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*The Journal of Economic History*, Vol. 58, No. 3. (Sep., 1998), pp. 659-683.

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# *Economic Integration and Convergence: U.S. Regions, 1840–1987*

SUKKOO KIM

Between the nineteenth and twentieth centuries, the regions of the United States went from a set of relatively isolated regional economies to an integrated national economy. Economic integration, as well as long-run secular changes in the economic structure associated with economic growth, played an important role in determining U.S. regional industrial structures. Moreover, although differences in regional industrial structures do not explain all the variations in regional income per capita, they played an important role in causing U.S. regional incomes to diverge and converge between the nineteenth and twentieth centuries.

One of the most salient trends in history is the integration of regional and national economies into a global economy.<sup>1</sup> The processes of integration involve reductions in the barriers to trade imposed by the physical costs of transportation and communications and in the political barriers erected by various polities. Throughout history, technological innovations in transportation and communication have continuously increased the geographic mobility of goods, factors, and information.<sup>2</sup> Over the long run, political barriers have also fallen, even if not always monotonically.<sup>3</sup> How will global integration affect the fortunes of regional and national economies? Will regions and nations turn into cores and peripheries? Will the early developers benefit at the expense of latecomers? Or will regions and nations converge in incomes?

Economic integration provides two sources of income convergence: one specified by models of growth and another by models of trade. The neoclassical Solow growth model argues that regional incomes differ because of differing capital-labor ratios. In this model, regions with higher initial capital-labor ratios are richer because workers in those regions are more productive. Economic integration in factors significantly increases the pace

*The Journal of Economic History*, Vol. 58, No. 3 (Sept. 1998). © The Economic History Association. All rights reserved. ISSN 0022-0507.

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Comments from Ed Glaeser, Charles Leven, Gary Libecap, Kenneth Sokoloff, and two anonymous referees are gratefully acknowledged. The author thanks Washington University for financial support through the faculty research grant program.

<sup>1</sup> See Krueger, "Threats"; and Williamson, "Globalization," for a discussion on long-run trends in globalization.

<sup>2</sup> The fall in transportation costs is not solely caused by innovations in transportation technology. North ("Ocean Freight Rates") estimated that the elimination of piracy, which led to the reorganization of ships, contributed significantly to the increase in productivity of ocean shipping from 1600 to 1850.

<sup>3</sup> In many instances, political barriers have been the binding constraints to integration. For example, Heckscher (*Mercantilism*) wrote that the greatest obstacles to trade in the Middle Ages were the tolls.

of income convergence in the growth model because labor and capital mobility speed up the rate at which capital-labor ratios converge.<sup>4</sup> The neoclassical Heckscher-Ohlin trade model argues that incomes of regions vary because of differing factor endowments and factor prices.<sup>5</sup> Economic integration and trade in goods lead to income convergence through factor price equalization. However, the convergence in factor returns does not lead to full convergence in aggregate incomes. Because regions differ in factor endowments, regions will specialize in different industries. Indeed, from the trade perspective, differences in aggregate incomes can only result from differences in regional industrial structures. Thus, if regional factor endowments become more dissimilar over time, then incomes may diverge as regional industrial structures diverge. Conversely, if factor endowments become more similar over time, then aggregate incomes must converge because both factor prices and industrial structures converge.

Economic integration also provides two sources of income divergence. The models of growth based on increasing returns in physical or human capital externalities, advanced by Paul Romer and Robert Lucas respectively, predict the possibility of income divergence.<sup>6</sup> In these models, regions with higher levels of physical or human capital can become even more wealthy as increasing returns reinforce their initial advantages. The models of trade based on increasing returns advanced by Paul Krugman also predict the possibility of income divergence through the divergence in industrial structures.<sup>7</sup> If high-tech, high-wage industries are subject to external economies, then the opening up of trade will cause the concentration of all the high-tech, high-wage industries in a few regions. This in turn causes regional incomes to diverge as the remaining regions are left with only the low-tech, low-wage industries.

The regions of the United States provide a unique opportunity to study the long-run effects of integration on regional income convergence and divergence.<sup>8</sup> After gaining their independence from Great Britain, the thirteen

<sup>4</sup> In the Solow ("Contribution") growth model, there is no role for trade because regions produce identical products. Consequently, economic integration characterized by goods mobility has little impact on income convergence. However, it is important to note that in the Solow growth model, regional incomes converge in the steady state even if the regional economies are closed. Given the assumption of diminishing returns to capital, poorer regions accumulate capital at a faster rate through domestic savings.

<sup>5</sup> Income per capita ( $PI$ ) for any two regions in terms of factor earnings is:  $PI_i = (w_i L_i + r_i K_i) / L_i = w_i + r_i (K_i / L_i)$ , for regions  $i = 1, 2$ . Thus, prior to economic integration, incomes of two regions may differ because both factor prices and factor endowment ratios can differ. When the two regions open up trade, the factor price equalization theorem predicts the convergence of  $w$  and  $r$  between the two regions so that the  $PI_i = w + r (K_i / L_i)$  between the two regions differ only by factor endowment ratios. However, if factors become mobile, then  $K / L$  also converges and  $PI$  of both regions must be identical. See Dollar and Wolff, *Competitiveness*; and Slaughter, "Per Capita Income Convergence."

<sup>6</sup> Romer, "Increasing Returns"; and Lucas, "On the Mechanics."

<sup>7</sup> Krugman, *Geography*.

<sup>8</sup> See Williamson, "Globalization"; and Alan Taylor, *Convergence*, for analysis on the role of international factor mobility on globalization.

former colonies began as a collection of independent sovereign states each with its own constitution and currency. These independent states faced enormous challenges to forging a new nation that was both politically and economically integrated. This loose confederation of states needed to invent a politically feasible mechanism for not only forming a union of formerly independent states, but eventually for incorporating vast new territories to the West. In addition establishing a system of speedy communication and transportation across the continent was equally challenging. However, between the nineteenth and twentieth centuries the United States overcame both the political and physical barriers and transformed itself from a set of regional economies to an integrated national economy.

The growing economic integration brought about significant changes in the patterns of U.S. regional specialization and industrial development. In agriculture, economic integration led to greater regional specialization in crops between the nineteenth and twentieth centuries. In manufacturing, economic integration first led to greater regional specialization at the two-digit industry level between the mid-nineteenth and the early twentieth centuries; however, over the second half of the twentieth century the trend reversed dramatically. In services, economic integration led to regional despecialization. Regional specialization in wholesale trade, retail trade, and other services at the two-digit industry level was quite low for most of the twentieth century. At the broad sectoral one-digit industry level, regional specialization increased between the nineteenth and the early twentieth centuries as the U.S. industrial structure shifted from converged as services became increasingly more important.

This article finds that the long-run trends in U.S. regional specialization or regional industrial structures are explained by the neoclassical Heckscher-Ohlin model of trade. However, the secular rise in incomes also contributes to explaining the long-run trends. In the short run, regional industrial structures are determined by the level of economic integration and trade. In the long run, however, industrial structures may change for secular reasons. Because the potential for regional specialization differs significantly for different sectors of the economy, the secular shift in industrial structures from agriculture to manufacturing and then to services has had an enormous influence on the overall level of U.S. regional specialization. Thus, any long-run study that examines the correlation between incomes and industrial structures must contend with secular changes in industrial structures as well as changes brought on by economic integration and trade.

The article also finds that although the regional industrial structures do not completely explain all the variations in regional income per capita, they played an important role in causing the divergence and convergence of U.S. regional income per capita. The divergence and convergence of regional

industrial structures at the broad one-digit industry category between the mid-nineteenth and the mid-twentieth centuries seem to have played a significant role in explaining the divergence and convergence of U.S. regional income per capita. However, the rapid convergence of regional income per capita over the second half of the twentieth century may have been caused by the convergence of regional industrial structures at both the broad one-digit industry level and the two-digit industry levels in manufacturing and in services. Throughout, differences in earnings within industries also contributed to explaining the divergence and convergence of U.S. regional income per capita.

#### THE INTEGRATION OF U.S. REGIONAL ECONOMIES

The early American republic faced enormous physical and political challenges to integrating its economy. The nation's roads were primitive and travel was largely limited to navigable waters. The political challenges to integration were even greater. There was no historical precedent for peacefully integrating sovereign states into one federation, and indeed, the first attempt was a failure. The Articles of Confederation did little to reduce sectional frictions. Yet despite these problems, the United States was able to overcome the barriers to interregional trade and successfully integrated its regional economies. By the early twentieth century the integrated U.S. economy possessed the largest domestic market in the world.

The Constitution of the United States laid a firm political foundation for economic integration by prohibiting taxes and duties on interstate commerce and by ensuring interstate mobility of people and capital.<sup>9</sup> In fiscal terms, however, the federal government played a relatively minor role until the second half of the nineteenth century. In an era when cities performed wholesale market functions for extractive industries, states and cities competed to become commercial centers for the region and the nation. Yet, the constitution constrained the scope of the political economy of disunion. Rather than erecting trade barriers, the states competed by building intrastate transportation networks to promote markets and by rejecting the spending of federal funds on projects in competing states. A number of federal pro-

<sup>9</sup> Although the Constitution prohibited states from issuing their own currencies, the United States did not have a single common currency until the early twentieth century. Prior to the founding of the Federal Reserve in 1914, a variety of paper monies circulated at any given time. Among the different monies were private bank notes, national bank notes, and non-interest-bearing U.S. Treasury notes called greenbacks issued in 1862. Although the proliferation of different currencies is likely to have increased the costs of doing business over long distances, the gold and the bimetallic standards of the times essentially fixed exchange rates between the states so that the varieties of currencies probably did not adversely affect interregional trade to a significant degree. However, some financial economic historians argue that the fragmented banking system resulting from the prohibition of branch banking in many states resulted in capital immobilities (see Calomiris and Ramirez, "Financing the American Corporation").

jects were voted down or vetoed due to sectional rivalries and questions concerning constitutionality.<sup>10</sup> The net effect of these rivalries probably was an inefficient national transportation system with too many canals and railroads in some states and too few in others. Nonetheless, the signs of the emergence of a national transportation system were unmistakable.

The political problems of integration were not limited to the construction of a national transportation system. The acquisition of vast new territories and the rise of North-South sectional frictions over tariffs and slavery ultimately led to the complete disunion of the republic. Although the Northwest Ordinance specified an orderly procedure for converting the vast new territories into states, sectional politics made such transitions a delicate operation. As sectional differences finally came to a head, eleven states seceded from the Union and formed the new Confederate States of America between December 1860 and May 1861. Because the Constitution had made no provision for the orderly secession of states, peaceful disintegration of the Union was a distinct possibility. However, the movement toward political disintegration was halted militarily by the northern states.

Had the political dissolution of the United States endured, the political barriers would have significantly hindered the pace of economic integration of the continental North America. Instead, the results of the Civil War quickened the pace of integration. In its aftermath political and economic forces worked together to bind the states more closely and to remove the physical barriers to trade. The federal government's commitment to integration strengthened as it subsidized the building of a transcontinental railroad by granting enormous tracts of land.<sup>11</sup> Between 1860 and 1890 national transportation and communication systems were established to coordinate the emerging interregional traffic flows. During those years, the national railroad and telegraph mileage increased exponentially from 30,626 to 166,703 and 50,000 to 19,382,000 respectively.

#### ECONOMIC INTEGRATION AND U.S. REGIONAL SPECIALIZATION

The U.S. regions were able to establish sizeable population levels prior to their rapid integration. Early in the nineteenth century the population was concentrated along the eastern seaboard states in the New England, Middle Atlantic, and South Atlantic regions. However, the incentive to migrate increased as the population grew. Given the importance of land in an agricultural economy and the relative abundance of land in the west, people

<sup>10</sup> See Meinig, *Shaping of America*, p. 334; and George Taylor, *Transportation Revolution*, p. 95.

<sup>11</sup> Following the Civil War, the Congress "gave to the four transcontinental roads alone 100 million acres, 10 percent of the public domain, in order to encourage railroad construction. Land grants to all railroads totaled 131 million acres, and the states added additional 49 million acres to spur on the railroads" (Hughes and Cain, *American Economic History*, p. 276). The western bias of the land grants is easily seen in figure 14.2, *ibid.*, p. 277.

migrated to that region. The costs of migration were high but the expected benefits were even higher. By the late nineteenth century, the percentage of people residing in the New England and South Atlantic regions fell sharply, the percentage in the Middle Atlantic region remained relatively constant, and in most other regions it rose significantly. Although the regional distribution of the U.S. population continued to change during the twentieth century, significant regional economies formed through migration and natural population increase by the late nineteenth century.<sup>12</sup>

The index of regional specialization captures the differences in the industrial structure of regions. The index of regional specialization is defined as:

$$SI_{ij} = \sum_{i=1}^n \left| \frac{E_{ij}}{E_j} - \frac{E_{ik}}{E_k} \right|$$

where  $E_{ij}$  is the level of employment industry  $i = 1, \dots, n$  for region  $j$  and  $E_j$  is the total industrial employment for region  $j$  and similarly for region  $k$ .<sup>13</sup> If the index is equal to zero, then the two regions,  $j$  and  $k$ , are completely despecialized and the industrial structures of the two regions are identical. Moreover, if factor prices equalize across the two regions, the two regions should also have identical income per capita because each region has the same proportion of its labor force in each of the industries. On the other hand, if the index is equal to two, then the regions are completely specialized and possess completely different industrial structures. Because each region has its workforce in completely different industries, there is no reason for income per capita to converge or diverge even if factor prices equalize. Indexes of regional specialization are calculated for each of the 36 bi-regional comparisons (of nine census divisions) and these indexes are averaged to derive an overall measure of U.S. regional specialization.

### *Regional Specialization in Agriculture*

The data on the value of output of various agricultural products are used to calculate the index of regional specialization for agriculture.<sup>14</sup> For reasons of historical comparability, the following agricultural products are used: wheat, barley, corn, oats, rye, cotton, tobacco, and vegetables.<sup>15</sup>

<sup>12</sup> See U.S. Bureau of the Census, *Census of Population*, various years.

<sup>13</sup> The index is from Krugman, *Geography*. For a more detailed discussion on the index see Kim, "Expansion" (1995).

<sup>14</sup> Unfortunately, data on employment by agricultural crops are unavailable.

<sup>15</sup> Data prior to 1900 are given in gross output form such as bushels and pounds. Prices from U.S. Bureau of the Census, *Historical Statistics of the United States*, are used to convert output into value terms. Due to the difficulty of obtaining regional agricultural prices, it is assumed that prices are equal across regions. The data for earlier years up to 1920 are from U.S. Bureau of the Census, *Census of Agriculture*; data for 1956 to 1987 are from U.S. Bureau of the Census, *Agricultural Statistics*.

The continental United States, given its vast geographic variation in topography, soil, climate, and rainfall, possesses great potential for territorial division of labor in agriculture.<sup>16</sup> The U.S. regions achieved significant levels of specialization by the mid-nineteenth century as the early American economy was based on exports of agricultural products. As these regions became more economically integrated, regional specialization in agriculture increased even more. The index of regional specialization rose steadily from 0.98 to 1.25 between 1870 and 1987 (see Figure 1).<sup>17</sup> The increase in regional specialization in agriculture was accompanied by significant geographic reallocation of major agricultural production such as wheat, corn, cattle, and dairy and by continued geographic concentration of crops such as cotton and tobacco in established areas.<sup>18</sup>

### *Regional Specialization in Manufacturing*

The data on manufacturing employment by 20 two-digit industries are used to construct the index of regional specialization for manufacturing. The data for 1860 and 1900 are from Albert Niemi, who categorized the raw data into two-digit industries using the 1963 standard industrial codes.<sup>19</sup> Because Niemi omitted the Mountain and Pacific regions, the data for these two regions were added.<sup>20</sup> The 1972 census definitions and Niemi's product list are used to categorize the raw data for years prior to 1939 into two-digit industries.

Regional specialization in manufacturing, after a slight decline between 1860 and 1890, rose substantially toward the turn of the twentieth century. The level of regional specialization flattened out during the interwar years but then fell continuously and substantially through 1987 to the point where regions were less specialized than they were in 1860. The aggregate index of regional specialization for manufacturing, calculated using census divisions and the two-digit SIC employment levels, was 0.69 in 1860, fell to 0.61 in 1890 before increasing to 0.75 in 1900. The index plateaued at 0.89, 0.86, and 0.87 in 1914, 1927, and 1939 respectively, and then fell to historic low levels of 0.45 in 1987 (see Figure 1).<sup>21</sup>

<sup>16</sup> See Baker, "Agricultural Regions"; and Haystead and Fite, *Agricultural Regions*.

<sup>17</sup> Kim ("Economic Integration," table 1) provides complete information on the 36 biregional indexes of regional specialization for agriculture.

<sup>18</sup> See Kim, "Economic Integration," for more details.

<sup>19</sup> Niemi, *State and Regional Patterns*.

<sup>20</sup> The remaining data are from U.S. Bureau of the Census, *Census of Manufactures and Annual Surveys of Manufactures*.

<sup>21</sup> Kim ("Economic Integration," table 3) provides complete information on the 36 biregional indexes of regional specialization for manufacturing. The qualitative pattern of regional specialization found at the two-digit level using census divisions is robust to how regions and products are defined. Similar results are obtained if the products are defined at the three-digit level or if the regions are defined at the state level. For details see Kim, "Expansion" (1995).

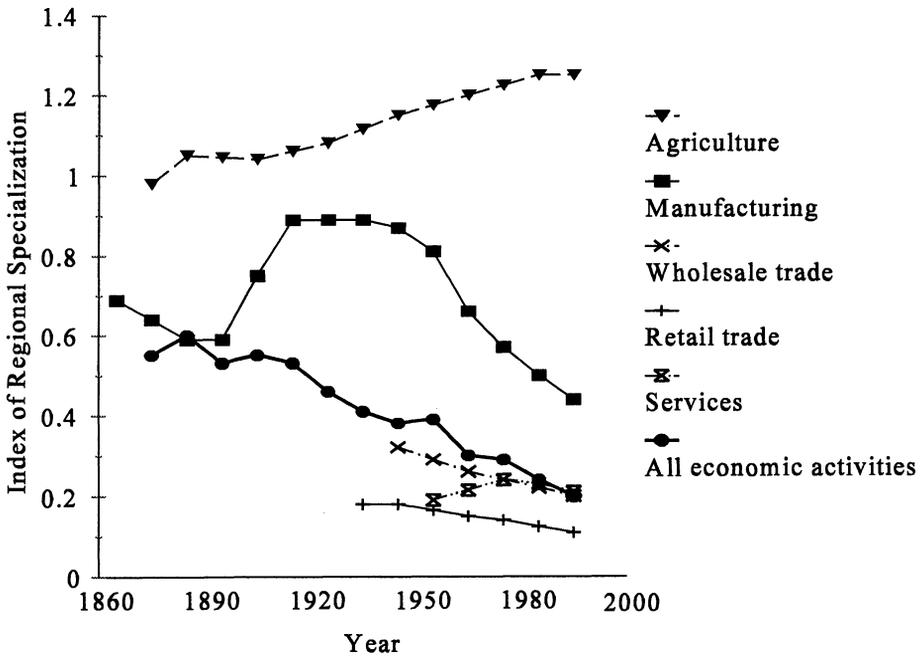


FIGURE 1  
U.S. REGIONAL SPECIALIALIZATION, 1860-1987

Source: See the text.

### *Regional Specialization in Wholesale and Retail Trade*

The data on wholesale and retail trade employment are used to calculate their respective indexes of regional specialization.<sup>22</sup> For wholesale trade, the data are categorized at the 20 two-digit industry levels that coincide with the definitions for manufacturing industries.<sup>23</sup> For retail trade, the data was categorized at the current two-digit retail industry definitions.<sup>24</sup>

Regional specialization in wholesale trade was relatively low in 1939 and continued to decline over the twentieth century. The index of regional specialization was 0.32 in 1939, fell to 0.26 in 1958, and then declined further to 0.20 in 1987 (see Figure 1).<sup>25</sup> The level of regional specialization in retail trade was lower than in wholesale trade and exhibited similar trends over

<sup>22</sup> The data for 1929 and 1939 are from U. S. Bureau of the Census, *Census of Distribution*; the data from 1954 to 1987 are from U.S. Bureau of the Census, *Census of Business*, *Census of Wholesale Trade*, and *Census of Retail Trade*.

<sup>23</sup> The current wholesale trade two-digit industries consist of two broad categories—durable and nondurable goods. The individual three-digit and four-digit industries were used to categorize the wholesale data into two-digit industries comparable to the census of manufactures.

<sup>24</sup> The retail trade industries consist of food and general stores, general merchandise, apparel, furniture, automotive, filling stations, eating, drug stores, and other.

<sup>25</sup> Kim ("Economic Integration," table 4) provides complete information on the 36 biregional indexes of regional specialization for wholesale trade.

time. The index of regional specialization in retail trade was 0.18 in 1929 and fell consistently to 0.11 in 1987 (see Figure 1).<sup>26</sup>

### *Regional Specialization in Services*

Regional specialization in services was low and remained low between 1947 and 1987.<sup>27</sup> The index of regional specialization for services was 0.19 in 1947, rose slightly to 0.24 in 1967, and remained stable at 0.23 and 0.21 in 1977 and 1987 respectively (see Figure 1).<sup>28</sup>

### *Regional Specialization in All Economic Activities*

Data on one-digit sectoral employment are used to calculate the index of regional specialization for all economic activities. The one-digit industries for the period between 1870 to 1950 include agriculture, mining, forestry, fishing, manufacturing, and services.<sup>29</sup> The one-digit industries for the period between 1939 and 1987 are slightly more comprehensive and include agriculture, mining, construction, manufacturing, transportation, wholesale trade, retail trade, finance, services, and government.<sup>30</sup>

Regional specialization in the overall economy rose through the nineteenth century, leveled off between the late nineteenth and the early twentieth centuries, and then fell precipitously through most of the twentieth century. The index of regional specialization in all activities increased slightly from 0.50 to 0.60 between 1870 and 1880 but then remained at 0.53 between 1880 and 1910. However, between 1939 and 1987, the index of regional specialization in all economic activities fell from 0.50 to 0.20 (see Figure 1).<sup>31</sup>

## EXPLAINING THE TRENDS IN U.S. REGIONAL SPECIALIZATION

Few scholars question the proposition that the location of agricultural products is predominantly explained by the Heckscher-Ohlin model. As land

<sup>26</sup> Kim (*ibid.*, table 5) provides complete information on the 36 biregional indexes of regional specialization for retail trade.

<sup>27</sup> The data on service employment at the two-digit industries from U.S. Bureau of the Census, *County Business Patterns*, are used to construct the index of regional specialization for services. Services in this study consist of hotel and other lodgings, personal services, business services, auto repair, services, and garages, miscellaneous repair services, motion pictures, amusement and recreational services, health services, legal services, educational services, social services, museums and botanical zoological gardens, membership organizations, and miscellaneous services.

<sup>28</sup> Kim ("Economic Integration," table 6) provides complete information on the 36 biregional indexes of regional specialization for services.

<sup>29</sup> The data for the period between 1870 and 1950 are from Perloff et al., *Regions*.

<sup>30</sup> The data for the period between 1939 and 1987 are from U.S. Bureau of the Census, *Census of Agriculture, County Business Patterns, and Census of Governments*.

<sup>31</sup> Kim ("Economic Integration," table 7) provides complete information on the 36 biregional indexes of regional specialization for all economic activities.

is immobile and agricultural crops are intensive in land, the Heckscher-Ohlin model predicts that agricultural products will be produced in regions with comparative advantages in the various agricultural crops. The location of various agricultural crops is determined by the qualities of land, which are functions of topography, climate, rainfall, and soil. The topography or physical relief of a region determines the type and intensity of crop production. The climate, which is primarily a function of latitude, determines the length of the growing season. The northern-most regions of the United States average fewer than 90 days of growing season whereas the southern-most average more than 240 days. The average annual precipitation, in general, rises from west to east, except for the northern pacific coast; in the eastern half of the United States, it rises from north to south. However, the more pertinent statistic, the percentage of rainfall received during the warm months, April to September, differs from the average annual patterns. The fertile regions of the Midwest tend to receive the most rainfall during this period. Finally, regional soil quality depends largely upon the geomorphology of its region.<sup>32</sup>

Scholars remain divided on whether the location of manufacturing is driven by regional comparative advantage or external economies of scale. The concentration of manufacturing activities in the manufacturing belt between the late nineteenth and the early twentieth centuries has been used by numerous writers as evidence for the importance of some kind of increasing returns. Moreover, the rise of two regions, the “manufacturing belt” and the “South,” during this period has been used as evidence for the emergence of core and periphery regions.<sup>33</sup>

The long-run trends in U.S. regional specialization and localization are more consistent with explanations based on the Heckscher-Ohlin model and production scale economies and inconsistent with explanations based on external economies.<sup>34</sup> In particular, the proponents of models based on increasing returns fail to note that the core and periphery regions—if they ever existed during the late nineteenth and the early twentieth centuries—have all but disappeared during the twentieth century. Contrary to the predictions of the models based on externalities, regional specialization in manufacturing has decreased rather than increased significantly since the mid-twentieth century.

<sup>32</sup> Technical advances in harvesting, manufacturing, and horticulture also contributed to the enhancement of geographic advantages in agriculture. For example, the invention of mechanical reapers and threshers, the introduction of hard winter and spring wheat, and the development of the automatic, all-roller, gradual reduction flour milling system gave significant regional comparative advantage in wheat growing to the Midwestern regions of the United States. The introduction of refrigerated cars and improvements in sanitation and pasteurization, which allowed the long distance shipments of meat and dairy products, increased the comparative advantage of corn- and hay-growing regions. See Baker, “Agricultural Regions,” pp. 460–61.

<sup>33</sup> See Krugman, *Geography*; and Meyer, “Emergence,” among others.

<sup>34</sup> This argument is presented in Kim, “Expansion” (1995).

The trend in U.S. regional specialization of manufacturing can be explained by changes in the relative mobility of factors within the context of the Heckscher-Ohlin model and changes in scale economies.<sup>35</sup> As transportation costs fell between the late nineteenth century and the turn of the twentieth century, firms adopted large scale production methods that were intensive in relatively immobile resources and energy sources. The rise in scale and the use of immobile resources caused regions to become more specialized. However, as factors became increasingly more mobile and as technological innovations favored the development of substitutes, recycling, and less resource-intensive methods during the twentieth century, regional resource differences diminished. The growing similarity of regional factor endowments and the fall in scale economies caused regions to become despecialized between World War II and today.<sup>36</sup>

The long-run trends in regional specialization in wholesale and retail trade and other services also seem more consistent with explanations based on the Heckscher-Ohlin model. The most significant input for services, labor, is mobile; whereas the final “goods” of many services is quite geographically immobile because the receipt of these services requires that production and consumption occur in the same location. As inputs to most services are more mobile than final goods, the Heckscher-Ohlin model predicts a low level of regional specialization; by contrast the increasing returns model predicts a high level of regional specialization. As predicted by the Heckscher-Ohlin model, regional specialization in these service industries was low and remained low over time.

The long-run trend in regional specialization at the broad one-digit sectoral level is explained by the secular rise in incomes and the Heckscher-Ohlin model. Because agriculture, manufacturing, and services exhibited considerably different patterns of regional specialization, the structural shift in industrial structures brought on by the secular rise in incomes had a pronounced impact on regional specialization of the overall economy. As the overall industrial structure shifted from agriculture to manufacturing between the early nineteenth and the early twentieth centuries, regional specialization at the one-digit level rose. The northern region became specialized in manufacturing whereas the southern region remained specialized in agriculture. However, since the mid-twentieth century the diminished relative importance of agriculture and manufacturing and the rising importance of services have led to a dramatic convergence in the U.S. regional economic structures.

<sup>35</sup> See *ibid.* for this argument.

<sup>36</sup> See Kim, “Expansion” (1993) and “Expansion” (1995), for more details. For additional evidence, see Kim, “Regions” and “Urban Development.”

## EXPLAINING THE TRENDS IN U.S. REGIONAL INCOME PER CAPITA

The historical trends in U.S. regional income per capita have been well documented by Richard Easterlin and a number of other scholars.<sup>37</sup> In 1840 when the U.S. regions were relatively isolated, the regional incomes were quite similar.<sup>38</sup> As the U.S. regions became integrated between the nineteenth and the early twentieth centuries, the regional income per capita diverged. The most significant cause of regional income divergence was the sharp relative decline in Southern income per capita. During the first half of the twentieth century, regional income per capita converged, but the Southern income per capita remained well below the national average. However, since the mid-twentieth century regional income per capita, including that of the South, rapidly converged toward the national average.

The trends in U.S. regional incomes have been recently examined from the growth perspective by Robert Barro and Xavier Sala-i-Martin who argue that the convergence of U.S. regional and state incomes between 1880 and 1990 is consistent with the neoclassical growth model rather than with models based on increasing returns.<sup>39</sup> They show that the growth of U.S. regional and state incomes between 1880 and 1990 were inversely related to the initial 1880 income levels as predicted by the growth model. Barro and Sala-i-Martin attribute the regional income divergence between 1840 and 1880 to the Civil War, but provide no explanation as to why the war had such a protracted negative influence on Southern incomes. They also provide little direct evidence that the regional income convergence is driven by the convergence in capital-labor ratios.

Examining the historical trends in U.S. regional incomes from the trade perspective explains differences in regional incomes by utilizing differences in regional industrial structures. A simple procedure used by Frank Hanna is adopted, which involves constructing two counterfactual regional income

<sup>37</sup> Easterlin ("Interregional Differences" and "Regional Income Trends") documents U.S. regional incomes between 1840 and 1950. Barro and Sala-i-Martin ("Convergence") and numerous other scholars provide information on incomes between 1950 and 1990.

<sup>38</sup> The regional differences in income per capita in 1840 depend on whether the Southern figures include the slave population. If the income per capita for the Southern regions includes the slave population, then the South's average falls well below that of other regions. However, income per capita of the white population in the South exceeded that of the national average. See Easterlin, "Interregional Differences"; and Fogel, *Without Consent*.

<sup>39</sup> Barro and Sala-i-Martin ("Convergence across States" and "Convergence") identify two measures of income convergence:  $\beta$ -convergence and  $\sigma$ -convergence.  $\beta$ -convergence occurs when poor economies grow faster than rich ones and  $\sigma$ -convergence occurs when there is a decline in cross-sectional dispersion of income per capita. The neoclassical growth model implies  $\beta$ -convergence. Barro and Sala-i-Martin also distinguish between absolute convergence and conditional convergence. The hypothesis that poor countries grow faster than rich countries without conditioning on any other characteristics of economies is defined as absolute convergence. The concept that an economy grows faster when it is further away from its steady state is defined as conditional convergence. Barro and Sala-i-Martin ("Convergence") show that the incomes of U.S. regions and states exhibit absolute,  $\beta$ -convergence. It is important to note that the U.S. regional incomes also exhibit  $\sigma$ -convergence.

estimates to separate income differences due to industry-mix and wage effects.<sup>40</sup> One hypothetical income is based on the assumption that all regions have identical industrial-mixes and identical wages in each of the industries. In this instance, all regional incomes per capita would be identical to the overall national average. The second hypothetical income per capita is based on the assumption that regions have different industrial structures but identical incomes per capita at the industry level. The industry income per capita for all regions is set equal to the national industry income per capita. The two hypothetical incomes per capita and the actual income per capita are then used to estimate industry-mix and wage effects. The difference between the two hypothetical incomes—industry-mix income and the overall national average—provides a measure of the income differences due to the divergence in regional industrial structures. The difference between the actual income per capita and the hypothetical industry-mix income provides a measure of the income differences due to divergence in wages.

For the period between 1840 and 1900, data from Easterlin are used to estimate the causes of regional income divergence.<sup>41</sup> Because Easterlin only provides information on agricultural and nonagricultural labor incomes, the regional differences in industrial structures are measured by using these two categories. For the period between 1900 and 1987, data on one-digit industrial employment described previously, earnings data from Charles Schwartz and Robert Graham, and data from *Survey of Current Business* are used to estimate the causes of income convergence.<sup>42</sup>

The use of the broad industrial categories, agriculture and nonagriculture, or even the one-digit industries, may attribute greater importance to wages in explaining regional differences in income per capita than is deserved. Regional wages in agriculture and manufacturing activities may be different because of differences in regional industrial structures at a finer industry level. Data from Niemi and the *Census of Manufactures* are used to examine the extent to which wage effects attributed at the broader industry category level are due to differences in industrial structures at a finer two-digit level.<sup>43</sup>

The calculations in Table 1 indicate that differences in industrial structures and in wages at the broad industry level played significant roles in causing incomes to first diverge and then converge between 1840 and 1954. The relative importance of industry-mix and wage effects on incomes differed by regions. For some regions, such as the New England and Middle

<sup>40</sup> Hanna, "Contribution."

<sup>41</sup> See Easterlin, "Regional Income Trends."

<sup>42</sup> See Schwartz and Graham, "Personal Income"; and "State Personal Income." Personal income is composed of three major components: wages and salaries, personal dividend, interest, and rental incomes, and transfer payments. Due to data availability, this section examines only the wage and salary component of personal income.

<sup>43</sup> See Niemi, *State and Regional Patterns*.

Atlantic regions, favorable regional industrial structures were responsible for their relatively high aggregate incomes per capita. For other regions, such as the Mountain and Pacific regions, their relatively high aggregate incomes were attributed to favorable wages. For the remaining regions, both industrial structures and wages played important roles in affecting their incomes.

The most significant cause of income divergence between 1840 and 1900 was the sharp relative decline in Southern income per capita caused by the region's growing unfavorable industry-mix and lower wages relative to other regions. In 1840 about 90 percent of the labor force in the Southern regions was employed in agriculture as compared to 71 percent for the rest of the nation. However, by the turn of the twentieth century the differences widened. In 1900, 82 percent of the labor force in the Southern regions remained engaged in agricultural activities as compared to only 43 percent for the rest of the nation.<sup>44</sup> Because agricultural workers earned less than half of the income of nonagricultural workers throughout this period, the Southern industry-mix toward agriculture lowered its aggregate income per capita relative to other regions.<sup>45</sup> The calculations in Table 1 show that the Southern income per capita in 1880 and 1900 would have increased by as much as 20 percent if its industrial structure had converged toward that of the national industrial structure. The data in Table 1 also show that Southern incomes fell relative to the national average because Southern workers received less income than workers in other regions in both agricultural and nonagricultural industries. In fact, lower relative wages were more important than unfavorable industry-mix in explaining the relative decline in the income per capita of the South Atlantic and East South Central regions. The lower wages were responsible for a decrease in Southern income per capita by 20 to 50 percent in 1800 and 1900.<sup>46</sup>

<sup>44</sup> Goldin and Sokoloff ("Relative Productivity Hypothesis") argue that one of the sources of the northern region's comparative advantage in manufacturing was its abundance in the female and child labor force.

<sup>45</sup> Kuznets ("Quantitative Aspects . . . II" and "Quantitative Aspects . . . III") finds that there is a negative and pronounced correlation between income per capita and shares in agriculture, and a slightly weaker negative correlation with shares in mining. Kuznets finds a positive correlation between income per capita and shares in manufacturing, and a weakly positive one with shares in construction and other service sectors. Also see Perloff, "Interrelations"; and Perloff et al., *Regions*.

<sup>46</sup> Economic historians have advanced a variety of explanations for the decline in southern income per capita. Whereas Goldin and Lewis ("Economic Cost") attribute the decline to the physical damage caused by the Civil War, most economic historians blame the decline to the fall of productivity in southern agriculture. There is, however, considerable controversy concerning the exact cause of the decline in southern agricultural productivity. Wright (*Political Economy*) believes that the collapse of the world cotton boom contributed to the decline. More recently Wright (*Old South*) has also argued that the general stagnation of the southern economy was caused by the development of an isolated southern labor market. Ransom and Sutch (*One Kind*) attribute the decline to monopolistic credit markets and the withdrawal of black labor. Fogel and Engerman and their co-contributors argue that the most important factor in the decline in southern productivity was due to the break-up of the gang labor system (see Fogel and Engerman, "Notes"; Fogel, *Without Consent*; Yang, "Explanations"; and Moen, "Changes," among many others). Although the decline in southern manufacturing wages played

TABLE 1  
DIFFERENCES IN REGIONAL INCOMES ATTRIBUTABLE TO INDUSTRY-MIX AND WAGE RATES, 1840, 1880, 1900, 1954, AND 1987

	NE	MA	ENC	WNC	SA	ESC	WSC	MT	PC	U.S.
1840										
Distribution of Labor by Industry (percentage)										
Agriculture	62	68	82	85	90	92	86			79
Nonagriculture	38	32	18	15	10	8	14			21
Total	100	100	100	100	100	100	100			100
Income Per Worker by Industry (dollars per year)										
Agriculture	182	225	147	140	148	156	238			173
Nonagriculture	465	462	348	372	343	380	904			437
Total	291	302	184	173	168	174	331			228
Hypothetical industry-mix	275	258	221	213	200	194	210			228
Percentage Difference Attributable to:										
Industry-mix	18.6	12.3	-3.3	-6.9	-13.2	-16.1	-8.0			0
Wages	5.9	15.8	-18.1	-20.7	-17.3	-10.9	45.3			0
1880										
Distribution of Labor by Industry (percentage)										
Agriculture	31	38	67	78	88	91	90	37	46	66
Nonagriculture	69	62	33	22	12	9	10	63	54	34
Total	100	100	100	100	100	100	100	100	100	100
Income Per Worker by Industry (dollars per year)										
Agriculture	274	388	345	272	142	166	177	206	524	252
Nonagriculture	544	574	567	635	407	510	613	724	716	572
Total	460	504	418	351	173	198	220	532	628	361
Hypothetical industry-mix	473	451	357	322	290	282	283	453	426	361
Percentage Difference Attributable to:										
Industry-mix	27.0	22.2	-1.2	-11.6	-22.1	-24.7	-24.2	22.7	16.5	0
Wages	-2.7	11.1	15.9	8.8	-51.5	-35.4	-25.3	16.0	38.9	0



TABLE 1—continued

	NE	MA	ENC	WNC	SA	ESC	WSC	MT	PC	U.S.
1954 continued										
Wages and Salaries Per Worker by Industry (dollars per year)										
Agriculture	1,267	1,292	2,020	2,145	1,241	867	1,136	2,010	2,596	1,571
Mining	5,572	4,211	4,778	4,453	4,057	3,556	4,976	4,670	4,873	4,509
Construction	4,094	4,689	4,809	3,956	3,500	3,692	3,643	4,390	4,896	4,307
Manufacturing	3,895	4,225	4,711	4,124	3,275	3,435	3,913	4,210	4,672	4,210
Transportation	2,318	2,875	2,996	3,008	2,721	2,864	2,696	2,949	3,269	2,894
Trade	3,439	4,037	3,698	3,299	3,051	2,894	3,184	3,337	4,024	3,574
Finance	3,886	3,946	3,818	3,497	3,719	3,793	3,667	3,688	4,125	3,842
Services	3,020	3,443	3,272	2,785	3,275	3,009	3,053	2,925	3,742	3,269
Government	4,419	4,388	4,145	3,757	5,502	5,670	4,821	4,904	5,791	4,778
Total	3,547	3,866	3,895	3,119	3,139	2,482	2,907	3,406	4,251	3,530
Industry-mix	3,822	3,796	3,667	3,173	3,469	2,991	3,191	3,345	3,646	3,530
Percentage Difference Attributable to:										
Industry-mix	7.9	7.3	3.8	-10.7	-1.7	-16.6	-10.1	-5.4	3.2	0
Wages	-7.5	1.8	6.0	-1.7	-10.0	-18.7	-9.3	1.8	15.4	0
1987										
Distribution of Labor by Industry (percentage)										
Agriculture	1.7	1.9	5.4	13.7	5.4	12.5	7.0	7.5	8.4	6.4
Mining	0.1	0.3	0.4	0.4	0.4	1.0	2.6	1.7	0.3	0.7
Construction	4.6	4.0	3.5	3.5	5.8	4.3	5.1	5.4	4.5	4.5
Manufacturing	21.0	17.7	22.4	15.6	16.6	20.6	13.7	10.8	16.2	17.6
Transportation	4.0	5.2	4.2	4.6	4.7	3.9	5.3	4.9	4.7	4.7
Wholesale	5.2	6.1	5.4	5.4	4.9	4.7	5.5	4.7	5.5	5.4
Retail	17.7	15.7	17.2	16.1	17.9	15.7	17.7	17.9	16.5	16.9
Finance	7.3	8.1	5.6	5.6	5.8	4.4	6.0	5.6	6.3	6.2
Services	25.6	25.7	21.4	20.2	21.7	16.9	20.2	23.4	22.7	22.2
Government	12.8	15.2	14.7	15.1	16.7	16.0	17.0	18.1	14.9	15.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0



The convergence of regional incomes between 1900 and 1954 was caused by the growing similarities in regional industrial structures and the convergence of regional wages at the industry level. For all regions in 1954 the income differences that can be attributed to the industry-mix effect were considerably lower than they were in 1900. In 1954 the unfavorable industry-mix toward agriculture accounted for only a 2 to 17 percent reduction in Southern income per capita. Moreover, the favorable industry-mix income effect for the New England and Middle Atlantic regions fell from 25 percent to less than 10 percent between 1900 and 1954. The reduction in the importance of differences in regional wages was even more dramatic. Both the disadvantages of lower wages in the Southern regions and the advantages of high wages in the Mountain and Pacific regions diminished considerably.<sup>47</sup>

U.S. regional income per capita continued to converge over the second half of the twentieth century due to significant convergence in regional industrial structures. Between 1954 and 1987, the percentage of earnings that is attributed to differences in industrial structures fell in every region. By 1987 differences in regional industrial structures accounted for only a small fraction of the differences in earnings.<sup>48</sup> The convergence in regional wages also contributed to the convergence in earnings, but its influence was less significant.<sup>49</sup> Although the percentage of earnings that is attributed to differences in wages fell for the majority of regions between 1954 and 1987, differences in wages continued to play a significant role in causing regional incomes to differ in 1987.

However, differences in income per capita attributed to wages at the broad one-digit industry categories may be due to regional differences in industrial structures at the finer level of aggregation.<sup>50</sup> There is considerable

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a relatively minor role in the decline of southern income per capita, there is evidence that the South's lower wages during this period were caused by its lower capital-labor ratios (see Niemi, *State*).

<sup>47</sup> The regional capital-labor ratios in manufacturing converged by 1954 (see Moroney, *Structure*; and Kim, "Expansion" [1993]).

<sup>48</sup> Agricultural earnings per worker in 1987 calculated in Table 1 seem quite low relative to that of other sectors. The most probable cause is the prevalence of migrant or part time workers in agriculture. The low relative agricultural wage is likely to bias the result toward attributing income differences to differences in industrial structures rather than to wages. However, given the size of the agricultural sector in 1987, the bias is likely to be small.

<sup>49</sup> Garnick and Friedenber ( "Accounting for Regional Differences") estimate that over half of the narrowing of the regional personal income per capita between 1940 and 1979 was accounted by the convergence of regional industrial structures. On the other hand reduction in regional wage differentials contributed to only about one-tenth of the convergence. Garnick and Friedenber also find that other factors such as a more uniform regional distribution of personal dividend, interest, and rental incomes, of transfer payments, and of the working age population all played a role in accounting for the convergence in U.S. regional incomes.

<sup>50</sup> Kuznets ("Quantitative Aspects . . . III") finds a negative correlation between income per capita and regional concentration in raw-material-intensive industries such as food, tobacco, textiles, lumber, furniture, paper, chemicals, petroleum, and stone, clay, and glass. On the other hand Kuznets finds a positive correlation with regional concentration in fabricated branches of manufacturing industries such

evidence that the lower agricultural wages in the Southern regions between 1880 and 1900 were due to those regions' specialization in cotton and tobacco rather than in grain and other agricultural crops. In manufacturing, the evidence is more mixed. The main cause of the decline in Southern manufacturing incomes between 1860 and 1900 still seems to be differences in wages rather than differences in industrial structures.<sup>51</sup> However, as regional industrial structures in manufacturing at the two-digit level diverged between 1900 and 1947, the differences in industrial structures became a more significant cause of differences in manufacturing incomes. Both the industry-mix and wage effects declined slightly between 1947 and 1987.

### CONCLUSION

One of the most important trends in history is the growing integration of regional and national economies over time. Yet, scholars remain divided on the effects of economic integration on regional and national industrial development and growth. On one hand the proponents of the new trade and growth models take the position that economic integration will lead to a divergence in industrial structures and incomes.<sup>52</sup> On the other the proponents of the neoclassical growth models argue that economic integration will inexorably lead to a convergence in incomes.<sup>53</sup> This article offers still another point of view based on the neoclassical models of trade, which argues that the divergence and convergence in regional incomes are explained by the divergence and convergence of regional industrial structures.

In order to understand the effects of integration on regional economic growth and development, this article documents the long-run trends in U.S. regional industrial structures and examines which model of trade is most consistent with the data. The article also decomposes the differences in U.S. regional income per capita into two components. One component attributes the differences in regional income per capita to differences in industrial structures whereas the other attributes them to differences in earnings within industries. In principle, differences in income due to industrial structures are explained by models of trade, and differences in income due to earnings within industries are explained by models of growth.

The data suggest that a combination of explanations based on the neoclassical trade and growth models seems most consistent with the long-run trend

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as machinery and equipment of various types. Also see Perloff, "Interrelations"; Perloff et al., *Regions*; and Hanna, "Contribution" and *State Income Differentials*.

<sup>51</sup> See Kim, "Urban Development," table 9.

<sup>52</sup> See Romer, "Increasing Returns"; and Lucas, "On the Mechanics," for growth models based on increasing returns. See Krugman, *Geography*, for models of trade and geography based on increasing returns.

<sup>53</sup> See Solow, "Contribution"; and Barro and Sala-i-Martin, "Convergence across States" and "Convergence."

in U.S. regional income per capita. Although the divergence in regional income per capita in the United States between the nineteenth century and the turn of the twentieth century appears to be consistent with predictions of the new trade and growth models based on increasing returns, the divergence can be accounted for by the growing dissimilarities in regional factor endowments. In the early nineteenth century U.S. regional factor endowments were relatively similar. The U.S. economy was predominantly agricultural and most regions were endowed with excellent agricultural land. However, as manufacturing became more important between the nineteenth and the early twentieth centuries, regional factor endowments became increasingly dissimilar. Regional differences in resources, such as energy and minerals, as well as capital and skilled labor became significantly more important as the U.S. economy became a manufacturing based economy. As predicted by the neoclassical trade model, the divergence of regional factor endowments contributed to the divergence in regional industrial structures and regional income per capita.

The divergence in U.S. regional incomes was also caused by divergence in regional wages. In particular, the divergence in U.S. regional wages was caused by the significant relative decline in wages in the Southern region in the agricultural and nonagricultural industries. Although economic historians continue to disagree on the exact causes, the relative decline in Southern agricultural wages was quite severe. In manufacturing the lower Southern wages relative to other regions are likely to have been caused by their lower capital-labor ratios. Although the divergence in capital-labor ratios and wages between the late nineteenth and the early twentieth centuries appears to favor explanations based on increasing returns, the divergence may also be consistent with explanations based on factor endowments. When manufacturing scale economies were relatively low during the first half of the nineteenth century, differences in regional capital supplies may have played a relatively minor role in determining productivity. However, as scale economies in manufacturing rose between the mid-nineteenth century and the turn of the twentieth century, the availability of capital may have become increasingly more important in determining productivity in manufacturing.

U.S. regional convergence in economic structures and income per capita over the twentieth century was caused by growing similarities in regional factor endowments and regional wages as predicted by the neoclassical trade and growth models. Although the differences in land qualities continued to play an important role in agriculture, the shift in the U.S. industrial structure away from agriculture and manufacturing into services significantly reduced the importance of regional differences in land and resources. Furthermore, differences in regional resource endowments in manufacturing diminished during the second half of the twentieth century as factors became more

mobile and as firms increased usage of substitutes and recycled inputs. As regional factor endowments converged, U.S. regional industrial structures and income per capita converged. In addition as factors became more mobile, regional capital-labor ratios also converged. This convergence caused regional wages to converge and contributed to the convergence in regional income per capita, especially during the first half of the twentieth century.

This article offers new insights concerning the causes of the long-run trends in U.S. regional industrial structures and incomes by taking a general equilibrium approach. The fortunes of a region are assumed to depend not only upon its own resources but also on the economies to which it is economically integrated. By contrast, many economic historians take a partial equilibrium approach and study the fortunes of a region by assuming that the economic activity of other regions are essentially fixed. For example, a number of studies that explore the decline in southern income per capita during the late nineteenth century take this approach.<sup>54</sup> Although studies of this type may provide insights as to why southern income per capita in real terms fell by 0.8 percent per year between 1860 and 1880, they provide only a partial explanation of why southern income per capita over this period fell below 50 percent of the national average.<sup>55</sup> This article takes the position that an understanding of the income per capita of any particular region in relation to other regions will necessarily involve providing a coherent explanation for the general trends in income per capita of all the regions of the United States.

Finally, the results of this study confirm an old view, proposed by Simon Kuznets, Hanna, Perloff, Easterlin, and others, that differences in regional and national industrial structures play an important role in explaining differences in regional and national income per capita.<sup>56</sup> However, the correlation between regional industrial structures and regional incomes poses new challenges. In order for regional industrial structures to affect regional income per capita, interindustry differences in earnings must be significant. Thus, although an analysis of the causes of differences in interindustry earnings is beyond the scope of this article, a more complete understanding of American economic development awaits such an explanation.

<sup>54</sup> See Wright, *Political Economy and Old South*; Ransom and Sutch, *One Kind*; and Fogel and Engerman, "Notes," among others.

<sup>55</sup> See Fogel, *Without Consent*, p. 89.

<sup>56</sup> See Kuznets, "Quantitative Aspects . . . II" and "Quantitative Aspects . . . III"; Hanna, "Contribution" and *State Income Differentials*; Perloff, "Interrelations"; and Easterlin, "Interregional Differences" and "Regional Income Trends." For more recent works, see Broadberry, "How Did the United States" and "Regional Income Trends"; and Dollar and Wolff, *Competitiveness*.

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