Section 1. Introduction - My project looks at changes in the timber products or forest products industry using a dataset published by the U.S. Forest Service. The intent is to show industry changes, in a visual format, in a way that is publicly accessible without having to be a member of any organization.

Bernhardt Timber Industry on Tableau Public

Timber Industry Visualization on Github

Section 2. Data Description

1. This dataset is extracted from a 2019 pdf publication from the US Forest Service titled "U.S. Timber Production, Trade, Consumption, and Price Statistics, 1965-2017" and is available at the following link. U.S. timber production, trade, consumption, and price statistics, 1965-2017 I used tables 3, 4, 9, 11a, 14, and 29. The original document has 60 tables and is very detailed.

2. **Table 3 – Average hourly earnings in timber-based industries and all manufacturing in the United States, 1972-2017**

Year – self-explanatory

All other columns are industry types with the first column showing average hourly earnings in timber-based industries in current US dollars and the second column showing average hourly earnings in timber-based industries in using an index created by setting 2009 as a base year at $100 U.S. Columns are as follows:

Lumber and wood products except furniture dollars; *decimal number*

Lumber and wood products except furniture index 2009 = $100; *decimal number*

Logging camps and logging contractors dollars; *decimal number*

Logging camps and logging contractors index 2009 = $100; *decimal number*

Sawmills and planing mills dollars; *decimal number*

Sawmills and planing mills index 2009 = $100; *decimal number*

Millwork, plywood, and structural members dollars; *decimal number*

Millwork, plywood, and structural members index 2009 = $100; *decimal number*

Paper and allied products dollars; *decimal number*

Paper and allied products index 2009 = $100; *decimal number*

Furniture and fixtures dollars; *decimal number*

Furniture and fixtures index 2009 = $100; *decimal number*

Manufacturing dollars; *decimal number*

Manufacturing index 2009 = $100; *decimal number*

Table 4 – Average employment in lumber-producing and lumber dependent industries in the United States, in thousand people, 1972-2017

Year – self-explanatory; *whole number*

Logging – average employment in thousands; *decimal number*

Sawmills and planning mills, general – average employment in thousands; *decimal number*

Table 9 – U.S. annual industrial wood product production in thousands of short tons, product weight, 1965-2017

Year – self-explanatory; *whole number*

Total – aggregate production of timber products across all type of products ; *whole number*

Softwood plywood – total short tons; *whole number*

Laminated veneer lumber - total short tons; *whole number*

Hardwood plywood and verneer - total short tons; *whole number*

Softwood lumber - total short tons; *whole number*

Hardwood lumber - total short tons; *whole number*

Pulp paper - total short tons; *whole number*

Other industrial products, production and consumption - total short tons; *whole number*

Table 11a – Per capita consumption of timber products, by major product, 1965-2017

Year – self-explanatory; *whole number*

All products cubic feet; *decimal number*

Total roundwood Cubic feet; *decimal number*

Lumber in Cubic feet; *decimal number*

Plywood and Verneer Cubic feet ; *decimal number*

Pulp products Cubic feet; *decimal number*

Fuelwood Cubic feet; *decimal number*

Table 14 – Value of imports and exports of all commodities and timber products, 1965-2017

Year – self-explanatory; *whole number*

All commodities millon current dollars; *whole number*

All commodities millon 2009 dollars; *whole number*

Timber products millon current dollars; *whole number*

Timber products millon 2009 dollars; *whole number*

Percent; decimal number

Table 29 – Lumber production, by region and softwoods and hardwoods, 1965-2017 (billon board feet)

Year – self-explanatory; *whole number*

All regions Total; *decimal number*

All regions Soft- woods; *decimal number*

All regions Hard- woods; *decimal number*

North Total; *decimal number*

North Soft- woods; *decimal number*

North Hard- woods; *decimal number*

South Total; *decimal number*

South Soft- woods; *decimal number*

South Hard- woods; *decimal number*

West Total; *decimal number*

West Soft- woods; *decimal number*

West Hard- woods; *decimal number*

3. **Table 3** rows = 46; columns = 15

Table 4 rows = 46; columns = 3

Table 9 rows = 53; columns = 9

Table 11a rows = 53; columns = 7

Table 14 rows = 53; columns = 6

Table 29 rows = 53; columns = 13

4.This dataset was extracted from a pdf published by the U.S. Department of Agriculture, Forest Service

Citation: Howard, James L.; Liang, Shaobo. 2019. U.S. timber production, trade, consumption, and price statistics. 1965-2017. Res. Pap. FPL-RP-701. Madison, WI: U.S. Department of Agriculture, Forest Service, Forest Products Laboratory. 96 p.

Section 3. Data Cleaning Strategies – This dataset was both extremely detailed and contained within a pdf that was published to the Forest Service website. I used Adobe Acrobat Pro to convert the pdf to an excel document. Adobe did a decent job of converting the document but because most of the tables had a header and multiple rows of column labels I had to do a lot of format editing to allow for an easier connection to Tableau.

Section 4. Clean Dataset - I only used 6 of the 60 available tables. I renamed several column labels to names that represented both levels of column labels. I also removed several columns from the tables I used so that the visuals created would not have several units of measure on them that would have added confusion.

Year	Lumber and	Lumber and	Logging	Logging	Sawmill	Sawmills and	Millwor	Millwork,	Paper	Paper and	Furniture	Furniture and	Manuf	Manufacturin
1972	3.33	22.3	4.25	25.0	3.29	22.0	3.37	21.6	3.95	20.5	3.08	20.5	3.82	20.9
1973	3.61	24.2	4.56	26.8	3.62	24.2	3.62	23.2	4.20	21.8	3.29	21.9	4.09	22.4
1974	3.89	26.1	4.91	28.9	3.88	26.0	3.91	25.1	4.53	23.5	3.53	23.5	4.42	24.2
1975	4.26	28.6	5.28	31.1	4.34	29.0	4.26	27.3	5.01	26.0	3.78	25.1	4.83	26.5
1976	4.72	31.6	6.03	35.5	4.86	32.5	4.67	30.0	5.47	28.4	4.34	28.9	5.68	31.1
1977	5.10	34.2	6.58	38.7	5.28	35.3	5.04	32.3	5.96	30.9	4.34	28.9	5.68	31.1
1978	5.60	37.5	7.25	42.6	5.83	39.0	5.55	35.6	6.52	33.8	4.68	31.1	6.17	33.8
1979	6.07	40.7	7.97	46.9	6.32	42.3	5.95	38.2	7.13	37.0	5.06	33.6	6.70	36.7
1980	6.55	43.9	8.64	50.8	6.70	44.8	6.41	41.1	7.84	40.6	5.49	36.5	7.27	39.9
1981	6.99	46.8	9.11	53.6	7.19	48.1	6.89	44.2	8.60	44.6	5.91	39.3	7.99	43.8
1982	7.43	49.8	9.79	57.6	7.73	51.7	7.33	47.0	9.32	48.3	6.31	42.0	8.49	46.5
1983	7.80	52.3	10.17	59.8	8.20	54.9	7.64	49.0	9.93	51.5	6.62	44.0	8.83	48.4
1984	8.03	53.8	10.70	62.9	8.42	56.4	7.81	50.1	10.41	54.0	6.84	45.5	9.19	50.4
1985	8.22	55.1	10.92	64.2	8.52	57.0	8.06	51.7	10.83	56.1	7.17	47.7	9.54	52.3
1986	8.34	55.9	10.82	63.6	8.58	57.4	8.23	52.8	11.18	58.0	7.46	49.6	9.73	53.3
1987	8.40	56.3	10.68	62.8	8.58	57.4	8.35	53.6	11.43	59.3	7.67	51.0	9.91	54.3
1988	8.61	57.7	10.78	63.4	8.75	58.6	8.55	54.8	11.69	60.6	7.94	52.8	10.18	55.8
1989	8.84	59.2	11.13	65.5	9.03	60.4	8.73	56.0	11.96	62.0	8.25	54.9	10.48	57.5
1990	9.08	60.9	11.22	66.0	9.22	61.7	9.04	58.0	12.31	63.8	8.52	56.6	10.83	59.4
1991	9.24	61.9	11.06	65.1	9.37	62.7	9.28	59.5	12.72	65.9	5.76	38.3	11.18	61.3
1992	9.44	63.3	11.17	65.7	9.59	64.2	9.48	60.8	13.07	67.8	9.01	59.9	11.46	62.8
1993	9.61	64.4	11.37	66.9	9.78	65.5	9.65	61.9	13.42	69.6	9.27	61.6	11.74	64.4
1994	9.84	66.0	11.44	67.3	10.05	67.3	9.89	63.4	13.77	71.4	9.55	63.5	12.06	66.1
1995	10.12	67.8	11.64	68.5	10.31	69.0	10.12	64.9	14.23	73.8	9.82	65.3	12.37	67.8
1996	10.44	70.0	11.76	69.2	10.59	70.9	10.51	67.4	14.68	76.1	10.15	67.5	12.78	70.1
1997	10.76	72.1	12.16	71.5	10.85	72.6	10.89	69.9	15.06	78.1	10.55	70.1	13.17	72.2

Section 5. Visualization Tools – I chose to use Tableau for this project because I knew I would be linking several tables together to create visuals.

[Bernhardt Timber Industry on Tableau Public](#)

[Timber Industry Visualization on Github](#)

Section 6. Visualizations and Stories

Goal #1 – Change in per capita consumption of wood products over time

The below visual illustrates the changes over time in consumption of wood products. Overall consumption of wood products remained relatively consistent, with normal highs and lows, until a crash in 2008 from which consumption has not recovered. Lumber consumption is the major driver in this overall crash. Fuelwood (firewood), plywood and veneer, and pulp product (paper and engineered wood product production) consumption experienced dips but they were not nearly as severe with fuelwood consumption even increasing since that time.
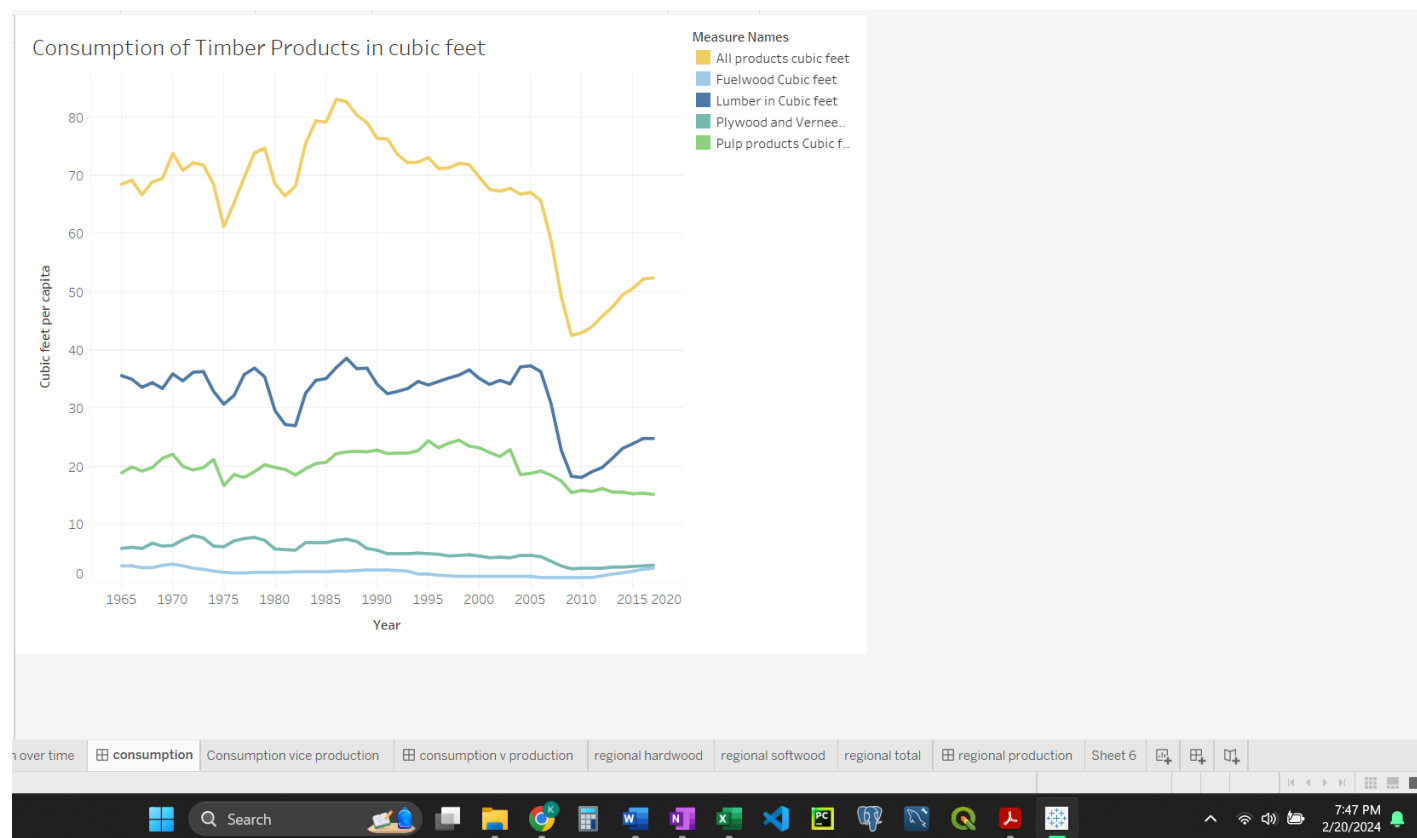
Goal #2 – Comparison between consumption vs production of wood products over time

      This visual is similar to Goal #1 showing the total consumption of timber products vs total production. While both metrics shared a similar crash in 2008 they rarely meet throughout time. The visual also shows the shift from the forest industry largely supporting the U.S. markets to exports becoming an important piece of the timber products market.

Goal #3 – The changes in average hourly earnings vs the value of timber product exports

This visual shows the change in average hourly earnings vs the value of timber product exports. The increase in the export of U.S. timber has played a part in the increase of average wages for forest industry employees. As shown in the Goal #2, the consumption of forest products has declined over time which increased the amount of forest products available to be exported.
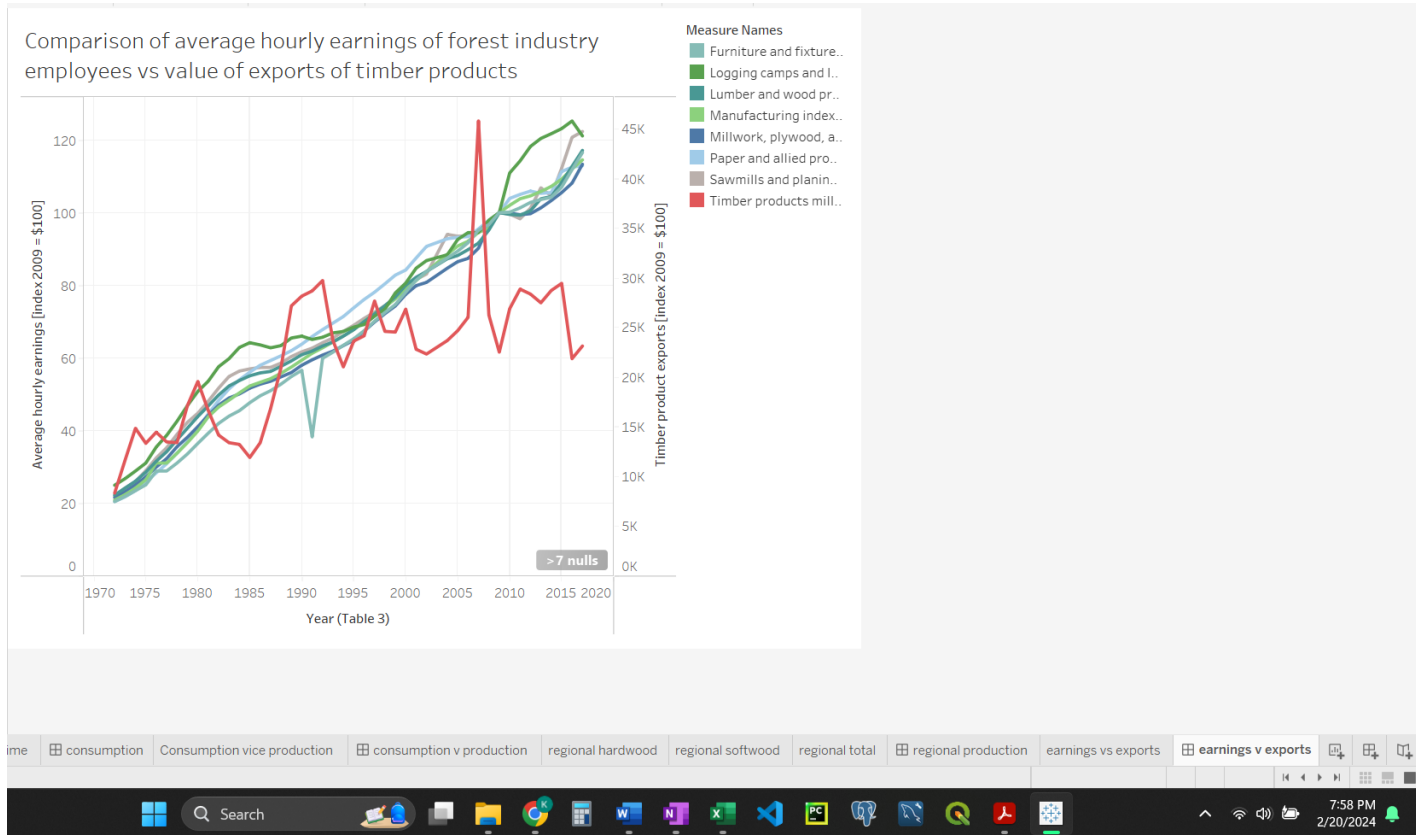
Goal #4 – Comparison between average employment and average hourly earnings over time

This dashboard shows the relationship between average employment and average hourly wages in the forest industry. As shown previously, the forest products industry has had a decrease in domestic consumption which. This has led to a decrease in average employment when combined with the increase of technology used in forestry,. The increase in wages can be attributed to the increase in exports as well as many other things including increased cost living, broader training and education requirements, and a lack of trained employees, among others.
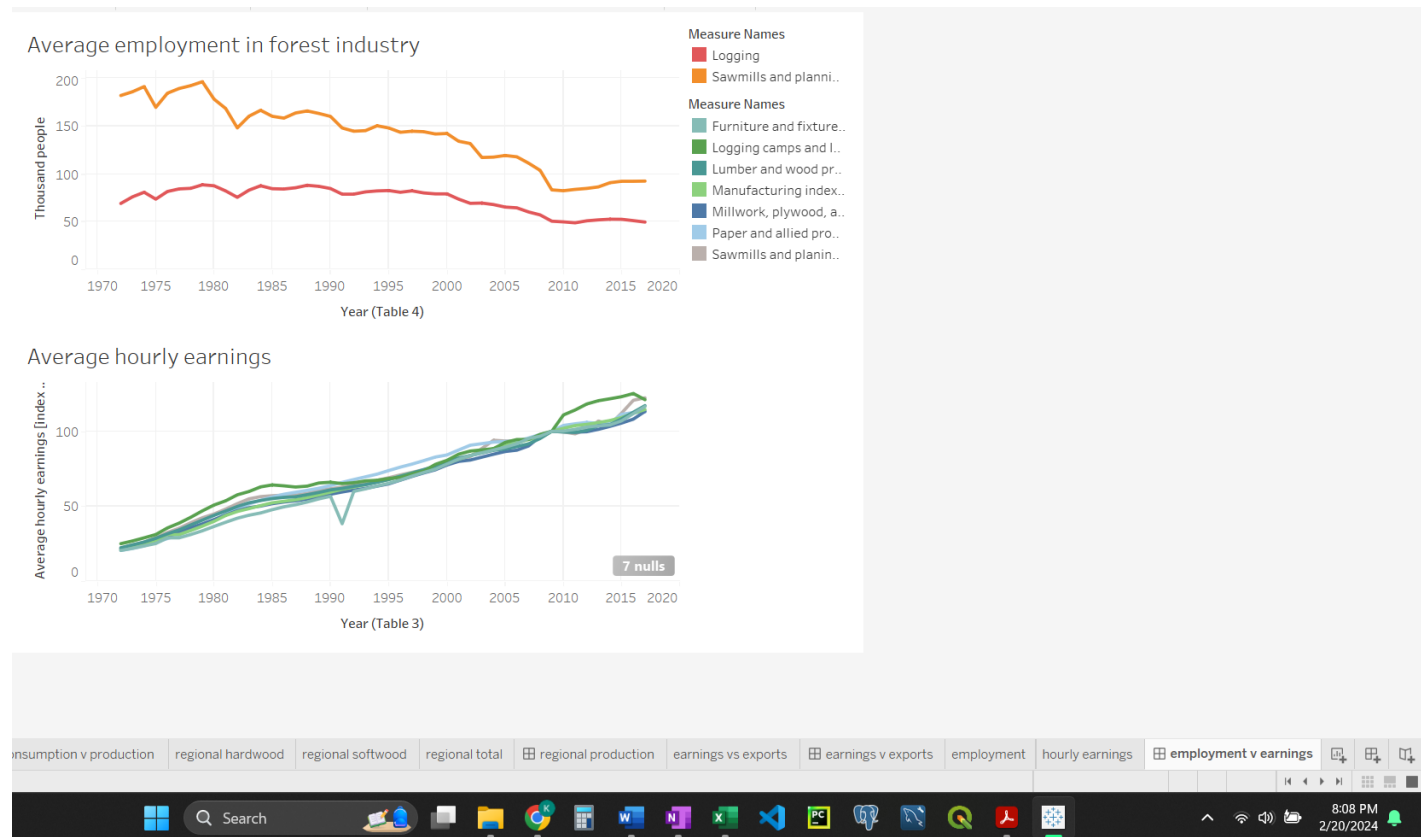
Goal #5 – The shifts in regional production tendencies by product type over time

This dashboard is three visuals showing the production tendencies of the three regions identified in Table 29. The West includes: Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, South Dakota, Utah, Washington, and Wyoming. The South includes: Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, Oklahoma, South Carolina, Tennessee, Texas, and Virginia. The North includes the remaining 24 states. The West and South dominate lumber production both in the total and softwood lumber categories. The North is a more specialized market that does not grow the same board footage of pine, fir, and spruce as the West and South. The North and South produce most of the nation's hardwood lumber, as oak, maple, and other hardwoods are not naturally occurring in abundance in the West.
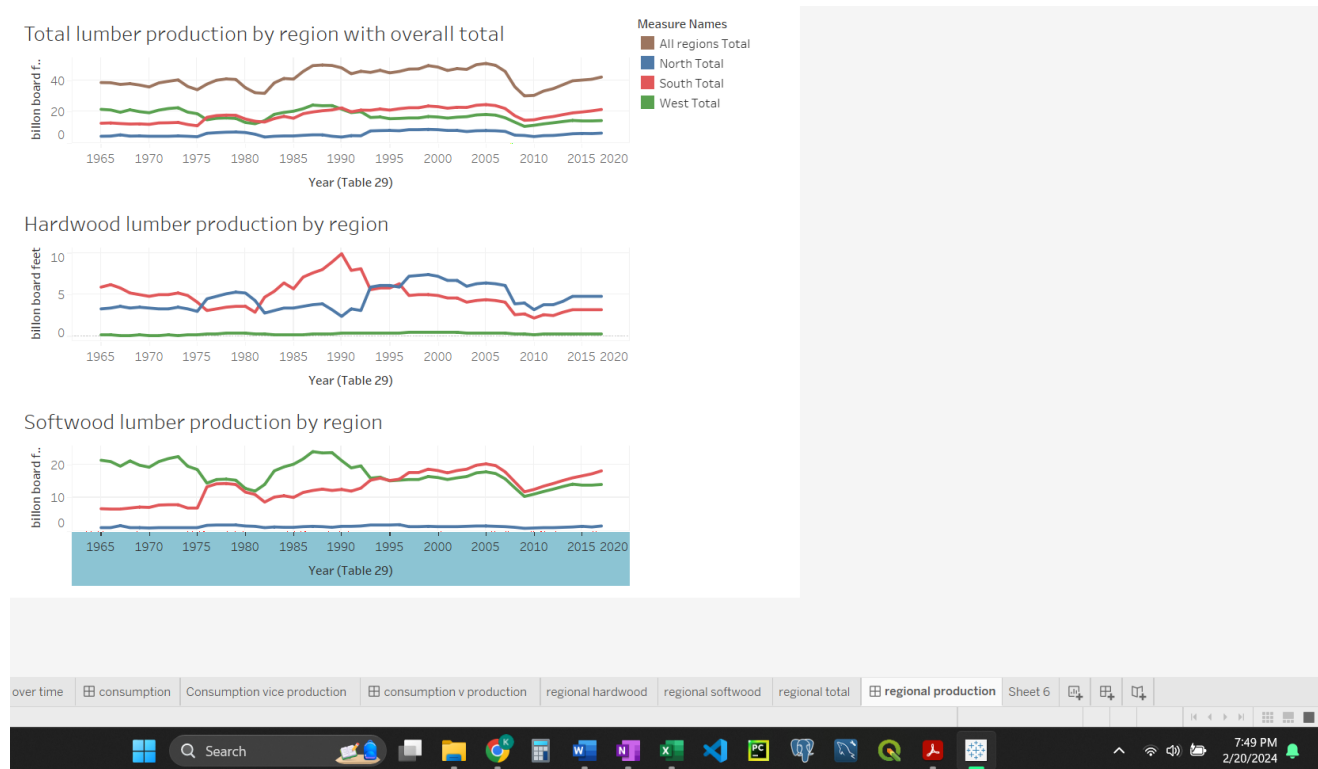
Goal #6 – Highlighting the effects of exports on the industry

This visual highlights the difference in production and consumption and the effects of exports. Since the turn of the millennium the production of softwood lumber alone has outpaced domestic consumption without even including hardwood lumber production.
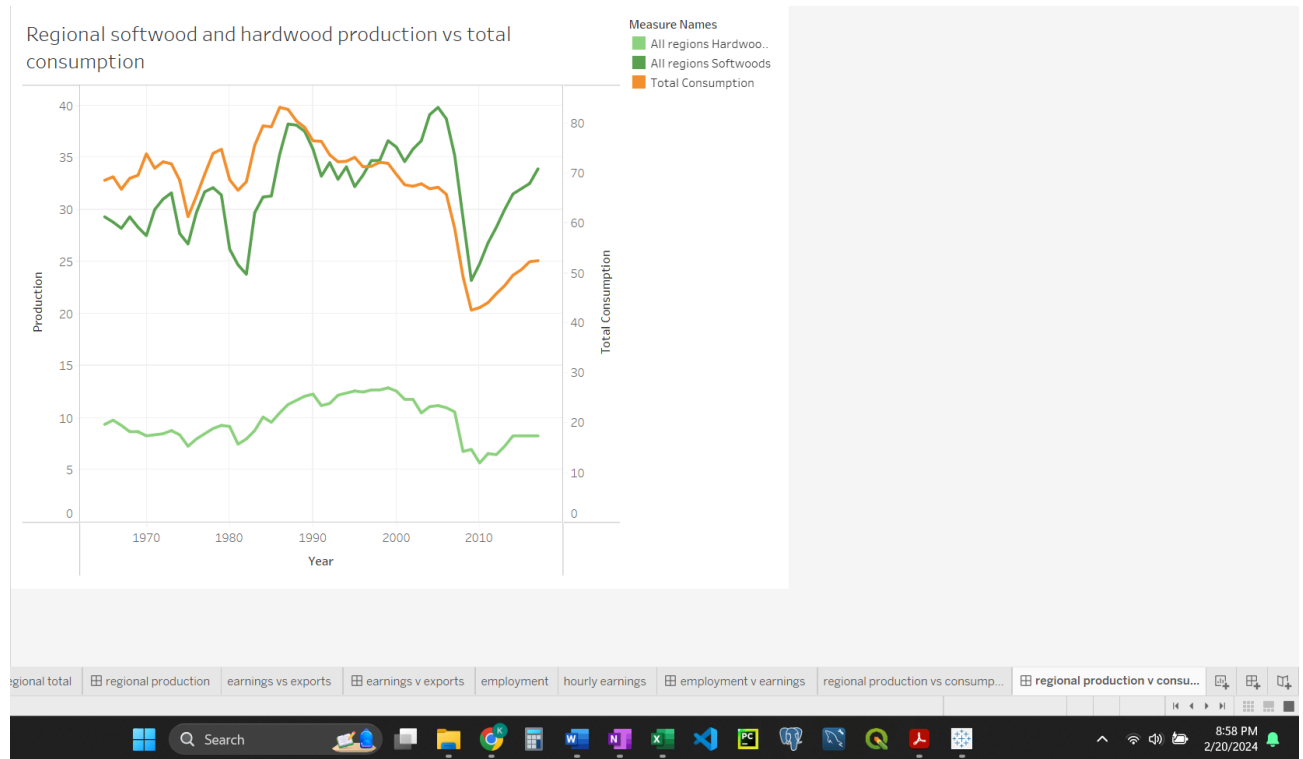
Section 7. Conclusions – This analysis has shown that the forest products industry has changed over time due to countless factors but specifically the increase in forest product exports, the reduction in employees, and the decrease of total domestic timber product consumption as well as the changes in regional production tendencies to a lesser extent. The industry has had to adapt to the decrease in consumption and has done so through several avenues such as exports and engineered timber products.