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Utah's Economic Regions

The Utah economy organizes systematically into six economic regions. These regions capture local commuting patterns and score well for other measures of economic connection.

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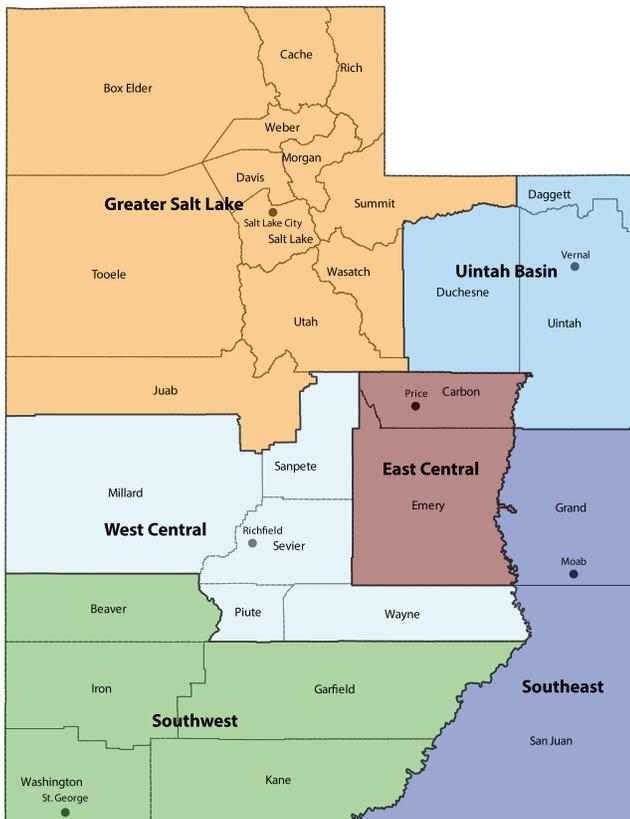
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Utah's Economic Regions

Analysis in Brief

Markets systematically organize into functional economic areas. The Kem C. Gardner Policy Institute identifies six of these economic regions in Utah: Greater Salt Lake, Uintah Basin, West Central, East Central, Southwest, and Southeast. Like an airshed or watershed in the natural world, these economic regions capture the “commutershed” of the local labor market and score well for other measures of economic connection, including consumption of health care, industry similarity, co-movement of wages, and unemployment rates. Decision-makers can use these economic regions to inform planning, budgeting, and policy decisions.

Utah's Economic Regions



Source: Kem C. Gardner Policy Institute and State of Utah, SGID

Key Findings

- Six economic regions** – The Utah economy organizes functionally into six economic areas that bound much of the economic activity of residents.
- Similar to Utah's Associations of Governments** – These economic regions, which have been defined using 2011–2015 American Community Survey data, are similar to the geographic boundaries of Utah's longstanding Associations of Governments, with some notable exceptions. The influence of the Greater Salt Lake Area has increased, resulting in a larger single northern economic region. Carbon and Emery counties also emerge as a single economic region.
- Greater Salt Lake Area dominates** – Utah's northern metropolitan region casts a long economic reach on the state, comprising 12 of Utah's 29 counties, 86% of the state's population, and 88% of the state's jobs.¹ Salt Lake City is the undisputed economic center of this region and the state, functioning as the center for commerce, finance, transportation, health care, arts, entertainment, and culture, as well as the seat of government.
- Commuting patterns** – Analysts define the regions using commuting data that capture the labor market activity and movement. These labor market connections can also be thought of as “commutersheds.” Further aspects of economic regions are measured using health care consumption patterns, industry similarity, co-movement of wages, and unemployment rates.
- Planning and policy support** – Decision-makers can use these economic regions to inform public and private investment, planning, and policy decisions.

i. Kem C. Gardner Policy Institute Utah State and County Annual Population Estimates by Single Year of Age and Sex: 2018 (population) and U.S. Bureau of Economic Analysis, Table CAINC 4: 2018 (employment).

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Introduction

There are many ways to create a set of regions (known as a “delineation”) from Utah’s 29 counties. To determine whether one delineation is better than another we need evaluation criteria. We follow the general principle that in a good delineation, counties in the same region will tend to be more strongly connected, or more alike, than counties in different regions. Of course, there are many ways counties can be connected or alike. The regions presented in this report aim to represent local labor markets and health service areas; to the extent possible, they bring together counties with similar economic interests.¹ More detail on how these criteria figure in the analysis is provided below. In addition, we impose the conditions that (1) regions form a contiguous group of counties, (2) every Utah county is in one and only one region, (3) no county outside of Utah is included in any Utah region, (4) regions consist of at least two counties, (5) no region is too big, and (6) the number of regions is manageable. We rely on informal methods to assess (5) and (6).

Results

Table 1 shows the economic regions determined by our analysis. We refer to these regions as Gardner 2020. Table 1 also shows two other delineations: Utah’s Associations of Governments (AOGs), and a set of economic regions proposed in 1966 (Proposed 1966) that served, in effect, as the prototype for the establishment of the AOGs a few years later.² Corresponding maps of these three delineations are shown in Figure 1.

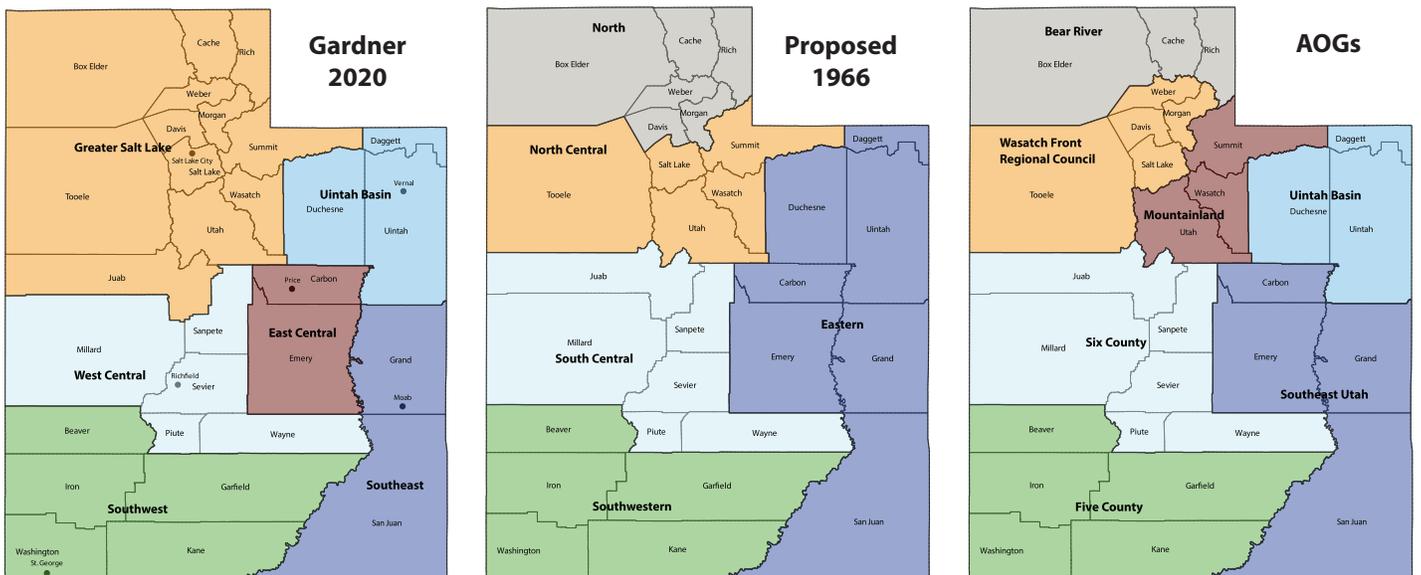
In terms of boundaries, there is a great deal of common ground between these older delineations and ours. In areas

Table 1: Utah Delineations

Region	Counties
Gardner 2020	
East Central	Carbon and Emery
Greater Salt Lake	Box Elder, Cache, Davis, Juab, Morgan, Rich, Salt Lake, Summit, Tooele, Utah, Wasatch, and Weber
Southeast	Grand and San Juan
Southwest	Beaver, Garfield, Iron, Kane, and Washington
Uintah Basin	Daggett, Duchesne, and Uintah
West Central	Millard, Piute, Sanpete, Sevier, and Wayne
Proposed 1966	
Eastern	Carbon, Daggett, Duchesne, Emery, Grand, San Juan, and Uintah
North Central	Salt Lake, Summit, Tooele, Utah, and Wasatch
North	Box Elder, Cache, Davis, Morgan, Rich, and Weber
South Central	Juab, Millard, Piute, Sanpete, Sevier, and Wayne
Southwestern	Beaver, Garfield, Iron, Kane, and Washington
AOGs	
Bear River	Box Elder, Cache, and Rich
Five County	Beaver, Garfield, Iron, Kane, and Washington
Mountainland	Summit, Utah, and Wasatch
Six County	Juab, Millard, Piute, Sanpete, Sevier, and Wayne
Southeast Utah	Carbon, Emery, Grand, and San Juan
Uintah Basin	Daggett, Duchesne, and Uintah
Wasatch Front Regional Council	Davis, Morgan, Salt Lake, Tooele, and Weber

Source: Kem C. Gardner Policy Institute

Figure 1: Utah’s Delineations of Economic Regions



Source: Kem C. Gardner Policy Institute and State of Utah, SGID

where there are differences, these differences generally contribute to improved performance as economic regions. See the high-level evaluation results below for more on this.

Compared with AOGs and Proposed 1966, Gardner 2020 unites northern Utah into a single region—Greater Salt Lake. In AOGs and Proposed 1966, Box Elder, Cache, and Rich are together in the same region, but not the same region as Salt Lake.

Beaver, Garfield, Iron, Kane, and Washington counties constitute a single region in all three delineations. This region is called “Southwest” in Gardner 2020, “Southwestern” in Proposed 1966, and “Five County” in AOGs.

Other counties that are part of the same region in all three delineations include Carbon and Emery; Daggett, Duchesne, and Uintah; Grand and San Juan; Summit, Utah, and Wasatch; Millard, Piute, Sanpete, Sevier, and Wayne; Salt Lake and Tooele; Morgan and Davis.

Methods

Fox & Kumar (1965) define a functional economic area as a geographical space that encloses most of the income generated by its residents, and in which a large share of personal consumption consists of goods and services provided in the same area. Our economic regions aim to be functional economic areas in this sense. We operationalize this concept by analyzing where people travel for work and to receive their health care.

Commuting to Work

A functional economic area should contain most of the income earned by its residents. Earnings from work make up the largest share of personal income for all of Utah’s counties. Consequently, to the extent there is significant commuting to work between one county and another, at least one of the two counties cannot be self-contained in terms of income-generating activities. For example, recent estimates show that about 37% of the working residents of Tooele County commute to jobs located in Salt Lake County. Given that about 75% of all income earned by residents of Tooele is earned through employment, perhaps one-quarter of the income earned by residents of Tooele is provided by work in Salt Lake.³ This argues that Tooele and Salt Lake should be part of the same (functional) economic region.

Each of our economic regions should therefore contain the commutes of the vast majority of its residents. Regions that do this may be called local labor markets. We delineate local labor markets by gathering together counties with strong commuting connections. The algorithm we use to accomplish this is called hierarchical agglomerative clustering and has been used in numerous studies with objectives similar to ours.⁴

The hierarchical clustering algorithm works as follows. First, the strength of commuting is computed for every pair of

counties using the proportional flow metric of Tolbert & Killian (1987), defined as:

$$P_{ij} = \frac{(F_{ij} + F_{ji})}{\text{Min}(W_i, W_j)}$$

where F_{ij} is the number of commuters who live in county i but work in county j , F_{ji} is the number of commuters who live in county j but work in county i ; and W_i and W_j are the number of employed residents of county i and county j , respectively. Larger values of P_{ij} indicate stronger connections. Proportional flow has a tendency to produce particularly strong measurements between large and small counties; for example, between Tooele and Salt Lake, and Juab and Utah. Proportional flow was used by Tolbert and Killian (1987) to define labor market areas for the U.S.⁵

To carry out this calculation we use data from the 2011–2015 American Community Survey (ACS), which provides estimates of the number of commutes between each pair of counties in the U.S.⁶

To illustrate the proportional flow calculation, consider the case of Carbon and Emery counties. According to estimates from the ACS, 500 of the 8,894 employed residents of Carbon traveled to work in Emery, while 813 of the 3,948 employed residents of Emery traveled to work in Carbon. The numerator is therefore 1,313 (500 + 813), while the denominator is 3,948, giving a proportional flow of 33%.

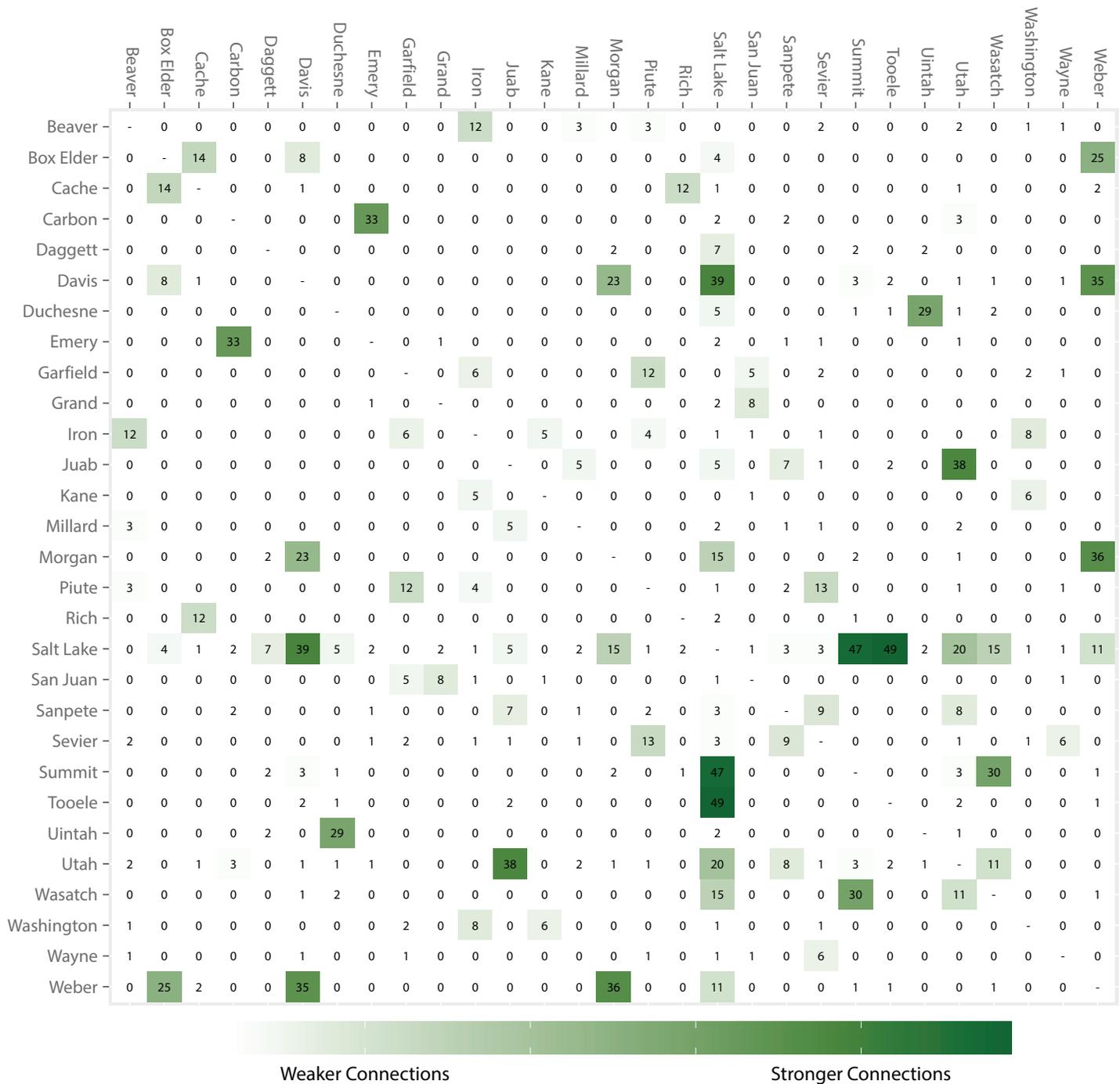
Figure 2 shows the proportional flow for each pair of counties. The darker green squares represent pairs of counties with stronger connections. Salt Lake and Tooele are the most strongly connected, followed closely by Salt Lake and Summit.

The process of combining Utah’s 29 counties into regions starts by merging the two counties most strongly connected—Salt Lake and Tooele. Next, proportional flows are examined among all pairs of the remaining 27 counties, as well as between each of those counties and the region comprising Salt Lake and Tooele. The definition of proportional flow shown above applies to pairs of counties. Tolbert and Killian (1987), as well as others, define the strength of commuting between a single county and a region comprising multiple counties as the average proportional flow between the single county and each of the counties within the region.⁷ In effect, when two counties are merged, the rows and columns in Figure 2 corresponding to these counties are deleted and replaced with a single row and column whose values are the average proportional flows between the two counties and each of the other 27 counties.

In Figure 2, since the counties are arranged in alphabetical order, we would expect to see only chance patterning of the darker squares (there’s no tendency for counties alphabetically close to have strong commuting relationships). But if the table in Figure 2 is reordered by region, then to the extent the regionalization is successful, we should see the darker squares belonging to pairs of counties from the same region.

Figure 2: Commuting Connections

Dark green squares indicate pairs of counties with stronger commuting connections



Source: Kem C. Gardner Policy Institute analysis of data from the U.S. Census Bureau, 2011–2015 American Community Survey

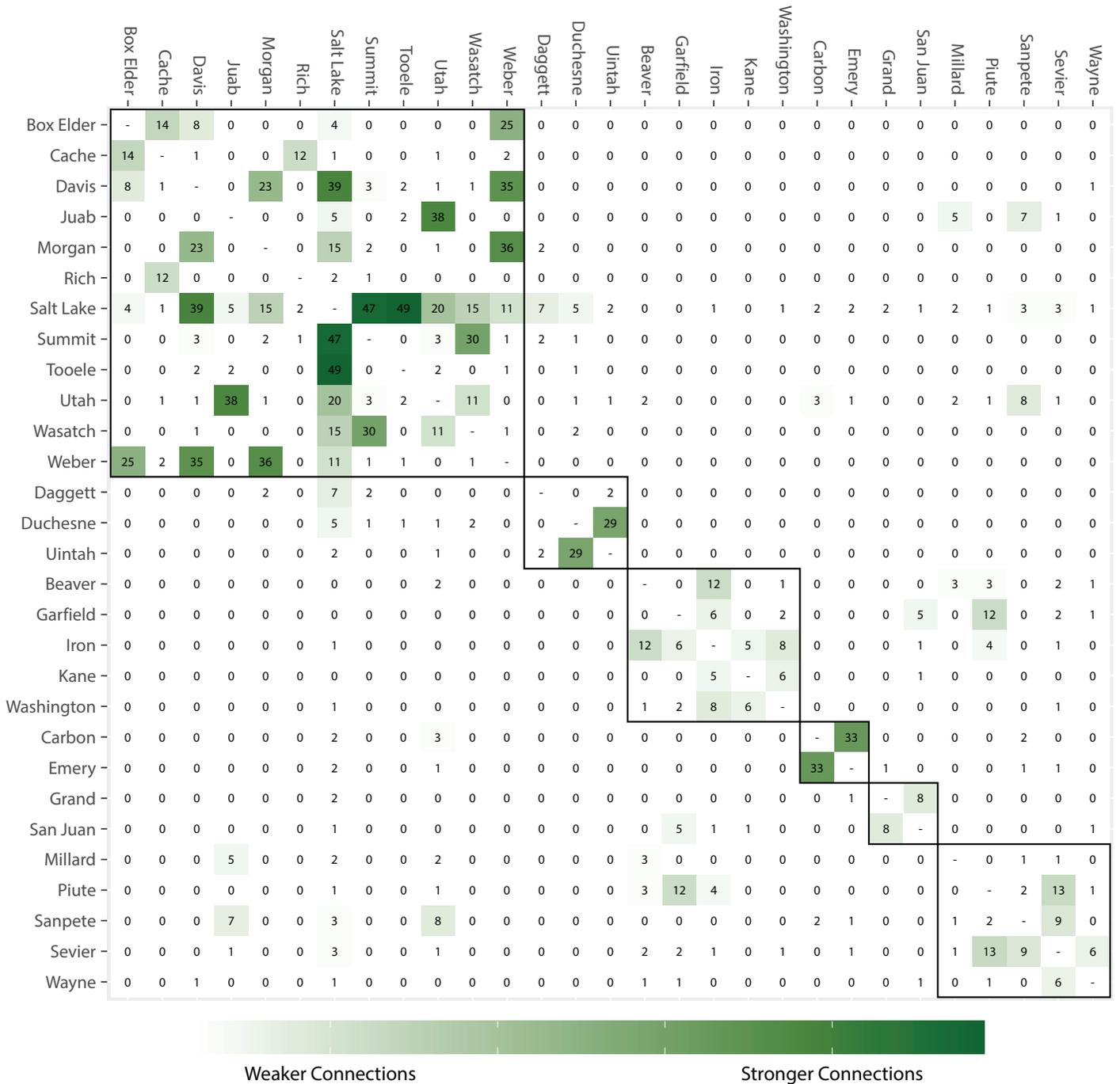
Figure 3 shows such a rearrangement of Figure 2. In this particular case, the table is ordered by the six Gardner 2020 regions. Boxes are drawn around counties belonging to the same region. The figure shows that for this set of regions, all strong commuting connections are among counties in the same region.

Gardner 2020 regions are based on a delineation specifically concerning commuting and created through the clustering algorithm described above. These regions, shown in Figure 4,

result from stopping the clustering algorithm once five regions remain; that is, after completing 24 steps of the process described above. At each step in the process, either two counties merge into a new region, or a single county merges with an existing region, or two regions merge. In any case, there is one fewer region than at the previous step.⁸ One way to show how the regions develop at each step along the way would be to create a set of maps (one at each step) similar to Figure 4.

Figure 3: Commuting Connections Clustered by Region

Dark green squares indicate pairs of counties with stronger commuting connections

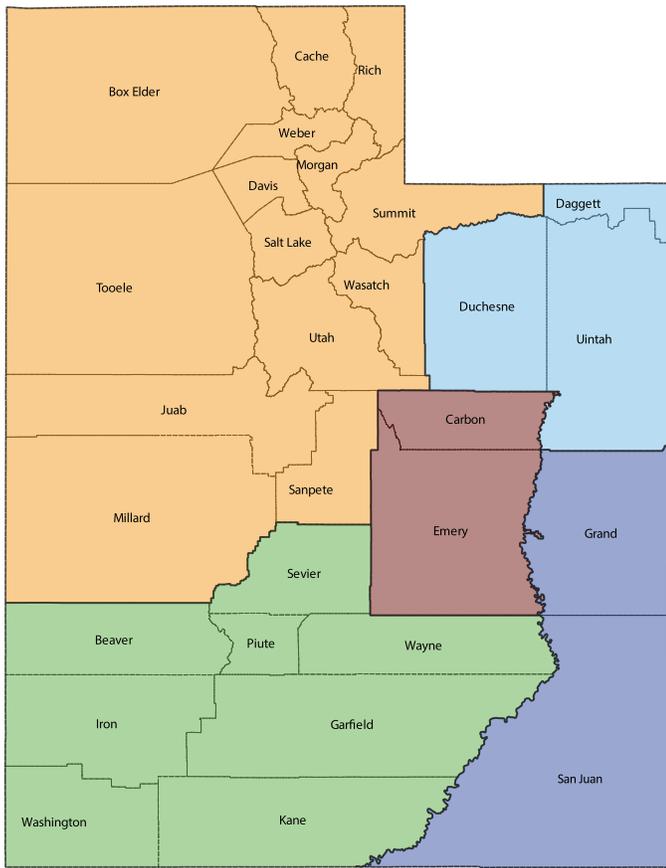


Source: Kem C. Gardner Policy Institute analysis of data from the U.S. Census Bureau, 2011–2015 American Community Survey

The five regions shown in Figure 4 are similar to Gardner 2020. The difference is that Gardner 2020 adds a sixth region (West Central) that pulls Millard and Sanpete from Greater Salt Lake and Piute, Sevier, and Wayne from Southwest. This was done to keep Greater Salt Lake and Southwest to manageable sizes and because these counties do not have a strong “northern” or “southern” orientation.

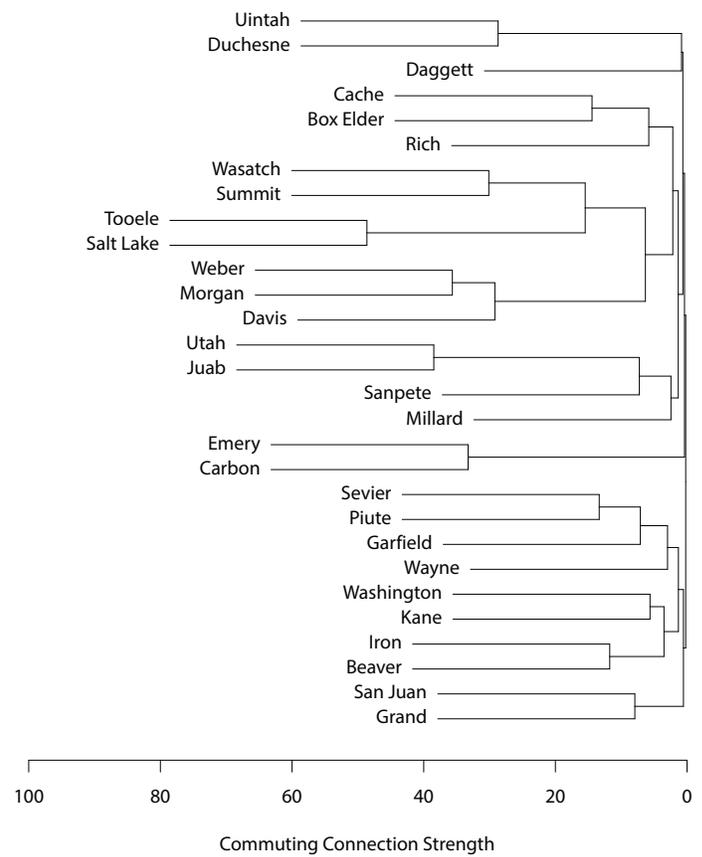
Figure 5 provides a single-figure alternative to a set of stepwise maps. The mergers corresponding to the first steps (the strongest connections) are shown at the left of the figure, with subsequent steps (weaker connections) closer to the right. The figure shows the sequence of mergers noted above: after Salt Lake combines with Tooele, Juab combines with Utah, then Morgan with Weber, Carbon with Emery, and Summit with Wasatch. Next, Davis joins the region composed of Morgan and Weber. After Duchesne

Figure 4: Local Labor Markets Based on Commuting to Work



Source: Kem C. Gardner Policy Institute analysis of data from the U.S. Census Bureau, 2011–2015 American Community Survey, and State of Utah, SGID

Figure 5: Clustering of Counties into Local Labor Markets



Source: Source: Kem C. Gardner Policy Institute analysis of data from the U.S. Census Bureau, 2011–2015 American Community Survey

joins Uintah, the region consisting of Salt Lake and Tooele joins the region consisting of Summit and Wasatch. After Box Elder combines with Cache, the more weakly connected southern counties begin to merge. Eventually, at the far right of the figure, the last two regions merge into one. The sense of connection between two regions is similar to that between a single county and a region—it’s the average proportional flow among each pair of counties from different regions.⁹

Figure 5 also shows the distinctiveness of certain pairs of counties. Carbon and Emery are among the first to merge, but do not combine with the other counties of northern Utah until near the very end, at which point the connection between those counties and Carbon and Emery is very weak. Similarly for Duchesne and Uintah.

Health Care Trips

Continuing in the tradition of a functional economic area, each economic region should also provide a large share of the goods and services consumed by its residents. Unlike commuting data, however, publicly available county-level origin-destination data on the production and consumption of

personal goods and services is rare. For the purpose of incorporating this aspect of functional economic areas into our regions, we obtained such data concerning a particularly important service—health care.¹⁰

Local labor markets are not automatically self-contained with respect to health care; it is possible for a region to be large enough to enclose commuting while having either too much or too little health care resources relative to the needs of its resident population. For example, between 2017 and 2019, only 14% of outpatient services received by residents of Emery County was provided within the county (almost half was provided in Carbon County, with nearly all the rest provided in Salt Lake and Utah counties). By contrast, the corresponding figure for Salt Lake County was 93% (and Salt Lake provides a substantial share of outpatient services for many of Utah’s other counties).

We created regions that enclose health care visits using the same method described in the section on commuting. In the early 1990s this method was used by the National Center for Health Statistics (NCHS) to create such regions (called “health service areas”) for the U.S. (Makuc et al., 1991). The NCHS regions are based on outpatient visits and only for those using

Figure 6: Health Care Connections

Darker green squares indicate pairs of counties with stronger health care travel connections



Source: Kem C. Gardner Policy Institute analysis of data from the Utah Office of Health Care Statistics

Medicare.¹¹ We follow the NCHS approach by only considering trips for outpatient services but, unlike NCHS, include visits from all types of payees, not just Medicare.

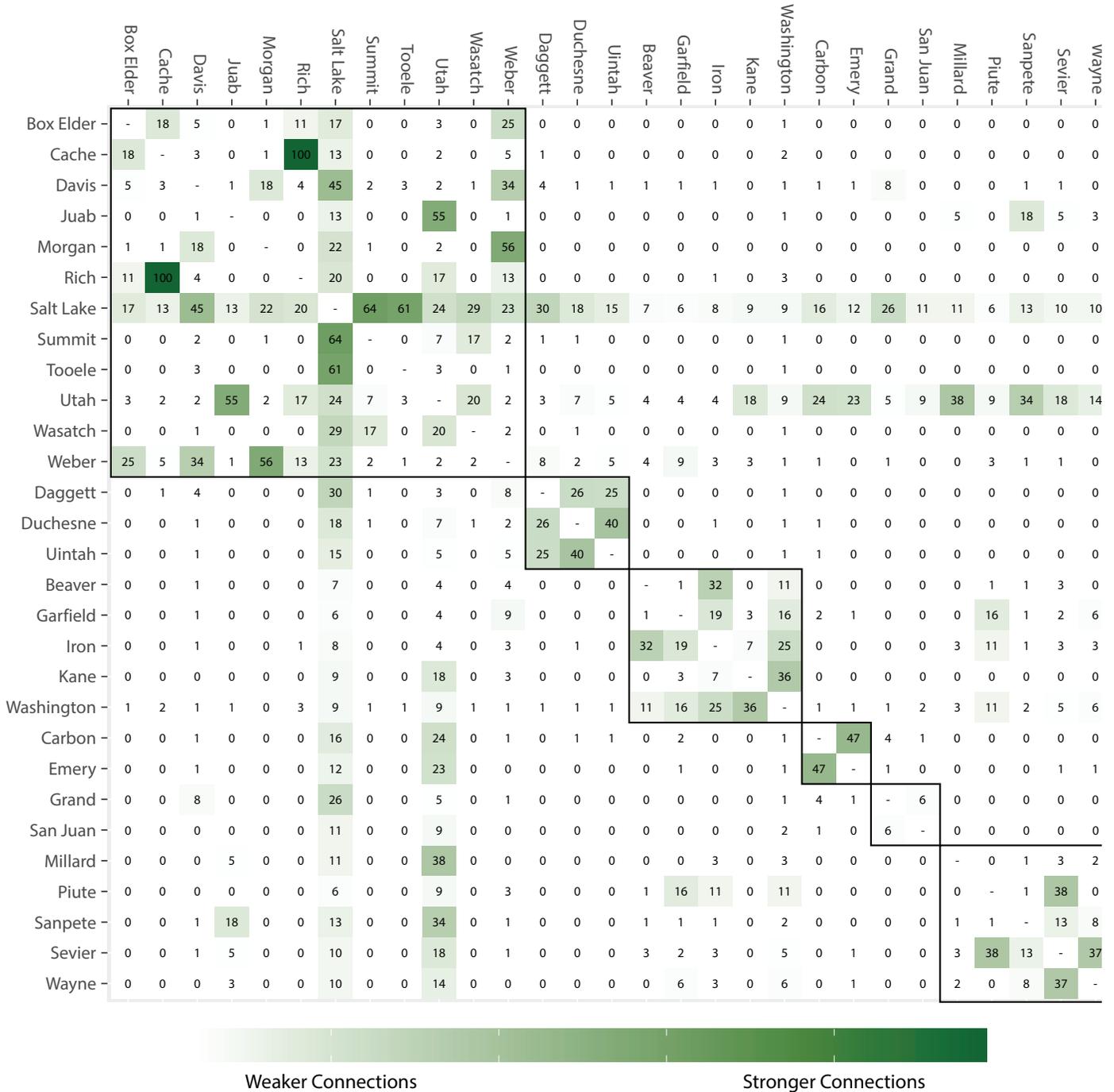
Results are presented in Figures 6–9. These are analogous to Figures 2–5.

As expected, Figure 6 shows no apparent clustering pattern when counties are arranged alphabetically. Grouping the table in Figure 6 by Gardner 2020 regions shows (Figure 7) that these

regions effectively bring together counties with strong health care connections (darker green squares). However, the Gardner 2020 regions do not contain health care trips as completely as they contain commuting. This is largely on account of the long reach of Salt Lake and Utah counties; these counties draw health care visits from much of the rest of the state.

Figure 7: Health Care Connections Clustered by Region

Dark green squares indicate pairs of counties with stronger health care travel connections



Source: Kem C. Gardner Policy Institute analysis of data from the Utah Office of Health Care Statistics

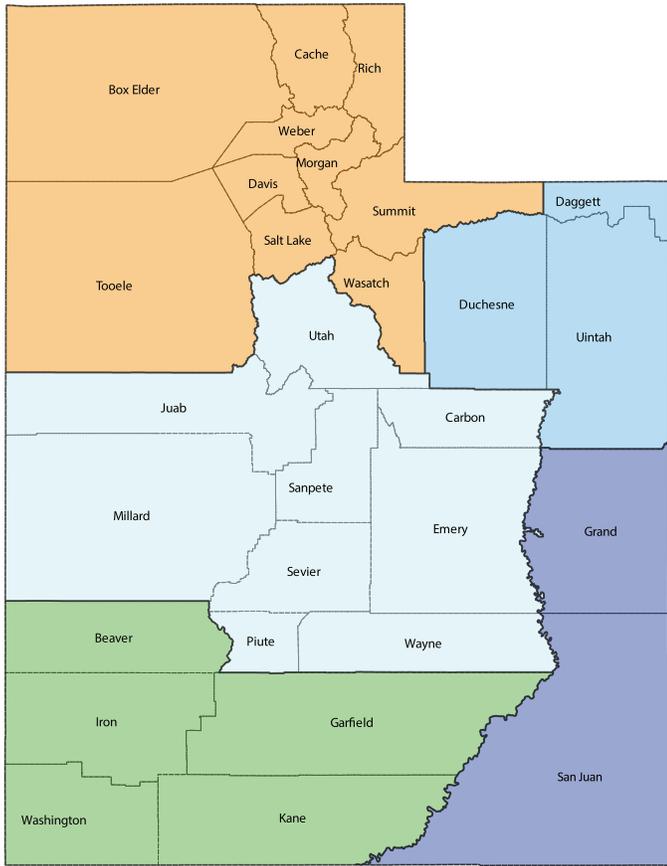
The regions of Gardner 2020 are informed by a delineation specifically aimed at containing health care visits, and based on the clustering algorithm described above. This delineation results from stopping the algorithm at five health care regions. These regions are shown in Figure 8.

Analogous to Figure 5, Figure 9 shows the entire path of mergers leading to the five regions shown in Figure 8.

Industry Similarity

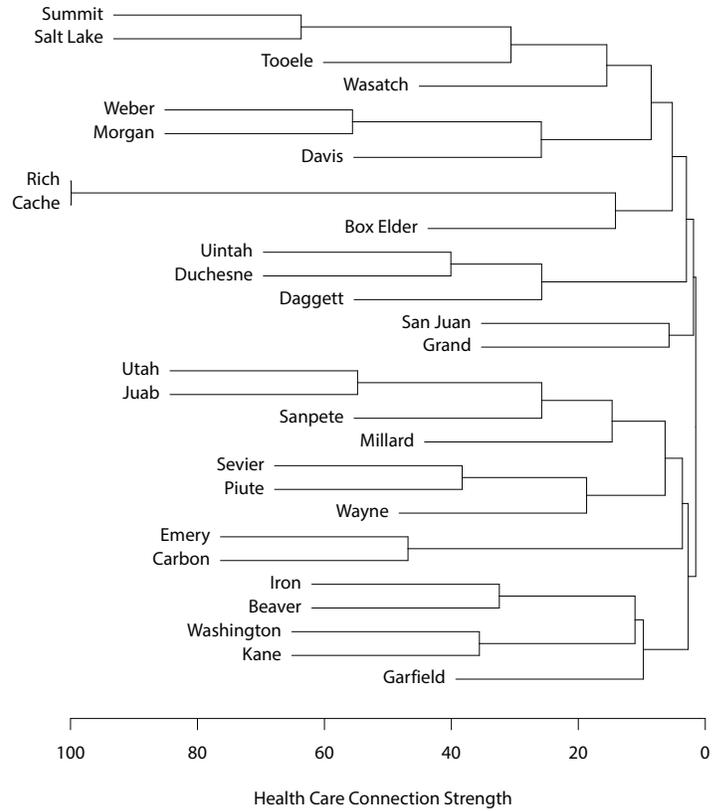
If counties within the same region tend to have similar industry bases, it may be effective to coordinate policy efforts at the regional level. For example, Carbon and Emery counties are highly concentrated in coal mining. If the demand for coal continues to decline, we would expect these counties to experience relative or even absolute declines in employment

Figure 8: Health Care Travel Areas



Source: Kem C. Gardner Policy Institute analysis of data from the Utah Office of Health Care Statistics, and State of Utah, SGD

Figure 9: Clustering of Counties into Health Care Travel Areas



Source: Kem C. Gardner Policy Institute analysis of data from the Utah Office of Health Care Statistics

and population, absent efforts to broaden or refocus their industrial base.

Ideally, counties within the same economic region will have industry structures that are more alike than among counties from different regions.

We measure the difference in the industry distribution of jobs between two counties using percent similarity.¹² The percentage similarity between two counties *i* and *j* is defined as:

$$S_{i,j} = \text{Min}(p_{i,1}, p_{j,1}) + \text{Min}(p_{i,2}, p_{j,2}) + \dots + \text{Min}(p_{i,N}, p_{j,N})$$

where $p_{m,n}$ is the share of jobs in industry *n* in county *m*, and *N* is the number of industries. This measure is intuitively appealing. Two counties are maximally similar when each industry has the same share in both counties, in which case *S* comes out to 100%. At the other extreme, two counties are maximally dissimilar if whenever one county has jobs in a given industry, the other county does not, in which case *S* comes out to 0%.

Figure 10 shows percentage similarity calculated for each pair of Utah's counties.¹³ Like the Tolbert-Killian measure, percentage similarity is symmetric: the upper right portion of the table is the mirror image of the lower left portion. The table shows, for example, that the county whose industry distribution of jobs is

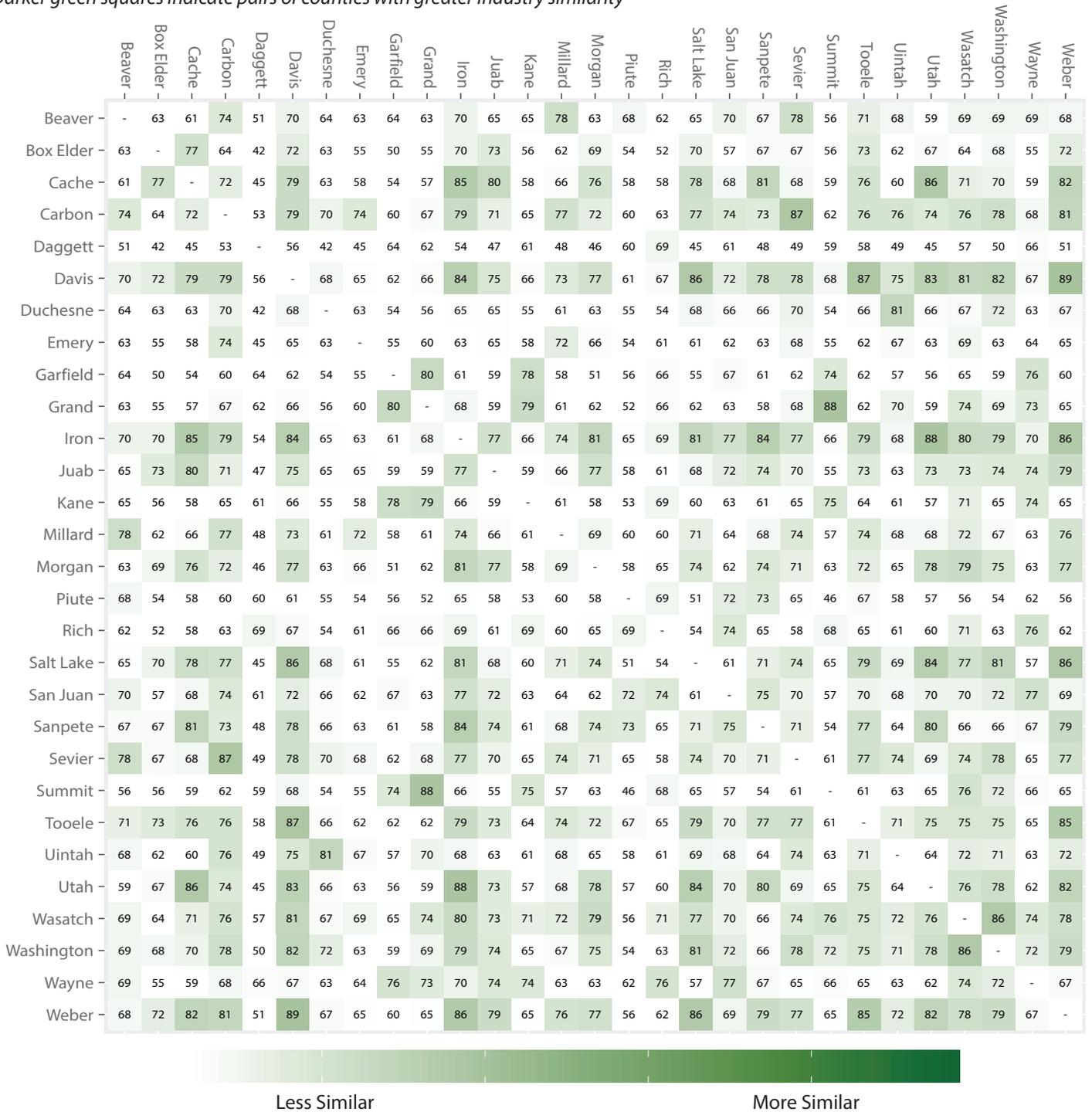
most similar to that of Davis County is Weber County, with a similarity score of 89%. Because the counties are listed in alphabetical order, rather than by region, any clustering of similarity is coincidental.

As Figure 10 makes clear, there is less of a tendency for counties that are close in geographical space to be close in terms of industry similarity. For example, the county whose industry structure is most similar to that of Rich County is Wayne County. Unlike the cases of commuting and health care, hierarchical clustering does not yield regions consisting of contiguous counties without adding a penalty for the distance between counties. We instead use an approach by Assunção et al., (2006) that guarantees the contiguity constraint is satisfied. As with local labor markets and health care travel areas, the reference delineation for industry similarity consists of five regions (Figure 12).

Figure 11 again shows the percentage similarity between each pair of counties, but like Figures 3 and 7, groups the counties according to the Gardner 2020 set of regions. Ideally, counties within the same region would tend to be more alike than counties in different regions. In terms of the figure, the darker green squares would tend to fall within the boxes.

Figure 10: Industry Similarity

Dark green squares indicate pairs of counties with greater industry similarity



Source: Kem C. Gardner Policy Institute analysis of data from the Utah Department of Workforce Services

Assessment

Operationally, our candidate delineations are generated on the basis of commuting patterns. As noted above, this helps ensure our economic regions are coextensive with local labor markets. However, we also evaluate delineations based on other factors that might be considered important for an economic region, including containment of health care visits, industry similarity, intra-region correlation in wages and

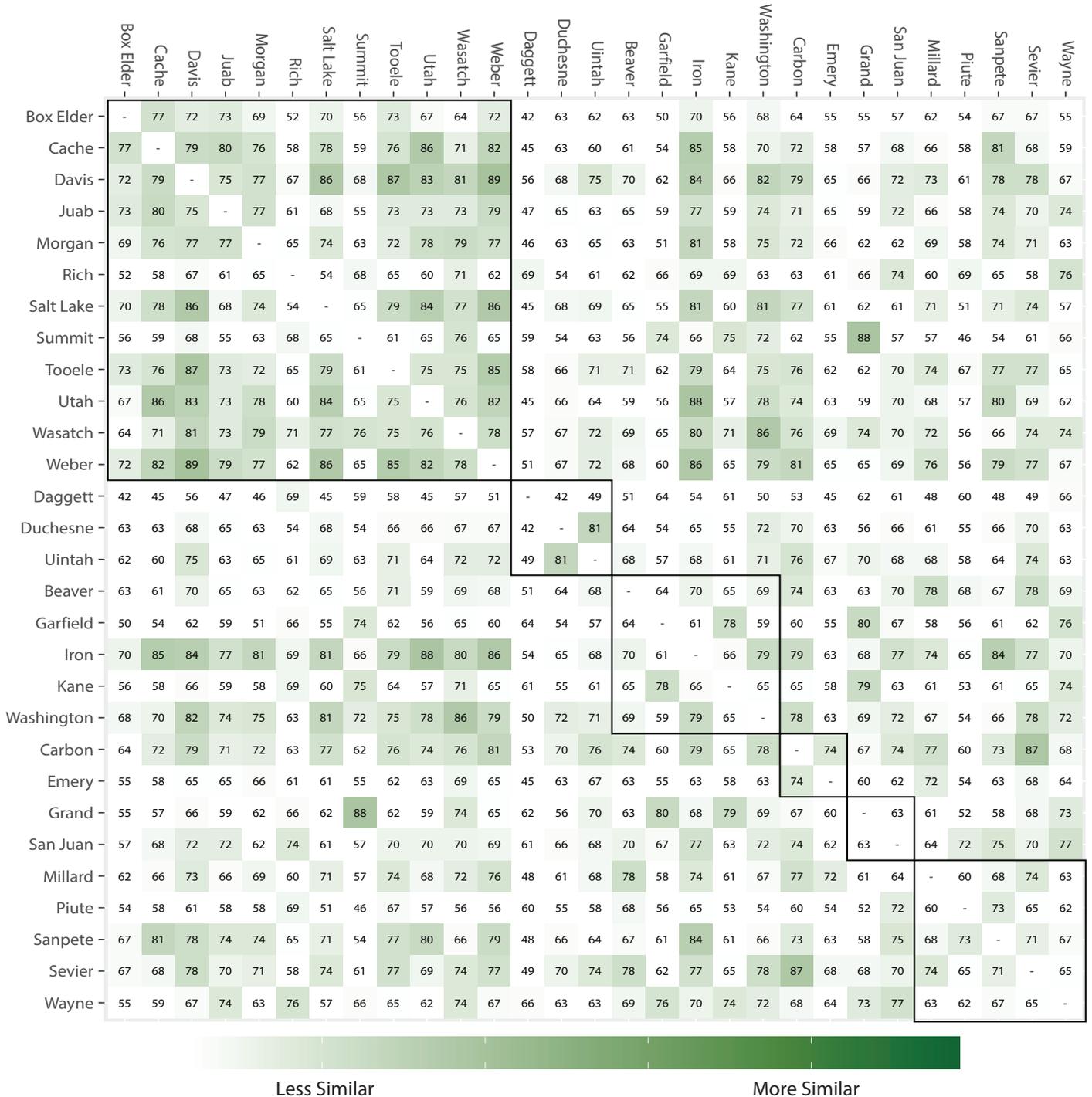
unemployment rates, and the role of “core” counties.

We evaluate Gardner 2020 against the Proposed 1966 and AOGs delineations. Most of the metrics are from Fowler et al (2018).

Table 2 shows how the three delineations perform on certain core-based measures. Here, “core” refers to counties that form a metropolitan or micropolitan statistical area. Ideally, each region contains at least one core county, and if a region contains a multicounty core area it contains it whole. Two of the regions

Figure 11: Industry Similarity Clustered by Region

Dark green squares indicate pairs of counties with greater industry similarity



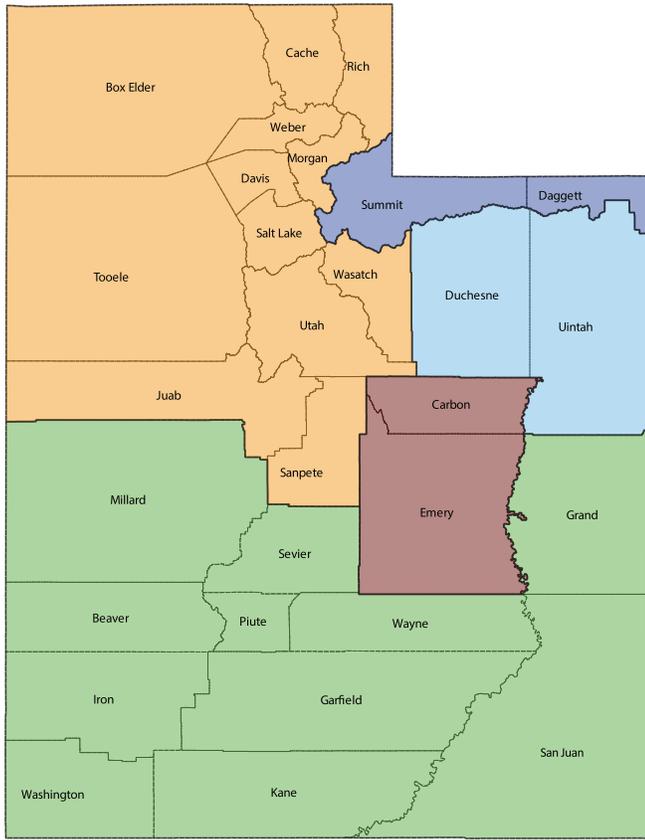
Source: Kem C. Gardner Policy Institute analysis of data from the Utah Department of Workforce Services

in Gardner 2020 (Southeast and West Central) do not contain core counties or areas. However, none of the regions in Gardner 2020 split a core area. The third and fourth columns in Table 2 show the percentage of those working and living in a core county within their regions. The last column shows the percentage of workers who live and work in the same region. This measure provides a fairly direct assessment of how well the delineations meet the Fox & Kumar (1965) criteria for a functional

economic region: Gardner 2020 regions do an excellent job of containment, with only 0.5% of workers commuting outside of their region of residence. The corresponding figures for Proposed 1966 and AOGs are about 6%.

Table 3 shows results from grouping counties together with stronger commuting connections. Ideally, counties in the same region will tend to be more strongly connected than counties in different regions. For example, the average proportional flow

Figure 12: Regions as Determined by Industry Similarity



Source: Kem C. Gardner Policy Institute analysis of data from the Utah Department of Workforce Services, and State of Utah, SGID

should be high within the region and low among counties between regions. It may also be desirable that the least connected counties *within* a region are not too disconnected and the most connected counties *between* regions are not too connected. This is captured by the minimum within and maximum between measures, respectively. Gardner 2020 allows some more-weakly connected counties compared with Proposed 1966 and AOGs. However, Gardner 2020 has higher average “within” and lower average and maximum “between” flows. Given that Gardner 2020 was created under a principle that closely aligns with the metrics in Table 3, its good performance on these metrics is not surprising.

Table 4 assesses how well Gardner 2020 regions contain commuting. As noted above, the ultimate goal of creating regions with strong internal and weak external commuting

Table 4: Commuting Containment

Delineation	Inflow Percent				Outflow Percent			
	Within		Between		Within		Between	
	Min	Average	Max	Average	Min	Average	Max	Average
Proposed 1966	92.4%	95.4%	7.1%	1.1%	81.5%	93.0%	18.4%	1.8%
AOGs	90.2%	95.0%	8.8%	0.8%	83.9%	93.4%	15.5%	1.1%
Gardner 2020	94.6%	96.8%	4.6%	0.6%	91.5%	97.3%	6.0%	0.5%

Source: Kem C. Gardner Policy Institute Source: Kem C. Gardner Policy Institute analysis of data from the U.S. Census Bureau, 2011–2015 American Community Survey

Table 2: Core-Based Measures

Delineation	Labor Markets with Core County	Number of CBSAs Split	Share Working in a Core County	Share Living in a Core County	Percentage of Workers Living and Working in the Same Region
Proposed 1966	100%	1	66.1%	67.6%	93.5%
AOGs	100%	2	67.4%	68.5%	93.7%
Gardner 2020	67%	0	53.6%	53.0%	99.5%

Source: Kem C. Gardner Policy Institute analysis of data from the U.S. Census Bureau, 2011–2015 American Community Survey

Table 3: Commuting Connections

Delineation	Pairwise Proportional Flow			
	Within		Between	
	Min	Average	Max	Average
Proposed 1966	17.3%	23.9%	3.0%	0.8%
AOGs	19.2%	33.1%	6.3%	0.9%
Gardner 2020	14.8%	36.9%	1.3%	0.4%

Source: Kem C. Gardner Policy Institute analysis of data from the U.S. Census Bureau, 2011–2015 American Community Survey

connections is to create regions that are relatively enclosed in terms of where people live and work. There are two senses in which a region can be enclosed. First, a large share of those working in the region are residents of the region. This is called the inflow percent. Second, a large share of the working residents of a region work in the region. This is called the outflow percent. In a good delineation, the minimum and average inflow percent should be large within regions, and the maximum and average should be small between regions. Likewise for the outflow percent. Note that the “within” of the inflow percent refers to the percent of a region’s workers who live in that region, while the “between” refers to the percentage of a region’s workers who live in a different region. Similarly, the “within” of the outflow percent refers to the percent of a region’s employed residents who commute to work within that same region, while the “between” refers to the percentage of a region’s employed residents who commute to work in a different region.

Table 5: Commuting Patterns Between Gardner 2020 Regions

Region/County	East Central	Greater Salt Lake	Southeast	Southwest	Uintah Basin	West Central
East Central						
Carbon	96.4%	2.6%	0.0%	0.2%	0.5%	0.4%
Emery	96.8%	1.3%	1.2%	0.1%	0.4%	0.2%
Greater Salt Lake						
Box Elder	0.0%	100.0%	0.0%	0.0%	0.0%	0.0%
Cache	0.0%	99.9%	0.0%	0.0%	0.0%	0.0%
Davis	0.0%	99.9%	0.0%	0.0%	0.1%	0.0%
Juab	0.5%	95.3%	0.0%	0.1%	0.1%	4.1%
Morgan	0.0%	99.6%	0.0%	0.0%	0.4%	0.0%
Rich	0.0%	99.7%	0.0%	0.3%	0.0%	0.0%
Salt Lake	0.0%	99.8%	0.0%	0.0%	0.1%	0.0%
Summit	0.0%	99.7%	0.0%	0.0%	0.2%	0.0%
Tooele	0.0%	99.8%	0.0%	0.0%	0.2%	0.0%
Utah	0.1%	99.6%	0.0%	0.1%	0.1%	0.1%
Wasatch	0.0%	98.8%	0.0%	0.0%	1.2%	0.0%
Weber	0.0%	99.9%	0.0%	0.0%	0.0%	0.0%
Southeast						
Grand	0.0%	1.3%	98.7%	0.0%	0.0%	0.0%
San Juan	0.2%	0.3%	99.0%	0.1%	0.4%	0.0%
Southwest						
Beaver	0.0%	0.9%	0.0%	96.3%	0.0%	2.9%
Garfield	0.0%	0.3%	5.2%	91.3%	0.0%	3.2%
Iron	0.0%	1.3%	0.3%	97.9%	0.2%	0.3%
Kane	0.0%	0.1%	0.7%	99.1%	0.1%	0.0%
Washington	0.0%	1.1%	0.0%	98.8%	0.0%	0.1%
Uintah Basin						
Daggett	0.0%	2.2%	0.0%	0.0%	97.8%	0.0%
Duchesne	0.1%	2.0%	0.0%	0.0%	97.9%	0.0%
Uintah	0.0%	0.7%	0.0%	0.0%	99.1%	0.1%
West Central						
Millard	0.0%	3.3%	0.0%	1.0%	0.1%	95.6%
Piute	0.0%	1.7%	0.0%	15.4%	0.0%	82.9%
Sanpete	2.5%	11.7%	0.0%	0.3%	0.6%	84.9%
Sevier	0.3%	1.8%	0.0%	0.9%	0.0%	97.0%
Wayne	0.0%	1.4%	1.4%	1.6%	0.0%	95.6%

Source: Kem C. Gardner Policy Institute analysis of data from the U.S. Census Bureau, 2011–2015 American Community Survey

Table 6: Health Care Connections

Delineation	Tolbert-Sizer Measure of Health Care Connection			
	Within		Between	
	Min	Average	Max	Average
Proposed 1966	20.5%	29.6%	7.8%	2.8%
AOGs	24.2%	41.2%	9.4%	2.7%
Gardner 2020	19.0%	43.2%	3.4%	1.4%

Source: Kem C. Gardner Policy Institute analysis of data from the Utah Office of Health Care Statistics

On the measures presented in Table 4, Gardner 2020 performs better than Proposed 1966 and AOGs across the board.

Table 5 shows outflow commuting patterns between Gardner 2020 regions. For example, 96.4% of employed residents of Carbon County commute to a work location within the region containing Carbon County (East Central), with most of the rest (2.6%) commuting to Greater Salt Lake. For all but two counties, at least 90% of commuting is contained within the county's region.

Tables 6 and 7 show the same measures for health care visits that were presented in Tables 3 and 4 for commuting. Here, rather than looking at where employed residents commute to work, we are considering where residents travel for health care. In keeping with Makuc et al. (1991) we specifically consider trips for outpatient and professional services.¹⁴ These tables show that Gardner 2020 regions also make for reasonably good health service areas. In fact, as health service areas, Gardner 2020 is competitive with the delineation we created specifically to enclose health care visits.

Table 8 shows health care outflow travel between Gardner 2020 regions. The two larger, more urban regions—Greater Salt Lake and Southwest—contain larger fractions of their residents' health care visits (more than 95% in the case of Greater Salt Lake). This is simply because the geographical distribution of the supply of health care services is not identical to the distribution of demand, with services concentrated in more urban areas. For example, 40% of (outpatient) health care trips made by residents of East Central required traveling to another region (almost all of which to Greater Salt Lake).

Fowler et al. (2018) argue that in a good delineation of local labor markets, wages should be more strongly correlated

Table 7: Health Care Containment

Delineation	Inflow Percent				Outflow Percent			
	Within		Between		Within		Between	
	Min	Average	Max	Average	Min	Average	Max	Average
Proposed 1966	86.0%	89.8%	10.4%	2.5%	56.3%	75.7%	37.4%	6.1%
AOGs	83.6%	89.8%	8.1%	1.7%	56.3%	74.8%	27.2%	4.2%
Gardner 2020	87.4%	92.2%	9.1%	1.6%	54.1%	73.7%	40.0%	5.3%

Source: Kem C. Gardner Policy Institute analysis of data from the Utah Office of Health Care Statistics

Table 8: Health Care Travel Patterns Among Gardner 2020 Regions

Region/County	East Central	Greater Salt Lake	Southeast	Southwest	Uintah Basin	West Central
East Central						
Carbon	59.9%	38.4%	0.2%	0.9%	0.3%	0.3%
Emery	59.6%	37.0%	0.5%	1.1%	0.1%	1.6%
Greater Salt Lake						
Box Elder	0.0%	98.8%	0.0%	1.1%	0.0%	0.1%
Cache	0.0%	98.1%	0.0%	1.8%	0.0%	0.1%
Davis	0.0%	99.4%	0.0%	0.5%	0.1%	0.1%
Juab	0.1%	95.7%	0.0%	0.7%	0.0%	3.5%
Morgan	0.0%	99.5%	0.0%	0.5%	0.0%	0.0%
Rich	0.0%	96.9%	0.0%	3.1%	0.0%	0.0%
Salt Lake	0.0%	99.4%	0.0%	0.4%	0.1%	0.1%
Summit	0.0%	99.4%	0.0%	0.4%	0.0%	0.1%
Tooele	0.0%	99.2%	0.0%	0.5%	0.1%	0.2%
Utah	0.1%	98.9%	0.0%	0.7%	0.1%	0.2%
Wasatch	0.0%	98.5%	0.0%	0.9%	0.2%	0.3%
Weber	0.0%	99.4%	0.0%	0.4%	0.1%	0.1%
Southeast						
Grand	4.1%	31.0%	64.1%	0.6%	0.1%	0.1%
San Juan	0.6%	20.2%	77.8%	1.1%	0.1%	0.0%
Southwest						
Beaver	0.0%	14.6%	0.0%	82.6%	0.1%	2.7%
Garfield	0.0%	20.1%	0.0%	74.7%	0.0%	5.2%
Iron	0.0%	12.5%	0.0%	86.6%	0.2%	0.6%
Kane	0.0%	30.9%	0.0%	68.9%	0.1%	0.1%
Washington	0.0%	15.6%	0.1%	84.0%	0.1%	0.2%
Uintah Basin						
Daggett	0.1%	46.6%	0.2%	1.2%	51.7%	0.3%
Duchesne	0.5%	25.7%	0.0%	0.8%	72.8%	0.2%
Uintah	0.8%	25.4%	0.1%	0.5%	72.9%	0.2%
West Central						
Millard	0.1%	52.0%	0.0%	5.4%	0.1%	42.4%
Piute	0.0%	18.7%	0.0%	38.0%	0.3%	43.0%
Sanpete	0.1%	50.1%	0.0%	2.0%	0.1%	47.7%
Sevier	0.2%	27.3%	0.0%	7.4%	0.1%	65.0%
Wayne	0.9%	24.0%	0.0%	8.0%	0.3%	66.8%

Source: Kem C. Gardner Policy Institute analysis of data from the Utah Office of Health Care Statistics

among counties within the same labor market than among counties in different labor markets. In Table 9 we show average “within” and “between” correlations for wages as well as unemployment rates. Although these criteria could be used to produce new delineations—e.g. using wage correlation between counties as a measure of similarity—we follow Fowler et al. (2018) in using the correlation criteria to evaluate existing delineations. Again, we see that compared with Proposed 1966 and AOGs, Gardner 2020 performs well on these measures. For example, the average correlation in unemployment rates among counties in the same region is 0.93, compared with 0.89 and 0.92 respectively for Proposed 1966 and AOGs. For wages, the average correlation among counties in different regions (which should be relatively low) is 0.48 for Gardner 2020, versus 0.65 and 0.55 respectively for Proposed 1966 and AOGs. In one case—average wage correlation within-region—AOGs performs slightly better, with a correlation of 0.83 versus 0.82 for Gardner 2020.

Another characteristic of a region is the tendency for the distribution of jobs across industries to be more similar among counties within the same region than among counties between different regions. Here, “similarity” is measured as percentage similarity, which is defined as the sum of the industry share of jobs for each industry, among whichever industry has the smaller share. If two counties had the same share of jobs by industry, their percentage similarity would be 100% (because in this case each county would have the same share for each industry, while for each county the shares must sum to 100%). At the opposite extreme, two counties are maximally different if for each industry one county has jobs in that industry while the other county does not (as then the minimum share is always

Table 10: Industry Similarity

Delineation	Industry Similarity			
	Within		Between	
	Min	Average	Max	Average
Proposed 1966	71%	64%	50%	54%
AOGs	76%	67%	45%	53%
Gardner 2020	78%	68%	46%	53%

Source: Kem C. Gardner Policy Institute analysis of data from the Utah Office of Health Care Statistics

Table 9: Unemployment and Wage Correlations

Delineation	Unemployment Rates				Wages			
	Within		Between		Within		Between	
	Min	Average	Max	Average	Min	Average	Max	Average
Proposed 1966	0.75	0.89	0.97	0.78	0.55	0.80	0.93	0.65
AOGs	0.83	0.92	0.99	0.73	0.59	0.83	0.95	0.55
Gardner 2020	0.83	0.93	0.94	0.71	0.72	0.82	0.92	0.48

Source: Kem C. Gardner Policy Institute analysis of data from the Utah Department of Workforce Services and the U.S. Bureau of Labor Statistics

Table 11: Population by Major Age Group

Region/County	Total	Preschool Age (Under 5)	School Age (5-17)	Working Age (18-64)	Retirement Age (65+)
East Central	32,064	6.0%	21.5%	56.2%	16.4%
Carbon	21,395	6.0%	20.5%	57.1%	16.4%
Emery	10,669	6.0%	23.4%	54.3%	16.3%
Greater Salt Lake	2,733,452	8.1%	22.0%	60.0%	10.0%
Box Elder	55,686	7.9%	24.1%	55.3%	12.7%
Cache	128,885	9.0%	21.8%	59.9%	9.4%
Davis	352,802	8.1%	24.5%	57.5%	9.9%
Juab	12,177	8.4%	25.5%	54.2%	11.9%
Morgan	11,963	6.9%	24.0%	57.4%	11.8%
Rich	2,429	7.0%	23.1%	51.3%	18.6%
Salt Lake	1,142,076	7.5%	20.1%	61.7%	10.7%
Summit	41,285	5.1%	17.8%	64.8%	12.3%
Tooele	68,859	7.3%	24.6%	58.8%	9.3%
Utah	633,582	9.5%	24.1%	58.9%	7.5%
Wasatch	32,137	7.4%	23.3%	57.8%	11.6%
Weber	251,571	7.6%	20.8%	59.8%	11.9%
Southeast	26,743	6.3%	20.9%	58.6%	14.2%
Grand	10,257	5.6%	16.9%	60.1%	17.3%
San Juan	16,486	6.7%	23.4%	57.6%	12.3%
Southwest	245,051	6.6%	19.3%	54.6%	19.5%
Beaver	6,911	7.7%	24.2%	54.0%	14.1%
Garfield	5,230	5.6%	19.5%	53.9%	20.9%
Iron	54,152	8.0%	20.0%	59.8%	12.3%
Kane	7,718	5.4%	18.0%	53.7%	22.9%
Washington	171,040	6.2%	19.0%	53.0%	21.8%
Uintah Basin	58,831	8.8%	25.2%	55.0%	11.0%
Daggett	1,060	3.3%	18.1%	53.3%	25.3%
Duchesne	20,850	9.3%	25.6%	53.3%	11.9%
Uintah	36,921	8.7%	25.2%	56.0%	10.1%
West Central	70,506	6.8%	20.9%	56.7%	15.6%
Millard	13,586	7.5%	22.2%	54.1%	16.2%
Piute	1,662	4.4%	21.9%	50.3%	23.4%
Sanpete	30,579	6.3%	19.4%	60.4%	13.8%
Sevier	21,929	7.3%	22.2%	54.1%	16.3%
Wayne	2,750	5.7%	20.4%	52.8%	21.0%

Source: Kem C. Gardner Policy Institute

Table 12: Employment by Select Sectors

Region/County	Total	Accommodations	Local Government	Health care
East Central	12,136	7.9%	17.0%	11.1%
Carbon	8,865	7.6%	14.8%	13.5%
Emery	3,272	8.7%	22.7%	4.5%
Greater Salt Lake	1,359,402	7.6%	7.8%	10.0%
Box Elder	21,241	7.4%	11.5%	8.2%
Cache	60,179	6.8%	9.0%	10.6%
Davis	130,748	7.7%	10.3%	10.5%
Juab	3,739	8.6%	21.0%	14.0%
Morgan	2,492	6.3%	20.3%	5.9%
Rich	898	20.8%	21.9%	1.7%
Salt Lake	718,282	7.1%	6.3%	9.3%
Summit	27,389	22.6%	10.1%	5.5%
Tooele	16,227	8.5%	16.2%	9.7%
Utah	260,165	7.1%	8.2%	11.0%
Wasatch	9,459	13.5%	15.6%	9.0%
Weber	108,585	7.3%	8.9%	12.5%
Southeast	10,256	26.0%	18.3%	10.0%
Grand	5,901	32.6%	11.5%	6.5%
San Juan	4,355	17.1%	27.5%	14.7%
Southwest	96,910.0	13.6%	10.3%	13.8%
Beaver	2,897	11.6%	23.4%	2.3%
Garfield	2,392	44.3%	14.2%	8.4%
Iron	19,592	11.6%	11.1%	11.0%
Kane	3,590	31.8%	16.9%	3.2%
Washington	68,440	12.3%	9.0%	15.9%
Uintah Basin	21,087	8.3%	22.5%	6.5%
Daggett	391	26.6%	32.5%	0.0%
Duchesne	7,782	5.6%	26.5%	4.8%
Uintah	12,915	9.3%	19.7%	7.8%
West Central	24,086	8.6%	17.2%	10.5%
Millard	4,875	7.4%	18.3%	9.9%
Piute	301	5.5%	44.3%	10.6%
Sanpete	8,727	6.2%	19.7%	8.1%
Sevier	9,110	9.7%	13.3%	13.0%
Wayne	1,074	25.5%	16.3%	10.9%

Kem C. Gardner Policy Institute analysis of data from the Utah Department of Workforce Services

zero). We use county-level data between 2014 and 2018 on approximately 100 industries.¹⁵ At the high level presented in Table 10, there are not substantial differences in the extent to which these three delineations contain counties with similar jobs by industry: Gardner 2020 performs marginally better than Proposed 1966 and AOGs in three cases out of four.

Population and Employment Profiles of Gardner 2020 Regions

Table 11 and Table 12 provide population and industry profiles of Gardner 2020 regions. Table 11 shows total population, and the share of that population by age group, for each Gardner 2020 region and county.¹⁶ This table shows, for example, the differences among regions in the share of residents who are retirement age (65+), with Southwest having about twice the share as Greater

Salt Lake. Table 12 shows similar information for employment by select industry.¹⁷ We see, for example, that health care claims a larger share of total employment in the Southwest region than in Greater Salt Lake. This makes sense, given Southwest's larger share of residents age 65+.

Conclusions

This report provides an analysis leading to a new, up-to-date set of economic regions for the state of Utah. Although largely based on considerations of commuting patterns and the local labor markets they define, this report shows the regions perform well on a number of other measures, including containment of health care visits, industry similarity, and comovement of wages and unemployment rates.

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Endnotes

1. A recent report by the Gardner Institute, Bateman & Young (2020), provides a rich assessment of Utah's county-to-county commuting patterns.
2. These regions are described in Neville et al. (1966).
3. The share of income earned through work is from the U.S. Bureau of Economic Analysis, Table CAINCSN, 2018.
4. See, for example, Tolbert & Killian (1987), Makuc et al. (1991), Tolbert & Sizer, (1996), and Fowler et al. (2016).
5. Tolbert, C. M., & Killian, M. S. (1987). *Labor Market Areas for the United States*. U.S. Department of Agriculture.
6. American Community Survey, 2011–2015, U.S. Census Bureau.
7. In the literature on statistical clustering, this sense of connection between a unit and a group of units is called average linkage. Alternatively, unit-group connections can be defined in terms of the strongest or weakest pairwise connection, but these are not commonly used in the literature on delineating local labor markets.
8. In this description of the algorithm, a county is considered a region consisting of one county.
9. For example, if there are two counties in region A and three counties in region B, the connection between A and B will be the average among the six pairs of counties where one county is from A and the other from B.
10. Data for this section was provided by the Utah Office of Health Care Statistics.
11. Makuc et al., 1991 argue that visitation patterns for the Medicare population are likely similar to those for the whole population.
12. See, for example, Wolda (1981).
13. Based on detailed employment data (100 industries) provided by the Utah Department of Workforce Services.
14. Makuc et al. (1991) create a national county-level delineation of health service areas using health care origin-destination data from Medicare (arguing that Medicare trips are a reasonable approximation to all health care trips). They use hierarchical agglomerative clustering to derive their delineation of health service areas, in the same manner we do for commuting. Although not shown in this report, we created an updated health service areas delineation using the Makuc et al. (1991) methodology, but with more recent (2017–2019) and comprehensive data on health care trips from the Utah Office of Health Care Statistics.
15. These data were obtained from the Utah Department of Workforce Services.
16. Kem C. Gardner Policy Institute Utah State and County Annual Population Estimates by Single Year of Age and Sex: 2018.
17. Employment data is from the Utah Department of Workforce Services. The three industries shown were chosen because they are large enough that we are able to disclose their employment numbers for all counties.

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