

Working Paper

A Reconfiguration of Census Tabulations: Maintaining Historical Consistency of Aggregate Industrial Categories at the County-Level

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Abstract

Consistent measures are imperative for conducting valid historical analyses. Collected in the long-form survey of the decennial census, employment data has traditionally been tabulated by aggregate industrial category for all counties. Starting in 2000, the industrial coding scheme drastically changed. In response, we develop a methodology to formulate “geographically-sensitive” conversion factors that reconfigure NAISC-based tabulations into long-established SIC categories.

Introduction

Consistent measures are imperative for conducting valid historical analyses. Collected in the long-form survey of the decennial census, employment data has traditionally been tabulated by aggregate industrial category for all counties. Starting in 2000, the industrial coding scheme drastically changed. In response, we develop a methodology to formulate “geographically-sensitive” conversion factors that reconfigure NAISC-based tabulations into long-established SIC categories.¹

Using the Standard Industrial Classification (SIC) to code data for all Census products, the basic structure of the industry classification system has remained generally the same from 1940 to 1990 (Scopp 2003). However, the Census Bureau took a “fresh slate” approach when implementing the North American Industry Classification System (NAICS) in its coding of data from the 2000 decennial census (Economic Classification Policy Committee, 1993). As the Bureau of Labor Statistics states:

NAICS uses a production-oriented approach to categorize economic units. Units with similar production processes are classified in the same industry. NAICS focuses on how products and services are created, as opposed to the SIC focus on what is produced. This approach yields significantly different industry groupings than those produced by the SIC approach (U.S. Department of Labor 2003).

Bridging classification systems used in the 1990 and 2000 Censuses, crosswalks have been produced that map detailed occupational and industrial categories across the 1987 SIC and 1997 NAICS. The approach that the Census Bureau takes when creating these crosswalks consists of two methods: the index titles method and double-coded samples. The first method examines the job titles found in the “Alphabetical and Classified Indexes of Industries and Occupations” published for the 1990 and 2000 censuses (Scopp 2003, U.S. Census Bureau 2004a). The second method draws a sample of cases from the 1990 Census for each detailed SIC category and recodes them into a detailed NAICS category. The results are conversion factors consisting of the proportions of a given detailed SIC category which have been recoded to various NAICS detailed categories.

Besides providing these crosswalks to match across detailed categorical systems, the Census Bureau has constructed SF-3 “Templates” which convert aggregate occupational and industrial categories from the 1990 to the 2000 system:

Using these Templates, data users can apply national conversion factors to any 1990 industry or occupation data from SF-3. Data users, however, will have to apply the same conversion factors and distributions to all levels of geography,

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both sexes, and all other characteristics, even though this is not a perfect method for comparing industry and occupation data in all circumstances. (Scopp 2003, p. 5)

Utilizing and expanding upon these methods developed by the Census Bureau, techniques have been developed to maintain historical consistency of occupational and industrial data for individuals and geographically-specific tabulations (e.g., county-level). One such project is the Public Use Microdata Series (IPUMS). IPUMS has compiled occupation and industry data collected from the 1850 to 2000 U.S. Censuses; all of which are coded within the 1950 SOC and SIC. Two guidelines have been imposed in the production of these data. First the coding of data has strictly adhered to the pre-existing 1950 classification system; whereby no new categories were added to this system as occupations/industries emerged across the timeline. Second, an important decision-rule has been applied in their processing of micro-data collected since 1950. A “plurality of persons” rule reassigns all cases in a given detailed category to the single, largest detailed category (measured by the highest conversion factor).²

Building upon the IPUMS methodology, Meyer and Osborne (2005) are creating crosswalks for 1960-2000 occupational data which reallocate them to the 1990 SOC. Their method constructs a unique occupational category system which reflects the 1990 SOC as well as a mapping of the flows of job titles across systems. Unlike the IPUMS, Meyer and Osborne’s system extensively uses the “not elsewhere classified” categories to address emergent or disappearing job titles which are not directly identified in the 1990 SIC. They are also investigating ways to split recorded occupations. Rather than allocating all cases into a single, largest category, they propose reallocating data from an earlier year (e.g., 1960) into multiple occupations categories based on trends found in later years (e.g., 1970 and 1980).³

Prior to the release of the Census Bureau’s technical paper and its associated crosswalks (Scopp, 2003), Deane and Shin (2002) developed a method to adjust aggregate data on “Managerial and Professional Specialty Occupations” from the 1990 Census to better reflect the 2000 coding of “Management, Professional, and Related Occupations”. In doing so, these researchers construct a decision rule determining which of the 60 major groups in the 1990 system should be removed or added to the summary occupational group. In short, this decision rule states that “if the number of persons misallocated was smaller than the number of occupational incumbents correctly reallocated, the reallocation was performed” (p. 10, Deane and Shin, 2002). This decision rule was derived from 1990 employment distributions across detailed occupation categories provided by the IPUMS. Their use of the IPUMS provides a useful

² The exception to this rule is the armed forces occupational category in 1990 (p. 6 of Meyer and Osborne, 2005).

³ They validate the historical consistency of their system by measuring the amount of change, from census to census, in income distributions and workforce percentage of each occupational category. For the proposed system, occupations with an extreme amount of change were flagged for gross errors. Change measures were also constructed for the IPUMS 1950 system; thus providing some indication as to how well their proposed system operates.

mechanism to capture the composition of aggregate categories as reflected by the IPUMS detailed codes.

Our proposed method directly builds upon the Census’ template which converts aggregate industrial categories from the SIC to the NAICS. By constructing “reverse” conversion factors and integrating sub-state 2000 employment distributions (for detailed NAICS categories), we reallocate 2000 county-level tabulations to better reflect the 1990 SIC and contemporary local labor markets. Earlier methods have relied on the “plurality of persons” rule (or some variant) to allocate micro-level and spatial occupational data. Unlike micro-level techniques, we are not trying to assign a specific person (and their associated human capital and income characteristics) to a specific category. Rather we wish to characterize labor markets in the aggregate. Consequently, we do not apply a “plurality of persons” rule; thereby we use all conversion factors to reallocate industry data into multiple categories. Furthermore we use IPUMS data to capture local labor market variability. This approach builds upon both the Census Bureau’s and Deane and Shin’s methodologies to transform Summary File data.

**Proposed Reconfiguration Method:
Data Sources, Variable Definitions, and Processing Procedure**

The Great Plains Project has compiled industry data collected from the 1930-2000 U.S. Censuses of Population and Housing for select counties in the Great Plains (see Gutmann, et al. 1998 for details). Aggregate industry categories based on the SIC were published for most of this time series. The exception is the 2000 census that uses the NAICS (U.S. Dept. of Commerce 1994, ICPSR Study No.13402). To maintain consistency of aggregate industry tabulations at the county-level, we wish to redistribute these data to reflect the long-standing SIC system as well as the geographic variability of industrial labor markets.

SIC _I	=	1990 <u>Aggregate</u> Census Industry Codes Based on 1987 SIC (I)
NAICS _J	=	2000 <u>Aggregate</u> Census Industry Codes Based on 1997 NAICS (J)
SIC _i	=	1990 <u>Detailed</u> Census Industry Codes Based on 1987 SIC (i)
NAICS _j	=	2000 <u>Detailed</u> Census Industry Codes Based on 1997 NAICS (j)

[Table 1]

Laying the groundwork for our proposed methodology, the Census Bureau has developed and published two documents of particular importance. One of these documents is Table 1 of the U.S. Census Bureau’s Technical Report #65 (Scopp 2003). This table provides conversion factors for detailed census industries that redistribute data based on the 1987 SIC into the 1997 NAICS (CF_{ij}). For instance, conversion factors for the SIC-based detailed code ‘agriculture production, crops’ ($SIC_i = 010$) reallocate a percentage of these jobs to two NAICS detailed codes ($NAICS_j = 017, 029$): ‘crop production’ (96.237%) or ‘support activities for agriculture and forestry’ (3.763%). Presented in Tables 2, 3, and 4, we provide an excerpt from this crosswalk and an example of how this information was converted by our proposed methodology.

Using these conversion factors to reallocate the 1990 experienced civilian labor force, this table also provides frequency distributions of workers as they fall within the 1990 and the 2000 classification systems (O_ECLF_i, O_ECLF_{ij}).^{4,5}

$$(1) \quad O_ECLF_{ij} = O_ECLF_i * CF_{ij}$$

Where:

O_ECLF_i = Experienced Civilian Labor Force (1990 Data),
Distributed Across SIC-Based Detailed Categories (i)

CF_{ij} = Conversion Factors Reallocating Data
Into NAICS-Based Detailed Categories (j)
From SIC-Based Detailed Categories (i)

O_ECLF_{ij} = Experienced Civilian Labor Force (1990 Data),
Distributed Across NAICS-Based Detailed Categories (j)
By SIC-Based Detailed Categories (i)

[Table 2]

From these frequency distributions, we estimate a set of “reverse” conversion factors ($CF_{j,i}$) to reallocate data based on the 1997 NAICS into the 1987 SIC. Of the 1,388,550 jobs categorized as NAICS ‘017’ (Crop production), 1,380,240 (99.4%) are to be reallocated to SIC ‘010’ (Agricultural production, crops). The remaining 0.6% of these jobs are to distributed to SIC ‘031’, ‘121’, and ‘561’ (Forestry; Miscellaneous food preparations and kindred products; Farm supplies).

⁴ Since the Census Bureau’s and our methodology reallocates only the civilian labor force, industries associated with the Armed Forces have been dropped.

⁵ The experienced civilian labor force (ECLF) is defined as persons age 16 and over who worked within the previous five years; not including “new workers” (i.e., persons seeking employment for the first time who had not secured their first job).

In order to more accurately convert 2000 NAICS data back into the SIC, a sample drawn from the Census 2000 for each detailed NAICS category is required for double-coding and has not been drawn. Unfortunately the resulting “reverse” conversion factors are not available (U.S. Census Bureau 2004b). Consequently the Census Bureau recommends against retrofitting the original conversion factors (p. 5 of Scopp, 2003). However, we feel that these estimated “reverse” conversion factors are adequate for the task of reallocating aggregate industry data. While the Census Bureau’s is forward-looking in their implementation of the NAICS, maintaining the historical time-series based on the SIC also has scientific value. Given these constraints, the trade-off is small between the potential error produced by our “reverse” conversion factors and the benefits of these historical data.

$$(2) \quad O_ECLF_j = \sum_i^l O_ECLF_{ij}$$

$$(3) \quad CF_{j,i} = O_ECLF_{ij} / O_ECLF_j$$

Where:

O_ECLF_j = Experienced Civilian Labor Force (1990 Data),
Distributed Across NAICS-Based Detailed Categories (j)

$CF_{j,i}$ = Conversion Factors Reallocating Data
Into SIC-Based Detailed Categories (i)
From NAICS-Based Detailed Categories (j)

Another important document laying the foundation of our methodology is a template produced by the Census Bureau containing crosswalks which redistribute data from aggregate categories based on the SIC to those based on the NAICS (U.S. Census Bureau 2004c). Information incorporated into this template consists of conversion factors and national employment estimates for detailed categories. These detailed conversion factors coupled with national employment estimates are compiled within aggregate categories. These “aggregated national” conversion factors are then applied to imported data from SF tabulations of aggregate industrial categories.

We expand upon this SF template by incorporating our reverse conversion factors as well as detailed employment data that captures variability in sub-national labor markets. Presented in Table 3, we provide an example of how reverse conversion factors (taken from Table 2) were transformed by local employment estimates.

[Table 3]

As our next step, we sum the reversed conversion factors that allocate jobs to each of the 17 aggregate SIC categories for each of the NAICS detailed industry codes. For the NAICS detailed category of ‘017’ (Crop production), 99.7% of its jobs are to be

reallocated to the SIC aggregate category of “Agriculture, Forestry, and Fisheries” (i.e., 90AGF)(99.4% and 0.3% estimated from the reversed conversion factors for detailed SIC ‘010’ and ‘031’, respectively). In sum, we assign the proportion of jobs from a NAICS detailed category that is to be reallocated to an aggregate SIC category ($CF_{j,I}$). But to better capture spatial variation in the composition of industrial markets (NAICS j), we must modify our aggregate conversion factors.

$$(4) \quad CF_{j,I} = \sum_i CF_{j,i}$$

Where:

$$CF_{j,I} = \text{Conversion Factors Reallocating Data} \\ \text{Into SIC-Based } \underline{\text{Aggregate}} \text{ Categories (I)} \\ \text{From NAICS-Based } \underline{\text{Detailed}} \text{ Categories (j)}$$

Using the 2000 Integrated Public Use Microdata Series (IPUMS), we estimate employment distributions of national and sub-national labor markets (Ruggles, et. al. 2004, IPUMS 5% Sample). Data are drawn from a sample of persons who are members of the experienced civilian labor force. This micro-data file includes information regarding the respondent’s geographic location within super-PUMAs. A super-PUMA (i.e., super public use microdata area) is a geographic area unit (designating by the Census Bureau) with 400,000 or more population within a state.⁶ For geographies with fewer than 30 persons in an aggregate NAICS industrial category (NAICS j), estimates of the proportion of that industry category are considered inadequate. For these super-PUMAs, we use state-level distributions (or national-level distributions if necessary) to describe the local industrial market.

$$(5) \quad \%CLF_{P,j} = ECLF_{P,j} / ECLF_{P,J}$$

Where:

$$ECLF_{P,j} = \text{Experienced Civilian Labor Force (2000 IPUMS Data),} \\ \text{Distributed Across NAICS-Based } \underline{\text{Detailed}} \text{ Categories (j)} \\ \text{For Super-PUMA (P)}$$

$$ECLF_{P,J} = \text{Experienced Civilian Labor Force (2000 IPUMS Data),} \\ \text{Distributed Across NAICS-Based } \underline{\text{Aggregate}} \text{ Categories (J)} \\ \text{For Super-PUMA (P)} \\ = \sum_j ECLF_{P,j}$$

$$\%CLF_{P,j} = \underline{\text{Detailed}} \text{ Labor Market Composition (j) of}$$

⁶ Some states have a total population size that is not large enough to support division into two or more super-PUMAs. These states are: Alaska, Delaware, North Dakota, South Dakota, Vermont, and Wyoming. Washington, DC, also does not have sufficient population for super-PUMA subdivision. The boundaries of super-PUMAs do not span across states.

NAICS-Based Aggregate Categories (J)
For Super-PUMA (P)

Specifically we calculate the composition of aggregate NAICS categories in terms of its detailed NAICS codes. For Super-PUMA ‘38100’ (area in North Dakota), 69.4%, 27.0%, 0.3%, 0.2%, 0.1%, and 3.1% of jobs in its NAICS aggregate category of “Agriculture, Forestry, Fishing and Hunting” (i.e., 2KAGF) are composed of jobs from the detailed NAICS categories of ‘017’, ‘018’, ‘019’, ‘027’, ‘028’, and ‘029’ (respectively). In contrast to the national job market, this Super-PUMA has relatively more “crop production” jobs (69.4% versus 54.8% nationally) and fewer “logging” jobs (0.2% versus 6.2% nationally).

Compared to reconfigurations based on national estimates, more of North Dakota’s agricultural jobs (i.e., 2KAGF) should remain in this aggregate category (i.e., 90AGF); rather than being allocated to the industry of durable-goods manufacturing (i.e., 90MFD). Consequently, we weigh our aggregated reversed conversion factors ($CF_{j,I}$) by our local labor market composition measures (merged by detailed NAICS industry):

$$(6) \quad LCF_{P,J,I} = \sum_j [\%CLF_{P,j} * CF_{j,I}]$$

Where:

$CF_{j,I}$ = Conversion Factors Reallocating Data
Into SIC-Based Aggregate Categories (I)
From NAICS-Based Detailed Categories (j)

$\%CLF_{P,j}$ = Detailed Labor Market Composition (j) of
NAICS-Based Aggregate Categories (J)
For Super-PUMA (P)

$LCF_{P,J,I}$ = Local Conversion Factors Reallocating Data
Into SIC-Based Aggregate Categories (I)
From NAICS-Based Aggregate Categories (J)
For Super-PUMA (P)

Representing the last step of our reconfiguration, we modify the Census’s SF template by incorporating our geographically-refined conversion factors [$LCF_{P,J,I}$] to select counties in the 2000 Census SF-3 file.⁷ County-level data based on the aggregated NAICS [$SF_{C,J}$] are then re-tabulated to better reflect the SIC [$SF_{C,I}$]. Our tabulations of government employment are not reallocated since data are drawn from the indicator of “class of worker” which is not affected by the NAICS implementation.

⁷ A single county may fall within the geographic area of more than one super-PUMA. For these cases, an average of the super-PUMA labor-market conversion factors is used.

Described in the formulas below and presented in Table 4, Cass County, North Dakota had an estimated 1,638 jobs in 2000 reallocated to the SIC aggregate category of “Agriculture, forestry, and fisheries” (i.e., 90AGF). This reconfigured number is drawn from 99.4% of the 1,288 jobs in the NAICS aggregate category of “Agriculture, forestry, fishing, and hunting” (i.e., 2KAGF), 11.46% of the 1,719 jobs in “Administrative, support and waste management services” (i.e., 2KAWM), 3.99% of the 3,606 jobs in “Professional, scientific, and technical services” (i.e., 2KPST), and less than 1% of the 11,559 jobs in “Manufacturing”, “Others services (except public administration)”, and “Public administration”.

$$(9) \quad SF_{C,J,I} = SF_{C,J} * LCF_{P,J,I}$$

$$(10) \quad SF_{C,I} = \sum_J SF_{C,J,I}$$

Where:

$SF_{C,J}$ = Employed Civilian Population Age 16 and Over
(2000 SF-3 Data),
Distributed Across NAICS-Based Aggregate Categories (J)
For County (C)

$SF_{C,J,I}$ = Employed Civilian Population Age 16 and Over
(2000 SF-3 Data),
Distributed Across SIC-Based Aggregate Categories (I)
By NAICS-Based Detailed Categories (J)
For County (C)

$SF_{C,I}$ = Employed Civilian Population Age 16 and Over
(2000 SF-3 Data),
Distributed Across SIC-Based Aggregate Categories (I)
For County (C)

[Table 4]

Data Highlights and Conclusion

Figure-A presents historical trends in the industrial composition of selected counties in the Great Plains between 1940 and 2000. The 2000 distributions tend to follow an expected pattern. Using our local conversion factors, employment in the agriculture industry decreased, respectively, by 4.65 percentage points between 1990 and 2000. At the same time, the other industries experiencing little proportional change. While government, trade and mining industries shrank by less than 1% (-.72%, -.86%, and -.83%), employment in service and manufacturing industries experienced marginal growth (0.30% and 0.99%).

[Figure-A]

If we did not account for variation in local labor markets, the 2000 distributions would have changed relatively little in the aggregate. Across all industries and counties, estimates varied by less than half of a percentage point between methodologies (0.41% average absolute difference). However there is considerable difference in estimates derived from the two sets of conversion factors when we compare them spatially. Looking at Maps A-D, we see that the national conversion factors sometimes do not adequately capture the industrial composition of local labor markets. Given these spatial patterns, our method seems to improve upon the straightforward application of published national conversion factors.

Great Plains' agriculture industries are less often composed of "manufacturing" jobs, compared to the whole national labor market. Specifically, Great Plains' agricultural industries are more likely engaged in crop production, rather than logging. If we did not account for this unique local market characteristic, up to 4% of most Great Plains counties' agriculture jobs would be erroneously assigned to manufacturing.

[Maps A - B]

Another methodological discrepancy is especially apparent in the southeastern counties of our Great Plains sample, located in Colorado and New Mexico. In these counties, employment tends to be disproportionately reallocated to service industries rather than into the trades when using our localized estimates. For 7 counties, there is between a 1 to 2% discrepancy in service industry employment.

[Maps C - D]

Finally, the composition of mining industries seems to be similar for the Great Plains and the nation as a whole with less than a 1 percentage-point difference between estimates.⁸

⁸ Maps for mining industries are not presented.

Since these patterns are not surprising, our proposed technique seems to be adequate for maintaining historical consistency of aggregate industrial categories at the county-level; where “geographically-sensitive” conversion factors are formulated to reconfigure NAISC-based tabulations into long-established SIC categories.

Data Sources

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Table 1. Summary of 2000 NAICS-Based and 1990 SIC-Based Industry Coding Schemes

2000 SF-3 Industry Categories (20)			1990 STF-3 Industry Categories (17)		
Category	2000 Agg. Cat. (NAICS _J)	2000 Det. Codes (NAICS _J)	Category	1990 Agg. Cat. (SIC _J)	1990 Det. Codes (SIC _J)
Agriculture, forestry, fishing & hunting	2KAGF	017-029	Agriculture, forestry, & fisheries	90AGF	010-032
Mining	2KMIN	037-049	Mining	90MIN	040-050
Construction	2KCON	077	Construction	90CON	060
Manufacturing	2KMFG	107-399	Manufacturing, nondurable goods	90MFN	100-222
			Manufacturing, durable goods	90MFD	230-392
Transportation & warehousing	2KTRW	607-639	Transportation	90TRN	400-432
Utilities	2KUTL	057-069	Communications & other public utilities	90CMU	440-472
Information	2KINF	647-679			
Wholesale trade	2KWHL	407-459	Wholesale trade	90WHL	500-571
Retail trade	2KRET	467-579	Retail trade	90RET	580-691
Finance & insurance	2KFIN	687-699	Finance, insurance & real estate	90FIR	700-712
Real estate, & rental & leasing	2KRRL	707-719			
			Business & repair services	90BUS	721-760
			Personal services	90PER	761-791
Arts, entertainment, & recreation	2KENT	856-859	Entertainment & recreation services	90ENT	800-810
Accommodation & food services	2KACF	866-869			
Health care & social assistance	2KHCS	797-847	Health services	90HLT	812-840
Educational services	2KEDU	786-789	Educational services	90EDU	842-860
Professional, scientific, & technical services	2KPST	727-749	Other professional & related services	90PRO	841,861-893
Management of companies & enterprises	2KMGM	757			
Administrative, support & waste management services	2KAWM	758-779			
Other services (except public administration)	2KOTS	877-929			
Public administration	2KPUB	937-959	Public administration	90PUB	900-932

Reference: U.S. Census Bureau (2004)

Table 2. Reversed Conversion Factors

U.S. Census Bureau's Technical Report #65 (Table 1), 1990 Census Industry Classification System and Its Redistribution into the Census 2000 Industry Classification System				Re-engineering for Reversed Conversion Factors	
1990 Census Codes and Categories (SIC _i)		Original Conversion Factors (% of 1990 Category) (CF i,j)	1990 CLF Redist to 2000 (O_ECLF i,j)	1990 CLF Factors Redist to 2000 (O_ECLF i,j)	Reversed Conversion (% of 2000 Category) (CF j,i)
2000 Census Codes and Categories (NAICS _j)	1990 Civilian Labor Force (O_ECLF I)				
Total Civilian Labor Force	123,473,450		123,473,450		For Crop Production (017):
010 Agricultural production, crops	1,434,216				
017 Crop production		.962	1,380,240	1,380,240	.994
029 Support activities for agriculture and forestry		.038	53,976		
031 Forestry	101,785				
017 Crop production		.036	3,661	3,661	.003
019 Forestry except logging		.662	67,368		
029 Support activities for agriculture and forestry		.302	30,755		
121 Miscellaneous food preparations & kindred products	159,496				
017 Crop production		.015	2,417	2,417	.002
107 Animal food, grain, and oilseed milling		.061	9,666		
109 Fruit and vegetable preserving and specialty food manufacturing		.030	4,833		
117 Dairy product manufacturing		.015	2,417		
118 Animal slaughtering and processing		.030	4,833		
127 Bakeries except retail		.121	19,333		
128 Seafood and other miscellaneous foods n.e.c.		.682	108,747		
137 Beverage manufacturing		.045	7,250		
561 Farm supplies	118,272				
017 Crop production		.019	2,232	2,232	.002
107 Animal food, grain, and oilseed milling		.025	2,975		
438 Drugs, sundries, and chemical and allied product wholesalers		.025	2,975		
457 Farm supplies wholesalers		.723	85,543		
489 Lawn and garden equipment and supplies stores		.208	24,547		
				1,388,550 = Total (O_ECLF j)	

Reference: U.S. Census Bureau (2003)

Table 3. Crosswalk From 2000 NAICS-Based To 1990 SIC-Based Industry Coding Schemes

2000 Census Codes and Categories (NAICS _i): Agriculture, Forestry, Fishing, and Hunting	Reversed Conversion Factors (% of 2000 Category) (CF _{j,i})	Aggregate Category		Sum of Reversed Conversion Factors By Each 1990 Aggregate Category (17) (CF _{j,l})		Super-PUMA "38100" 2000 CLF
		From 2000 (NAICS _j)	To 1990 (SIC _l)	90AGF.....	90PUB	LCF _{j,l} & CF _{j,l}
1990 Census Codes and Categories (SIC _i): Agriculture, Forestry, and Fisheries						%CLF _j
By 2000 Aggregate Category: Agriculture, Forestry, Fishing, and Hunting (NAICS_j)						.994
017 Crop production		2KAGF		.997694
010 Agricultural production, crops	.994		90AGF			.691
031 Forestry	.003		90AGF			
121 Miscellaneous food preparations & kindred products	.002		90MFN			
561 Farm supplies	.002		90WHL			
018 Animal production		2KAGF		1.000270
011 Agricultural production, livestock	.991		90AGF			.270
030 Agricultural services, n.e.c.	.002		90AGF			
032 Fishing, hunting, and trapping	.007		90AGF			
019 Forestry except logging		2KAGF		1.000003
031 Forestry	1.000		90AGF			.003
027 Logging		2KAGF				.002
230 Logging	1.000		90MFD			.000
028 Fishing, hunting, and trapping		2KAGF		1.000001
032 Fishing, hunting, and trapping	1.000		90AGF			.001
029 Support activities for agriculture and forestry		2KAGF		.942031
010 Agricultural production, crops	.349		90AGF			.029
030 Agricultural services, n.e.c.	.394		90AGF			
031 Forestry	.199		90AGF			
102 Canned, frozen, & preserved fruits & vegetables	.018		90MFN			
741 Business services, n.e.c.	.022		90BUS			
760 Miscellaneous repair services	.018		90BUS			

Reference: U.S. Census Bureau (2003)


 = Aggregated conversion factors applied to county-level tabulations (merged by super-PUMA) (LCF_{P,j,l})

Table-4. Conversion of County-Level Tabulations from 2000 NAICS-Based to 1990 SIC-Based Industry Coding Schemes

2000 Census Tabulations: Cass County, North Dakota (FIPS=38017)
Conversion Factor: Super-PUMA "38100"

2000 SF-3 Industry Categories (20) and Conversion Factors (Percents)					Conversion to 1990 STF-3 Industry Categories (17)					
Category	Agg. Cat.	2000 Codes	Number Employed ¹	Percent ²	To	Category	Agg. Cat.	1990 Codes	Number Employed	
Agriculture, forestry, fishing & hunting	2KAGF	017-029	1,288	99.4	90AGF	[1] Agriculture, forestry, & fisheries	90AGF	010-032	1,638	
				0.0	90MIN	[1]				
				0.0	90CON	[1]				$\text{employed_90agf} =$ $(\text{employed_2kagf} * \text{percent_90agf_1}) + (\text{employed_2kmin} * \text{percent_90agf_2})$ $+ (\dots) + (\text{employed_2kpub} * \text{percent_90agf_20})$
				0.2	90MFN	[1]				
				0.2	90MFD	[1]				
				0.0	90TRN	[1]				
				0.0	90CMU	[1]				
				0.1	90WHL	[1]				
				0.0	90RET	[1]				
				0.0	90FIR	[1]				
				0.1	90BUS	[1]				
				0.0	90PER	[1]				
				0.0	90ENT	[1]				
				0.0	90HLT	[1]				
				0.0	90EDU	[1]				
				0.0	90PRO	[1]				
				0.0	90PUB	[1]				
100.0										
Mining	2KMIN	037-049	10	0.000	90AGF	[2] Mining	90MIN	040-050	65	
Construction	2KCON	077	4,435	0.000	90AGF	[3] Construction	90CON	060	4,451	
Manufacturing	2KMFG	107-399	6,361	0.026	90AGF	[4] Manufacturing, nondurable goods	90MFN	100-222	2,488	
						Manufacturing, durable goods	90MFD	230-392	4,060	
Transportation & warehousing	2KTRW	607-639	3,167	0.000	90AGF	[5] Transportation	90TRN	400-432	3,393	
Utilities	2KUTL	057-069	293	0.000	90AGF	[6] Communications & other public utilities	90CMU	440-472	1,024	
Information	2KINF	647-679	1,637	0.000	90AGF	[7]				
Wholesale trade	2KWHL	407-459	3,664	0.000	90AGF	[8] Wholesale trade	90WHL	500-571	3,760	
Retail trade	2KRET	467-579	10,453	0.000	90AGF	[9] Retail trade	90RET	580-691	14,609	
Finance & insurance	2KFIN	687-699	5,097	0.000	90AGF	[10] Finance, insurance & real estate	90FIR	700-712	6,267	
Real estate, & rental & leasing	2KRRL	707-719	1,173	0.000	90AGF	[11]				

Table-4 (cont). Conversion of County-Level Tabulations from 2000 NAICS-Based to 1990 SIC-Based Industry Coding Schemes

2000 Census Tabulations: Cass County, North Dakota (FIPS=38017)
Conversion Factor: Super-PUMA "38100"

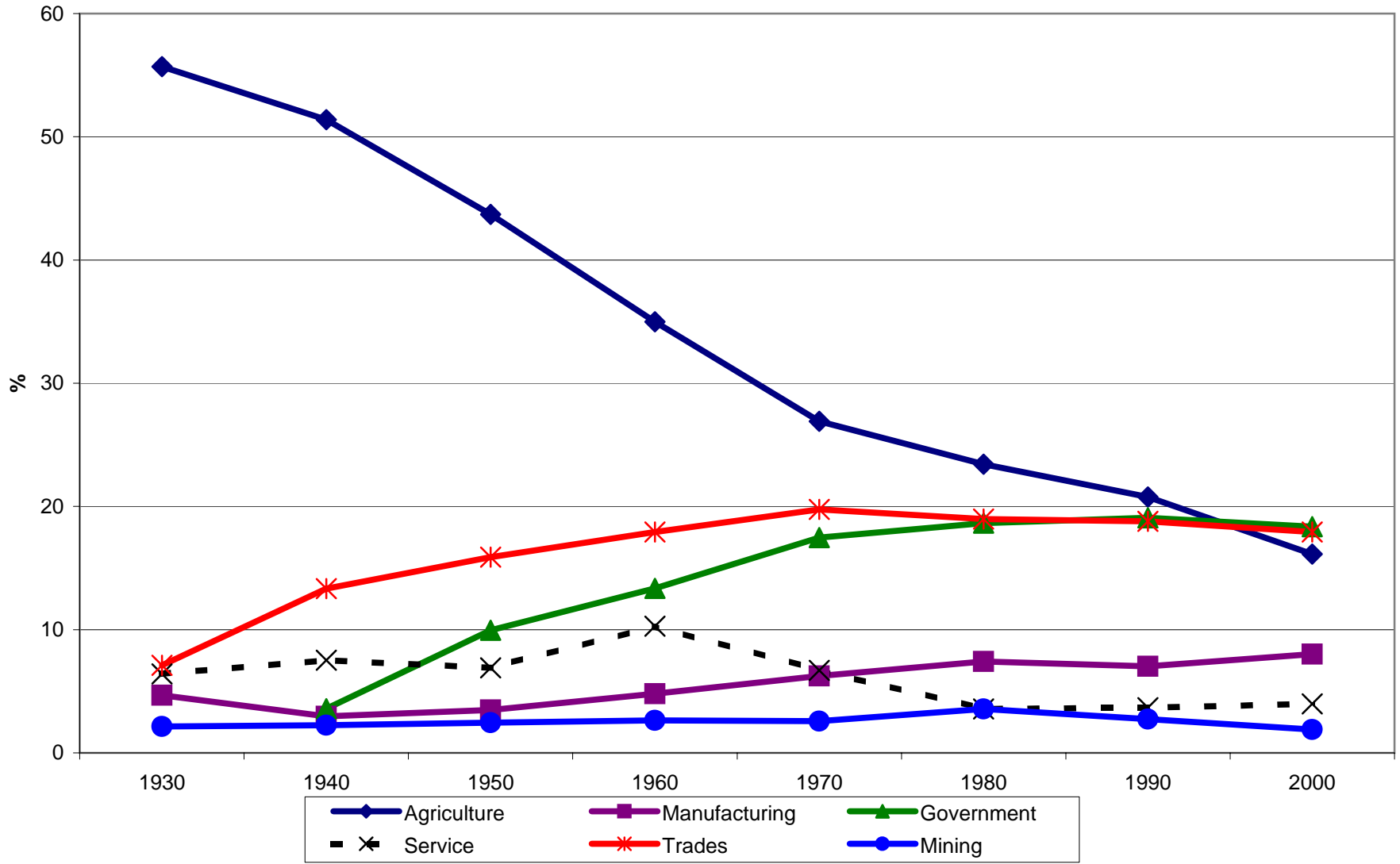
2000 SF-3 Industry Categories (20) and Conversion Factors (Percents)					Conversion to 1990 STF-3 Industry Categories (17)				
Category	Agg. Cat.	2000 Codes	Number		To	Category	Agg. Cat.	1990 Codes	Number Employed
			Employed ¹	Percent ²					
						Business & repair services	90BUS	721-760	3,896
						Personal services	90PER	761-791	2,084
Arts, entertainment, & recreation	2KENT	856-859	1,155	0.000	90AGF [12]	Entertainment & recreation services	90ENT	800-810	1,193
Accommodation & food services	2KACF	866-869	4,953	0.000	90AGF [13]				
Health care & social assistance	2KHCS	797-847	9,639	0.000	90AGF [14]	Health services	90HLT	812-840	7,132
Educational services	2KEDU	786-789	6,426	0.000	90AGF [15]	Educational services	90EDU	842-860	6,588
Professional, scientific, & technical services	2KPST	727-749	3,606	3.992	90AGF [16]	Other professional & related services	90PRO	841,861-893	5,964
Management of companies & enterprises	2KMGM	757	211	0.000	90AGF [17]				
Administrative, support & waste management serv	2KAWM	758-779	1,719	11.462	90AGF [18]				
Other services (except public administration)	2KOTS	877-929	3,280	0.396	90AGF [19]				
Public administration	2KPUB	937-959	1,918	0.128	90AGF [20]	Public administration	90PUB	900-932	1,875
				0.0	90MIN [20]				
				0.0	90CON [20]				
				0.0	90MFN [20]				
				0.0	90MFD [20]				
				0.1	90TRN [20]				
				0.6	90CMU [20]				
				0.0	90WHL [20]				
				0.0	90RET [20]				
				0.3	90FIR [20]				
				0.0	90BUS [20]				
				0.0	90PER [20]				
				0.1	90ENT [20]				
				1.3	90HLT [20]				
				0.0	90EDU [20]				
				2.4	90PRO [20]				
				95.0	90PUB [20]				
				100.0					
TOTAL			70,485			TOTAL			70,485

¹ Distributions of people produced from Census 2000 SF3 file.

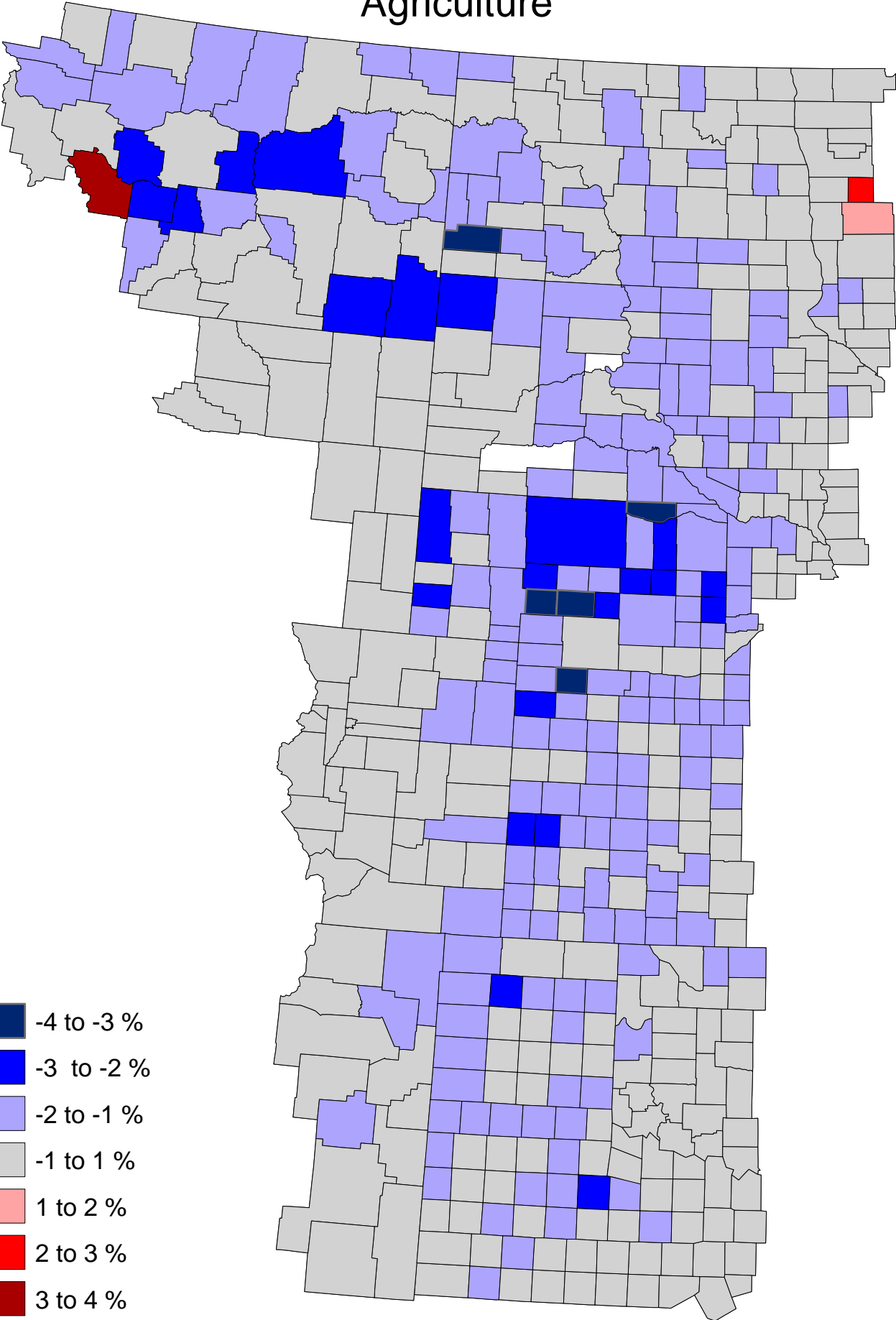
² Super-PUMA labor-market conversion factors produced from IPUMS 2000 5% file. A single county may also fall within the geographic area of more than one super-PUMA. In this case (for 16 counties), an average of the super-PUMA labor-market conversion factors are used.

Note: all data in this table add up to the 2000 totals

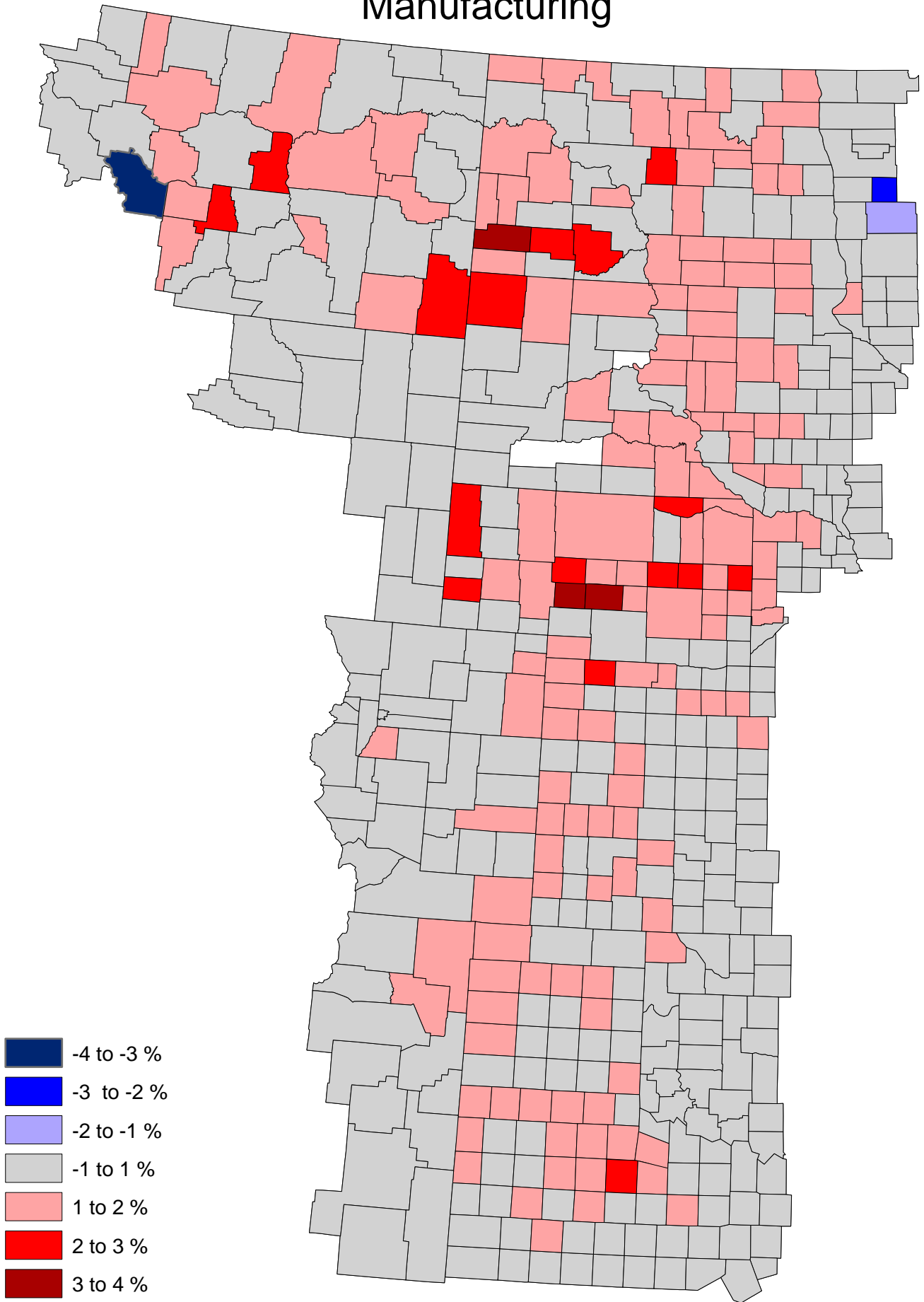
Figure A. Percentage of Jobs By SIC-Based Aggregate Industry, Great Plain States



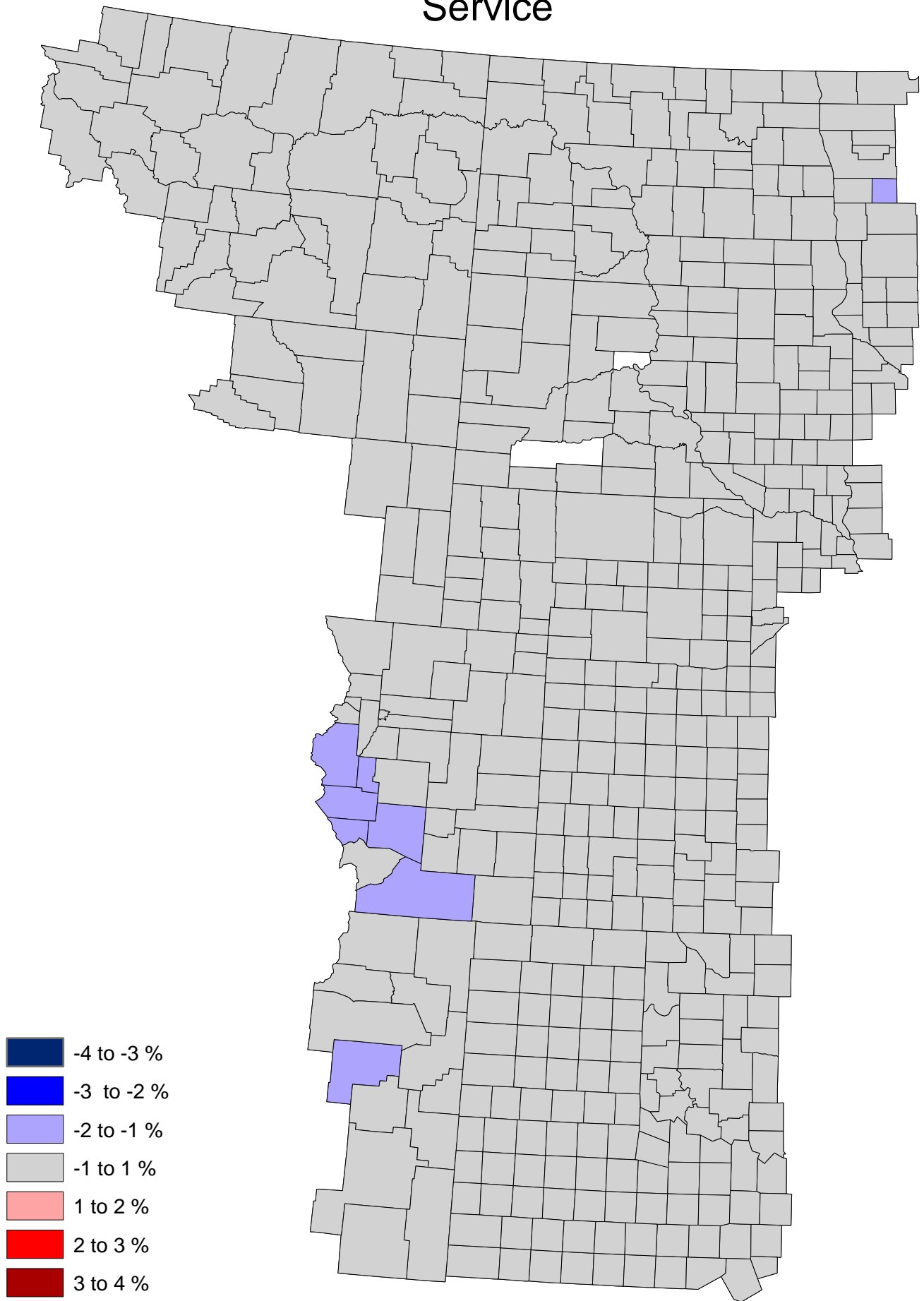
Map A. Percent Difference in Industrial Composition, Agriculture



Map B. Percent Difference in Industrial Composition, Manufacturing



Map C. Percent Difference in Industrial Composition, Service



Map D. Percent Difference in Industrial Composition, Trade

