

SEPTEMBER 25, 2018



# PINELLAS COUNTY

ECONOMIC DEVELOPMENT

[WWW.PCED.ORG](http://WWW.PCED.ORG)

## ECONOMIC ANALYSIS OF MANUFACTURING IN PINELLAS COUNTY

PREPARED BY BENJAMIN FRIEDMAN

13805 58TH STREET NORTH  
CLEARWATER, FL 33760  
727-464-7332

## **EXECUTIVE SUMMARY**

Manufacturing plays a substantial role in the American economy and is undergoing a renaissance across the country. Pinellas County has its own role to play as one of the largest manufacturing hubs in Florida. Over 32,000 people, or 7% of the local workforce, are employed in manufacturing. Manufacturing has an almost \$5B annual economic impact on Pinellas County's gross regional product (GRP; the sum of all economic activity within the county). Directly, 11.5% of industrial GRP<sup>1</sup> derives from the manufacturing. This figure is larger than the impact of other major industries like tourism, finance, and healthcare and is the largest share of local economic activity.

Great importance is placed on manufacturing in local economies because factories are export oriented primary industries. Primary or base industries are firms that sell products and services to other regions. Communities want to grow their exports, whether down the road and across the globe, because exports bring new money back into the economy. The new money circulates through the rest of the economy and supports secondary industries. Secondary industries are businesses like hardware stores, dentist's offices, and cafes making up the consumer economy. Pinellas County has multiple primary industries such as manufacturing, corporate headquarters, tourism, and finance. Primary industries also help set overall local wages levels. When primary industries pay well there is more money in the rest of the economy and wages at secondary industries rise. Compared with other primary industries, manufacturing tends to have higher wages and a more positive effect on local welfare.

Roughly 17.5% of all exports from Pinellas County are manufactured goods. Together these exports are valued at \$6.7B. Even with so many exports, Pinellas still runs a \$1.7B manufacturing trade deficit. Much of the trade deficit is driven by goods such as processed food, cars, and gasoline that Pinellas County is not well positioned to make. When considering target industries, Pinellas runs substantial trade surpluses across sectors. The county's targeted industries, based on Enterprise Florida's designation, have a trade surplus over \$1.2B and its locally targeted industries have a surplus of almost \$1.1B. Advanced manufacturing has export sales of \$5.4B and a trade surplus of \$1.1B. Overall, manufacturing in Pinellas County has strong exports in high tech sectors including aviation, medical devices, and electronics.

However, concerning trends loom on the horizon. Forecast models predict manufacturing jobs will decline between 2017 and 2027. This decline is projected even as the total number of jobs in Pinellas County increases. One likely reason is because much of the manufacturing workforce is older and nearing retirement. A disproportionate number of industry employees are part of the 45 and 64 age band. The lack of developable land is another long standing issue in Pinellas County hindering industrial growth. A final and alarming concern is the localized effect of the national Opioid Epidemic. Potentially over 7,500 men aged 25 to 54 in Pinellas County have left the labor force thanks to opioid abuse. For manufacturing, opioids are a significant threat to long term growth and viability because the men getting hooked on opioids are, demographically, the bulk of the manufacturing workforce. Good news for the sector is that wages are expected to broadly increase in manufacturing occupations.

---

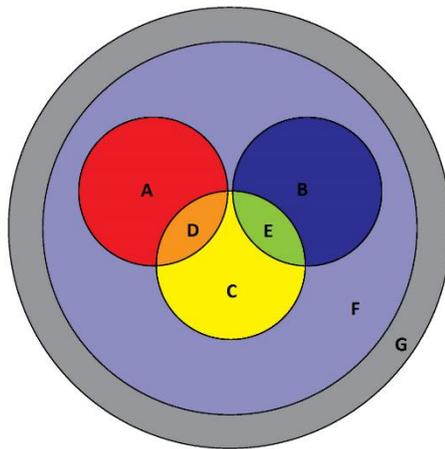
<sup>1</sup>Industrial GRP, the sum of economic activity from NAICS industries, is used in this report instead of total GRP. Total GRP in Pinellas is several billion dollars higher because, homeowners "rent" their homes to themselves. As a result, homeowner "rent" inflates GRP.

**Background and Methods**

This report subdivides the broad manufacturing sector several ways using established groupings. The multiple categories generally agree and share the overarching goal to promoting high paying and export oriented industries. The four organizations responsible for creating the categories in this report are Enterprise Florida, Pinellas County Economic Development (PCED), the St Petersburg Area Chamber of Commerce, and the City of St Petersburg.

Enterprise Florida is the state’s principle economic development organization and created the statewide target industry framework used to attract and grow tax incentivized industries. The state’s targets are broader than just manufacturing, but categories such as aviation/aerospace and medical/life sciences have significant manufacturing components. PCED uses these sectors and supplements them with microelectronics and industrial and commercial manufacturing. These categories were selected in order to preserve and build on Pinellas County’s historic manufacturing base. Enterprise Florida also considers advanced manufacturing as a target industry, but problematically advanced manufacturing is somewhat fuzzy category and has an “I know it when I see it” quality to it.

Fortunately, the St Petersburg Area Chamber of Commerce and City of St Petersburg in their Grow Smarter Initiative have placed definitions around the advanced manufacturing sector. Grow Smarter is a multipronged economic development strategy that includes advanced manufacturing as one of its pillars. Grow Smarter casts a very wide net and covers almost all of the manufacturing industries found in the other strategies and more. As a result, it works well as an umbrella category for advanced manufacturing.



A	Enterprise Florida Targets
B	PCED Industries
C	Grow Smarter Advanced Manufacturing
D	Grow Smarter + Enterprise Florida Targets
E	Grow Smarter + PCED Industries
F	All Manufacturing
G	All Industries

*How Manufacturing Industry Groupings Intersect – Not to Scale*

The North American Industrial Classification System (NAICS) is used to classify industries. NAICS is a joint classification program between the United States, Canada, and Mexico. It uses an iterative coding process ranging from two to six digits. Industries are placed in broad code families that progressively become more specific. Manufacturing is slightly different from other sectors and has three categories covering a diverse range of industries: 31, 32, and 33. A six digit example code is 311211 – “flour milling.” The source for most of the data in the report is the Emsi developer tool. Emsi mixes data

from multiple public and private sources in order to create economic projections. The most recent data from Emsi covers 2017.

**Jobs Counts**

Category	Jobs	%All Jobs
All Jobs	463,132	100.0%
All Manufacturing	32,443	7.0%
Grow Smarter Advanced Manufacturing	23,490	5.1%
PCED Industries	10,781	2.4%
- Microelectronics	4,865	1.1%
- Industrial & Commercial Manufacturing	5,916	1.3%
Enterprise Florida Target Industries	8,659	1.9%
- Aviation & Defense	3,596	0.8%
- Medical Manufacturing	5,063	1.1%

Manufacturing’s importance in the overall economy is often understated because the sector only employs 7.0% of the total workforce. Advanced manufacturing meanwhile employees are an even smaller fraction. Compared to other major industries, manufacturing’s raw employment numbers are significantly smaller. The vast majority of the population likewise does not have direct involvement with production. The term “commodity fetishism” has been used to describe the abstract and alienated relationship most people have toward industrial production. Generally, manufactured products appear all around people without individuals having direct relationships to the manufacturing process. People therefore often ascribe a “magical” quality to manufactured products because of the gulf between themselves and production process. Consequently, public perception biases away from manufacturing and understates its impacts and importance. Later sections of this report, will highlight that manufacturing has an outsized impact much larger than its employment figures.

Pinellas County’s ten largest manufacturing industries, based on total employment, are all within the various target industry sectors. Medical manufacturing shows the strongest overall clustering among large manufacturers. Three of the top ten industries are in the medical manufacturing category. All of the largest manufacturing industries fall under the Grow Smarter Initiative umbrella, but there is a slight caveat. “Commercial Printing” is technically considered part of the “Creative Arts” pillar in Grow Smarter. As a result, it was not tallied as part of the advanced manufacturing sector. The difference is mainly semantic, but in this report it causes a slight undercount of advanced manufacturing employment.

Manufacturing Industries with the Largest Employment

NAICS	Description	Jobs	Categories
334511	Search, Detection, Navigation, Guidance, Aeronautical, & Nautical System and Instrument Manufacturing	2,330	Grow Smarter; Enterprise Florida Aviation/Defense
334412	Bare Printed Circuit Board Manufacturing	1,737	Grow Smarter; PCED Microelectronics
323111	Commercial Printing (except Screen and Books)	1,593	Grow Smarter*
339112	Surgical & Medical Instrument Manufacturing	1,571	Grow Smarter; Enterprise Florida Biomedical
325412	Pharmaceutical Preparation Manufacturing	1,206	Grow Smarter; Enterprise Florida Biomedical
334220	Radio & Television Broadcasting & Wireless Communications Equipment Manufacturing	1,190	Grow Smarter
336612	Boat Building	766	Grow Smarter; PCED Industrial and Commercial
332710	Machine Shops	727	PCED Industrial and Commercial
333993	Packaging Machinery Manufacturing	717	Grow Smarter; PCED Industrial and Commercial
339115	Ophthalmic Goods Manufacturing	712	Grow Smarter; Enterprise Florida Biomedical

## WAGES

NAICS Sector	December Employment	Total Quarterly Wages	Average Weekly Wage	%Difference vs Overall Average Wage
NAICS 22 Utilities	699	\$14,212,425	\$1,576	+60.5%
NAICS 23 Construction	22,832	\$298,660,281	\$1,007	+2.5%
NAICS 31-33 Manufacturing	31,910	\$573,029,437	\$1,384	+40.9%
NAICS 42 Wholesale Trade	13,545	\$257,337,713	\$1,469	+49.6%
NAICS 44-45 Retail Trade	56,627	\$446,518,223	\$616	-37.3%
NAICS 48-49 Transportation and Warehousing	5,615	\$62,354,705	\$867	-11.7%
NAICS 51 Information	6,688	\$100,651,437	\$1,165	+18.6%
NAICS 52 Finance and Insurance	20,675	\$481,436,833	\$1,797	+83.0%
NAICS 53 Real Estate and Rental and Leasing	10,366	\$117,976,107	\$883	-10.1%
NAICS 54 Professional and Technical Services	30,842	\$531,992,589	\$1,341	+36.6%
NAICS 55 Management of Companies and Enterprises	15,040	\$424,744,487	\$2,185	+122.5%
NAICS 56 Administrative and Waste Services	28,161	\$250,171,347	\$674	-31.4%
NAICS 61 Educational Services	8,063	\$90,871,924	\$860	-12.4%
NAICS 62 Health Care and Social Assistance	67,792	\$858,510,120	\$974	-0.8%
NAICS 71 Arts, Entertainment, and Recreation	7,718	\$81,491,691	\$815	-17.0%
NAICS 72 Accommodation and Food Services	48,195	\$240,126,542	\$384	-60.9%
NAICS 81 Other Services	12,878	\$116,166,286	\$695	-29.2%
NAICS 99 Unclassified	343	\$4,387,912	\$1,039	+5.8%
All Industries <sup>2</sup>	387,989	\$4,950,640,059	\$982	-

Source: Bureau of Labor Statistics Q4 2017 Private Sector Data

Primary employers set the general wages in a local economy. This is because secondary industries compete with primary industries to hire workers. Across industries this effect plays out differently, but there are similar patterns. As an example, manufacturers may compete with construction firms for workers. When factory jobs pay significantly more, then the construction industry will raise wages in order to compete for employees. Ideally, “a rising tide lifts all boats.” Different economies have different types of primary industries and not all primary industries are high wage. In Pinellas manufacturing, finance and insurance, and corporate management are examples of high wage primary industries. On the other hand, industries related to tourism and retirement, such as retail and restaurants, tend to depress average wages.

The average wage across industries in Pinellas County is \$982 a week, but varies significantly by sector. Manufacturing overall pays 40.9% more than the county wide average job in Pinellas and has a

---

<sup>2</sup> Employment numbers in the Quarterly Census of Economic Wages (QCEW) are lower than estimates from other source. The QCEW only uses data from firm that file quarterly.

noteworthy wage premium compared with other “blue collar” sectors like construction or transportation and warehousing. Manufacturing’s high wages are one reason why it tends to have an outsized impact on the local economy. Well paid workers spend their income locally and keep secondary industries humming along.

By contrast, wages in the service economy have a more two-humped distribution. Industries like management of companies and enterprise and professional and technical services pay significantly above the county average. On the other end of the spectrum, industries such as arts, entertainment, and recreation and accommodation and food services pay significantly below the county weekly wage averages. Contrasted with the service economy, wages in production industries tend to bunch together.

## **TRADE**

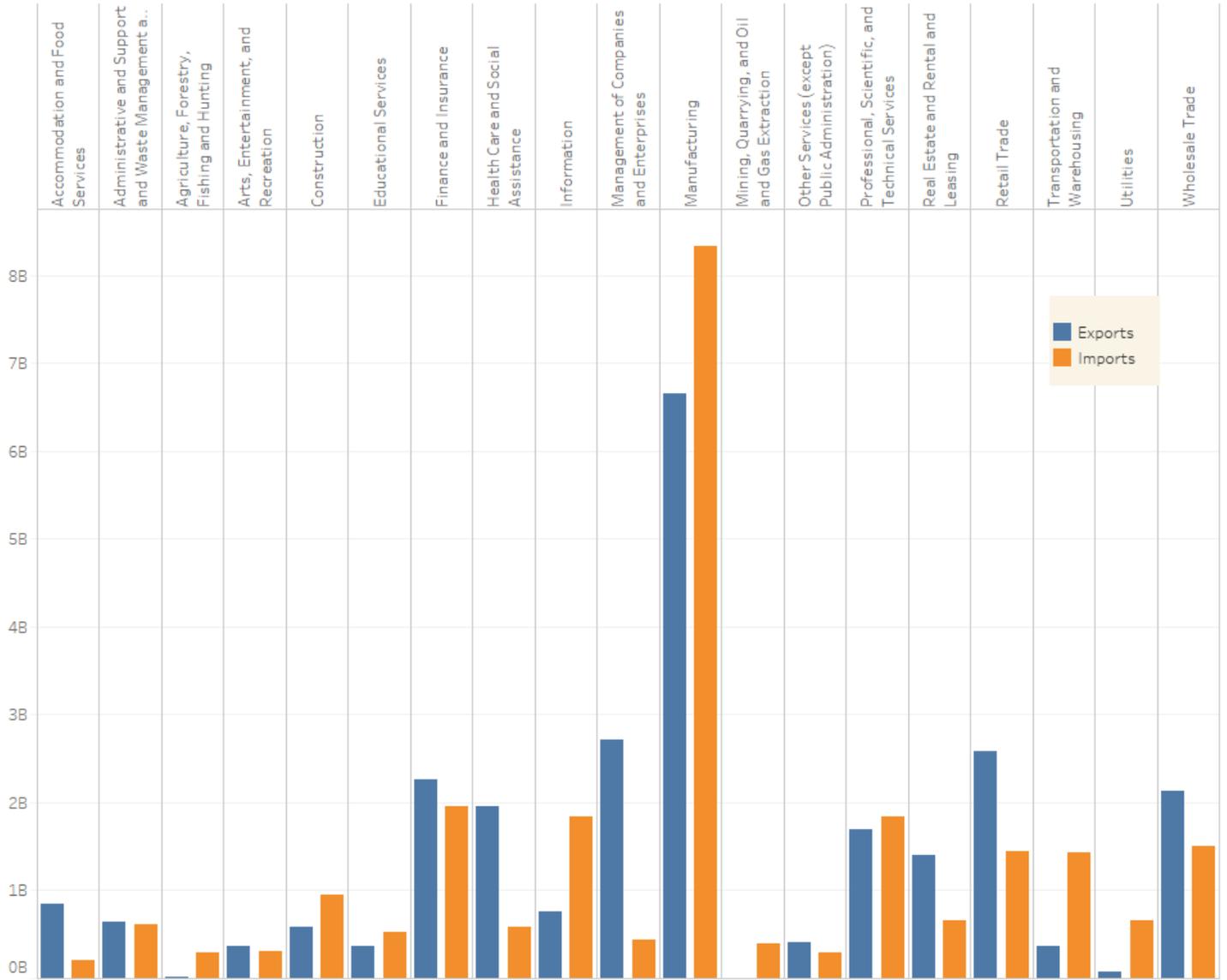
Trade is paramount to consider in the manufacturing sector because, ultimately, specialized manufacturing’s value comes from exporting goods to other markets. This section is a brief overview of manufacturing trade. A more thorough investigation is available in the PCED Data Center<sup>3</sup>. Overall, Pinellas County has a trade deficit across all industries that is slightly over \$3B. At a high level, Pinellas County runs trade deficits across industries such as agriculture, information, and public administration. Of all private industries, manufacturing has the largest gap at almost \$1.7B. Much of the deficit is driven by manufactured goods such as petroleum, processed food, and automobiles.

Target industries, contrasted with total manufacturing, have trade surpluses thanks to their productivity and high value outputs. Advanced manufacturing has a more modest trade surplus than summing surpluses across categories because it is a broader industrial mix. As a result, the Grow Smarter advanced manufacturing category includes more industries with trade deficits. Aspirational high value manufacturing targets such as specific industrial chemicals and automobiles are not currently in Pinellas County, but could arise in the future.

	Demand Met in Region	Demand Met by Imports	Total Demand	Exported Sales	Net Trade
All Industries	\$47,615,639,232	\$41,144,893,904	\$88,760,533,135	\$38,092,858,996	<b>\$(3,052,034,908)</b>
All Manufacturing	\$2,847,559,745	\$8,341,301,631	\$11,188,861,376	\$6,662,696,005	<b>\$(1,678,605,626)</b>
Grow Smarter Advanced Manufacturing	\$1,827,461,910	\$4,310,005,708	\$6,137,467,618	\$5,446,911,069	<b>\$1,136,905,361</b>
Aviation & Defense	\$172,426,071	\$230,695,301	\$403,121,372	\$889,867,381	<b>\$659,172,080</b>
Medical	\$572,563,774	\$542,786,800	\$1,115,350,574	\$1,119,279,692	<b>\$576,492,892</b>
Microelectronics	\$296,727,455	\$538,235,645	\$834,963,100	\$1,142,093,125	<b>\$603,857,480</b>
Industrial & Commercial	\$359,247,001	\$514,132,607	\$873,379,608	\$994,872,273	<b>\$480,739,666</b>

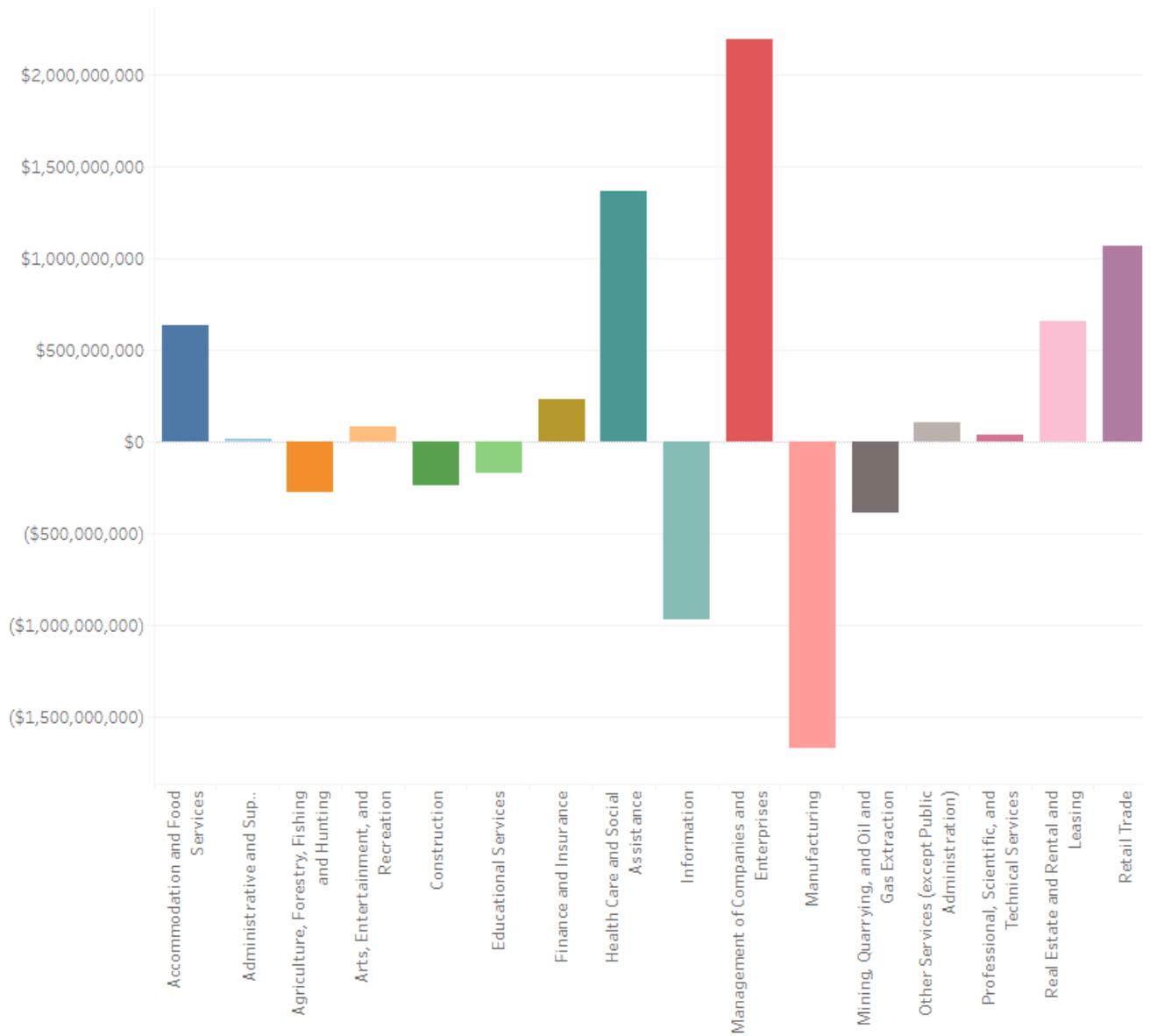
<sup>3</sup> <https://www.pced.org/page/DataCenter>

### Total Trade by NAICS Family



*Total manufacturing trade dwarfs other industries*

Net Trade by NAICS Family



*Paradoxically, manufacturing has the greatest export value and the largest trade deficit*

10 Largest Exporting Manufacturing Industries by Value

NAICS	Description	2017 Exported Sales	2017 Demand Met by Imports	Net Trade	Target Groups
334220	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing	\$765,526,245	\$8,220,562	\$757,305,682	Grow Smarter
334412	Bare Printed Circuit Board Manufacturing	\$722,135,452	\$20,711	\$722,114,741	Grow Smarter; PCED Microelectronics
334511	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing	\$544,037,120	\$17,043,491	\$526,993,629	Grow Smarter; Defense/Aviation
339112	Surgical and Medical Instrument Manufacturing	\$318,434,508	\$20,703,977	\$297,730,531	Grow Smarter; Medical Manufacturing
333993	Packaging Machinery Manufacturing	\$174,738,123	\$322,420	\$174,415,703	Grow Smarter; PCED Microelectronics
325412	Pharmaceutical Preparation Manufacturing	\$271,085,135	\$119,906,964	\$151,178,172	Grow Smarter; Medical Manufacturing
339115	Ophthalmic Goods Manufacturing	\$147,220,961	\$1,586,676	\$145,634,285	Grow Smarter; Medical Manufacturing
336612	Boat Building	\$144,253,543	\$2,131	\$144,251,413	Grow Smarter; PCED Industrial and Commercial
326121	Unlaminated Plastics Profile Shape Manufacturing	\$138,194,230	\$242,287	\$137,951,944	Grow Smarter; PCED Industrial and Commercial
316998	All Other Leather Good and Allied Product Manufacturing	\$136,279,413	\$20,765	\$136,258,648	-

Most of the county’s largest export industries are in at least one target category. Generally, exporting industries tend to have few corresponding imports. Industries that have both large amounts of exports and imports are a special case. These industries tend to be very complex and diverse. Medical manufacturing, devices and pharmaceuticals, fit in this category thanks to the vast array of products on the market. Likewise “search, detection, navigation, guidance, aeronautical, and nautical system and instrument manufacturing,” is an expansive category with a varied group of companies producing many types of devices.

### 10 Largest Imported Manufacturing Industries by Value

NAICS	Description	2017 Exported Sales	2017 Demand met by Imports	Net Trade
324110	Petroleum Refineries	\$725,136	\$643,641,962	\$(642,916,826)
336112	Light Truck and Utility Vehicle Manufacturing	\$-	\$539,155,639	\$(539,155,639)
336111	Automobile Manufacturing	\$5,362,663	\$261,089,125	\$(255,726,462)
311611	Animal (except Poultry) Slaughtering	\$-	\$148,746,172	\$(148,746,172)
311615	Poultry Processing	\$106,811	\$143,072,665	\$(142,965,855)
311612	Meat Processed from Carcasses	\$-	\$142,483,771	\$(142,483,771)
334413	Semiconductor and Related Device Manufacturing	\$3,768,129	\$141,294,917	\$(137,526,789)
325211	Plastics Material and Resin Manufacturing	\$6,793,187	\$142,950,709	\$(136,157,522)
311513	Cheese Manufacturing	\$-	\$121,002,662	\$(121,002,662)
336411	Aircraft Manufacturing	\$212,058	\$119,257,264	\$(119,045,206)

Ultimately, Pinellas County is not positioned to locally produce most products it regularly imports. Many products are made by rural industries that do not fit well in an urban economy. Automotive manufacturing meanwhile requires large open spaces of land not well suited for Pinellas County's land constraints. "Aircraft manufacturing" is an interesting case because Pinellas County is a net exporter in the aviation industry. This is because the county's aviation exports come from producing aircraft components instead of whole planes. For Pinellas County to have more automobile related manufacturing, it would likely need to follow the same pattern. Instead of a cars and trucks, manufacturing components like onboard computers and spark plugs would be a better fit.

Of all of the major import sectors, semiconductors may be the industry with the most growth potential. Pinellas County already has multiple locally related industries and some of the county's most valuable export industries are electronic devices and machinery used to make semiconductors. Whole sale trade in computer hardware is also a major local industry. The supply chain surrounding semiconductors already exists and could be integrated. This would not only grow a new industry, significantly reduce imports.

#### **Location Quotients**

A similar concept to net trade is using location quotients (LQ) in order to gauge industry specialization. LQ is a measure used to evaluate how specialized regional industries are compared to a reference area. If 10% of the workforce in Car Town builds cars, but only 5% of the workforce nationwide builds cars, then Car Town's LQ for car manufacturing would be 2 because:

$$LQ = \%local/\%reference = 10\%/5\% = 2$$

The usual reference point for LQs is the national economy. More localized measures such as a state or multi-county areas can also be used in order to see how a community compares with its

neighbors. LQs greater than one not only signify that an area has above average employment in an industry, but also indicate an industry is a base industry bringing new money into the region.

Sector	LQ
All Manufacturing	0.89
Grow Smarter Advanced Manufacturing	1.19
Aviation & Defense	1.56
Medical Manufacturing	2.04
Microelectronics	1.81
Industrial & Commercial Manufacturing	1.33

Pinellas County has strong concentrations in its target industries when compared to the national economy. Medical manufacturing’s LQ being greater than 2 points shows an extremely high concentration. Overall manufacturing has a LQ of 0.89. This comes back to Pinellas County’s trade deficit and reliance on manufacturing imports. Grow Smarter Manufacturing’s LQ being larger than 1, shows Pinellas County’s outsized advanced manufacturing economy.

LQ can also be used to see how regional industries compare with more localized reference geographies. The following table uses percent employment figures for the broad manufacturing category to make sense of how Pinellas County fits in as part of a different regions it belongs to.

	Pinellas	MSA	Greater Tampa Bay	Florida	USA
Manufacturing Jobs	32,443	66,211	100,153	371,386	12,640,351
Total Jobs	463,132	1,376,641	1,932,517	9,467,917	160,946,219
%Manufacturing Jobs	7.0%	4.8%	5.2%	3.9%	7.9%
Pinellas LQ vs...	1.00	1.46	1.35	1.79	0.89

Immediately it is apparent that Pinellas County is a manufacturing powerhouse when compared with its neighbors. The Tampa-St Petersburg-Clearwater MSA is made of Pinellas, Hillsborough, Pasco, and Hernando Counties. Greater Tampa Bay is a grouping that includes the Tampa-St Petersburg-Clearwater MSA along with Sarasota, Manatee, and Polk Counties. Even though Pinellas County is a manufacturing hub in Florida, it still has less manufacturing than the “average” community nationwide. For Pinellas County to become nationally average would require a significant expansion of its manufacturing base. This would also require reducing Pinellas County’s specialization in other fields. Advanced and target industries however would be the ideal way of increasing manufacturing as these fields already are clustered with networks in Pinellas County. The following table shows the ten manufacturing industries with the highest location quotients.

NAICS	Description	LQ	Net Exports	Categories
334412	Bare Printed Circuit Board Manufacturing	21.5	\$722,114,741	Advanced Manufacturing; PCED Microelectronics
316998	All Other Leather Good & Allied Product Manufacturing	15.2	\$136,258,648	-
333993	Packaging Machinery Manufacturing	11.9	\$174,415,703	Advanced Manufacturing; PCED Industrial & Commercial
339115	Ophthalmic Goods Manufacturing	9.6	\$145,634,285	Advanced Manufacturing; Enterprise Florida Biomedical
339940	Office Supplies (except Paper) Manufacturing	9.0	\$59,000,795	PCED Industrial & Commercial
334220	Radio & Television Broadcasting & Wireless Communications Equipment Manufacturing	8.5	\$757,305,683	Grow Smarter
335311	Power, Distribution, & Specialty Transformer Manufacturing	6.9	\$105,448,146	Advanced Manufacturing; PCED Industrial & Commercial
325212	Synthetic Rubber Manufacturing	6.7	\$61,700,042	Grow Smarter;
334511	Search, Detection, Navigation, Guidance, Aeronautical, & Nautical System & Instrument Manufacturing	6.7	\$526,993,629	Advanced Manufacturing; Enterprise Florida Defense/Aviation
336612	Boat Building	6.4	\$144,251,412	Advanced Manufacturing; PCED Industrial & Commercial

Industries with high location quotients tend to be export oriented industries. Unsurprisingly, these ten industries all have very large net exports. What makes LQs quirky is that industries are specialized very heavily at the six digit NAICS level. A single factory can radically skew LQ values when considering specialized codes, so broader four digit NAICS families provide more generalized information. At the four digit level, Pinellas County's broad specializations such as medical manufacturing, electronics, and industrial equipment are very clear.

NAICS	Description	LQ
3169	Other Leather and Allied Product Manufacturing	13.6
3342	Communications Equipment Manufacturing	5.4
3391	Medical Equipment and Supplies Manufacturing	3.5
3344	Semiconductor and Other Electronic Component Manufacturing	2.7
3345	Navigational, Measuring, Electromedical, and Control Instruments Manufacturing	2.5
3353	Electrical Equipment Manufacturing	2.3
3366	Ship and Boat Building	2.1
3334	Ventilation, Heating, Air-Conditioning, and Commercial Refrigeration Equipment Manufacturing	1.8
3335	Metalworking Machinery Manufacturing	1.7
3359	Other Electrical Equipment and Component Manufacturing	1.7

## SALES

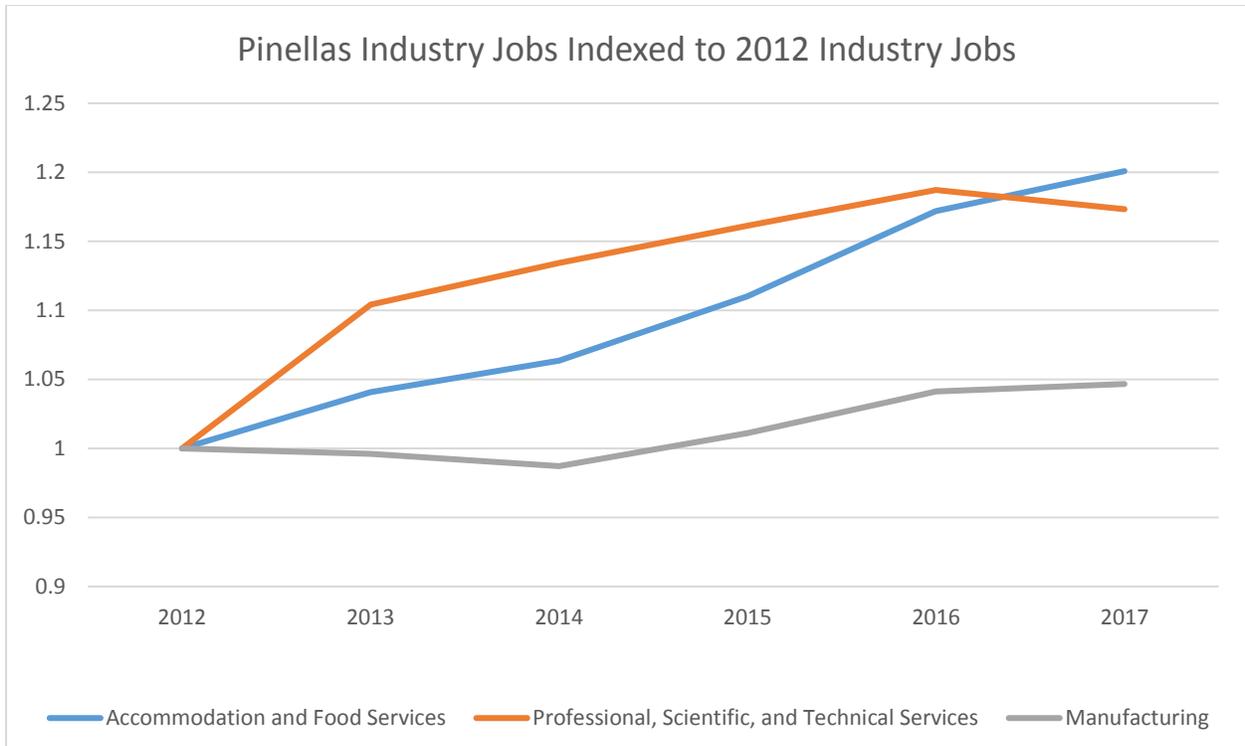
	Jobs	In Region Sales	Export Sales	Total Sales	Sales/Job
All Jobs	463,132	\$45,667,499,326	\$38,092,858,996	\$83,760,358,322	\$180,856
All Manufacturing	32,443	\$2,848,051,195	\$6,662,696,005	\$9,510,747,200	\$293,153
Grow Smarter Advanced Manufacturing	23,490	\$1,827,947,279	\$5,446,911,069	\$7,274,858,348	\$309,700
Aviation & Defense	3,596	\$172,550,092	\$889,867,381	\$1,062,417,473	\$295,444
Medical	5,063	\$572,564,131	\$1,119,279,692	\$1,691,843,823	\$334,158
Microelectronics	4,865	\$296,818,482	\$1,142,093,125	\$1,438,911,607	\$295,768
Industrial & Commercial	5,916	\$359,547,228	\$994,872,273	\$1,354,419,501	\$228,942

Sales per job is a good measure of stability in the economy and, to an extent, economic insulation. One way to think about a sales/jobs ratio is comparing it to “specific heat” in chemistry. Some materials like water require lots of energy to heat up and then retain heat very well while other materials like copper heat up quickly and then lose their heat very quickly too. Similarly, some industries like medical manufacturing requires comparatively large amounts of sales in order to create or to lose jobs. On the other hand, industries such as hospitality require comparatively few sales in in order to see shifts in employment.

Industry	Total Sales	Jobs	Sales/Job
Manufacturing	\$9,510,747,202	32,443	\$293,153
Finance and Insurance	\$7,333,827,787	22,064	\$332,389
Professional, Scientific, and Technical Services	\$5,339,647,134	33,818	\$157,894
Management of Companies and Enterprises	\$3,819,654,567	14,697	\$259,893
Arts, Entertainment, and Recreation	\$954,931,300	9,572	\$99,763
Accommodation and Food Services	\$3,412,423,726	48,838	\$69,872

Large sales/job figures indicate industries that are more reluctant to scale up or scale down operations. As a result, their employment figures tends to be more stable. Here it is evident that manufacturing jobs on the whole are more insulated than average jobs in Pinellas County, so slight shifts in spending patterns do not cause large changes in employment. What makes industries with large sales/job ratios a mixed bag is being more resilient to shocks, but less recoverable after losses.

The past few years illustrate this trend as manufacturing employment increased, but at a slower rate than other economic sectors. Manufacturing, hospitality, and professional services are three of the largest employment sectors in Pinellas County. Using 2012 as a baseline, manufacturing has struggled to gain many new jobs in the county even though the other two sectors have enjoyed more substantial growth. Demand for manufactured products must be very significant before employers hire more workers. In contrast, rebounding consumer spending and a low sales/job ratios mean that bars, restaurants, and hotels scaled up their operations quickly.



Sales data can also be used to approximate how many jobs in the local economy are supported by exports and trade. The ratio of export sales divided by total sales creates a reasonable estimate of how important trade is to the manufacturing sector.

	Jobs	Export Sales	Total Sales	Export/Total	Export Jobs
All Jobs	463,132	\$38,092,858,996	\$83,760,358,322	0.45	210,625
All Manufacturing	32,443	\$6,662,696,005	\$9,510,747,200	0.70	22,728
Grow Smarter Manufacturing	23,490	\$5,446,911,069	\$7,274,858,348	0.75	17,588
Aviation & Defense	3,596	\$889,867,381	\$1,062,417,473	0.84	3,012
Medical	5,063	\$1,119,279,692	\$1,691,843,823	0.66	3,350
Microelectronics	4,865	\$1,142,093,125	\$1,438,911,607	0.79	3,861
Industrial & Commercial	5,916	\$994,872,273	\$1,354,419,501	0.73	4,346

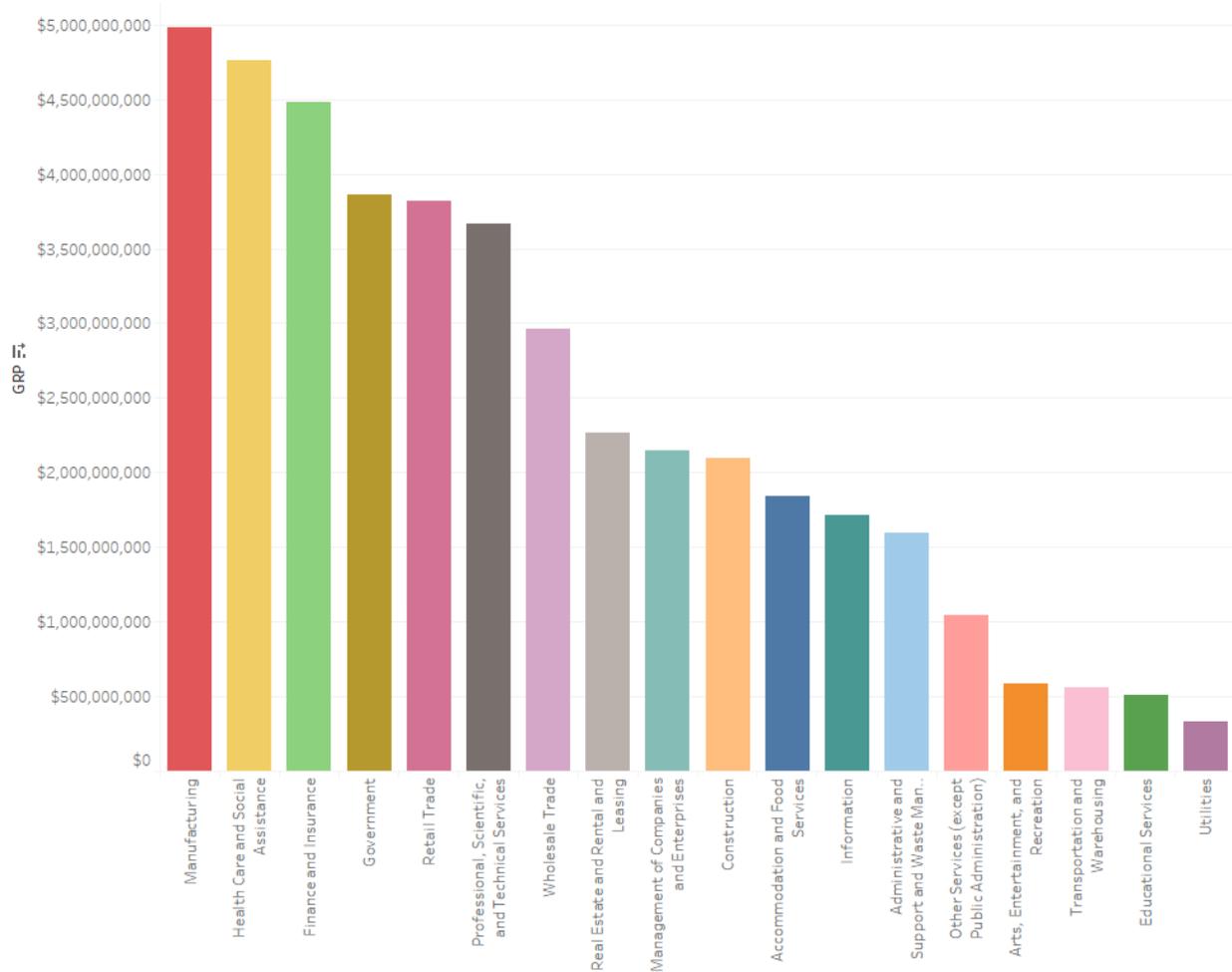
Compared to other sectors, manufacturing has a very high ratio of export sales to total sales. Consequently, the majority of manufacturing jobs are export oriented. At first blush the numbers may seem high, but there are two factors to consider. First, exports in this context include both foreign and domestic trade partners. An export going to Tallahassee, Tennessee, or Timbuktu is considered the same to Emsi. Using the aviation/defense industry as an example, a notable local export is avionics equipment from Pinellas being shipped to Fort Worth, Texas for final assembly in F-35s. Second, manufacturing is highly specialized with large economies of scale involved. Once a firm starts building product, it will likely expand by increasing current production instead of pivoting to make a different product. A

pharmaceutical plant producing ibuprofen would find it easier to scale and export instead of starting a parallel production line manufacturing antibiotics.

**GRP**

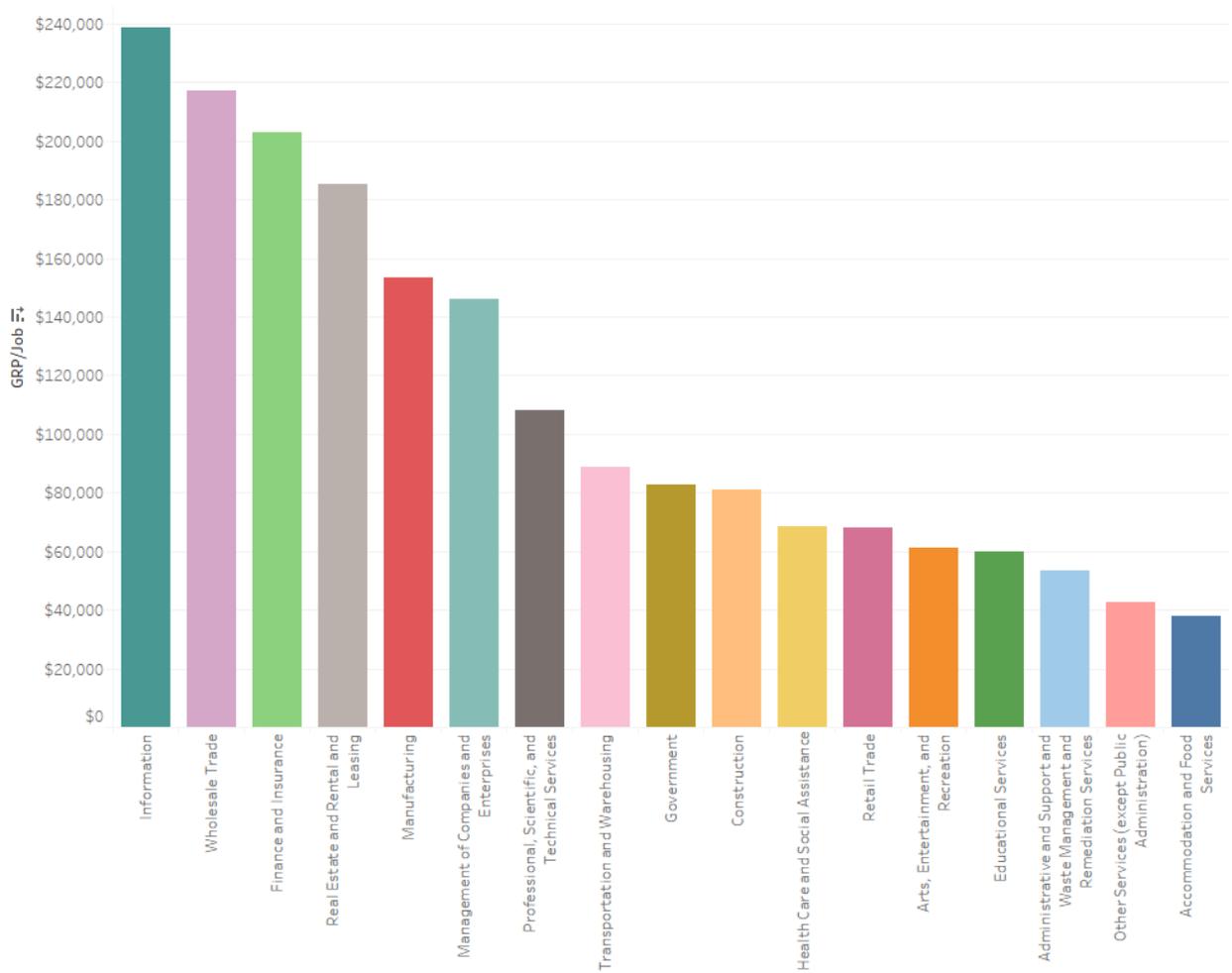
	2017 Jobs	Industrial GRP	GRP/Job	% GRP	% Jobs	%GRP/%Jobs
All Industries	463,132	\$43,250,404,359	\$93,387	100.0%	100.0%	1.00
All Manufacturing	32,443	\$4,978,174,884	\$153,444	11.5%	7.0%	1.64
Grow Smarter Manufacturing	23,490	\$4,155,084,480	\$176,887	9.6%	5.1%	1.89
Aviation & Defense	3,596	\$674,858,695	\$187,669	1.6%	0.8%	2.01
Medical Manufacturing	5,063	\$ 1,043,570,581	\$206,117	2.4%	1.1%	2.21
Microelectronics	4,865	\$953,048,328	\$195,899	2.2%	1.1%	2.10
Industrial & Commercial Manufacturing	5,916	\$591,420,514	\$99,970	1.4%	1.3%	1.07

GRP by Industry



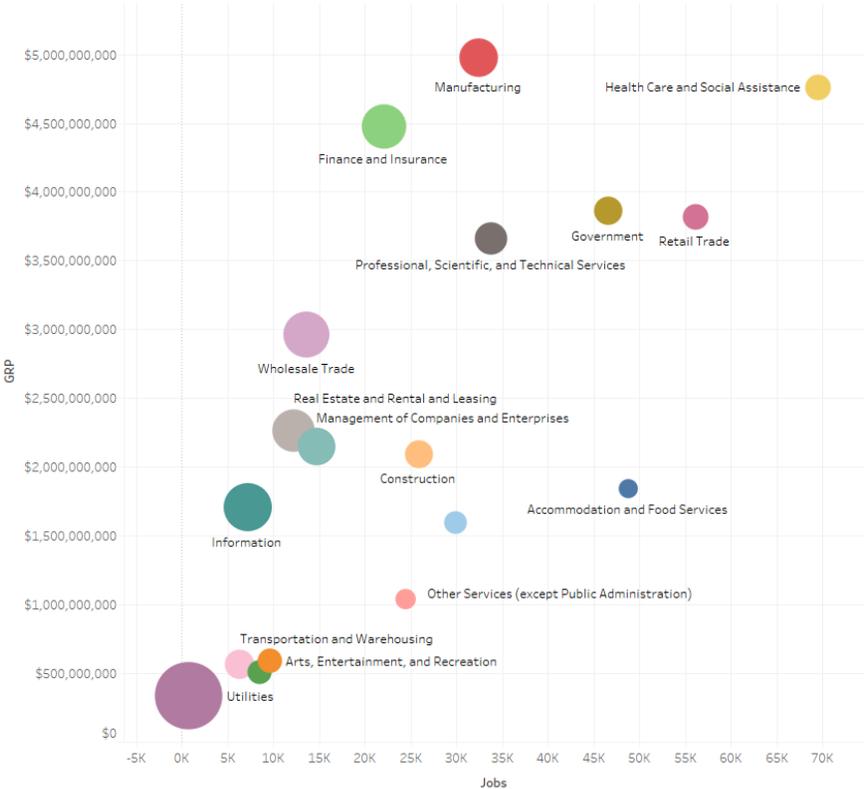
Manufacturing’s economic impact is mostly demonstrated by looking its large impact on GRP and small employment base. Advanced manufacturing has an even great impact on GRP with smaller employment. Aviation/defense, medical manufacturing, and microelectronics all have huge impacts on GRP from a per job basis. These are industries that add substantial value to materials during the manufacturing process. Legacy manufacturing, found in industrial and commercial manufacturing, tends to have the lowest value adds during the manufacturing process, but still has more impact on GRP per job than the typical county industry.

An important ratio is the %GRP/%Jobs figure. This quotient measures how much impact each industry’s job has on the rest of the local economy. A value greater than 1 indicates an industry has an outsized impact on the rest of the local economy and creates wealth that circulates throughout the region. Primary industries with large %GRP/%Jobs quotients create the wealth needed to support the secondary jobs in the rest of the economy. Compared to other large industries, manufacturing is one of the few sectors that employs a large number of workers and has a %GRP/%Jobs ratio greater than one. To put the numbers into perspective:



Sector	Jobs	GRP	GRP/Job	%GRP/%Jobs
Manufacturing	32,443	\$4,978,174,884	\$153,444	1.64
Construction	25,928	\$2,095,050,214	\$80,803	0.87
Finance and Insurance	22,064	\$4,477,090,731	\$202,914	2.17
Professional, Scientific, and Technical Services	33,818	\$3,663,100,239	\$108,318	1.16
Management of Companies and Enterprises	14,697	\$2,144,182,929	\$145,893	1.56
Administrative and Support and Waste Management and Remediation Services	29,880	\$1,597,334,689	\$53,458	0.57
Educational Services	8,554	\$511,245,791	\$59,767	0.64
Health Care and Social Assistance	69,486	\$4,760,552,110	\$68,511	0.73
Arts, Entertainment, and Recreation	9,572	\$587,424,177	\$61,369	0.66
Accommodation and Food Services	48,838	\$1,843,530,623	\$37,748	0.40

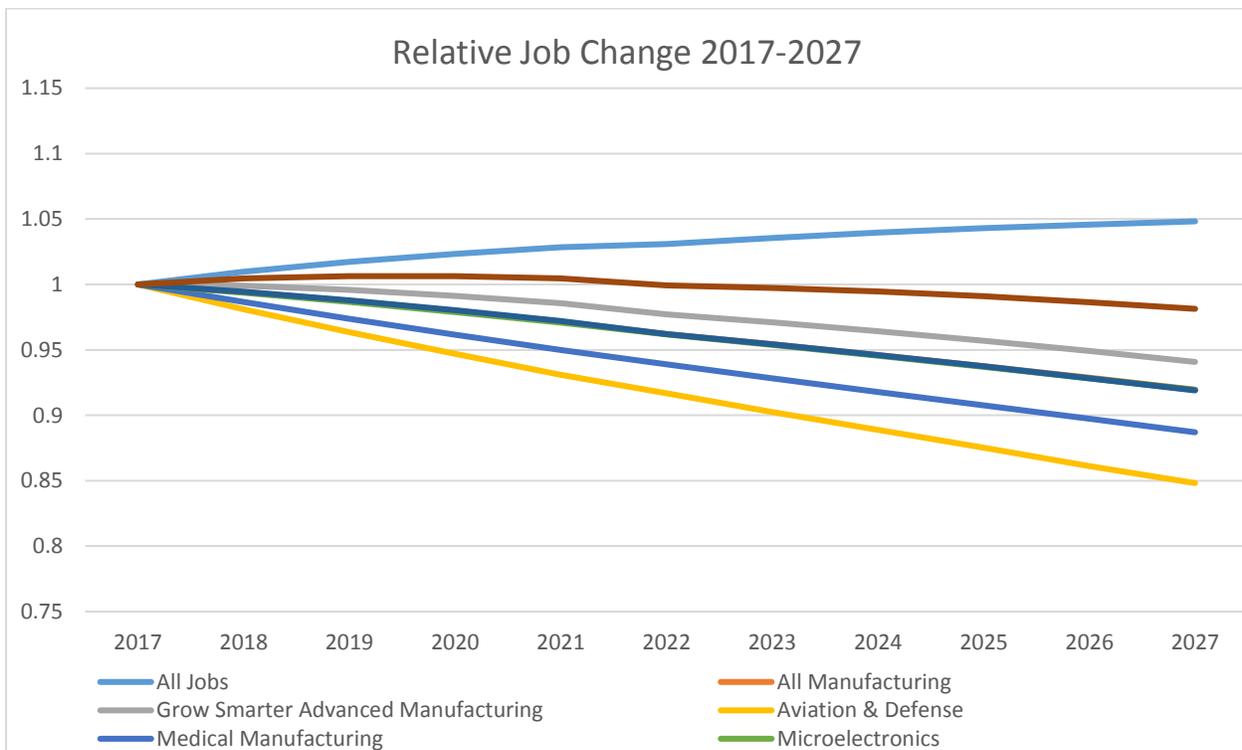
This is not an exhaustive industry list, but manufacturing is one of the top performing sectors on the %GRP/%Jobs metric. Some industries not in the table above such as information and wholesale trade have ratio values above 2, so manufacturing is not the only high impact sector. Manufacturing however is the only industry that employs over 30,000 people with a %GRP/%Jobs ratio over 1.5. The important contrast is many industries employing large segments of the workforce have low GRP impacts.



Bubble Size is Directly Proportional to \$GRP/#Jobs

## Projections

A concerning trend is that the overall manufacturing industry is projected to see employment decline between 2017 and 2027. On the one hand, this is not a unique problem for Pinellas County. Nationally, manufacturing employment is expected to decline over this period. More concerning is that manufacturing employment is projected to decline faster in Pinellas than the overall American economy. This decline is expected even though the county is also projected to gain over 20,000 net new jobs. The caveat with economic projections is that projections are only estimates based on the assumption that the future will conform to the same patterns as the past. Projection should be interpreted as “if trends continue, then...” and are not set in stone. For example, the aviation/defense sector’s projection is likely still being affected by the 2013 federal budget sequestration that cut military spending. Even after funding was restored, those lean years have greatly influenced long term projections. Regardless, manufacturing compared with other industries faces unique headwinds.



	2017	2027	Δ	%Δ
All Jobs	463,132	485,466	22,334	4.8%
All Manufacturing	32,443	29,833	-2,610	-8.0%
Grow Smarter Manufacturing	23,490	22,099	-1,391	-5.9%
Aviation & Defense	3,596	3,050	-546	-15.2%
Medical Manufacturing	5,063	4,491	-572	-11.3%
Microelectronics	4,865	4,473	-392	-8.1%
Industrial & Commercial Manufacturing	6,028	5,540	-488	-8.1%
National Manufacturing	12,640,351	12,404,745	-235,606	-1.9%

The first factor to consider is Pinellas County’s status being “built out.” Pinellas is the first county in Florida with virtually no greenfield land left for development. It not only is the most densely populated county in Florida, at over 3,500 people per square mile, but one of the most densely populated counties in the nation. Being “built out” disadvantages the county when seeking to accommodate large industrial development because development in Pinellas County generally means redeveloping existing property and land remediation. Pinellas County is being proactive about this and will be using part of the “Penny for Pinellas” sales tax for economic development to make industrial redevelopment more attractive to primary employers. Penny funding is not a silver bullet, but should be able to help offset some issues.

Another factor is that the manufacturing workforce is, on the whole, older than the rest of the Pinellas County’s workforce. The following table uses the “production workers” standard occupational classification (SOC) code data from Emsi to compare workforce age brackets. SOC is a federal classification system that functions as a bottom up counterpart to the top down NAICS system. The “production workers” occupational code covers the bulk employees working in the manufacturing industries (roughly 2/3) and particularly the most vital employees assembling product. As a result, it works reasonably well as an approximation for the manufacturing industry as a whole.

SOC 51-0000	Production Occupations	All Occupations	Production/All
Age 14-18 % of Occupation	0%	2%	-
Age 19-21 % of Occupation	2%	4%	0.50
Age 22-24 % of Occupation	4%	5%	0.80
Age 25-34 % of Occupation	17%	20%	0.85
Age 35-44 % of Occupation	21%	20%	1.05
Age 45-54 % of Occupation	28%	23%	1.22
Age 55-64 % of Occupation	23%	19%	1.21
Age 65+ % of Occupation	6%	7%	0.86

As the above table makes clear, there is a larger concentration of manufacturing workers near retirement age compared to the general workforce. A slight majority, 51%, are between 45 and 64 years old. Meanwhile, 31% of Pinellas County’s workforce is under 35 years old, but only 23% of “production workers” are in that age bracket. An ageing manufacturing workforce is likely one of the most significant reasons as to why the number of manufacturing jobs is projected to decrease. Emsi also estimates the annual replacement rate, the percentage of workers either retiring or permanently leaving an occupation, for the production worker family to be 11.1%. Declines in the overall workforce would appear to be masked by the large turnover within the industry as factories struggle to replace an aging workforce. An illustration of what this could look like would be a large manufacturer having 15 employees leave in one year and only being able to find 13 qualified replacements. Surface level indicators would be extremely positive for the manufacturing sector with visible “HELP WANTED!” signs, job postings on websites, and recruiters at job fairs, but these signals would be masking a structural problem.

There are several ways that this employment situation could play out over time. The first is the classic supply and demand model in which we assume the demand curve remains the same and the

workforce supply decreases. In theory, wages would rise and equilibrium would be reached with slightly lower employment than before. In reality, barriers to entry into many manufacturing jobs make it more difficult to recruit workers than just increasing hourly wages by a couple of dollars and having potential employees flock to the doors. As manufacturing has become more high tech, workers have become more skilled and credentialed than ever before. Employers are now expecting many new manufacturing hires to enter into the field with some form of postsecondary training. Advances in manufacturing technology mean that new hires need to come in with a diverse set of skills and knowledge including a bit of know how in many fields. Problematically, this makes it more difficult for companies to rapidly hire and expand operations as even the most basic manufacturing training programs available locally can take several months to over a year to complete. Apprenticeship, part time, and shorter term programs are all being implemented and investigated, a very good sign, but these programs may need to expand.

Manufacturing training and exposure has become more common among high school students part of “Generation Z” and could help ameliorate the coming workforce crisis. Problematically, this cohort is comparatively small when contrasted with Millennials and Baby Boomers. Manufacturing training programs will likely need to target an older population, Millennials and Gen Xers, in order to fill workforce gaps and modify their programs in order to accommodate working adults more effectively. A shift in the general manufacturing training paradigm may be moving from teaching full time students to upskilling working adults coming from backgrounds such as food service, retail, and construction.

Another possibility is that rising wages and a worker shortage will cause firms to invest more in capital equipment in order to increase productivity for each remaining worker. The Cobb-Douglas production function is the theoretical basis for this argument. Rational firms will compare the cost of increasing output in terms of capital and labor, then invest accordingly for maximum benefit. This process is taking place and has been ongoing for the past few decades. The “manufacturing paradox” illustrates this trend as the American manufacturing economy proportionally employs fewer workers, but makes more products than ever before. New tools such as artificial intelligence, advanced robotics and additive technology are some of the possible capital investments in the coming years firms may use in order to replace their retiring workforce and make factories more productive. Anecdotal conversations with factory owners suggest there is interest in investing in new manufacturing technologies that would reduce the demand for labor, but also a reticence about spending large amounts of money on relatively unproven technology. The general mood among many firms, particularly smaller manufacturers, is that they are excited about these new developments, but are unwilling to “go out on a limb” and be early adopters.

A concerning note about the manufacturing workforce that must be addressed is the Opioid Crisis. The Manufacturing Alliance for Productivity and Innovation in their report on the *Impacts of Opioids on Manufacturing*<sup>4</sup> identified a strong correlation between manufacturing employment and opioid abuse in local economies. A powerful summary of the dangers opioids present to future manufacturing productivity is that:

Much has been written about the “deaths of despair,” but drug overdose deaths have bifurcated into two age-related groups – those in their middle age and those in their 20s to 30s. Any loss of life is tragic, but the increasing trend of younger drug users dying from illicit opioids has an

---

<sup>4</sup> <https://mapifoundation.org/economic/2018/2/22/ignorance-isnt-bliss-the-impact-of-opioids-on-manufacturing>

irreversible impact on local economies. The lost future productivity from the premature death of prime working age adults compounds year-over-year. In an industry where the workforce closely resembles the demographics of drug overdose deaths, the consequences are painful today, and the effects will persist into the future as well.

Economist Alan Krueger of the Brookings Institute calculated the Opioid Epidemic’s impact on the national workforce and presented truly disturbing conclusions about its effect. Krueger’s paper *Where Have All the Workers Gone?*<sup>5</sup> blames declining workforce participation in large part on opioid addiction. He estimates half of prime age working men (age 25 to 54) not in the labor force take daily pain killers and that two thirds of those take a prescription medication. Using Krueger’s proportions coupled with demographic information from the 2016 American Community Survey suggests there are over 7,500 prime age men in Pinellas County out of labor force thanks to opioid abuse.

Age	Men Not in Labor Force	Kruger Estimates	
		Take Daily Pain Killer	Take Rx Painkiller
25 to 29 Years	4,276	2,851	1,425
30 to 34 Years	3,475	2,317	1,158
35 to 44 Years	5,530	3,687	1,843
45 to 54 Years	9,665	6,443	3,222
Sum	22,946	15,297	7,649

Source: American Community Survey 2016 1 Year Population Estimates

A “Kruger estimate” for Pinellas County may be higher or lower, but works as a starting for approximating the local effect. The Pinellas manufacturing workforce is roughly two thirds male, so these findings are of particular concern to the industry. This is not to discount the Opioid Epidemic’s effect on women. The drugs take a terrible toll on all people, but overdose statistics from the Kaiser Family Foundation<sup>6</sup> show men are a more at risk population. As a result, problems in the labor market may have to be addressed as a public health issue.

A final and more positive note to end this report on comes from looking at projected wages for production occupations. Even though overall employment is expected to decline, there is positive wage growth associated with the industry. Taking all of the occupations from the production SOC family, there is a decline in employment from 23,355 to 22,046 between 2017 and 2022, but average wages are projected to increase from \$16.57 to \$16.69 per hour. These wages are in constant 2017 dollars, so this is not merely a function of inflation. What seems to be occurring is that lower skill and lower pay production occupations are more likely to see declines as opposed to higher skill, and consequently higher wage, manufacturing occupations. Corroborating this trend, the SOC 17-0000 family, composed mainly of engineers and technicians, is a high wage grouping of jobs with wages averaging \$33.13 per hour and employment is projected to increase from 5,225 to 5,319 from 2017 to 2022. A possibility is that low wage manufacturing jobs are being phased out and replaced with higher wage, higher skill jobs and this trend appears likely to continue in the future.

<sup>5</sup> [https://www.brookings.edu/wp-content/uploads/2017/09/1\\_krueger.pdf](https://www.brookings.edu/wp-content/uploads/2017/09/1_krueger.pdf)

<sup>6</sup> <https://www.kff.org/other/state-indicator/opioid-overdose-deaths-by-gender/?dataView=1&currentTimeframe=0&sortModel=%7B%22colId%22:%22Location%22,%22sort%22:%22asc%22%7D>