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A Shift/Share Analysis of Michigan Agriculture

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Introduction

Briefly stated, a shift/share analysis studies changes over time in the level of production and percent of total output produced by a firm or a geographic area. In this case, Michigan's level of output compared to the level of output in the U.S. analyzed. This paper considers most of the major agricultural commodities produced in the state. The largest sector that is not considered is nursery/landscape/turfgrass sector. This is due to the difficulty of obtaining consistent data from throughout the country for comparison. Due to gaps in the data set, turkey production is also not considered. In many respects, this paper is an update of MSU Staff Paper 00-34 *Trends in Michigan Agriculture and Food Processing* by Jake Ferris.

This paper will identify trends in affecting commodity based agriculture in Michigan. For example, if Michigan's share of production is increasing at the same time the state's production is increasing (augmentation), then the market trend is positive. Conversely, if Michigan's share of production is declining while the state's production is also declining (degeneration), the trends are negative. The analysis will look at two time periods 1980-2004, with a few exceptions such as dairy and commodities that lack data that go back to 1980, and the time period from 1995 to 2004. This allows for an analysis of 25 years which usually captures trends if they exist, and a ten year time period to determine if more recent trends have asserted themselves.

There are two things that this analysis does not do. The first is that the paper does not try to determine or "explain" the sources or causes of the trends. It only provides statistical evidence that the trends exist. The second thing this paper does not do is

discuss the potential for developing specialty products or markets for entrepreneurs. This paper takes a commodity approach and looks at the overall trends. The existence of negative trends for some commodities may provide the rationale and impetus for producers, processors, and others, to change their focus away from traditional commodity markets to high value specialty markets that exhibit positive trends. The paper may also aid policymakers and others interested in determining what commodities have a bright future and commodities that are facing difficulties. This paper can also be used with the recent analysis of the economic impact of the agri-food system (Peterson, Knudson, Abate) as well as the opportunity assessments that can be found at <http://www.aec.msu.edu/product/roa.htm>, to give a complete picture of the status and potential of Michigan's agri-food system.

This paper will discuss the concept behind shift/share analysis and some of the implications of a changing level of production and market share of Michigan agricultural commodities. An actual analysis of major field crops, fruits, vegetables, and livestock products will follow. For the most part, Michigan is not a major producer of most agricultural commodities. However, there are exceptions such as tart cherries and cucumbers. The paper also includes an appendix which discusses the actual statistical findings that are used in the analysis.

Discussion

There has not been a great deal of research in the changing geographic distribution of production of agricultural commodities (Herath, Weersink, and Carpentier, p.49). This paper explicitly compares Michigan's position relative to the rest of the country. Seven different patterns of geographic concentration have been identified and

are outlined in table 1. This typology is adapted from Herath, Weersink and Carpentier (p.52).

Table 1: Michigan's Output and Market Share		
Change in Share of Production	Change in Output	Concentration Pattern
Increase	Increase	Augmentation
Increase	Constant	Reallocation
Increase	Decrease	Attrition
Decrease	Increase	Diffusion
Decrease	Constant	Reallocation
Decrease	Decrease	Degeneration
Constant	Constant	Stable

Share of production is simply Michigan's percentage of total U.S. production; output is Michigan's actual production. Augmentation occurs when Michigan's share of production is increasing as its output is increasing. This implies that Michigan is becoming a more important source of that commodity for the U.S. Its position relative to other states is improving. The first reallocation means that while Michigan's share of production is increasing it is due to other states cutting back on production, not from an increase in Michigan's output. Attrition occurs when Michigan's output is declining but not as fast as other states. This would be indicative of an industry in decline both in Michigan and the U.S. Diffusion occurs when Michigan's share of production declines even as its output increases. Other states are increasing their output faster than Michigan, and are therefore becoming more important sources of the commodity. The second reallocation occurs when Michigan share of production declines while the state's output is constant. Degeneration occurs when Michigan's share of production is decreasing as is its level of output. As is the case with attrition, this is evidence of an industry in decline.

It should be noted that if both the market share and the level of output is unchanged, Michigan's position relative to the rest of the country could be characterized as stable.

For the most part, two time periods are used 1980-2004 and 1995-2004 to determine the relative position of the commodity. The longer the time period generally the more robust the statistical results, however a shorter time period may show changes or reverses in Michigan's relative position. Simple ordinary least squares (OLS) is used to indicate whether or not these trends are statistically significant. A further discussion of the results can be found in the appendix.

Field Crops

Corn

Corn is a major field crop for both the U.S. and Michigan. More acres are devoted to corn production in the Michigan than any other crop, although Michigan's share of U.S. production is not very large. The analysis here is for corn for grain. The results are shown in table 2. To obtain Michigan's share of production in percentage terms for both table 2 and all succeeding tables multiply the Michigan share column by 100.

Table 2: Corn For Grain (1,000s bushels)			
Year	U.S. Production	Michigan Production	Michigan Share
1980	6,644,841	247,000	0.0371716946
1981	8,118,650	268,800	0.0331089528
1982	8,235,101	293,180	0.0356012634
1983	4,174,678	165,600	0.0396677301
1984	7,674,020	220,080	0.0286785805
1985	8,876,706	286,650	0.0322923841
1986	8,249,864	257,250	0.0311823322
1987	7,131,300	192,060	0.0269319759
1988	4,928,681	112,000	0.0227241325
1989	7,525,493	222,610	0.0295807863
1990	7,934,028	238,050	0.0300036753
1991	7,474,765	253,000	0.0338472179
1992	9,476,698	241,500	0.0254835598
1993	6,336,470	225,500	0.0355876379
1994	10,102,735	260,910	0.0258256799
1995	7,373,876	249,550	0.0338424460
1996	9,232,557	211,500	0.0229080633
1997	9,206,832	255,060	0.0277033403
1998	9,758,685	227,550	0.0233176909
1999	9,430,612	253,500	0.0268805460
2000	9,915,051	241,800	0.0243871665
2001	9,506,840	199,500	0.0209848909
2002	8,966,787	234,000	0.0260963041
2003	10,089,222	259,804	0.0257506476
2004	11,807,217	257,280	0.0217900628

Source: USDA Agricultural Statistics

From 1980 to 2004, U.S. production varied from a low of 4.17 billion bushels in 1983 to a high of 11.81 billion bushels in 2004. During the same time period Michigan production varied from 112.00 million bushels in the drought year of 1998 to 293.18 million bushels in 1982. The state's market share varied from 2.10 percent in 2001 to 3.97 percent in 1983.

From 1995 to 2004, U.S. production varied from a low of 7.37 billion bushels in 1995 to a high of 11.81 billion bushels in 2004. Michigan production varied from almost 260 million bushels in 2003 to 199.50 million bushels in 2001. The statistical analysis indicates that both U.S. and Michigan corn production trended upward from 1980 to 2004, and that Michigan's share of total corn production was fairly constant. However, from 1995 to 2004 Michigan's level of corn production was fairly flat while U.S. production increased, which means that Michigan's production share of the corn for grain market is declining. If this emerging trend holds, total corn production will be reallocated to other states.

Soybeans

Another major field crop in the state is soybeans. Table 3 shows U.S. production, Michigan production and Michigan's share of U.S. production from 1980 to 2004.

Table 3: Soybeans (1,000s bushels)			
Year	U.S. Production	Michigan Production	Michigan Share
1980	1,792,062	30,400	0.0169636988
1981	1,989,110	31,200	0.0156854070
1982	2,190,297	35,340	0.0161347982
1983	1,635,772	33,800	0.0206630264
1984	1,860,863	32,130	0.0172661824
1985	2,098,531	34,560	0.0164686631
1986	1,940,101	28,830	0.0148600511
1987	1,937,722	39,240	0.0202505829
1988	1,548,841	35,090	0.0226556503
1989	1,923,666	38,880	0.0202114088
1990	1,925,947	43,320	0.0224928308
1991	1,986,539	52,820	0.0265889570
1992	2,190,354	47,520	0.0216951233
1993	1,870,958	54,720	0.0292470488
1994	2,516,694	56,980	0.0226408137
1995	2,176,814	59,600	0.0273794637
1996	2,380,274	46,740	0.0196363948
1997	2,688,750	71,610	0.0266331939
1998	2,741,014	73,710	0.0268915080
1999	2,653,758	77,600	0.0292415510
2000	2,757,810	73,080	0.0264992875
2001	2,890,682	63,900	0.0221055100
2002	2,729,709	78,155	0.0286312570
2003	2,543,665	54,725	0.0215142324
2004	3,140,996	75,240	0.0239541852

Source: U.S. Agricultural Statistics

From 1980 to 2004, U.S. soybean production ranged from a low of 1.64 billion bushels in 1983 to a high of 3.14 billion bushels in 2004. During the same time period, Michigan production ranged from a low 30.40 million bushels in 1980 to a high of 78.16 million bushels in 2002. Michigan's share of output during this time period ranged from a low of 1.49 percent in 1986 to a high of 2.92 percent in 1999.

From 1995 to 2004, U.S. output ranged from 2.18 billion bushels in 1995 to 3.14 billion bushels in 2004. Michigan's output during this time period ranged from 59.60 million bushels in 1995 to 78.16 million in 2002. The statistical analysis strongly indicates that there has been an upward trend in soybean production in the U.S. both from 1980 to 2004 and from 1995 to 2004. The analysis indicates that there was an increase in Michigan production from 1980 to 2004, but that the growth rate may have slowed down from 1995 to 2004. Michigan's share of output has basically stayed the same during the two time periods, indicating no change in Michigan's position relative to other states.

Wheat

Michigan does not produce spring wheat; therefore Michigan's share of winter wheat production is analyzed. Michigan is a major white wheat producer but the USDA did not differentiate between white wheat and other types of winter wheat. Table 4 shows winter wheat production from 1980 to 2004 for the U.S. and Michigan as well as Michigan's share of winter wheat production. It should be noted that table 4 likely underestimates Michigan's importance in wheat production because it does not differentiate between white winter wheat and other types of winter wheat.

Year	U.S. Production	Michigan Production	Michigan Share
1980	1,895,383	35,200	0.018571444
1981	2,097,057	41,500	0.019789639
1982	2,073,560	22,960	0.011072744
1983	1,988,304	35,770	0.017990207
1984	2,060,266	45,600	0.022133064
1985	1,827,615	45,000	0.024622254
1986	1,521,498	30,600	0.020111758
1987	1,565,381	19,200	0.012265385
1988	1,561,910	26,040	0.016671895
1989	1,454,642	33,920	0.023318452
1990	2,030,874	41,250	0.020311452
1991	1,371,617	24,080	0.017555921
1992	1,609,284	35,280	0.021922793
1993	1,760,143	22,140	0.012578523
1994	1,661,943	30,740	0.018496423
1995	1,544,653	37,200	0.024083079
1996	1,469,618	22,800	0.015514236
1997	1,845,528	32,240	0.017469255
1998	1,880,733	30,780	0.016365959
1999	1,696,580	41,400	0.024402032
2000	1,566,023	36,000	0.022988168
2001	1,361,479	35,840	0.026324313
2002	1,142,802	32,830	0.028727636
2003	1,716,721	44,880	0.026142862
2004	1,499,434	40,960	0.027316974

Source: U.S. Agricultural Statistics

From 1980 to 2004, U.S. winter wheat production varied from a low of 1.14 billion bushels in 2002 to a high of almost 2.10 billion bushels in 1981. The U.S. has not had a harvest in excess of 2.00 billion bushels since 1990. Michigan production ranged from a low of 19.20 million bushels in 1987 to a high of 44.88 million bushels in 2003. Michigan's share of production ranged from a low of 1.23 percent in 1987 to a high of 2.87 percent in 2002.

From 1995 to 2004, U.S. winter wheat production ranged from low of 1.14 billion bushels in 2002 to a high of 1.88 billion bushels in 1998. Michigan production ranged from a low of 22.80 million bushels in 1996 to a high of 44.88 million bushels in 2002. During this time frame, the state's share of production ranged from 1.55 percent in 1996 to a high of 2.87 percent in 2002. The statistical analysis indicates that U.S. production has been declining from 1980 to 2004 and that the trend has likely continued from 1995 to 2004. Michigan's production has likely been constant from 1980 to 2004 and appears to be increasing from 1995 to 2004. Michigan's share has been constant from 1980 to 2004 and appears to be increasing from 1995 to 2004.

These results indicate that Michigan's winter wheat industry may be undergoing a period of augmentation, a period of increased absolute and relative production. This may be due to the high value of white wheat compared to the red winter wheat varieties that are produced in other states. Also, other states that have traditionally been major producers of winter wheat may be increasing their production of other crops at the expense of winter wheat.

Sugarbeets

Compared to many commodities, Michigan is a major source of sugarbeets. Table 5 shows the level of output for U.S., and Michigan sugarbeet production from 1980 to 2004, as well as Michigan's share of production during that time period.

Table 5: Sugarbeets (1,000s tons)				
Year	U.S. Production	Michigan Production	Michigan Share	
1980	23,502	1,892	0.0805037869	
1981	27,538	2,030	0.0737163193	
1982	20,894	1,853	0.0886857471	
1983	20,992	1,976	0.0941310976	
1984	22,134	2,117	0.0956447095	
1985	22,529	2,325	0.1032003196	
1986	25,162	2,288	0.0909307686	
1987	28,072	2,911	0.1036976347	
1988	24,810	2,393	0.0964530431	
1989	25,131	2,565	0.1020651785	
1990	27,513	3,266	0.1187075201	
1991	28,203	2,573	0.0912314293	
1992	29,143	3,098	0.1063034005	
1993	26,249	3,179	0.1211093756	
1994	31,853	3,029	0.0950930839	
1995	28,065	2,970	0.1058257616	
1996	26,680	1,963	0.0735757121	
1997	29,886	3,040	0.1017198688	
1998	32,499	2,768	0.0851718514	
1999	33,420	3,534	0.1057450628	
2000	32,541	3,403	0.1045757660	
2001	25,764	3,220	0.1249805931	
2002	27,550	3,204	0.1162976407	
2003	30,710	3,400	0.1107131228	
2004	29,932	3,439	0.1148937592	

Source: USDA Agricultural Statistics

From 1980 to 2004, U.S. sugarbeet production ranged from a low of 20.89 million tons in 1982 to almost 33.42 million tons in 1999. During the same time period, Michigan production ranged from a low 1.85 million tons in 1982 to a high of 3.44 million tons in 2004; and the state's share of production varied from a low of 7.36 percent in 1996 to a high of almost 12.50 percent in 2001.

From 1995 to 2004, U.S. output ranged from a low of 25.76 million tons in 2001 to a high of 30.71 million tons in 2003 while Michigan production ranged from a low of

1.96 million tons in 1996 to a high of 3.44 million tons in 2004. The state's share of production varied from a low of 7.36 percent in 1996 to a high of almost 12.50 percent in 2001. From 1980 to 2004, there is strong statistical evidence that both U.S. and Michigan sugarbeet production has increased, as has Michigan's share of production. From 1995 to 2004, U.S. sugarbeet production has leveled off while Michigan production has continued to increase. Michigan's sugarbeet industry is undergoing a period of augmentation. However, this may not continue if there is a change in the U.S. sugar program that would increase imports from other countries and the lower prices that accompany increased imports from other countries. Michigan's sugarbeet industry will likely remain strong as long as the sugar program exists, but if the program is eliminated or substantially altered, sugarbeet growers will face difficult times.

Edible Dry Beans

Michigan is also a major producer of dry beans. Table 6 outlines the level of U.S. production, Michigan production and the state's share of production from 1980 to 2004.

Year	U.S.Production	Michigan Production	Michigan Share
1980	26,395	7,752	0.2936919871
1981	32,751	7,198	0.2197795487
1982	25,563	7,975	0.3119743379
1983	15,520	4,550	0.2931701031
1984	21,070	4,290	0.2036070242
1985	22,175	5,412	0.2440586246
1986	22,886	2,720	0.1188499519
1987	26,031	5,135	0.1972647997
1988	19,253	2,142	0.1112553888
1989	23,729	3,975	0.1675165409
1990	32,379	5,445	0.1681645511
1991	33,765	6,753	0.2000000000
1992	22,615	4,290	0.1896971037
1993	21,913	6,080	0.2774608680
1994	29,028	4,680	0.1612236461
1995	30,812	6,930	0.2249123718
1996	27,912	4,640	0.1662367441
1997	29,370	4,941	0.1682328907
1998	30,418	4,425	0.1454730752
1999	33,085	7,350	0.2221550552
2000	26,409	4,125	0.1561967511
2001	19,583	780	0.0398304652
2002	30,312	4,903	0.1617511217
2003	22,492	2,475	0.1100391250
2004	17,799	3,145	0.1766953200

Source: USDA Agricultural Statistics

From 1980 to 2004, U.S. production varied from a low of 15.52 million hundredweight (cwt.) in 1983 to a high of 33.77 million cwt. in 1991. During this time Michigan's output ranged from a low of 780,000 cwt. in 2001 to a high of 7.98 million in 1982, and the state's market share varied from 3.98 percent in 2001 to a high of almost 31.20 percent in 1982.

From 1995 to 2004, U.S. production varied from a low of 17.80 million cwt. in 2004 to a high of 33.09 million cwt. in 1999. During this time, Michigan's output ranged

from a low of 780,000 cwt. in 2001 to a high of 7.35 million cwt. in 1999. The statistical analysis indicates that from 1980 to 2004, U.S. production has been fairly steady, while Michigan's production has been declining as has Michigan's share of production. From 1995 to 2004, U.S. production, Michigan production and Michigan's share of production all appear to be declining. This is likely due to increased competition from other countries such as Canada which has encouraged dry bean producers in the U.S. to shift to other crops. The Michigan dry bean industry is in a period of degeneration that may continue unless new markets or new varieties of dry beans are produced that appeal to changing consumer tastes.

Vegetables

Carrots

Carrots are one of several types of vegetables that are sold for the fresh market and the processing market. The fresh market will be considered first and then the processing market. The level of production of carrots for the fresh market in the U.S., Michigan, and the state's share of U.S. production is outlined in table 7.

Table 7: Carrots (Fresh) (1,000s cwt.)				
Year	U.S. Production	Michigan Production	Michigan Share	
1980	12,355	880	0.0712262242	
1981	13,146	830	0.0631370759	
1982	14,764	1,092	0.0739636955	
1983	15,234	1,133	0.0743731128	
1984	15,476	1,425	0.0920780563	
1985	15,347	1,110	0.0723268391	
1986	25,594	494	0.0193013988	
1987	20,896	1,150	0.0550344564	
1988	18,235	1,139	0.0624622978	
1989	19,813	978	0.0493615303	
1990	20,405	1,316	0.0644939966	
1991	19,973	1,404	0.0702948981	
1992	21,698	1,479	0.0681629643	
1993	21,720	1,272	0.0585635359	
1994	25,133	1,475	0.0586877810	
1995	23,478	1,938	0.0825453616	
1996	33,236	1,300	0.0391142135	
1997	38,589	1,325	0.0343362098	
1998	35,935	1,334	0.0371225824	
1999	32,332	1,316	0.0407027094	
2000	30,598	1,260	0.0411791620	
2001	31,464	1,160	0.0368675311	
2002	25,865	1,320	0.0510342161	
2003	27,114	1,470	0.0542155344	
2004	26,752	1,302	0.0486692584	

Source: USDA Agricultural Statistics

From 1980 to 2004, the level of output in the U.S. varied from a low of 12.36 million cwt. in 1980 to a high of 38.59 million cwt. in 1997, while the level of output in Michigan varied from 494,000 cwt. in 1986 to a high of 1.94 million cwt. in 1995. During this time period, Michigan's share of output varied from a low 1.93 percent in 1986 to a high of 9.21 percent in 1984.

From 1995 to 2004, the level of output in the U.S. varied from a low of 23.48 million cwt. in 1995 to a high of 38.59 million cwt in 1997. During this time period,

Michigan's output varied from a low of 1.16 million cwt. in 2001 to a high of 1.94 million cwt. in 1995. The statistical analysis indicates that from 1980 to 2004, fresh carrot production increased in Michigan but not as fast as U.S. production meaning that the state's share of production declined during that time period. From 1995 to 2004, U.S. carrot production was fairly stable as was Michigan production although both may be trending downward. Michigan's share of production appears to be fairly steady during this time period. The trend for Michigan's fresh carrot production appears to be in a period of diffusion; Michigan is becoming less important in the production of fresh carrots, although the state's total output is fairly stable.

The level of U.S. production, Michigan production and Michigan's share of production of processed carrots is outlined in table 8.

Table 8: Carrots (Processed) (Tons)			
Year	U.S. Production	Michigan Production	Michigan Share
1980	359,170	22,680	0.0631455857
1981	365,960	24,300	0.0664006995
1982	419,830	30,860	0.0735059429
1983	395,170	26,130	0.0661234405
1984	412,920	30,000	0.0726532985
1985	378,570	27,710	0.0731965026
1986	373,970	21,560	0.0576516833
1987	391,220	38,760	0.0990746894
1988	381,590	28,480	0.0746350795
1989	458,710	34,380	0.0749493144
1990	441,610	28,000	0.0634043613
1991	430,020	21,060	0.0489744663
1992	554,700	39,950	0.0720209122
1993	498,150	37,050	0.0743751882
1994	549,960	41,400	0.0752782021
1995	585,550	33,600	0.0573819486
1996	590,460	36,800	0.0623242895
1997	569,450	37,500	0.0658530161
1998	549,280	30,400	0.0553451791
1999	575,640	39,000	0.0677506775
2000	518,880	35,000	0.0674529756
2001	452,240	31,500	0.0696532814
2002	401,205	41,400	0.1031891427
2003	449,570	38,400	0.0854149521
2004	428,080	32,500	0.0759203887

Source: USDA Agricultural Statistics

From 1980 to 2004, the level of production in the U.S. varied from a low of 359,170 tons in 1980 to a high of 590,460 tons in 1996; Michigan production varied from a low of 21,060 tons in 1991 to a high of 41,400 tons in both 2002 and 1994. The state's share of production varied from a low of almost 4.90 percent in 1991 to a high of 10.32 percent in 2002.

From 1995 to 2004, the level of production in the U.S. varied from a low of 401,205 tons in 2002 to a high of 585,550 tons in 1995. Production in Michigan varied

from a low of 30,400 tons in 1998 to a high of 41,400 tons in 2002. Statistical analysis of processed carrot production indicates that from 1980 to 2004, U.S. production is trending upward as is Michigan production. During this time period, the state's level of production is stable. From 1995 to 2004, U.S. production is trending downward while Michigan production appears to be stable or perhaps increasing slightly, which means that Michigan's share of output is increasing. The tendency for Michigan processed carrot production appears to be reallocation towards Michigan, or even augmentation.

Celery

Michigan is one of the few states that produce celery, which is dominated by California. The level of celery production in the U.S., Michigan and the state's share of U.S. production from 1980 to 2004 is shown in table 9.

Table 9: Celery (1,000 cwt.)			
Year	U.S. Production	Michigan Production	Michigan Share
1980	18,655	1,387	0.074350040
1981	18,628	1,440	0.077302985
1982	19,139	1,551	0.081038717
1983	18,287	1,295	0.070815333
1984	18,757	1,560	0.083168950
1985	18,349	1,312	0.071502534
1986	17,614	1,040	0.059043942
1987	17,847	1,147	0.064268505
1988	19,423	1,178	0.060649745
1989	20,276	1,064	0.052475833
1990	19,816	1,290	0.065098910
1991	19,089	1,218	0.063806381
1992	21,052	1,242	0.058996770
1993	17,575	1,134	0.064523471
1994	17,328	1,118	0.064519852
1995	18,830	1,050	0.055762082
1996	19,015	1,196	0.062897712
1997	18,119	1,081	0.059661129
1998	18,000	1,034	0.057444444
1999	18,727	855	0.045656005
2000	18,425	950	0.051560380
2001	18,856	873	0.046298261
2002	18,737	987	0.052676522
2003	19,256	1,166	0.060552555
2004	18,802	1,232	0.065524944

Source: USDA Agricultural Statistics

From 1980 to 2004, U.S. production of celery ranged from a low of 17.33 million cwt. in 1994 to a high of 21.05 million cwt. in 1992. During the same time period, Michigan production varied from a low of 855,000 cwt. in 1999 to a high of 1.55 million cwt. in 1982. The state's share of production ranged from a low of 4.57 percent in 1999 to a high of 8.10 percent in 1982.

From 1995 to 2004, the level of celery production in the U.S. varied from a low of 18.00 million cwt. in 1998 to a high of 19.26 million cwt. in 2003. From 1995 to 2004,

Michigan production varied from a low of 855,000 cwt. in 1999 to a high of 1.23 million cwt. in 2004. During this time period, the state's share of celery production varied from a low of 4.57 percent in 1999 to a high of 6.55 percent in 2004. The statistical analysis indicates that from 1980 to 2004, U.S. celery production has been flat while Michigan production has declined and as a result the state's share of production has declined. However, from 1995 to 2004, Michigan's total output and share of production has been relatively stable. It appears that after a period of degeneration from 1980 through 1999, the industry has stabilized.

Cucumbers

Michigan is a major producer of both fresh cucumbers and cucumbers that are used for pickles. U.S. production of fresh cucumbers, Michigan fresh cucumber production and the state's share of total production from 1996 to 2004 is shown in figure 10. Due to the nature of the publication of data from the USDA the time series only goes back to 1996.

Table 10: Fresh Cucumbers (1,000 cwt.)			
Year	U.S. Production	Michigan Production	Michigan Share
1996	9,836	1,100	0.1118340789
1997	11,571	1,280	0.1106213810
1998	11,263	1,235	0.1096510699
1999	11,921	1,452	0.1218018623
2000	10,950	1,340	0.1223744292
2001	10,756	1,210	0.1124953514
2002	10,939	1,140	0.1042142792
2003	9,425	1,024	0.1086472149
2004	9,652	1,295	0.1341690841

Source: USDA Agricultural Statistics

During this time period U.S. production of fresh cucumbers varied from 9.43 million cwt. in 2003 to a high of 11.92 million cwt. in 1999. Michigan production varied from a low

of 1.02 million cwt. in 2003 to a high of 1.45 million cwt. in 1999. Michigan's share of output ranged from a low of 10.42 percent in 2002 to a high of 13.41 percent in 2004.

Given the short time period, it is difficult to come to strong conclusions based on statistical analysis of the fresh cucumber market. It appears that there is a downward trend in U.S. production while Michigan production appears to be more stable. The general trend for fresh cucumber production in Michigan appears to be reallocation away from other states towards Michigan.

Michigan has long been a major producer of cucumbers that are used for the production of pickles. Total U.S. output, Michigan production and Michigan's share of production from 1984 to 2004 is shown in table 11. As is the case with fresh cucumbers, the time series for cucumber for pickle production does not extend to 1980.

Table 11: Cucumbers for Pickles (Tons)			
Year	U.S. Production	Michigan Production	Michigan Share
1984	618,240	117,150	0.1894895186
1985	694,430	134,400	0.1935400256
1986	639,550	139,200	0.2176530373
1987	635,450	160,800	0.2530490204
1988	651,580	126,500	0.1941434667
1989	642,690	147,000	0.2287261355
1990	653,480	141,600	0.2166860501
1991	623,030	144,000	0.2311285171
1992	588,070	111,800	0.1901134219
1993	586,980	127,600	0.2173838972
1994	631,340	132,000	0.2090791016
1995	610,460	143,000	0.2342495823
1996	563,689	137,800	0.2444610415
1997	620,100	135,200	0.2180293501
1998	593,720	130,000	0.2189584316
1999	628,360	159,000	0.2530396588
2000	613,160	180,000	0.2935612238
2001	581,540	125,380	0.2155999587
2002	619,310	158,700	0.2562529266
2003	648,430	180,900	0.2789815400
2004	585,980	172,500	0.2943786477

Source: USDA Agricultural Statistics.

From 1984 to 2004, U.S. cucumber for pickle production varied from a low of 563,689 tons in 1996 to a high of 694,430 tons in 1985. Michigan production varied from a low of 111,800 tons in 1992 to a high of 180,900 in 2003. The state's share of production varied from a low of 19.01 percent in 1992 to a high of 29.44 percent in 2004.

From 1995 to 2004, U.S. production varied from a low of 563,689 tons in 1996 to a high of 648,430 in 2003, while Michigan production varied from a low of 125,380 tons in 2001 to a high of 180,900 tons in 2003. The state's share of production varied from 23.42 percent in 1995 to a high of 29.44 percent in 2004. The statistical analysis indicates that U.S. cucumber for pickle production declined from 1984 to 2004 while

Michigan production and Michigan's share of production increased. From 1995 to 2004 U.S. production appears to be stable while Michigan production and share of production continued to increase. Evidence indicates that Michigan cucumber for pickle production is undergoing a period of augmentation.

Asparagus

Michigan is also a major producer of asparagus. Table 12 shows the level of asparagus production in the U.S., Michigan and the state's share of production from 1985 to 2004. This includes both fresh and processed asparagus production.

Table 12: Asparagus (1,000s cwt.)			
Year	U.S. Production	Michigan Production	Michigan Share
1985	2,136	230	0.1076779026
1986	2,230	246	0.1103139013
1987	2,347	242	0.1031103536
1988	2,422	248	0.1023947151
1989	2,495	253	0.1014028056
1990	2,447	259	0.1058438905
1991	2,253	259	0.1149578340
1992	2,351	273	0.1161207997
1993	2,203	285	0.1293690422
1994	2,210	247	0.1117647059
1995	2,024	306	0.1511857708
1996	1,989	298	0.1498240322
1997	2,026	263	0.1298124383
1998	1,979	278	0.1404749874
1999	2,176	297	0.1364889706
2000	2,272	283	0.1245598592
2001	2,078	290	0.1395572666
2002	1,868	219	0.1172376874
2003	1,843	317	0.1720021704
2004	1,708	290	0.1697892272

Source: USDA Agricultural Statistics

As was the case with cucumbers, consistent asparagus statistics did not extend back to 1980.

During this time period, U.S. asparagus production varied from a low of 1.71 million cwt. in 2004 to a high of 2.50 million cwt. in 1989. From 1985 to 2004, Michigan production varied from a low of 230,000 cwt. in 1985 to a high of 317,000 cwt. in 2003. The state's share of production varied from a low of 10.14 percent in 1989 to a high of 17.20 percent in 2003.

From 1995 to 2004, U.S. production varied from a low of 1.71 million cwt. in 2004 to a high of 2.27 million cwt. in 2000, while Michigan production varied from a low of 219,000 cwt. in 2002 to a high of 317,000 cwt. in 2003. The state's share of production varied from 11.72 percent in 2002 to a high of 17.20 percent in 2003. The statistical analysis indicates that from 1985 to 2004, U.S. production has been generally declining while Michigan production has been increasing. During this time period Michigan's share of production has been increasing as well. From 1995 to 2004, it appears that U.S. output has been declining while Michigan production appears to be more stable or declining slightly, the state's share of production has been stable. Overall, from 1985 to 2004 the state's asparagus production has undergone a period of augmentation and has been stable from 1995 to 2004.

Potatoes

Michigan has a long history of producing potatoes, especially for the chip and other processed potato product market. Table 13 outlines U.S., and Michigan potato production as well as Michigan's share of potato production from 1980 to 2004.

Table 13: Potatoes (1,000 cwt.)				
Year	U.S. Production	Michigan Production	Michigan Share	
1980	302,857	7,403	0.0244438795	
1981	340,623	8,575	0.0251744597	
1982	355,131	10,530	0.0296510302	
1983	333,911	9,840	0.0294689303	
1984	362,612	12,540	0.0345824187	
1985	407,109	12,100	0.0297217698	
1986	361,743	9,625	0.0266072875	
1987	389,320	9,720	0.0249666084	
1988	356,438	7,820	0.0219392994	
1989	370,444	7,350	0.0198410556	
1990	402,110	9,240	0.0229787869	
1991	417,622	8,840	0.0211674672	
1992	425,367	10,800	0.0253898398	
1993	428,693	11,780	0.0274788718	
1994	467,924	12,180	0.0260298681	
1995	443,606	16,350	0.0368570308	
1996	499,254	13,800	0.0276412407	
1997	467,091	14,250	0.0305079738	
1998	475,771	14,648	0.0307879211	
1999	478,216	14,963	0.0312892082	
2000	513,621	14,963	0.0291323758	
2001	444,766	14,030	0.0315446774	
2002	458,171	13,878	0.0302900009	
2003	457,814	15,015	0.0327971622	
2004	456,362	13,650	0.0299104658	

Source: USDA, Agricultural Statistics

From 1980 to 2004, U.S. potato production varied from a low of 302.86 million cwt. in 1980 to a high of 513.62 million cwt. in 2000. During the same time period, Michigan production varied from a low of 7.35 million cwt. in 1989 to a high of 16.35 million cwt. in 1995. The state's share of production varied from 1.98 percent in 1989 to 3.69 percent in 1995.

From 1995 to 2004, U.S. production varied from a low of 443.61 million cwt. in 1995 to a high of 513.62 million cwt. in 2000. Michigan production varied from a low of 13.65 million cwt. in 2004 to a high of 16.35 million cwt. in 1995. The statistical analysis indicates that from 1980 to 2004 both U.S. and Michigan production increased, and that Michigan's share of total production remained unchanged. From 1995 to 2004, both U.S. and Michigan production may have trended downward very slightly but the state's share of production remained stable from 1995 to 2004. The trend for Michigan potato production appears to be stable.

Tomatoes

As is the case with cucumbers and carrots, tomatoes produced in Michigan are used both for the fresh market and the processing market. Table 14 outlines U.S. production, Michigan production and the state's share of total production for fresh tomatoes. Overall, Michigan is not a major supplier of fresh tomatoes with output being well less than 2 percent of total U.S. production.

Table 14: Fresh Tomatoes (1,000 cwt.)				
Year	U.S. Production	Michigan Production	Michigan Share	
1980	25,415	374	0.0147157191	
1981	26,176	391	0.0149373472	
1982	26,769	403	0.0150547275	
1983	27,237	396	0.0145390462	
1984	28,189	420	0.0148994289	
1985	29,898	320	0.0107030571	
1986	31,554	285	0.0090321354	
1987	32,414	252	0.0077744185	
1988	35,785	204	0.0057007126	
1989	35,904	250	0.0069630125	
1990	33,709	300	0.0088997004	
1991	33,988	351	0.0103271743	
1992	39,033	350	0.0089667717	
1993	35,599	360	0.0101126436	
1994	36,636	416	0.0113549514	
1995	34,535	360	0.0104242073	
1996	33,634	432	0.0128441458	
1997	32,777	400	0.0122036794	
1998	32,628	483	0.0148032365	
1999	36,735	494	0.0134476657	
2000	37,500	408	0.0108800000	
2001	35,527	378	0.0106397951	
2002	39,588	420	0.0106092755	
2003	35,578	484	0.0136039125	
2004	36,116	546	0.0151179533	

Source: USDA Agricultural Statistics

From 1980 to 2004, U.S. fresh tomato production varied from a low 25.42 million cwt. in 1980 to a high of 39.03 million cwt. in 1992. During the same time period, Michigan fresh tomato production varied from a low of 204,000 cwt. in 1988 to a high of 546,000 cwt. in 2004, and the state's share of U.S. output varied from 0.57 percent in 1988 to 1.51 percent in 2004.

From 1995 to 2004, U.S. production varied from a low of 32.63 million cwt. in 1998 to a high of 39.59 million cwt. in 2002. Michigan output ranged from 360,000 cwt.

in 1995 to 546,000 cwt. in 2004. The state's share of total production varied from a low of 1.06 percent in 2002, to a high of 1.51 percent in 2004. Statistical analysis indicates that from 1980 to 2004, both U.S. and Michigan production increased and the state's share of total production was constant. The same trends appear to hold true for the 1995 to 2004 time period. Michigan's share of the fresh tomato market is stable.

Table 15 outlines U.S. production, Michigan production and the state's share of the processed tomato market from 1980 to 2004.

Table 15: Processed Tomatoes (Tons)			
Year	U.S. Production	Michigan Production	Michigan Share
1980	6,210,590	73,680	0.0118636072
1981	7,024,930	118,300	0.0168400255
1982	7,298,990	204,670	0.0280408659
1983	7,029,840	183,080	0.0260432670
1984	7,681,160	173,900	0.0226398096
1985	7,177,130	166,320	0.0231736084
1986	7,393,290	133,380	0.0180406828
1987	7,607,690	118,500	0.0155763445
1988	7,409,920	112,320	0.0151580584
1989	9,484,470	132,840	0.0140060541
1990	10,355,260	169,860	0.0164032579
1991	10,872,990	169,510	0.0155900079
1992	8,777,430	182,400	0.0207805702
1993	9,676,540	182,000	0.0188083757
1994	11,542,310	144,000	0.0124758389
1995	11,286,040	135,000	0.0119616801
1996	11,407,301	143,000	0.0125358312
1997	9,973,259	133,300	0.0133657413
1998	9,402,010	90,000	0.0095724212
1999	12,836,020	87,000	0.0067778018
2000	10,858,240	84,800	0.0078097371
2001	9,248,720	105,400	0.0113961716
2002	11,670,820	126,000	0.0107961566
2003	9,819,710	125,400	0.0127702346
2004	12,266,410	108,500	0.0088452938

Source: USDA Agricultural Statistics

From 1980 to 2004, U.S. processed tomato production varied from a low of 6.12 million tons in 1980 to a high of almost 12.84 million tons in 1999. During the same time period Michigan processed tomato production varied from a low of 73,680 tons in 1980 to a high of 204,670 tons in 1982. The state's share of the processed tomato market varied from 0.68 percent in 1999 to 2.80 percent in 1982.

From 1995 to 2004, U.S. processed tomato production varied from a low of 9.25 million tons in 2001 to a high of 12.84 million tons in 1999. Michigan production varied from a low of 84,800 tons in 2000 to a high of 143,000 tons in 1996, and the state's share of total production varied from 0.67 percent in 1999 to 1.34 percent in 1997. The statistical analysis indicates that from 1980 to 2004, U.S. processed tomato production increased while Michigan production declined leading to a decline in the state's share of production. The period from 1995 to 2004 indicates that the trend may be continuing but there is not a strong statistical relationship. Overall, it appears that Michigan is undergoing a period of degeneration. This may be due to Michigan producers focusing on the fresh market to the detriment of the processed market.

Fruit

Apples

Michigan is a major producer of a number of fruits. Michigan is typically the country's third largest producer of apples. Table 16 shows the U.S. level of output, production in Michigan and Michigan's share of U.S. production of apples from 1980 to 2004.

Table 16: Apples (Million Pounds)			
Year	U.S. Production	Michigan Production	Michigan Share
1980	8,810.40	900	0.1021520022
1981	7,705.90	660	0.0856486588
1982	8,110.20	980	0.1208354911
1983	8,357.90	750	0.0897354599
1984	8,318.10	770	0.0925692165
1985	7,835.80	1,070	0.1365527451
1986	7,907.30	700	0.0885257926
1987	10,451.30	1,050	0.1004659707
1988	9,078.40	830	0.0914258019
1989	9,917.40	950	0.0957912356
1990	9,658.20	750	0.0776542213
1991	9,658.80	880	0.0911086263
1992	10,474.30	1,050	0.1002453625
1993	10,573.90	1,020	0.0964639348
1994	11,331.40	1,020	0.0900153556
1995	10,389.90	1,220	0.1174217269
1996	10,330.00	700	0.0677637948
1997	10,254.30	1,000	0.0975200648
1998	10,762.50	960	0.0891986063
1999	10,446.50	1,180	0.1129564926
2000	10,322.20	795	0.0770184651
2001	9,214.40	900	0.0976732072
2002	8,374.10	515	0.0614991462
2003	8,623.00	890	0.1032123391
2004	9,927.90	720	0.0725228900

Source: USDA Agricultural Statistics

From 1980 to 2004, U.S. production of apples ranged from a low of 7.71 billion pounds in 1981 to a high of 11.33 billion pounds in 1994. During the same time period, output in Michigan varied from a low of 515 million pounds in 2002 to a high of 1.22 billion pounds in 1995. The state's share of production varied from a low of 6.15 percent in 2002 to a high of 13.66 percent in 1985.

From 1995 to 2004, U.S. production of apples ranges from a high of 10.45 billion pounds in 1999 to a low of 8.37 billion pounds in 2002. Production in Michigan varied

from a low of 515 million pounds in 2002 to a high of 1.22 billion pounds in 1995. The state share of production ranged from a low of 6.15 percent in 2002 to 11.74 percent in 1995. The statistical analysis indicates that U.S. apple production increased overall from 1980 to 1994, but declined from 1995 to 2004. From 1980 to 2004, Michigan apple production was stable and the state's share of apple production declined slightly during this time period. From 1995 to 2004, the state's output appears to have declined while the state's share of production was constant. It is difficult to make a determination on the state of the Michigan's apple production; it has been argued that foreign competition has forced the state into a period of degeneration and that appears to be the case from 1980 to 2004; but from 1995 to the present, the state's share of production has stabilized.

Sweet Cherries

While sweet cherries are not as important to the state as tart cherries, it is an important fruit produced in the state. Table 17 shows the level sweet cherry production in the U.S., Michigan and Michigan's share of production from 1980 to 2004.

Year	U.S. Production	Michigan Production	Michigan Share
1980	166,300	29,000	0.1743836440
1981	146,020	23,000	0.1575126695
1982	134,610	25,500	0.1894361489
1983	168,765	18,000	0.1066571860
1984	164,250	31,000	0.1887366819
1985	126,500	31,000	0.2450592885
1986	136,760	20,000	0.1462415911
1987	213,020	32,000	0.1502206366
1988	184,510	28,000	0.1517532925
1989	190,930	25,000	0.1309380401
1990	132,350	13,500	0.1020022667
1991	148,550	21,000	0.1413665433
1992	205,400	18,000	0.0876338851
1993	160,575	27,000	0.1681457263
1994	192,910	23,000	0.1192265823
1995	153,070	27,000	0.1763898870
1996	151,700	22,000	0.1450230719
1997	223,490	27,000	0.1208107745
1998	208,410	33,000	0.1583417302
1999	227,760	26,500	0.1163505444
2000	204,020	19,600	0.0960690128
2001	219,620	23,000	0.1047263455
2002	177,305	2,600	0.0146639971
2003	243,580	13,000	0.0533705559
2004	278,160	24,700	0.0887978142

Source: USDA Agricultural Statistics

From 1980 to 2004, U.S. production of sweet cherries varied from a low of 126,500 tons in 1985 to a high of 278,160 tons in 2004. During the same time period, Michigan production of sweet cherries varied from a low of 2,600 tons in the disastrous crop year of 2002 to a high of 33,000 tons in 1998. The state's share of total production varied from a low of 1.47 percent in 2002 to a high of 24.51 percent in 1985.

From 1995 to 2004, U.S. production varied from a low of 151,700 tons in 1996 to a high of 278,160 tons in 2004. Michigan production varied from a low of 2,600 tons in

2002 to a high of 33,000 tons in 1998. Michigan's share of production varied from a low of 1.47 percent in 2002 to a high of 17.64 percent in 1995. The statistical analysis indicates that U.S. production of sweet cherries increased quite dramatically from 1980 to 2004, while Michigan production declined slightly. These two factors caused the state's share of production to decline. These trends also held true from 1995 to 2004. The state is undergoing a period of degeneration in the production of sweet cherries as output shifts away from Michigan to other states.

Tart Cherries

Michigan is the dominant producer of tart cherries in the nation, with a share of total production that often exceeds 75 percent of the nation's output. Table 18 outlines tart cherry production for the U.S., Michigan, and the state's share of production from 1980 to 2004.

Table 18: Tart Cherries (tons)			
Year	U.S. Production	Michigan Production	Michigan Share
1980	216.2	149	0.6891766883
1981	132.8	88	0.6626506024
1982	244.9	195	0.7962433646
1983	153.6	87	0.5664062500
1984	255.9	195	0.7620164127
1985	280.2	215	0.7673090650
1986	218.4	165	0.7554945055
1987	286.0	225	0.7867132867
1988	233.5	180	0.7708779443
1989	243.0	170	0.6995884774
1990	202.9	160	0.7885657960
1991	189.7	110	0.5798629415
1992	313.0	235	0.7507987220
1993	256.2	215	0.8391881343
1994	282.3	210	0.7438894793
1995	311.2	250	0.8033419023
1996	260.1	195	0.7497116494
1997	283.3	221	0.7800917755
1998	305.6	229	0.7493455497
1999	254.1	185	0.7280598190
2000	281.4	200	0.7107320540
2001	307.9	242	0.7859694706
2002	62.2	15	0.2411575563
2003	226.3	154	0.6805125939
2004	213.0	149	0.6995305164

Source: USDA Agricultural Statistics

From 1980 to 2004, U.S. tart cherry production ranged from a low of 62.2 tons in 2002 (due largely to what was essentially a crop failure in Michigan) to a high of 313.0 tons in 1992. Michigan output varied from a low of 15 tons in 2002 to a high of 250 tons in 1995, and the state's share of national output varied from a low of 24.12 percent in 2002 to a high of 83.92 percent in 1993.

From 1995 to 2004, output in the U.S. varied from a low of 62.2 tons in 2002 to a high of 307.9 tons in 2001, while production in Michigan varied from a low of 15 tons in

2002 to a high of 250 tons in 1995. The state's share of production varied from a low of 24.11 percent in 2002 to a high of 80.33 percent in 1995. The statistical analysis indicates that from 1980 to 2004 U.S., Michigan and Michigan's share of production were stable. From 1995 to 2004, U.S. Michigan, and Michigan's share of production appears to be declining although the low level of production in 2002 may skew these results. U.S. production outside of Michigan may be increasing or steady but the since the state's share of total U.S. output is so great, this fact may not be captured by the data. Changes in production in Michigan will also have an effect on U.S. production. Overall, tart cherry production is stable or in a slight state of degeneration.

Grapes

The grape industry in Michigan is undergoing profound change. Grape production of wine grapes is increasing while the production of juice grapes appears to be declining. Unfortunately, with the exception of California, USDA figures do not attempt to separate wine grape and other types of grape production. Table 19 shows the total level of production of grapes in the U.S., Michigan, and the state's share of production from 1980 to 2004.

Table 19: Grapes (tons)				
Year	U.S. Production	Michigan Production	Michigan Share	
1980	5,594,800	49,500	0.0088475013	
1981	4,457,000	53,000	0.0118914068	
1982	5,864,900	58,500	0.0099745946	
1983	5,360,200	60,000	0.0111936122	
1984	5,168,800	49,000	0.0094799567	
1985	5,606,700	51,000	0.0090962598	
1986	5,225,300	32,000	0.0061240503	
1987	5,253,450	60,000	0.0114210662	
1988	6,032,100	53,000	0.0087863265	
1989	5,930,050	43,000	0.0072512036	
1990	5,659,780	46,000	0.0081275244	
1991	5,555,270	46,000	0.0082804256	
1992	6,032,200	43,000	0.0071284109	
1993	6,014,550	49,000	0.0081469104	
1994	5,869,200	65,000	0.0110747632	
1995	5,912,750	64,000	0.0108240666	
1996	5,553,600	65,000	0.0117041199	
1997	7,290,900	61,000	0.0083665940	
1998	5,816,405	70,400	0.0121036964	
1999	6,234,830	75,000	0.0120291973	
2000	7,687,330	87,200	0.0113433403	
2001	6,568,400	28,500	0.0043389562	
2002	7,336,810	42,500	0.0057927083	
2003	6,398,630	80,500	0.0125808181	
2004	5,960,900	58,000	0.0097300743	

Source: USDA Agricultural Statistics

From 1980 to 2004, production of grapes in the U.S. ranged from a low of 4.46 million tons in 1981 to a high of 7.69 million tons in 2000. During the same time period, production in Michigan ranged from a low of 28,500 tons in 2001 to a high of 80,500 tons in 2003. The state's share of total U.S. output ranged from a low of 0.43 percent in 2001 to a high of 1.26 percent in 2003.

From 1995 to 2004, U.S. production of grapes varied from a low of 5.55 million tons in 1996 to a high of 7.69 million tons in 2003, while output in Michigan ranged from 42,500 tons in 2002 to a high of 80,500 tons in 2003. The state's share of total U.S. output ranged from a low of 0.43 percent in 2001 to a high of 1.26 percent in 2003. Statistical analysis indicates that from 1980 to 2004, both U.S. and Michigan grape production increased while Michigan's share appears to have stayed constant. Data from 1995 to 2004 are inconclusive, although it appears that U.S. output may have increased slightly while Michigan production decreased slightly although the poor year of 2002 may have skewed these results. Given these facts it is difficult to determine the trend for Michigan grape production. Further complicating the analysis is the possibility that Michigan grape producers may be replacing lower priced juice grapes with higher priced wine grapes.

Livestock Products

Milk

In dollar terms, milk is the largest valued commodity produced by Michigan farmers although the state generally accounts for only approximately 3.5 percent of U.S. output. Table 20 outlines the level of production in the U.S., Michigan, and the state's share of production from 1979 to 2003. One interesting fact about livestock products in general, and milk production in particular, is the fact that there tends to be little year to year variation in production compared to crop and fruit production which is more affected by the weather. This makes the determination of trends easier.

Table 20: Milk (Million Pounds)			
Year	U.S. Production	Michigan Production	Michigan Share
1979	123,411	4,830	0.0391375161
1980	128,525	4,970	0.0386695195
1981	133,013	5,103	0.0383646711
1982	135,802	5,253	0.0386813154
1983	139,672	5,528	0.0395784409
1984	135,450	5,350	0.0394979697
1985	143,147	5,568	0.0388970778
1986	143,381	5,404	0.0376897915
1987	142,557	5,248	0.0368133448
1988	145,152	5,228	0.0360174162
1989	144,239	5,152	0.0357184950
1990	148,313	5,233	0.0352834883
1991	148,477	5,256	0.0353994221
1993	150,582	5,435	0.0360932914
1994	153,664	5,545	0.0360852249
1995	155,425	5,565	0.0358050507
1996	154,259	5,430	0.0352005394
1997	156,091	5,410	0.0346592693
1998	157,348	5,365	0.0340963978
1999	162,711	5,455	0.0335256989
2000	167,559	5,705	0.0340477086
2001	165,336	5,855	0.0354127353
2002	170,063	6,120	0.0359866638
2003	170,312	6,360	0.0373432289

Source: USDA Agricultural Statistics

There was a slight decline in Michigan production in the mid to late 1980s due to the Dairy Termination Program which reduced the number of dairy cows in the state.

From 1979 to 2003, U.S. milk production varied from a low of 123.41 billion pounds of milk in 1979 to a high of 170.31 billion pounds in 2003. Production in Michigan varied from a low of 4.83 billion pounds in 1979 to a high of 6.36 billion pounds in 2003. During this time period the state's share of U.S. milk production varied from 3.35 percent in 1999 to a high of 3.96 percent in 1983.

From 1994 to 2003, U.S. milk production varied from a low of 153.66 billion pounds in 1994 to a high of 170.31 billion pounds in 2003. Output in Michigan varied from a low of 5.37 billion pounds in 1998 to a high of 6.36 billion pounds in 2003. The state's share of output varied from 3.35 percent in 1999 to 3.73 percent in 2003. The statistical analysis indicates that both U.S. and Michigan production increased from 1979 to 2003 and from 1994 to 2003. Michigan's share of total production has also appears to be fairly constant. During this time period, Michigan's relative position appears to be constant.

Eggs

Table 21 shows U.S. and Michigan production of eggs from 1980 to 2004, as well as Michigan's share of output during that time period.

Table 21: Eggs (Millions)				
Year	U.S. Production	Michigan Producton	Michigan Share	
1980	69,684	1,459	0.0209373744	
1981	69,827	1,541	0.0220688272	
1982	69,706	1,525	0.0218776002	
1983	68,169	1,484	0.0217694260	
1984	68,230	1,519	0.0222629342	
1985	68,407	1,693	0.0247489292	
1986	68,398	1,644	0.0240357905	
1987	69,531	1,656	0.0238167148	
1988	69,655	1,553	0.0222955997	
1989	67,236	1,454	0.0216253198	
1990	67,889	1,406	0.0207102771	
1991	69,196	1,396	0.0201745766	
1992	70,749	1,398	0.0197599966	
1993	71,936	1,401	0.0194756450	
1994	73,911	1,435	0.0194152427	
1995	74,591	1,388	0.0186081431	
1996	76,148	1,318	0.0173083994	
1997	77,532	1,327	0.0171155136	
1998	79,690	1,395	0.0175053332	
1999	82,715	1,533	0.0185335187	
2000	84,412	1,621	0.0192034308	
2001	85,745	1,677	0.0195579917	
2002	86,698	1,771	0.0204272302	
2003	87,473	1,888	0.0215838030	
2004	89,131	2,009	0.0225398571	

Source: USDA Agricultural Statistics

From 1980 to 2004, U.S. egg production varied from a low of 68.17 billion in 1983 to a high of 89.13 billion in 2004. During the same time period Michigan output ranged from a low of 1.32 billion in 1996 to a high of 2.01 billion in 2004. The state's share of total U.S. production varied from 1.71 percent in 1997 to 2.47 percent in 1985.

From 1995 to 2004, U.S. production varied from a low of 74.59 billion eggs in 1995 to a high of 89.13 billion in 2004, while production in Michigan varied from a low of 1.32 billion in 1996 to a high of 2.10 billion in 2004. The state's share of U.S.

production varied from 1.71 percent in 1997 to 2.25 percent in 2004. The statistical analysis indicates that from 1980 to 2004, U.S. and Michigan output increased and the state maintained its share of output overall. From 1995 to 2004, Michigan's output increased faster than U.S. output and its market share increased slightly. It appears that the state is beginning a period of augmentation in the egg industry.

Cattle

Determining the level of beef production is difficult. Compared to most states, Michigan has more dairy cattle relative to beef cattle, but most of these cows eventually enter the beef market in one form or another. Also, Michigan is primarily a cow calf state meaning that steers are often fed out somewhere other than Michigan. The data used to determine Michigan's share of the cattle market is the number of cattle and calves in the state. The figures for the U.S., Michigan and Michigan's share from 1980 to 2004 is shown in table 22.

Table 22: Cattle and Calves (1,000s)			
Year	U.S.	Michigan	Michigan Share
1980	111,192.0	1,310	0.011781423
1981	114,321.0	1,340	0.011721381
1982	115,604.0	1,450	0.012542819
1983	115,001.0	1,500	0.013043365
1984	113,700.0	1,475	0.012972735
1985	109,749.0	1,450	0.013211965
1986	105,468.0	1,410	0.013368984
1987	102,000.0	1,325	0.012990196
1988	99,622.0	1,225	0.012296481
1989	98,065.0	1,225	0.012491715
1990	98,162.0	1,225	0.012479371
1991	98,896.0	1,200	0.012133959
1992	97,556.0	1,150	0.011788101
1993	99,175.9	1,200	0.012099714
1994	100,988.0	1,230	0.012179665
1995	102,755.0	1,200	0.011678264
1996	103,487.2	1,170	0.011305746
1997	101,459.7	1,130	0.011137427
1998	99,744.0	1,050	0.010526949
1999	99,115.0	1,050	0.010593755
2000	98,198.0	1,010	0.010285342
2001	97,308.5	980	0.010071063
2002	96,704.0	990	0.010237426
2003	96,106.0	990	0.010301126
2004	94,888.0	1,030	0.010854903

Source: USDA Agricultural Statistics

From 1980 to 2004, the number of cattle and calves in the U.S. varied from a low of 94.89 million head in 2004, to a high of 115.60 million head in 1982. The number of cattle and calves in Michigan varied from a low of 980,000 in 2001 to a high of 1.50 million in 1983. The state's share of cattle and calves varied from just under 1.01 percent in 2001 to a high of 1.34 percent in 1986.

From 1995 to 2004, the number of cattle and calves in the U.S. varied from a low of 94.89 million in 2004 to a high of 103.49 million in 1996. The number of cattle and

calves in Michigan varied from a low of 980,000 in 2001 to a high of 1.20 million in 1995. The state's share of the total number of cattle and calves varied from a low of 1.01 percent in 2001 to a high of 1.17 percent in 1995. The statistical analysis indicates that from 1980 to 2004, the number of cattle and calves declined in the U.S. as well as in Michigan. The state's share of the total number of cattle and calves remained unchanged. These trends also appear to hold true from 1995 to 2004.

Hogs

Table 23 outlines the number of hogs in the U.S., the number of hogs in Michigan and the state's share of hogs. Looking at hog numbers is somewhat easier than cattle figures because hogs are only used for meat, and usually stay in the state until they reach slaughter weight.

Table 23: Hogs and Pigs (Thousands)			
Year	U.S.	Michigan	Michigan Share
1980	64,512	830	0.0128658234
1981	58,688	690	0.0117570883
1982	54,534	900	0.0165034657
1983	56,694	1,250	0.0220481885
1984	54,073	1,310	0.0242265086
1985	52,313	1,190	0.0227476918
1986	50,920	1,250	0.0245483111
1987	54,384	1,350	0.0248234775
1988	55,469	1,250	0.0225351097
1989	53,821	1,260	0.0234109363
1990	54,477	1,250	0.0229454632
1991	57,684	1,300	0.0225365786
1992	58,202	1,280	0.0219923714
1993	57,904	1,220	0.0210693562
1994	59,992	1,250	0.0208361115
1995	58,264	1,100	0.0188795826
1996	56,141	1,000	0.0178122940
1997	61,158	1,030	0.0168416233
1998	62,206	1,120	0.0180046941
1999	59,342	980	0.0165144417
2000	59,848	950	0.0158735463
2001	59,804	960	0.0160524380
2002	58,943	860	0.0145903670
2003	60,444	950	0.0157170273
2004	60,501	940	0.0155369333

Source: USDA Agricultural Statistics

From 1980 to 2004, the number of hogs in the U.S. varied from a low of 50.92 million in 1986 to a high of 64.51 million in 1980. The number of hogs in Michigan varied from a low of 690,000 in 1981 to a high of 1.35 million in 1987. The state's share of the total number of hogs varied from a low of 1.18 percent in 1981 to a high of 2.48 percent in 1987.

From 1995 to 2004, the number of hogs in the U.S. varied from a low of 56.14 million in 1996 to a high of 60.50 million in 2004. During the same time period, the

number of hogs in Michigan varied from a low of 940,000 in 2004 to a high of 1.12 million in 1998. It should be noted that the state has never had more than 1 million hogs since 1998. The statistical analysis indicates that U.S. production has tended upward while Michigan production has tended downward both from 1980 to 2004 and from 1995 to 2004. Michigan's share of production is also trending downward indicating the state is undergoing a period of degeneration in hog production. The loss of a major hog processor has likely had an adverse effect on hog production in Michigan.

Conclusion

It is somewhat difficult to make definitive comments given the wide range of commodities analyzed in this paper. These commodities generate the vast majority of farm income in Michigan. Overall, it appears that from 1980 to about 1995, the state's position relative to others declined. However, that decline seems to have stabilized since then. The state's relative position for most commodities has remained fairly stable. Some commodities such as winter wheat have seen improvement primarily because other states have cut back on production. For example, the plains states have reduced wheat production and have increased their production of corn and soybeans. This helps explain Michigan's increasing importance in winter wheat production as well as its relative decline in corn production despite stable corn production in the state.

With few exceptions, Michigan is not a major producer of most of the commodities discussed in this paper. Many of the commodities outlined represent one to three percent of U.S. output. However, Michigan's role in the production of some commodities such as tart cherries, sugarbeets and cucumbers for pickles are quite large.

Michigan's diversity of crops and livestock products produced is also captured in the analysis. Few other states would be produce the number of commodities listed here.

Another important fact to be considered is that while the shift/share analysis considers commodities produced in the U.S. and Michigan it does not consider markets for individual products. While the overall trend may be declining, the trend for individual niche markets may be positive and vice versa. One way to use this report is to use this shift share analysis with the product opportunity papers that can be found at <http://www.aec.msu.edu/product/roa.htm>, as well as the MSU Product Center for Agriculture and Natural Resources paper on the agri-food system's economic impact on the state of Michigan's economy that can be found at <http://www.aec.msu.edu/product/documents/Working/Economic%20Impact%20of%20Michigan%20Agri-Food%20Final%20010906.pdf>. These resources as well as this paper give a fairly complete view of the trend's, opportunities, and impact of the agri-food system in Michigan.

Technical Appendix

The statistical analysis used a very simple ordinary least square equation to determine the possible relationship between time, output and share of production. Production was regressed on year in equation 1 below:

$$\text{Production} = a + b(\text{year}) \quad (1)$$

where a is the y intercept b is the coefficient related to time. This equation was used for both U.S. and Michigan production for both the longer time period, usually between 1980 and 2004, and the shorter time period 1995 to 2004.

A very similar equation was used to determine Michigan's share of total U.S. production. Share was regressed on year in equation 2 below:

$$\text{Share} = a + b(\text{year}) \quad (2)$$

again where a is the y intercept b is the coefficient related to time. This equation was also used for both the longer and shorter time period. SPSS was the statistical software package used to obtain the results.

Generally speaking, the statistical results were stronger for the longer time period than for the 1995 to 2004 time period. The shorter time period had fewer observations, which meant fewer degrees of freedom, and therefore the less confidence in the results. For the most part, the statistical analysis for the longer time period generated results that had a high level of confidence in the results.

It is very important to note that these regression results only indicate whether or not a trend likely exists. Time per se does not "cause" output to increase or decrease, nor does it "cause" the share of production to change. Other factors such as foreign competition, technological advances, an increase or reduction in processing capacity, and

changes in consumer tastes and preferences all are factors that cause production and share of production to change. This paper does not explicitly attempt to determine the causal factors that change output or share of production figures. It simply attempts to determine whether or not there have been changes in output and share of production over time.

The data used came from the USDA's Agricultural statistics annual report that covered the years in the tables. Charts and the statistical analysis are available from the author who can be contacted at knudsonw@msu.edu. Please be sure to include your address because the size of the computer files are quite large and will have to be mailed to you. Files for individual commodities are also available.

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