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REGIONAL BUSINESS CYCLES: A SURVEY*

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Introduction

Along with export-base theory, regional business cycle theory is one of the oldest fields of regional economics.¹ McLaughlin [47] presented perhaps the first study of regional business cycles and Vining in a series of articles [65, 66, 67, 68] in the 1940's systematically examined the problem. Since Vining, a plethora of studies have appeared dealing with industrial structure, diversification, growth and various policy and theoretical aspects of regional cyclical performance.

That differences in regional business cycles still exist is documented by several recent authors;² Gellner[33], Bretzfelder [11, 12] Fearn [29], Sum and Rush [59]. It is noteworthy that Borts, writing in 1960, found postwar regional cyclical differences to be diminishing over time for two reasons: (1) the industrial structures of regions were becoming more diversified and, hence, alike and (2) postwar cycles were milder. However, more recent authors as Sum and Rush have found such differences to be increasing.

The present survey of regional business cycles includes three major sections and a conclusion. In Section II is presented Vining's three generalizations on regional cycles as well as attempts to develop models of interregional business cycles. The vast empirical literature is surveyed in Section III. Studies which concentrate on the policy aspects of regional business cycles are discussed in Section IV. In the final section of the paper a conclusion and some directions for further research are given.

Theoretical Models Of Regional Business Cycles

Vining's Generalizations

There are many ideas and conclusions and much evidence contained in Vining's series of articles in the 1940's. We shall concentrate on his three theoretical generalizations which have inspired much of the research to be surveyed in Section III.

In general, Vining considers the cyclical sensitivity of one region. The region's link to the rest of the world is through its export-base activities. Income

¹The fact that business cycle theory and export-base theory share a similar history is no accident. Vining, in his development and refinement of regional business cycle theory, relied heavily on the concept of the export base.

²Most authors have emphasized differences in the amplitudes of regional business cycles and have neglected timing and duration aspects. This is partly due to choice and partly due to (until recent years) a lack of monthly data on the regional magnitudes necessary for a study of the latter problems. Authors who have studied the problem of timing include: Bassett and Haggett (5), Blain, et.al (8) and Bartels (3).

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fluctuations in the rest of the world are transmitted to the region through a change in the latter's exports. To estimate the actual effect on regional income for a given change in exports, Vining derives the following equation:

$$(1) \frac{dY}{dX} = \frac{1 - (C + Y)/Y + M/Y}{1 - c - m}$$

where Y = regional income

C = consumption

I = investment

X = exports

M = imports

c = marginal propensity to consume (locally)

m = marginal propensity to import

Using equation (1), Vining makes the following three generalizations: The greater will be the change in regional income for a given change in exports (i.e., the greater the cyclical sensitivity of a region): (1) the greater the proportion of imported goods relative to regional income (M/Y); (2) the less the short run income elasticity of demand for imported goods; (3) the greater the short run income elasticity of demand for the region's export goods.

Interregional Models Of Business Cycles

Vining's approach to the study of regional business cycles is heavily dependent upon the use of export-base theory. A distinction is made between one region and the rest of the world and the interrelations and feedbacks which exist between regions are ignored. An interregional model of economic fluctuations incorporates the links and feedbacks between regions. Regions are not studied in isolation as in export-base theory. One region's imports become another region's exports and are the major links through which business cycles are transmitted from one region to another. Multiplier effects are emphasized as in Vining's work, but it is the full multiplier as developed by Metzler which includes the feedback effects of import expansion which is used.

Metzler [49] laid the basic framework for interregional business cycle theory. Regions within a country are related primarily through their imports and exports to each other. The expansion of spending (eg., investment spending) in one region will have effects upon all other regions as their incomes will tend to increase because of increased exports. The extent of the change in the region in which spending increased (say, region 1) and the effects upon its trade balance will depend upon the value of what Metzler calls the generalized multiplier.

The generalized multiplier includes the secondary effects on region 1 which result from an expansion of imports from that region by all other regions. The rise in investment spending in region 1 causes it to increase its imports. The increased exports of the other regions lead to higher incomes for them and, hence, additional imports, some of which are from region 1. Metzler shows that the balance of trade moves against region 1 if the marginal propensities to spend in all regions are less than one, the most likely case.

The major contribution of Airov [1] is to integrate the multiregion trade model of Metzler (which allows for the transmission of business cycles between regions) and business cycle theory (which contains mechanisms for

generating cycles) into interregional models of economic fluctuations. He presents four models in matrix form: (1) an interregional multiplier-accelerator model; (2) an interregional inventory accelerator; (3) an interregional flexible accelerator; (4) a non-accelerator model. In each of these models, in all regions, consumption out of regional income is allowed on locally-produced goods as well as on imported goods. In the accelerator models, induced investment outlays in a region are dependent upon the change in its regional income and on the changes in the incomes of all other regions. That is, the export of investment goods is also allowed.

While Airov's solutions to some of his models contain a few errors (as pointed out by van Duijn [24]), he does arrive at some interesting conclusions. If it is assumed the trading system is indecomposable (that is, each region trades directly or indirectly with every other region), the solution involves the solving of one simultaneous system of equations. The result is the time paths for the regions have similar qualitative characteristics. However, regional cyclical amplitudes will differ because of: (1) differences in regional structures in relation to the composition of consumption (stable) and investment (unstable) output; and (2) the extent and stability of regional ties through trade. The latter point does not appear in an export-base approach to regional business cycles.

The model which van Duijn [24] develops is of the flexible-accelerator type in which investment is the primary source of fluctuations in economic activity. An important part of the model is the inclusion of ceilings and floors which act to limit economic fluctuations. It is possible for capacity constraints to dampen expansion in one region even if excess capacity exists in other regions. The effect of ceilings and floors, therefore, should be to reduce regional differences in cyclical amplitudes.

Given a three-region economy and various reasonable assumptions on the parameters of the model, simulations of the model produce cases of cycles in one region while steady growth exists in other regions. The region which has a relatively large proportion of investment goods in its output mix tends to lead national cycles and to experience cycles of larger amplitudes. This conclusion is similar to that of Airov on regional structure. Two other conclusions of van Duijn which depend on the inclusion of capacity constraints are interesting. One, if the migration of labor is allowed, interregional equity is improved but economic fluctuations are greater than if labor resources are immobile. This occurs because if labor is not allowed to migrate between regions, ceilings tend to retard cycles in regions of expanding economic activity. Migration extends those ceilings in receiving regions, allowing more room for cyclical fluctuations. Two, if production is concentrated in a few regions, stability is increased in those regions as the output levels will be closer to the capacity ceilings. These stabilizing effects will tend to be transmitted to the rest of the country, making all regions more stable.

Jutila [44] develops an interesting interregional model in which relations between regions are unidirectional; that is, region i exports only to region $i + 1$ and imports only from region $i - 1$. Economic development is initiated in one region. While economic development at the national level is non-oscillatory, regions may experience business cycles because of feedback effects. Jutila also shows that regional business cycles become more pronounced as the number of regions increases.

Summary Of The Theoretical Models

The theories presented in the previous section seem to indicate two major reasons for divergences in regional business cycles. One revolves around regional industrial structure and the other concerns regional trade relations. By way of classification, Vining's approach emphasizes industrial structure and ignores interrelationships between regions. Airov and van Duijn incorporate both industrial structure and regional trade ties in their models. Jutila's model includes only regional interrelations.

Because of data limitations, no attempts have been made to study regional trade relations as causes of differences in regional cyclical behavior. Instead, the emphasis has been on industrial structure. But it should be noted that industrial structure is frequently used as a proxy for the income elasticities which are part of Vining's three generalizations. Therefore, regional industrial composition is commonly used as a measure of the short run income elasticity of demand for a region's exports. It is presumed that this elasticity will be higher (and the region more cyclically sensitive) the greater the weight of durable goods in the industrial structure of a region. This approach is based on the premise that industries within different regions react similarly to national business cycles. A region's business cycle is viewed as a composite of its industries' cycles, appropriately weighted.³ Obviously, purely regional factors are not given very much emphasis in this approach.

Industrial diversification can be used as a proxy for the short run income elasticity of demand for a region's exports or for the dependence of a region on imported goods. As Richardson [53] points out, diversification can be defined in several ways: (1) a roughly equal blend of durable and non-durable manufacturing; (2) an industrial structure similar to that of the national economy; (3) equal weight of all industries in the region's industrial structure. To use diversification as a proxy for a region's dependence on imported goods, definition (2) would probably be best. As a proxy for the income elasticity of the region's exports, definition (1) is preferred.⁴ Because of the similarity of the two mentioned proxies in measure and in concept, diversification and industrial structure usually do not appear in the same study.

In addition to the industrial structure approach which dominates the empirical literature, emphasis on the role of regional growth as a cause of differences in regional cyclical performance is also evident. Engerman [27] provides a clear statement of the supply and demand aspects of the growth hypothesis. On the supply side, a region which is growing rapidly would tend to have industries which are characterized by new, more efficient plants which are less likely to be shut down in periods of economic slack. Slowly-growing regions, on the other hand, have older, marginal plants which are more likely to be closed when demand falls. On the demand side, faster-growing regions experience high demands for local investments which place floors on declines in demand aspects of the growth hypothesis. Both aspects of the growth hypothesis, as outlined by Engerman, would predict that fast-growing regions have milder recessions than more slowly-growing regions.

Empirical Studies of Regional Business Cycles

In order to see the development of regional business cycle research more

³A good statement of this hypothesis (though he does not subscribe to it) is given by Isard (39).

⁴In this form, the industrial diversification hypothesis is obviously very similar to the industrial composition hypothesis.

clearly, the studies are presented in chronological order. Four periods of research are considered: the period to 1950, the 1950's, the 1960's, and the 1970's. Each of these periods is surveyed separately. A brief summary of the empirical research is given at the end of this section.

The Period To 1950

McLaughlin's 1930 article [47] is the first in a long line of studies which emphasizes industrial structure. He was primarily concerned with the advantages and disadvantages of industrial concentration for regional business cycles. In particular, he postulated that regional concentration in (relatively unstable) producers' goods should lead to greater cyclical sensitivity for a region. He found a statistically significant relationship between a city's value added in producers' goods and the city's decline in total value added in the post World War recession (1919).

Kidner [45] studied business cycles in California. He concluded that the state's cycles were very similar to U.S. cycles, especially in terms of cycle amplitude. He did find, however, a tendency for California to recover more quickly from a recession than did the rest of the U.S. This could partially be explained by the existence of rapid economic growth in the state.

Neff and Weifenbach [52] examined business cycles in six U.S. urban areas. Using data on bank debits, department store sales, power sales, and industrial employment, they concluded that there were consistent differences in cyclical patterns among the six selected areas. To explain these differences, they offered two main hypotheses. One centered on industrial diversification. Following Vining's theoretical conclusions, a diversified city should be identified with a favorable cyclical pattern. They noted, however, that industrial specialization in a city leads to the production of goods and services in which the city has a comparative advantage. Therefore, a tradeoff may occur between economic stability and comparative advantage. The second hypothesis for urban divergences concerned economic growth. Neff and Weifenbach postulated that fast-growing cities would tend to have shorter cycles because of competitive advantages vis-a-vis other cities. Fast-growing cities can absorb new techniques more quickly than can slowly-growing cities, so the former will tend to have a delayed upper turning point and an earlier lower turning point compared to the latter. However, a smaller cyclical amplitude was not considered likely as is predicted by Engerman's analysis of growth.

The research findings of Neff and Weifenbach did not give much support for either hypothesis for urban differences in business cycles (amplitude or timing). Growth rates did not appear to affect the timing of a city's cycle nor was a city's industrial pattern found to be a direct or simple cause of urban differences. They concluded at one point:

Cycles are much too complex phenomena, and their causes too diverse to permit simple generalizations to suffice as explanations for divergent durations. Each series and each cycle in each area demands individual study. (52, p. 94)

The 1950's

Williams [69] uses the basic theoretical framework of Vining in a test of the industrial composition hypothesis. The different amplitudes of regional business cycles were seen as being due, in part, to differences in the industrial structures of regions. The imports and exports of a region would reflect its

industrial composition. Williams compared the exports of Boston with those of Detroit. He found Boston to export, relatively, more nondurable goods than did Detroit. Therefore, Detroit's business cycles should exhibit greater amplitudes than those of Boston. In an empirical test, Williams found a high rank correlation coefficient between a city's percentage of manufacturing employment in nondurables and the stability of retail sales in 1929-1937. However, given the uniqueness of his period of study, it is hard to assess the significance of Williams' results.

Garbarino [31], like Neff and Weifenbach, uses urban areas for the regions in his study. He finds urban differences in unemployment rates in the same industry are quite a bit greater than are industry differences in unemployment rates within a city. This implies a cycle in a city would affect all industries in about the same degree. Therefore, urban variations in business cycles would be more important than is predicted by industrial structure alone.

The last significant study of the 1950's was by Rodgers [55]. His main contribution was to formulate a new measure of industrial diversification. In a test of Pennsylvania cities Rodgers found no significant correlation between his diversification index and deviations in employment.

The studies of regional business cycles up to 1960 were not very encouraging. Neither growth nor industrial composition seemed to be a significant explanation of regional business cycle amplitude or timing. All of the early authors used fairly simple methodology, usually employing correlation analysis to test their theories. None of the studies was comprehensive as most were limited to a single state or a few selected cities.

The 1960's

The first truly comprehensive study (in a regional sense) of the reasons for differences in regional cyclical performance was done by Borts [9]. The title of his article is indicative of its nature; it is concerned with regional cycles of manufacturing employment. Such an approach can be defended on at least two grounds. One, the transmission of national business cycles to regions can be expected to take place primarily through changes in the manufacturing exports of a region and, therefore, manufacturing employment. Two and relatedly, manufacturing employment should be more sensitive to national cyclical swings than, for example, local service employment which could be expected to follow changes in the former. Thompson [64], for example, develops a model in which local service employment responds in a parallel fashion to the export cycle pattern.

To test the industrial composition hypothesis, Borts develops a useful technique. He constructs hypothetical state cycles of manufacturing employment which would occur if each national industry were given the weight it has in a particular state. Therefore, the only differences in state cycles are due to the relative importances of the respective industries in the states. Borts finds that the hypothetical cyclical amplitudes are considerably less than the actual cyclical amplitudes of the industries. This leads him to conclude that the state components of national cycles do not follow the national cyclical patterns of the industries in a consistent manner. This means a state's business cycle is *not* just the composite of its industries' cycles.

The findings of Borts can be summarized as follows: (1) there are differences in the severity of the cyclical fluctuations among the states, which are partially

due to differences in industrial composition; (2) the differences in regional business cycles have diminished over time because of increasing industrial diversification in states and because of milder fluctuations;⁵ (3) the differences in cyclical severity are greater than predicted by industrial composition alone, a point which follows from (1) above; (4) growth influences cyclical stability: states with low growth rates have greater cyclical amplitudes than do states with high growth rates. It will be recalled that Neff and Weifenbach did not find growth to have a consistent influence upon a region's cyclical performance.

Brechling [10] developed an econometric approach which was adopted by Thirlwall [61], Harris and Thirlwall [37] and by van Duijn [25], among others. A region's unemployment rate (or first differences on such rates) over time is regressed on the national unemployment rate (or first differences) for the same time period. If the b-coefficient is greater than 1, this identifies a region which is cyclically sensitive. If the coefficient is less than 1, the region is considered to be cyclically insensitive. The next step is usually to discover the reasons for the cyclical sensitivity of some of the regions.

It can be questioned, however, whether in the above form this is a satisfactory measure of cyclical sensitivity. If a given region has a b-coefficient which is greater than 1, this may be due to a long-term economic disadvantage (eg., structural unemployment) vis-a-vis the rest of the economy and not to cyclical sensitivity. In fact, in Thirlwall's study [61], the regions with b-coefficients greater than one also tend to be regions with unemployment rates that are secularly above the national average, regardless of the phase of the business cycle. The inclusion of a time trend in the regression equation (as done by Brechling and by Fearn [29]) would appear to be necessary to remove the influence of structural unemployment. The equation to be estimated would then be of the form:

$$(2) \quad U_t^R = a + bU_t^N + ct + e_t$$

where U_t^R is the regional unemployment rate in time t , U_t^N is the national unemployment rate in time t , t is a time trend,⁶ e_t is the error term and a , b , and c are parameters to be estimated. Following Brechling, the residuals from equation (2) can be taken as the regional component of the region's cycle of unemployment rates. That is, after accounting for those components of the regional cycle which are due to national influences and long-term trends (Brechling also includes seasonal dummy terms), the remaining component of the cycle is due purely to regional factors. It is interesting that Fearn estimates an equation which is similar to equation (2) for 142 U.S. cities and finds that regional unemployment rates over the period of estimation differ primarily because of cyclical unemployment; the structural components of regional unemployment rates are found to be small. Such results point up the need for continuing study of regional business cycles.

Thirlwall [61] finds one-half of the cyclical sensitivity of regions in Great Britain to be due to differences in their industrial compositions. He concludes that the other half must be due primarily to regional factors. Harris and Thirlwall [37] obtain a similar result as "intra-industry factors," which result in fluctuations in the rate of unemployment in an industry to be different between

⁵Recent evidence indicates that this has not been true since the mid 1960's. See Sum and Rush (59).

⁶The specific form of the time trend may, of course, be different from the one given in equation (2).

regions, are found to better explain cyclical sensitivity than "inter-industry factors," which result in different fluctuations in unemployment rates between industries.

They proceed to offer possible explanations for their conclusion. One, some regions may possess a high proportion of branch plants⁷ or marginal plants which are more likely to be forced to curtail production in a recession. Engerman [27], of course, was the first to state this explanation (see above). Two, in some regions, labor may be occupationally immobile in comparison to other regions. As unemployment rises nationally, this labor does not readily seek or secure new employment. Finally, labor may be, secularly, in short supply in some regions. This induces producers to hoard labor and, therefore, to retain redundant workers during times of economic slack. In regions with sufficient supply of labor relative to demand, labor is more readily dismissed when the demand for goods is weak. This latter point could possibly be tested by a comparison of the productivity of labor between regions over the business cycle. If labor productivity typically falls to a greater extent in regions with relatively low unemployment during a recession, then this could be indicative of labor hoarding. The labor productivity in such regions would have to be compared with the course of labor productivity in regions with relatively high unemployment. These explanations offered by Harris and Thirlwall are interesting and deserve further testing.

By 1970, comprehensive investigations of the U.S. Borts [9] and of Great Britain Brechling, [10], seemed to indicate the importance of purely regional factors in determining differences in regional cyclical performances. It is also apparent that differences in the industrial structures of regions could account for some of the differences in regional business cycles. Growth differences also appeared to be of some significance. The additional studies of the 1970's have not altered these conclusions very much.

The 1970's

The most recent empirical research in the area of regional business cycles has been directed along several lines of inquiry. The main concern has remained that of explaining why regional cycle amplitudes differ. However, some authors have been concerned with the identification of timing difference of regional business cycles.

With respect to the latter issue, early studies found little evidence of timing differences between regions' cycles. (See, for example, Neff and Weifenbach [52], Borts [9] and most recently, Bartels [3].) Bassett and Haggett [5] attempt to identify "leading areas," a concept similar to the leading indicators developed by the National Bureau of Economic Research. Presumably, a slowdown in economic activity in a region's leading areas would foretell a similar reaction in the rest of the region. Using the city of Bristol as the reference point for the South-West Planning Region of Great Britain, Bassett and Haggett find several areas to lead consistently over Bristol in economic changes by up to six months. The actual length of the lag, however, is probably not stable. Since only one business cycle was studied by Bassett and Haggett, this latter assertion is quite tentative. Two comments seem appropriate: 1)

⁷Clark (20) studied a region in Sweden and found that small branch plants are cyclically sensitive. However, large branch plants appear to be cyclically less sensitive than are large parent plants. These are interesting results which indicate the need for more research in this area.

given the data collection and publication lags that are common at the regional level, at least six months will normally lapse before the corroborating data appears, and 2) even if no publication lag occurred, it is unlikely that a notice of six months would be sufficient to allow regional policies to be formulated and implemented.

Several studies have appeared in the 1970's which attempt to explain differences in regional cyclical performances. Each study or set of studies can be placed in one of four categories. One set of studies is concerned with regional business cycles primarily as spatical phenomena (Jeffrey, et. al, [43]; King, et.al., [46]; Jeffrey [41]). A second author (Beare [6]) views such cycles as primarily monetary phenomena. Van Duijn [25] emphasizes the existence of output ceilings and floors as a cause of variations in regional cyclical behavior. A final set of studies (Bartels [3]; Blain, et. al. [8]; Cho and MacDougall [19]) can be classified together according to their use of statistical tool, spectral analysis.

The studies by Jeffrey, Jeffrey, et. al, and by King, et.al., appear to have two primary goals. One goal is to delineate regional subsystems or groupings of cities which display distinct cyclical patterns in their economic fluctuations over time. Jeffrey shows through the use of factor analysis the importance of the spatial dimension in determining a region's response to national cycles. King, et.al. use simple correlation analysis to discover the timing and intensity of linkages between major cities in the East and Midwest and the influence of those cities on their subcenters. Their methodology is straightforward; for each city, its unemployment rate is regressed on the national rate in order to remove the influence of aggregate economic activity. Correlations are then performed on the residuals from the regression between pairs of cities, lagged where appropriate. The result of the linkage analysis was the discovery of five groupings of cities, one each centered on Chicago, Detroit, Cleveland, Pittsburgh and Indianapolis.

The second goal of the studies is to discover the spatial levels of activity which are involved in the unemployment time series for cities. Jeffrey, et.al. use bi-factor analysis to find four such levels. These levels are: (1) national factors, (2) subnational factors which affect all cities in a particular grouping, (3) factors which affect only subsets of cities in a particular grouping, and (4) factors which are unique to each city. These levels are somewhat similar to Brechling's [10] four components of regional unemployment: (1) aggregate or national cyclical components, (2) structural components of regional unemployment which relate to a time trend such as industrial composition, (3) seasonal components of unemployment, (4) regional cyclical components which are peculiar to a region.

Beare [6] proposes the use of a monetarist model to explain regional cyclical performance rather than the implicit Keynesian multiplier approach which is used by most researchers. He employs a regional version of the reduced form St. Louis equation:

$$(3) \quad E_i = a + bM + cA_i + e_i$$

where E_i equals expenditures on the products of the i region, M is the national stock of money, A_i equals autonomous expenditures on the products of region i , and e_i is the error term. Beare uses regional income as his measure of E_i . He finds that, in general, the national money supply is a more important determinant of regional income than are autonomous expenditures (for these

expenditures, Beare uses expenditures on farm goods, the major exports of the Western Canadian Provinces of his study).

This approach would appear to have limited usefulness as an explanation of regional differences in business cycles primarily because of his use of the national stock of money and a reduced form equation. A more valid test would employ a measure of the regional supply of money, perhaps approximately by bank debits (as used by Neff and Weifenbach [52] and by Blain, et. al., [8]. Variations in the regional money supplies should lead to variations in regional economic activities.⁸ The use of the national money supply in an empirical test would not allow a test of the above ideas. As Beare acknowledges, a better test would be to estimate a structural model for a region rather than just the reduced form. Perhaps an economic model of the type developed by Fishkind [30] (see next section) would allow such an improved test.

The study by van Duijn [25] represents an attempt to test some of the conclusions of his model of interregional fluctuations (see preceding section). According to van Duijn, a major reason for regional cyclical differences is the existence of output ceilings. As a region approaches its full employment output path the possibility of large cyclical fluctuations around the trend level of unemployment is reduced. According to van Duijn: "This explains why regions with the same occupational group sensitivity indices [that is, similar industrial structures] can still experience cyclical variations that are quite different from each other" [25]. In his study of Dutch provinces, van Duijn finds the role of industrial composition to be quite small in explaining the cyclical sensitivity of regional unemployment. In particular, he finds that in Northern Dutch provinces changes in industrial compositions have tended to lead to greater cyclical sensitivities. But these tendencies have been out-weighted by "a rise in the relative level of economic activities, bringing the actual output path closer to the full-employment path, *thereby reducing the possibility of large cyclical fluctuations*" [25, p. 119].

A recent development in the study of regional business cycles is the use of cross-spectral analysis. Several authors have employed this technique. In cross-spectral analysis, the time series of the data is "decomposed into its cyclical component" [8, p. 383]. A cross-spectrum is then calculated which compares similar components in the two given time series. "The spectrum at a particular frequency represents the contribution of that frequency to the total variation of the series." [19, p. 67].

When the cross-spectrum is calculated, summary statistics of coherence square, gain and phase are generated. Coherence square is similar to the multiple correlation coefficient in regression analysis as it measures the linear relationship between two variables and is bounded by zero and one. Gain provides a measure of the amplitude of the crossed series to the base series and is similar to the b-coefficient in a bivariate regression. If the gain coefficient exceeds one, the base series possesses an average amplitude which is less volatile than that of the crossed series. Phase measures the average lead or lag between the cyclical components.

Cho and MacDougall [19] analyze the employment data of 27 U.S. cities with the use of cross-spectral analysis. The summary statistics of coherence square, gain, and phase allow, respectively, the following conclusions: (1) regional cycles are basically a reflection of national cycles; (2) there are wide

⁸Fishkind (30) gives a very useful analysis of this idea using IS — LM curves.

differences in the amplitudes of regional cycles; and (3) leads and lags in regional cycles are not very important. Cho and MacDougall then use rank correlation analysis to test the various hypotheses of regional cyclical behavior. Using population as a measure of diversification, a positive and significant rank correlation coefficient is found between coherence square and population size. This implies that diversified regions closely follow national cyclical behavior. A strong and positive rank correlation is found between gain and durable goods manufacturing. This supports the industrial composition hypothesis. Finally, the rank correlation between gain and population growth is also positive and significant, implying that high population growth cities have tended to be cyclically unstable. This result contradicts the growth hypothesis of Engerman. No attempt is made by Cho and MacDougall to study what have been called the purely regional factors.

A summary of cross-spectral analysis provides an appropriate summary of the empirical studies of regional business cycles. While the use of cross-spectral analysis is relatively new, the results are familiar: regional cycles closely follow national cycles, regional amplitudes differ and industrial composition is one reason for these differences, though not the only reason, etc. The statement by Siegel is still quite relevant; "The really interesting question . . . is whether or not regions differ from each other in cyclical performance for reasons other than industry mix." [56, p.44]. That is, what are the reasons for industry A to be stabilizing in region 1 or even in most regions of the country, but destabilizing in region 2? Very few authors have attempted to measure the purely regional factors that might help to answer that crucial question. Clark's paper (see footnote 7) stands out as one such attempt.

If more is to be learned about regional business cycles, new approaches would appear to be necessary. There is probably little more to be gained from additional studies of industrial composition, diversification, etc. Directions for further research are presented in the last section of this paper.

Policy Aspects With Respect To Regional Business Cycles

The regional planner is very concerned with the policy aspects of his theoretical and empirical results. With respect to regional business cycles, his goal is to pursue policies which increase regional stability. Such policies may be implemented at the national level in which case the regional planner may have limited influence. Alternatively, stabilizing policies may be implemented at the regional level, requiring the participation and expertise of the regional planner. There are two parts to this section of the paper. One is concerned with policies at the national level which may have regional effects. The other part deals with regional policies that can influence the cycle sensitivity of regions.

Regional Impacts of National Policies

One aspect of policy at the national level is concerned with the regional impact of a change in monetary policy. A period of monetary restraint, for example, may not affect all regions of the country in the same manner, leading to differences in regional cyclical performance. Fishkind [30] reports of simulations of the Indiana econometric model. The model allows for three channels of monetary policy transmission: (1) the cost of money capital; (2) the availability of money capital; and (3) wealth effects. He finds that during a period of monetary restraint the growth rates of output, personal income, and total employment in Indiana are, on the average, 4.7 percent less than in the rest of

the U.S. During a period of monetary ease, the growth rates of the above magnitudes in Indiana are about the same as in the rest of the U.S. Fishkind concludes that Indiana is one state which is forced to bear the brunt of the economic slowdowns which accompany periods of monetary restraint. He proposes that Federal grants be given to states which are disproportionately affected by monetary policy.

Two comments can be made concerning Fishkind's results and proposals. First, one reason Indiana is more adversely affected by periods of monetary restraint than are other regions could be its industrial composition. Since Indiana is relatively specialized in the production of durable goods, a period of tight money is more likely to curtail disproportionately the demand for goods which are frequently purchased with the use of credit. Therefore, Fishkind may actually be presenting another aspect of the industrial composition hypothesis. Second, the main purpose of monetary restraint is usually to reduce inflationary pressure in the economy. Inflation would likely be aggravated by the Federal grants which are proposed by Fishkind.

A second aspect of policy at the national level is concerned with the regional impact of fiscal policy. Federal government attempts to reduce cyclical unemployment through increased expenditures could be or necessarily should be regionally oriented. Engerman [27] outlines three possible targets for Federal government spending: (1) maximize the increase in national employment, regardless of its regional distribution; (2) maximize the increase in employment in one designated region, (3) maintain (or attain) a target regional distribution of employment. He uses a two-region trade model to illustrate the conditions necessary to achieve each of these goals. A couple of his results are indicative of this approach. If the goal is to maximize the increase in national employment, regardless of its distribution (1), Engerman shows that Federal government expenditures should be placed in the region with the highest marginal propensity to consume. If the goal is to maximize the employment increase in one region (2), say region 1, then expenditures in region 1 are more efficient than expenditures in the other region, say region 2, unless either the marginal propensity to consume or the marginal propensity to import in region 2 is greater than one. It should be noted that Engerman's conclusion on the marginal propensity to import is essentially the same conclusion one would reach using Metzler's generalized multiplier as derived from his interregional trade model.

In his simulation model, van Duijn [24] finds attempts to distribute Federal government expenditures regionally involve a clear tradeoff between equality in regional unemployment rates and stability of regional growth. If, for example, all regions are placed on the same trend path of growth through government expenditures, there will be greater oscillations in capital goods-producing regions as compared to other regions. If government expenditures are concentrated in capital goods-producing regions, instability is reduced in those regions, but the trend level of output falls in other regions. Therefore, the Federal government can achieve steady-state growth in all regions but with inter-regional differences in unemployment rates or it can achieve equal trend levels of output in all regions but with different regional cycles. Only if overall Federal government expenditures are raised to a level where the trend levels of output are near the output ceilings in all regions can the cycles be eliminated. It is highly unlikely that society would opt for the high levels of Federal government expenditures implied by such a policy.

The reason for the tradeoff which occurs in van Duijn's model is apparent. Investment expenditures are the model's main source of instability. But capital goods production is distributed unequally in a regional sense (by design). Therefore, attempts by the government to reduce instability must necessarily be focused on capital goods-producing regions to the disadvantage of other regions; hence, the inequity in unemployment rates which occurs if regional instability is eliminated.

Regional Policies Which Affect Regional Cyclical Behavior

The regional planner is unlikely to have any control over the national money supply or Federal government expenditures. Therefore, the regional policy implications of the above conclusions are limited. However, one area in which the regional planner can exert some influence is the attraction of private investment. Through tax incentives and industrial development districts private firms may be attracted to particular locations. The goal of the regional planner in this respect is to attract firms so as to maximize regional welfare: maximum employment, rapid economic growth, economic stability. Tradeoffs may be necessary between objectives. With respect to the topic of this paper, a frequently mentioned tradeoff occurs between the stability which industrial diversification presumably means and the efficiency of industrial specialization.

If economic stability is chosen as a primary objective, it is necessary to identify those industries which improve regional cyclical performance. A major contribution of Conroy [21] (and expanded upon by Barth, et.al. [4]) is to show empirically that industries which are the most stable at the national level may not be at the regional level because of inter-industry interdependence. That is, industry A, which is nationally stable (unstable) may be unstable (stable) in region 1 because of the existence of some industry B in that region.

Conroy attempts to show the above ideas with a portfolio approach to industrial diversification. It is assumed that a region possesses a finite set of resources which yield stochastic flows of returns. Both the level and the variance of returns to regional resources are measurable. The region's resources are distributed among a set of industries which constitute the region's portfolio. The regional planner then attempts to attract industries (that is, choose the portfolio) which will reduce economic fluctuations in the returns to the region. In making the proper selections, the regional planner is concerned with the stability of individual industries in the region's portfolio.

When the interdependencies between regions are considered, Conroy finds that an industry which increases economic stability in one city (Detroit) may actually reduce economic stability in other cities (Great Falls and Stockton). This is very useful to know. It is the further verification and measurement of an important fact; that industries behave differently at the regional level than they do at the national level.⁹ Conroy's contribution is developing a method which allows the identification of stabilizing industries for a region, though the method does not outline the kinds of interindustry interdependencies which lead to stability in some cases and instability in others. One final point that is apparent is the limitation of a regional welfare measure which concentrates on only one objective, economic stability in this case. A better approach would be

⁹Kidner, for example, recognized this fact in *California Business Cycles*. (45). See quote in Isard (40, p. 187).

to develop a regional welfare function in which one of the elements is stability of regional economic growth.

Summary and Directions for Further Research

Our knowledge of regional business cycles reflects both theoretical and empirical developments. Theory and empirical research both confirm the importance of industrial structure in explaining regional cyclical differences. Growth also appears to be important, though it requires further testing. The importance of interregional economic relations in regional cyclical variations is suggested by theory, but no empirical research has been directed along that line. Finally, it is apparent from the empirical studies that purely regional factors are important causes of cyclical differences between regions.

Further research would profit by an emphasis on the intra-regional factors (the term of Harris and Thirlwall [37]) which influence regional cyclical performance. One possible line of inquiry represented by Clark [20] has been mentioned (see footnote 7). A study of the labor hoarding hypothesis might be relevant in some regions. A third line of inquiry would focus on the degree to which substantial structural unemployment in a region leads to poor cyclical performance. Along the same lines, if labor migration is cyclically sensitive (or insensitive), regional unemployment rates may differ in business cycles (see Gordon [35]).

However, regardless of the lines of inquiry, it is important to realize that the selection of a definition of a region will affect the results of a study (as is usually true in regional economics). The use of states as the regions of study, while not necessarily inappropriate, may cause the researcher to miss the wide variations in cyclical performance which a state's cities may exhibit. Furthermore, it would probably be helpful to study regions individually as it appears that no *one* factor alone can explain economic instability (or the lack of such) in *all* regions (except, perhaps, for the existence of a national cycle). One region may have a preponderance of marginal or branch plants and be quite sensitive to business cycles. Another may be characterized by labor hoarding and experience relatively small increases in unemployment during a recession. A third may be dominated by its industrial composition. A fourth may be growing rapidly and, therefore, be relatively immune to business cycles. A study of an individual region could be designed to discover which factors are the most relevant to explain its cyclical behavior.

One tool of regional analysis that could be applied to the study of regional business cycles is shift/share analysis. While this method has been reserved for the study of regional growth, there is no reason why it could not be used to analyze regional cycles. The author has used a shift/share framework to study employment changes in New York cities from 1974 to 1975 (this, of course, corresponds to a period of recession in the national economy). The result is a classification of the cities into those with favorable or unfavorable industrial structures (in a cyclical sense) as well as classification into cities with a cyclical advantage or disadvantage (employment falls less or more than is predicted by industrial structure alone) (See Table 1). As Siegel [56] implied (see quote above), it is really the last column on the right of Table 1 that needs to be explained by any study of regional business cycles.

A natural vehicle for the study of regional business cycles is the regional econometric model (see Crow [22], Glickman [34], Ballard and Glickman [2] and Domazlicky [23]). Most of these models include links with the national

Table 1. Summary of Shift/Share Analysis

Area	Employment Change, 1974- 75 (Thou.)	Employment Change if at National Rate, 1974-75	Emp. Chg. due to Indus. Structure, 1974-75	Emp. Chg. due to Cyclical Adv. or Disadv. (-), 74-75 -
1. New York City	-160.8	-61.2	+40.7	-141.8
2. Albany Area	- 6.3	- 5.5	+ 2.4	- 3.2
3. Buffalo Area	- 17.9	- 8.6	- 2.9	- 6.4
4. Binghamton Area	- 2.2	- 1.9	- 1.4	+ 1.1
5. Rochester Area	- 11.3	- 5.9	- 6.8	+ 1.4
6. Syracuse Area	- 10.4	- 4.1	- .4	- 5.9
7. Utica-Rome	- 3.0	- 1.8	- .3	- .9

economy via some sort of export-base relations. These links could be used to test Vining's third generalization with respect to the short run income elasticity of demand for a region's exports. Given a decline in GNP, the region will experience a decline in its exports (the extent of the decline will be determined in part by the region's industrial structure), leading to reduced employment in the export sectors. Subsequently, there will be a reduction in spending on local goods and services that will help to determine the total reaction in the region to a decline in GNP. As Borts has stated:

The cycle spreads among the states through the impact of changes in national demand upon each state's industry-mix. The cycle spreads within each state through the impact of the contraction in the state's key industries on the demand for the products of its other industries. [9, p. 152]

It is the combination of both impacts which regional econometric models are capable of measuring.

The only limitation of using regional econometric models is their "lack of supply side considerations" [54, p. 27]. Such considerations of supply may be particularly important in identifying the purely regional factors which are mentioned above.

After over 30 years of research into the topic of regional business cycles it is apparent that our knowledge is far from complete. Clearer statements of certain portions of the theory of regional cycles are necessary, especially to allow the identification and testing of the purely regional factors which are involved. To some extent, the study of regional business cycles follows that of national business cycles (much like regional cycles follow national cycles). With the prolonged prosperity of the 1960's and the relatively mild recession of 1970-1971, the necessity to study business cycles (at the national or regional level) seemed to be less pressing. But the economic problems of the 1970's and the especially severe recession of 1973-75 have generated renewed interest in business cycles at both levels.

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