Carolina industrial mix and the national earnings level for each industry.

The industrial mix term would equal zero if the North Carolina industrial mix were identical to that of the United States, as is apparent if ϕ_i^{NC} is replaced with ϕ_i^{US} . Likewise, if all employees nationwide received the same average earnings, there would be no "low-wage" or "high-wage" industries, and the industrial mix term would again equal zero. This can be seen if w_i^{US} is replaced with \bar{w}^{US} . That the industrial mix term in either case would equal zero, regardless of the structure of North Carolina earnings by industry, is true since the industrial mix term is independent of intra-industry regional earnings differentials.

The second term in equation (1), $\sum_i (w_i^{US} - w_i^{NC}) \phi_i^{NC}$, accounts for that part of the earnings gap attributable to the differential in earnings between an industry in North Carolina and earnings in the same industry nationwide. This term is the local effect. If all employees in North Carolina received earnings identical to those of their counterparts nationwide, $w_i^{US} - w_i^{NC}$ would equal zero for all industries, and the local effect would contribute nothing to the gap in average weekly earnings between the United States and North Carolina. Although the term ϕ_i^{NC} is used to weight each industry's contribution to the local effect, the local effect term does not contain the term ϕ_i^{US} and is therefore independent of the variation of industrial mix between the state and the nation.

The disaggregation of the earnings gap into these two independent component parts not only provides a more descriptive formulation of the problem, but is also necessary for the analysis of alternative policy choices to reduce the earnings gap. If the earnings gap is primarily due to industrial mix, ameliorative policy must aim at alteration of the economic structure of the State; if the earnings gap is mainly accounted for by the local effect, programs must strive to narrow the national-State earnings difference within each industry. Thus, the local and industrial mix effects measure two distinct phenomena, each pointing toward a different avenue of intervention.

To analyze the two effects, the North Carolina economy was disaggregated into twenty-nine industrial sectors. For each sector, the local and industrial mix effects were calculated using 1971 data. The specific gap examined pertains to

differences in average weekly earnings. No correction for differences in average numbers of hours worked per week was attempted. Thus this analysis does not identically reflect differences in wage rates but is a close approximation.

results

Results of the analysis are shown in Table I. It is apparent that the earnings gap between the State of North Carolina and the United States is attributable in varying proportions to the effects of both local earnings differentials and industrial mix differentials between the State and the nation as a whole. In the explanation of the results, the following terminology will be used:

Low wage industry - the national average earnings of workers in the industry is below the national average for all industries.

High wage industry - the national average earnings for workers in the industry is above the national average for all industries.

Over-represented industry - the percentage of North Carolina workers in the industry is greater than the national percentage of workers in the industry.

Under-represented industry - the percentage of North Carolina workers in the industry is less than the national percentage of workers in the industry.

industrial mix effect

Nearly thirty-eight percent of the differences between national and State average weekly earnings may be attributed to the adverse effects of the current sectoral mix in the State economy. The figures in Table I reveal a dominance of the State economy by industrial sectors in which earnings are less than the national average of \$126.59. It should be kept in mind, however, that the individual industrial mix figures represent effects of the North Carolina sectoral mix at the prevailing national average weekly earnings in the particular sectors. Thus, the State is penalized for both having a relatively large proportion of employment in sectors in which earnings are below the national average in the nation as a whole and having a relatively small proportion of employment in sectors which have earnings above the overall national average.

There are two groups of industries whose industrial mix components of the earnings gap tend to increase the difference between North Carolina and United States average weekly earnings:

I. low wage - over-represented industries

- Agriculture, Forestry, and Fisheries
- Tobacco Products
- Textile Mill Products
- Apparel and Needle Products
- Furniture and Fixtures

Group I accounts for over thirty-four percent of North Carolina employment but less than ten percent nationwide. As a group, the low wage - over represented industries account for \$6.64 of the industrial mix component of the earnings gap.

II. high wage - under-represented industries

- Mining and Quarrying
- Food and Kindred Products
- Petroleum and Coal
- Printing and Publishing
- Rubber Products
- Stone, Clay, and Glass Products

Group II industries employ less than nineteen percent of the North Carolina labor force as compared to the national average of over thirty-one percent. This group of high wage - under-represented industries accounts for \$4.43 of the industrial mix component of the earnings gap.

The two groups of industries which tend to decrease the industrial mix component of the earnings gap are:

III. high wage - over-represented industries

- Construction
- Lumber and Wood Products
- Motor Freight

Group III accounts for 8.7% of the North Carolina labor force, while nationwide the comparable figure is 7.6%. Due to the slight over-representation of these

industries, this group **decreases** the industrial mix component of the earnings gap by \$0.38.

- Leather Products
- Wholesale and Retail Trade
- Finance, Insurance, and Real Estate
- Services
- Miscellaneous Manufacturing

IV. low wage - under-represented industries

Group IV employs 38.3% of the North Carolina labor force, compared to 51.4% nationwide. Since employees in these industrial sectors receive earnings below the national average for all industries, the under-representation of this group in North Carolina **decreases** the industrial mix component of the earnings gap by \$2.79.

The relative predominance in North Carolina of industries in groups one and two overshadows the favorable effects of groups three and four. Overall, the cumulative effect of the differential variation in North Carolina and United States industrial mix accounts for \$7.91 of the \$21.34 North Carolina earnings gap.

Of the \$21.34 difference in average weekly earnings, \$13.43, roughly sixty-two percent, is directly attributable to workers in a specific industry in North Carolina earning less than the national average for that same industry. It is noteworthy that in only four of the twenty-eight sectors examined were North Carolina average weekly earnings higher than comparable national figures. These four sectors, tobacco products, professional and scientific instruments, wholesale and retail trade, and finance insurance and real estate, account for twenty-three percent of the employed labor force in the State.

local effect

The remaining seventy-seven percent of the employed labor force in North Carolina works in sectors in which earnings are below national sectoral averages. Deficits in average weekly earnings range from \$3.23 in paper and allied products to \$88.68 in contract construction. North Carolina employees in the later sector earn less than sixty percent of the national average. The construction sector alone contributes \$4.88 of the \$13.43 deficit attributable to North Carolina's local effect.

With the exception of the four sectors with earnings above national averages and the construction industry, contributions to the gap in average weekly earnings are relatively evenly distributed among the remaining sectors. Notable contributors to the local effect are: services (\$1.53); agriculture (\$.95); transportation, communication, and utilities (\$.77); textile mill products (\$.76); and food and kindred products (\$.72).

The total effect of any given industry on the earnings differential is the sum of the local effect plus the industrial mix effect. The primary overall contributors to the \$21.34 gap in average weekly earnings are: construction (\$4.71); textiles (\$3.56); transportation, communication, and utilities (\$1.46); public administration (\$1.39); transportation equipment (\$1.38); and apparel (\$1.21). Several other sectors, including food and kindred products, furniture, primary metals, electrical machinery, and non-electrical machinery also contribute substantially.

total effect

Of the twenty-nine sectors, only five contribute negatively to the earnings gap; that is, on the balance their relative earnings and mix tend to reduce the earnings differential. Four of the five sectors are low wage, under-represented industries whose relative absence in the North Carolina economy tends to offset the detrimental effects of the industry on average earnings. The remaining industry is tobacco manufacturing, a low wage, over-represented industry, which reduces the gap slightly because of its local effect.

It is noteworthy that none of the high wage industries, whether over- or under-represented in the North Carolina economy, currently contribute to a decrease in the earnings gap. For the three high wage, over-represented sectors, the possible gains due to the favorable industrial mix are more than offset by the low earnings in these sectors when North Carolina is compared to national figures. The most striking example is the construction industry, whose local

effect of \$4.88 dominates the favorable industrial mix effect of -\$0.17. In the sixteen high wage, under-represented industries, the principle reason for the absence of a reduction in the earnings gap is the under-representation of the industries themselves. However, many of these industries suffer significant local effects as well. The transportation equipment sector, for example, contributes \$0.32 and \$1.06 to the local and industrial mix effects, respectively, for a total contribution in the earnings gap of \$1.38.

TABLE 1
CONTRIBUTIONS TO AVERAGE WEEKLY EARNINGS GAP

INDUSTRY GROUP	SIC	LOCAL EFFECT	INDUSTRIAL MIX EFFECT	TOTAL EFFECT
Agr., For., Fish.	01-09	\$0.94	\$2.64	3.58
Min. & Quarrying	10-14	0.09	.27	.36
Construction	15-17	4.88	-.17	4.71
Food & Kindred Prod.	20	0.72	.04	.76
Tobacco Manufacturers	21	-0.25	.13	-.12
Textile Mill Prod.	22	0.76	2.80	3.56
Apparel & other Needle	23	0.45	.76	1.21
Lumber & Wood	24	0.44	-.002	.44
Furniture & Fixtures	25	0.42	.31	.73
Paper & Allied Prod.	26	0.03	.00	.03
Printing & Pub.	27	0.25	.21	.46
Chemicals	28	0.40	.00	.40
Petroleum & Coal	29	0.007	.19	.20
Rubber Products	30	0.13	.01	.14
Leather & Leather Prod.	31	0.01	-.05	-.04
Stone; Clay & Glass	32	0.23	.05	.28
Primary Metal Ind.	33	0.13	.62	.75
Fabricated Metal	34	0.19	.24	.43
Nonelectrical Mach.	35	0.50	.35	.85
Elec. Mach., Equip. & Sup.	36	0.60	.03	.63
Trans. Equip.	37	0.32	1.06	1.38
Prof. & Sci. Ind.	38	-0.002	.05	+.05
Misc. Man.	39	0.04	-.04	0.00
Trans., Comm., Utilities except Motor Freights	40-41 43-49	0.77	.69	1.46
Motor Fr. Trans & Wh.	42	0.44	-.21	.23
Wholesale & Retail Trade	50-59	-0.95	-1.03	-1.98
Finance, Ins, Real Es.	60-67	-0.41	-.09	-.50
Service Ind.	70.89	1.53	-1.58	-.05
Public Admin.		0.76	.63	1.39
TOTAL		\$13.43	\$7.91	\$21.34
Total as % of earning gap		62.9%	37.1%	

reducing the gap

Currently, the principle contribution to the differential in average weekly earnings between North Carolina and the United States as a whole is attributable to the local effect of low earnings in the State as compared to the nation as a whole. It is useful to examine appropriate policies for the reduction of the gaps in terms of the four industrial groups outlined previously.

Group I includes the low wage, over-represented industries of agriculture, tobacco, textiles, apparel and furniture. Together, they account for forty-two percent of the earnings gap. Since the principle detrimental effect of these sectors is their relative predominance in the North Carolina economy, adjusting earnings to closely approximate national earnings in these industries would have little effect in reducing their contribution to the earnings gap. The adverse effects of group one industries are best ameliorated by orienting future industrial development away from these industries so as to reduce the proportion of the North Carolina labor force working in these sectors. While an increase in the share of these industries in North Carolina may seem sound, it will only serve to widen the average earnings gap between the State and the nation as a whole, barring the unlikely development of a local negative local effect.

Group II includes sixteen high wage, under-represented industrial sectors. In this case, North Carolina's average earnings are adversely affected by the

relative absence of these industries in the State economy and also, to a lesser extent, by the lower weekly earnings accruing to North Carolinians in these sectors. While it is important to insure that North Carolina workers in these sectors receive at least national earnings levels, future development policy is critical. To reduce the earnings gap, expansion of these industries at the expense of group one industries is appropriate.

Group III includes the three high wage industries in which North Carolina has a relatively larger share of employment than the nation. While the over-representation is a plus for the State in terms of industrial mix, North Carolina suffers from low average weekly earnings accruing to employees in these sectors. To reduce the contribution of these industries to the earnings gap, it is therefore imperative to raise weekly earnings relative to the nation. This would reduce the overall earnings gap by twenty-eight percent.

Group IV includes five low wage, under-represented industries. Currently, North Carolina benefits by the relative absence of these sectors in the State economy. The only contribution to narrowing the earnings gap which may ever be made by these sectors is through continuing the under-representation and through an increase in average earnings relative to the nation.

The differential between North Carolina's average weekly earnings and that of the nation as a whole is attributable to lower earnings accruing to North Carolina employees for equivalent work and the over-representation of low paying industrial sectors in the State economy. To reduce the differential, State policy could be directed at correcting the local effect. This action alone would reduce the earnings gap by nearly sixty-three percent. Further, the remaining thirty-seven percent of the earnings gap may be narrowed by appropriate future industrialization of the State, favoring high wage over low wage industrial sectors.

Throughout this investigation, the United States economy has been taken as the norm, and policy interventions have been discussed in terms of moving the North Carolina economy closer to the national average. Of course, North Carolina economic development need not view the national average as a ceiling, to be approached only asymptotically. Naturally, some states are well above the national average weekly earnings level. However, the analysis will still prove useful, even if this were the case for North Carolina. The only difference would be that the total gap would be negative, and policies to raise per capita personal income would still strive to reduce (make more negative) the local and industrial mix effects.

Footnotes

10.c.f. United States Water Resources Council, **1972 OBERS Projections: Regional Economic Activity in the United States**, (Washington: September, 1972), p. 140.