

Empirical Distribution of the Plant-Level Components of Energy and Carbon Intensity at the Six-digit NAICS Level Using a Modified KAYA Identity

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Abstract

Three basic pillars of industry-level decarbonization are energy efficiency, decarbonization of energy sources, and electrification. This paper provides estimates of a decomposition of these three components of carbon emissions by industry: energy intensity, carbon intensity of energy, and energy (fuel) mix. These estimates are constructed at the six-digit NAICS level from non-public, plant-level data collected by the Census Bureau. Four quintiles of the distribution of each of the three components are constructed, using multiple imputation (MI) to deal with non-reported energy variables in the Census data. MI allows the estimates to avoid non-reporting bias. MI also allows more six-digit NAICS to be estimated under Census non-disclosure rules, since dropping non-reported observations may have reduced the sample sizes unnecessarily. The estimates show wide variation in each of these three components of emissions (intensity) and provide a first empirical look into the plant-level variation that underlies carbon emissions.

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1.Introduction:

There is a paucity of detailed industry-level data on carbon emissions in U.S. manufacturing. The EPA Greenhouse Gas Reporting Rule collects direct emissions from large emitters but does not include indirect emissions from electricity. It also does not identify the underlying level of production activity of the plant and so cannot determine *why* any given plant has high (or low) emissions. Various energy system models have estimated emissions using a variety of techniques and levels of data aggregation but fail to come to much agreement regarding the base year, much less policy results (Kaplan et al. 2024). Worrel and Boyd (2022) leverage the National Energy Modeling System (NEMS) forecast and underlying data in an analysis of industrial decarbonization, but those NEMS data are based on aggregate national data sources and do not provide any insight into regional variation and cover only three or four-digit NAICS level. This paper provides insight into the plant-level variation in carbon intensity by decomposing carbon intensity into several components, energy intensity, carbon intensity of energy, and energy mix, at a highly detailed six-digit NAICS level. The variation is measured by estimating the quintiles of the industry-level distribution of these ratios. The plant locations capture the regional variation in indirect carbon emission based on the electricity grid location of the plant purchasing the power. These estimates have the potential to inform modeling and policy analysis of industrial decarbonization and also inform plant-level carbon management, by providing helpful benchmarks of performance.

These estimates can complement ENERGY STAR's focus on energy efficiency as a principal action for achieving greenhouse gas (GHG) mitigation. This paper

describes how the project constructs these “Energy and Carbon Intensity” (ECI) indicators and provides a framework for benchmarking that can help to reduce GHG emissions. The indicators use a modified KAYA identity framework. The KAYA identity can be used to decompose GHG emissions into different driving factors such as energy use and economic growth. The framework proposed includes the calculation of four types of potential carbon⁵ emission reducing actions: (1) energy efficiency, (2) carbon content of electricity, (3) carbon content of fuel, and (4) electrification. These sources of carbon emission reductions are fundamental pathways for industrial decarbonization. The framework provides explicit ways to measure each of them and then implements the metrics using existing available data for performance benchmarking.

There are two main objectives from this facility-level framework for GHG emissions benchmarking. The facility can use the framework for baseline reporting/tracking of contributing factors to plant-level changes in carbon emissions. This framework also allows the facility to benchmark the level of emissions against an appropriate peer group. In other words, baseline reporting/tracking is a within-plant comparison and benchmarking is a between-plant comparison. To achieve the stated objectives, the framework is designed to measure the separate contributions of energy efficiency and other actions to reduce carbon in a complementary manner.

There are several sources where the manufacturing plants emit GHG. The first one is the direct emissions from facility-level fossil fuel combustion and non-energy

⁵ Throughout this document the term “*carbon*” is used as a shorthand for CO₂ equivalent greenhouse gas emissions from energy use.

process emission. The second source is the indirect emissions from facility-level use of energy produced offsite, primarily electricity. The third source is the indirect emissions from carbon embodied in inputs produced upstream from the facility and from the use, maintenance, and disposal or recycling of those products downstream. Because a goal of this framework is to complement the role of ENERGY STAR in generating emission reductions via energy efficiency, the framework focuses on the first two of the three components and focuses on GHG emissions that are directly or indirectly attributable to energy use.⁶ This focus does not mean that one should ignore non-energy GHG emissions; it simply says that the sources of these non-energy GHG emissions and associated mitigation options are sector-specific and should be treated accordingly. The framework proposed here considers GHG mitigation options that are common across all types of energy use.

In this paper, we construct three ratios (energy per \$1,000 production, fuel share, and carbon per unit of energy). The three indicators are industry-specific (i.e., we can compare a manufacturing plant's energy use, fuel share, and carbon emission to plants in the same industry) and separate the performance into five categories (i.e., thresholds set based on quintiles). Our paper proceeds as follows. Section 2 lays out the aspect of the modified KAYA identity framework,⁷ Section 3 describes the data sets we used to construct the ratios, Section 4 describes the methods we

⁶ The largest process emission from manufacturing is from calcination of limestone for cement and lime manufacturing, but other industries have process related emissions. Fugitive emissions of refrigerants may also be important in manufacturing that require large amounts of cooling.

⁷ The framework does not provide any guidance regarding the accounting schema for disclosing emissions publicly through sustainability reports, etc. Instead, it assumes that a suitable schema has been implemented for measuring the emissions described in this paper.

used to construct the ratios, Section 5 discusses the results, and Section 6 concludes.

2. Carbon Intensity Framework

In the spirit of businesses using of a variety of key performance indicators (KPI), multiple metrics should work together in a consistent fashion. This framework highlights the main mechanisms that give rise to carbon emissions as well as those that can lower them. Carbon emissions result from the productive activities of individual facilities or plants. If we denote output from productive activities of the facility as Y and carbon emissions as C , then the *carbon intensity* of a facility is the ratio of carbon emissions per unit of production: $\frac{C}{Y}$. This framework decomposes carbon intensity as the product of the two primary factors. The first is the *energy intensity*, defined as the ratio of total energy use per \$1,000 of total production: $\frac{E}{Y}$. The second is the *carbon content of energy*, defined as the ratio of total carbon emissions per unit of total energy: $\frac{C}{E}$. We can write the carbon emissions as:

$$C = Y \times \frac{E}{Y} \times \frac{C}{E} \quad (1)$$

This simple framework, sometimes referred to as the KAYA identity, shows that carbon emission is the combination of ***production activity, energy intensity, and carbon content of energy***. This approach allows the framework to develop separate methods to benchmark and baseline energy intensity and carbon content, since different factors enter into each of these two components of emissions.

Benchmarking and baselining energy intensity by industry is a complex topic in itself. The choice of an appropriate production metric, Y , is a major topic, as is normalization for other external factors that influence energy. Simple energy/output ratios using output measured in terms of sales (i.e., total value of shipments), physical measures for select industries, or normalized measures that are more complex that account for product mix, weather, etc., such as the ENERGY STAR Energy Performance Indicator (EPI) (see Boyd 2016) or plant-level regression-based models, are possible approaches. This paper does not discuss benchmarking and baselining approaches for energy intensity. The important aspect of this framework is that it treats these two components of carbon emissions in a complementary fashion.

To incorporate other pathways to decarbonization a more detailed framework for benchmarking the carbon content of energy and discussing contributing factors to plant-level changes in emissions is needed. Two major components of total carbon arise from the two major components of total energy: (1): fuel use; and (2): off-site produced energy, in this case electricity. Since each has its own consideration, we need to account for those components and denote total energy as:

$$E = f + e \quad (2)$$

where f represents fuel and e is for electricity. This requires an energy accounting approach that puts electricity and fuel on an “equal energy basis.” This paper uses “source energy”, where kWh of electricity is converted to $MBtu$ (million Btu) of a fuel equivalent based on energy use of the national grid, including transmission losses.

Although the energy accounting system can also encompass elements that the proposed carbon benchmarking framework captures, this paper uses the carbon framework to account for regional differences in the power grid in the carbon accounting framework and we use the national site/source grid electricity conversion in the energy benchmarking components. We denote total carbon into two components:

$$C = C_f + C_e \quad (3)$$

where C_f is the carbon emission from fuel use and C_e is the carbon emission from electricity use. Some algebra allows us to express the carbon content of total energy, $\frac{C}{E}$, as the carbon content of electricity and the difference between carbon content of fuel and carbon content of electricity times the fuel share of energy.

$$\frac{C}{E} = \frac{C_e + C_f}{f + e} = \frac{C_e}{e} + \left(\frac{C_f}{f} - \frac{C_e}{e} \right) \times \frac{f}{E} \quad (4)$$

Equation (4) is the sum of two components. The first term $\frac{C_e}{e}$ is the carbon content of electricity (i.e., the carbon emissions that arise indirectly from plant-level electricity use). Lowering the carbon content of electricity use has a direct impact on the total carbon content of energy. The second component has two elements. The first element $\left(\frac{C_f}{f} - \frac{C_e}{e} \right)$ captures the carbon content of fuels relative to carbon content of electricity, while the second element $\frac{f}{E}$ captures the possible benefit from electrification represented by the fuel share. When the fuel share declines, the plant experiences electrification. These three elements are the principal mechanisms for potentially reducing the total carbon content of energy.

To understand how this works, consider the simple case where $\frac{c_e}{e}$ and $\frac{f}{E}$ remain the same, but the plant switches the fuel use from coal to natural gas. Because the carbon emissions from natural gas is lower, such switch would make the carbon content of fuel $\left(\frac{c_f}{f}\right)$ declines and the total carbon content of energy $\left(\frac{C}{E}\right)$ would decrease.

When there is a change in the fuel share of energy $\left(\frac{f}{E}\right)$, the impact on carbon content depends on the sign of the relative carbon content: $\left(\frac{c_f}{f} - \frac{c_e}{e}\right)$. When $\frac{c_f}{f} > \frac{c_e}{e}$ (i.e., the carbon content of electricity is less than the fuel), electrification (i.e., fuel share $\frac{f}{E}$ declines) will lower the total carbon content of energy. However, if $\frac{c_f}{f} < \frac{c_e}{e}$, electrification will increase the total carbon content of energy. The carbon content of fuels $\left(\frac{c_f}{f}\right)$ and fuel share of energy, $\left(\frac{f}{E}\right)$ are directly under the control of the manufacturing plant/firm because the plant/firm decides the fuels used generally and how much can be electrified.

3. Data

This section describes the datasets we used to construct the Energy and Carbon Intensity (ECI) indicators.

3.1 Non-Public Census Data

The main data source we used to construct the indicators is the non-public Census of Manufactures (CMF) 2017 data.⁸ Under Title 13 and 26 of the U.S. code, the data are

⁸ The 2022 CMF data are not available as of 7/17/2024.

non-public and are used under permission of Census Bureau,⁹ and the confidentiality restrictions prevent the disclosure of any information that would allow the identification of a specific firm's or plant's activities. The CMF data are part of the quinquennial Economic Census and cover virtually all plants in the industry. We used plant-level electricity use¹⁰ and the cost of fuel to construct the indicators. Due to the missing rates on those two variables, we conducted a multiple imputation method using plant-level shipment values and labor (measured by total production worker hours) as independent variables to replace the missing values (described in detail in Section 4.1).

Although natural gas is the most common fuel type, since plants may use other types of fuels, we utilize non-public Manufacturing Energy Consumption Survey (MECS) 2018 data¹¹ to obtain a plant's fuel use. The MECS is a national survey of the energy consumed by a sample of manufacturing plants. The Energy Information Administration (EIA) sponsors the MECS and for every plant surveyed, the MECS collects detailed data on the consumption of more than 20 types of energy. This paper focuses on five most common fuels in this analysis: natural gas, coal, residual fuel oil, distillate fuel oil, and coke & breeze. We first used MECS data to construct a fuel price calculated from energy expenditure and energy consumption for each of the five fuels. With information on energy consumption, we constructed the use share for each fuel

⁹ However, a research program maintained by the Center for Economic Studies allows academic and government researchers with Special Sworn Status to access these micro-data at Research Data Centers.

¹⁰ We conducted an energy accounting approach to convert electricity use from MWh to MBtu so that we can combine electricity and fuel to calculate total energy use. We then convert the electricity use from "site energy" to "source energy", so we can put electricity and fuel on an "equal energy basis."

¹¹ We applied a GDP deflator to adjust 2018 to 2017 data when we merged 2019 MECS data to 2017 CMF data.

type and used this share to calculate the weighted fuel price for each plant, each industry by region,¹² and each 3-digit NAICS industry. We then merged¹³ MECS data with CMF data and used this weighted fuel price to calculate the fuel consumption for each CMF plant by dividing fuel costs by the average price. The choice of the average fuel price used depended on whether a plant was included in MECS. A non-plant-specific price (regional or national) was used for non-MECS sample plants.

3.2 Carbon Emission Data

We used EPA Emission & Generation Resource Integrated Database (eGRID) to get the carbon emission information from electricity use. The eGRID data include total and non-baseload output emission rate for CO₂e for every eGRID subregion. We then merged each U.S. zip code to the corresponding eGRID subregion. Because some zip codes may be covered by more than one subregion, we constructed the average CO₂e emission, by taking the average over the overlapped subregions, for each zip code.¹⁴

For the carbon emission from fuels, we used the emission information provided by EPA Energy Star and EIA. The carbon emission (with unit $kg/(site\ MBtu)$) is 53.11 for natural gas, 95.92 for coal, 75.09 for residual fuel oil, 74.30 for distillate fuel oil, and 108.27 for coke and breeze.¹⁵

¹² The industry-by-region definitions are based on public MECS data.

¹³ We first tried to merge each CMF plant to MECS data. If the CMF plant could not be merged, we then merged the plant to its corresponding industry by region. If the CMF plant still could not be merged, we then merged it to its corresponding industry.

¹⁴ The raw eGRID data provide carbon emission in unit lb/MWh, and we converted the unit to kg/MBtu in this paper.

¹⁵ To construct the ECI indicators, we adjusted the emission by source factors: 1.05 for natural gas, and 1.01 for residual fuel oil and distillate fuel oil.

4. Energy and Carbon Intensity

4.1 Multiple Imputation

In the 2017 CMF data, many plants do not report electricity purchases and/or cost of fuel. The missing rate for the variable “electricity purchased” is around 17.47 percent and 47.64 percent for the variable “cost of fuel”. One approach to deal with missing data is the complete-case analysis (i.e., simply exclude the missing values).

However, it would not be correct to assume plants/firms do not use any electricity or/and fuels and dropping those with missing values may bias the results. Thus, in this paper, we replace the missing values of these two variables with plausible values using an approach called “imputation”.

One common approach to deal with missing values is the mean-value imputation (i.e., missing values are replaced with the mean value of that variable). However, previous research showed that in many settings, this approach may lead to biased estimates of statistics and artificially narrow confidence intervals (i.e., mean-value imputation artificially reduces the variation in the data set) and it is recommended in randomized trials only (Austin et al. 2021).

In this paper, we used another popular method, multiple imputation (MI), to replace missing values for electricity use and fuel cost. This method is used to fill in missing values by generating plausible numbers derived from distributions of observed variables in the data set. Multiple imputation allows the researchers to incorporate the uncertainty about the true value of imputed variables. Unlike simple imputation,

multiple imputation fills missing data many times and multiple plausible values of a given variable are imputed for each subject that has missing data for that variable (Rubin 1972, Rubin, 1996, Li et al., 2015, Austin et al., 2021). The analysis is then separately conducted for each imputed data set and results are pooled across the imputed sets.

There are two stages in the multiple imputation. The first step is to generate replacement values (“imputations”). This paper conducted 10 imputations and applied a log-log regression to impute the missing values. Imputations are separately done by electricity purchase and cost of fuel and separated by each NAICS industry. The independent variables we used are sales (total shipment) and labor (working hours).

The second stage is to analyze these 10 imputed data sets and combine the estimates of interests from all the imputed data sets into a single estimate. In this paper, we first constructed the three ratios and the associated quintiles for each industry (described in Section 4.2) and for each imputed sample, then took the average of the quintile thresholds estimated from each of the imputed data sets.

4.2 Ratio and Quintile Calculation

For each manufacturing industry, we constructed the estimates of the percentile distribution on three ratios: (1) *MBtu* (million Btu) of total energy use per \$1,000 of production (defined as E/Y , where energy use E is a combination of electricity and fuel use and the CMF variable “total value of shipment” for production Y), (2) fuel share (defined as f/E), and (3) carbon emissions per *MBtu* (million Btu) of total

energy use (defined as C/E , where carbon emissions C is a combination of carbon emissions from electricity use and fuel use).

Plant-level fuel consumption is calculated as dividing cost of fuel (provided by CMF data) by the weighted average fuel price (calculated from MECS data). For the weighted average fuel price, we considered five most common fuels: natural gas, coal, residual fuel oil, distillate fuel oil, and coke & breeze. We used MECS data to calculate the fuel price and fuel use share for each of the five fuels. We then merged MECS data with CMF data, and the average fuel price is a weighted average of all five fuel prices (with fuel use share as the weights). Plant-level energy consumption is then a combination of electricity and fuel use.

Plant-level carbon emissions combine emissions from both electricity and fuel use. For carbon emissions from electricity use, we used the zip codes to merge CMF data with eGRID data. Based on the plant's location (zip code), we used electricity grid emission (from eGRID) and plant's electricity use to calculate plant-level emission from electricity use. For carbon emissions from fuel use, we used information from both fuel use share and scientific number of carbon emission of each fuel use (described in Section 3.2) to construct the plant-level average carbon emission from fuel use. The estimated carbon emission from fuel use is a weighted average of carbon emission from all fuel types (with weight equal to the use share for that plant).¹⁶

After constructing those three ratios for each plant, we then separately constructed the estimated quintile distribution (20th, 40th, 60th, and 80th percentiles) of the three

¹⁶ If the information is still missing in the end, we assume the plant uses natural gas for the fuel.

ratios for each industry. We only considered manufacturing plants in this study (NAICS numbers starting with “31”, “32”, and “33”). We followed census rules on disclosing percentiles, by constructing the estimated values on the percentiles. There are four industries that fail the disclosure requirements resulting in estimates for 356 manufacturing industries.¹⁷

5. ECI Analysis

5.1. Carbon Per \$1,000 Production Quintiles Interpolation.

This project constructs the estimated quintiles for energy intensity (energy per \$1,000 production, E/Y), fuel share (f/E), and carbon content of energy (carbon per (MBtu) energy, C/E) ratios. Carbon per dollar (C/Y) ratio is another important indicator. While we could also use the confidential Census data to construct the (C/Y) ratio and estimate the quintiles, we wished to minimize the number of disclosures required by the Census. Instead, we used the disclosed quintiles of (E/Y) and (C/E) to construct a distribution and interpolate the ratio (C/Y).

With quintiles of (E/Y) and (C/E), we first found all possible combinations by multiplying each percentile value of (E/Y) by each percentile value of (C/E) and this generates 16 possible products. We assumed equal probability for each combination and each product has probability of 1/16. We then sorted these 16 products in ascending order and used a linear interpolation to find the quintiles to generate the quintiles of (C/Y).

¹⁷ There are a few industries that fail census disclosure rules to disclose the quintiles. Instead, we either suppressed the 40th and 60th percentiles to median (50th) or only reported the 20th and 80th percentiles for these industries. To be consistent, we conducted a linear interpolation to calculate the 40th and 60th percentiles.

5.2. Ratio Distributions

For the eGRID carbon emissions, we constructed the quintile distribution across all U.S. zip codes and such quintile thresholds are not industry specific. After converting the eGRID emission unit to $kg/MBtu$, the quintile distribution is 28.77 for 20th percentile, 36.76 for 40th percentile, 44.56 for 60th percentile, and 47.76 for 80th percentile.

This paper constructs the distributions of ratios into quintiles: eGRID carbon emission, energy intensity (defined as energy per \$1,000 production), fuel share, carbon content of energy (defined as carbon emission per $MBtu$ energy use), and imputed carbon per \$1,000 production.

To better understand how the quintiles vary by industries, we first plotted the distributions of the (industry-specific) estimated quintiles of these four ratios in figures 1-4. In each figure, we labeled the 20th, 40th, 60th, and 80th quintiles of each ratio's quintile distribution.¹⁸ For example, for the 20th quintile of the energy intensity (energy per \$1,000 sale) ratio, across all of these 356 industries, around 20% of them have 20th quintile values less than 0.74.

¹⁸ We plot the distribution in logged terms but label the percentiles in actual terms.

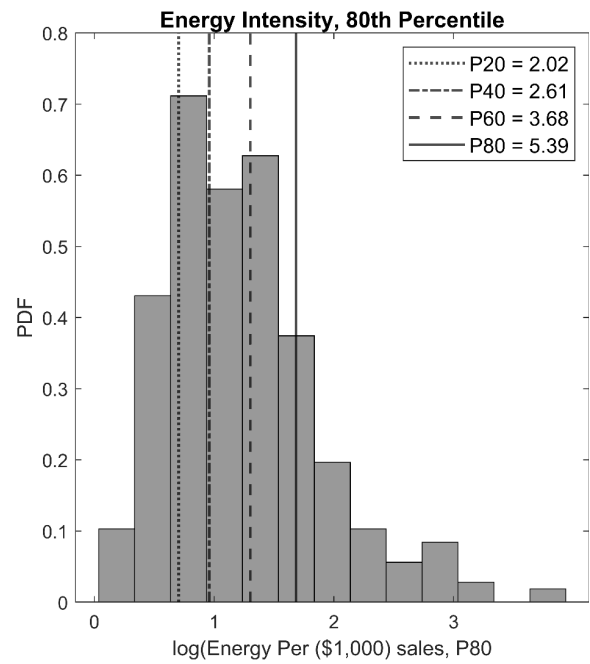
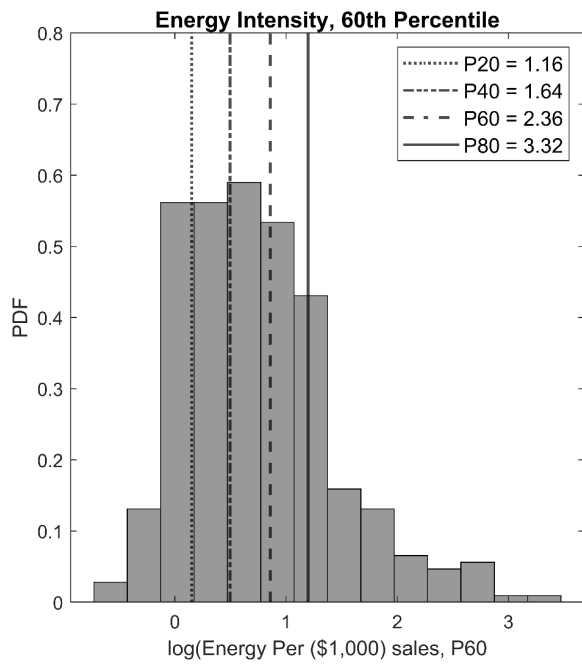
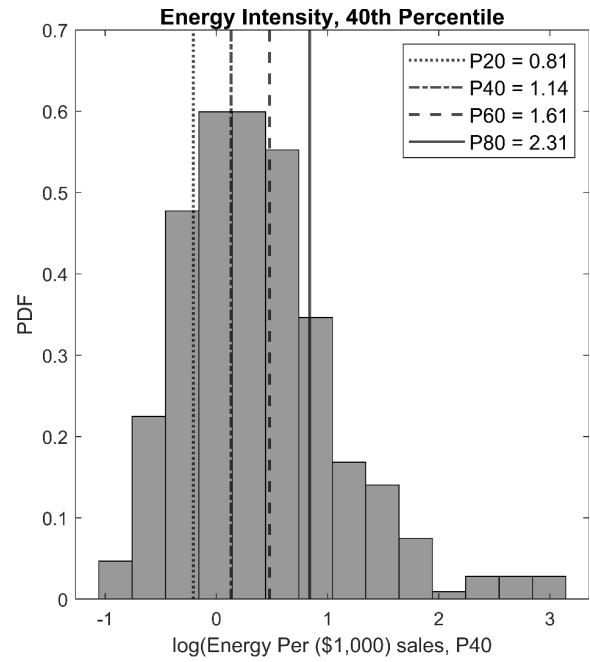
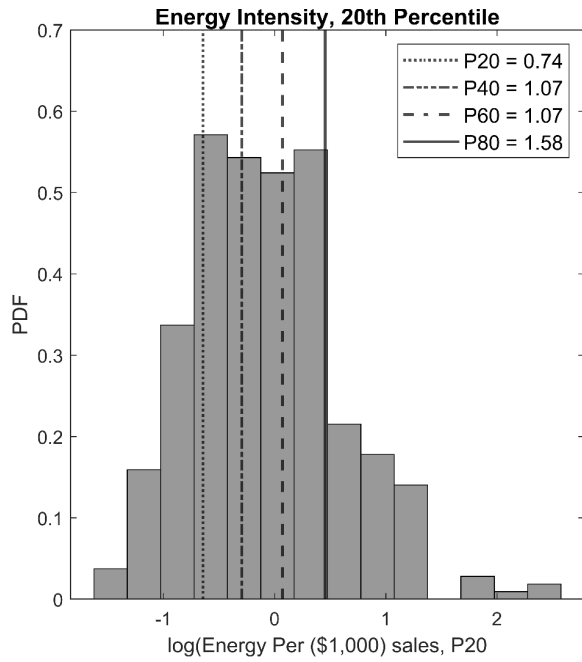


Figure 1: Energy Per \$1,000 Sale Quintiles, Distribution

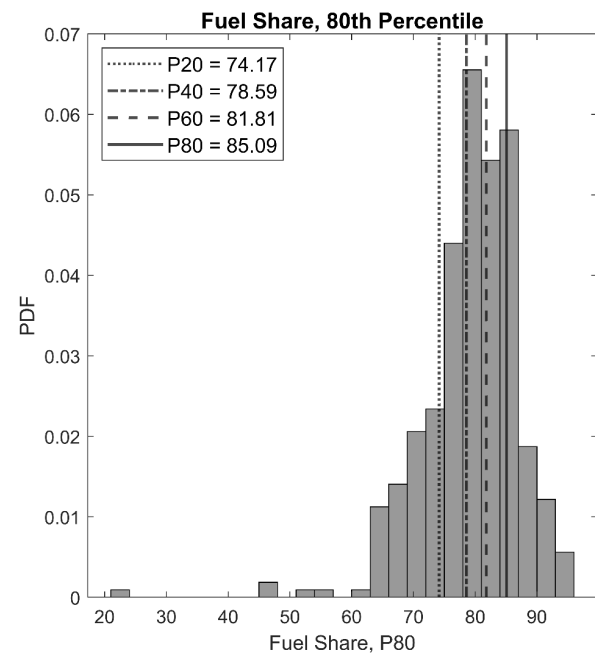
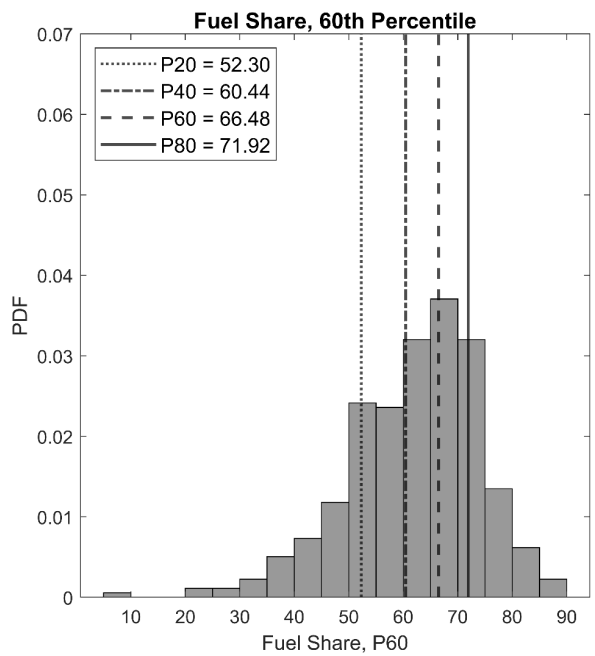
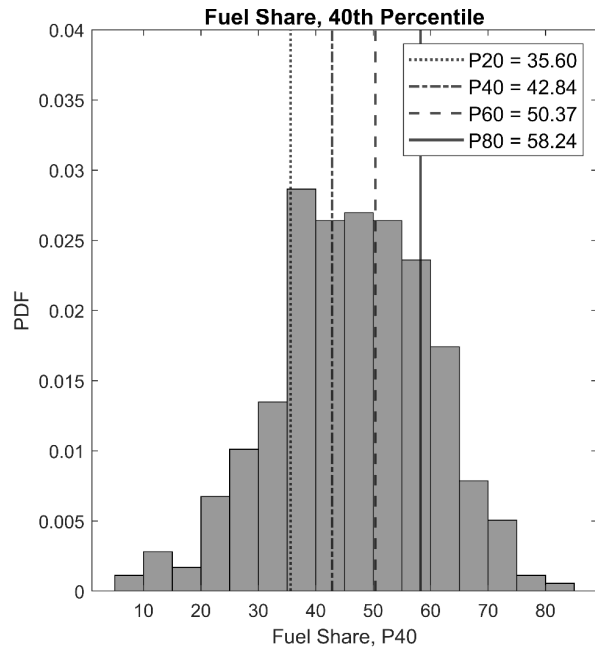
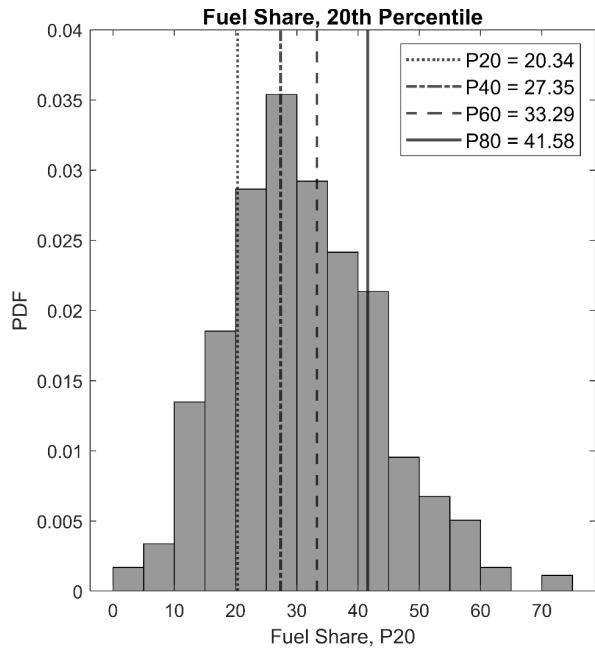


Figure 2: Fuel Share Quintiles, Distribution

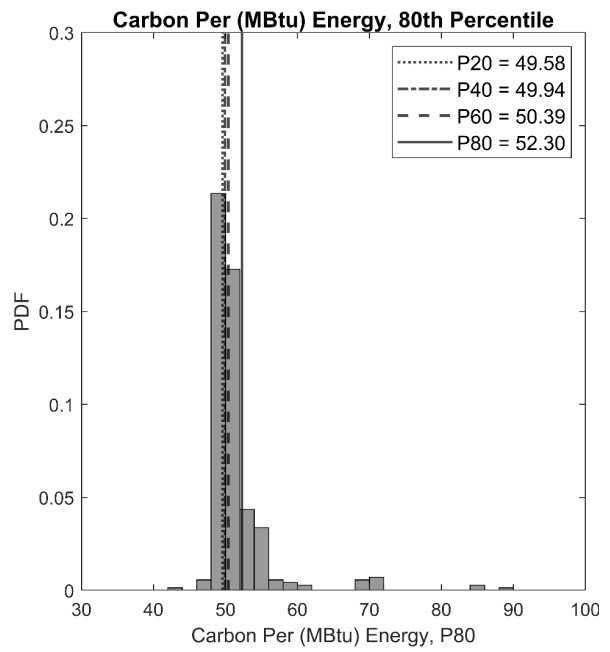
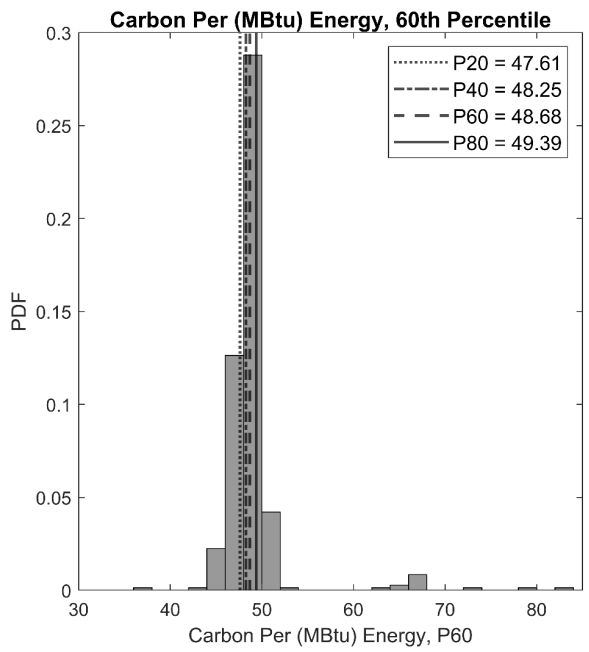
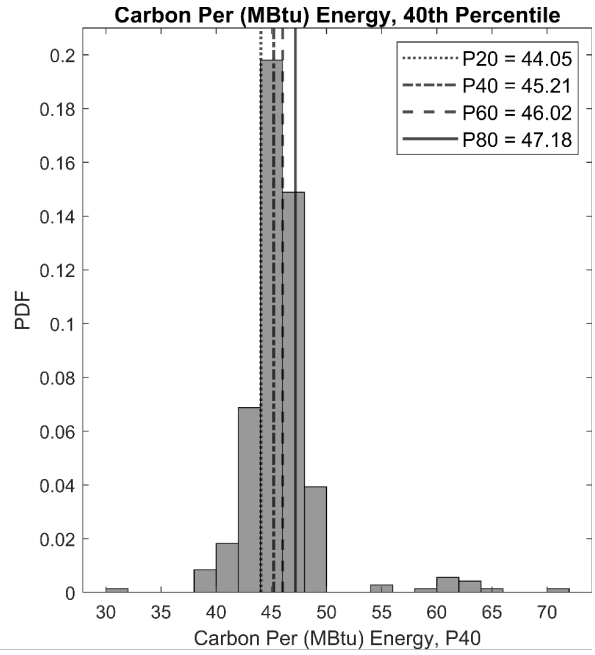
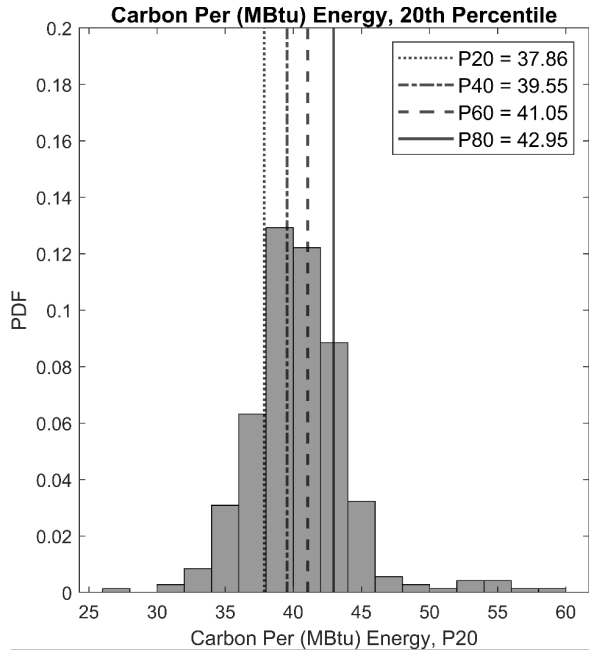


Figure 3: Carbon Per (MBtu) Energy Quintiles, Distribution

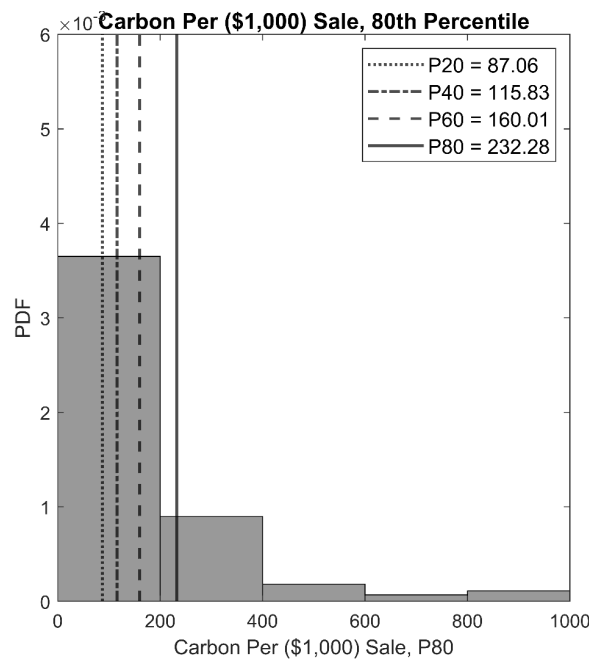
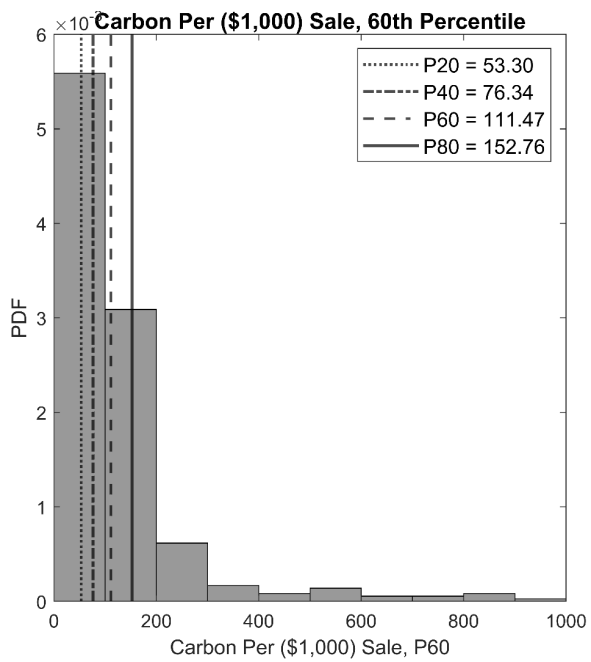
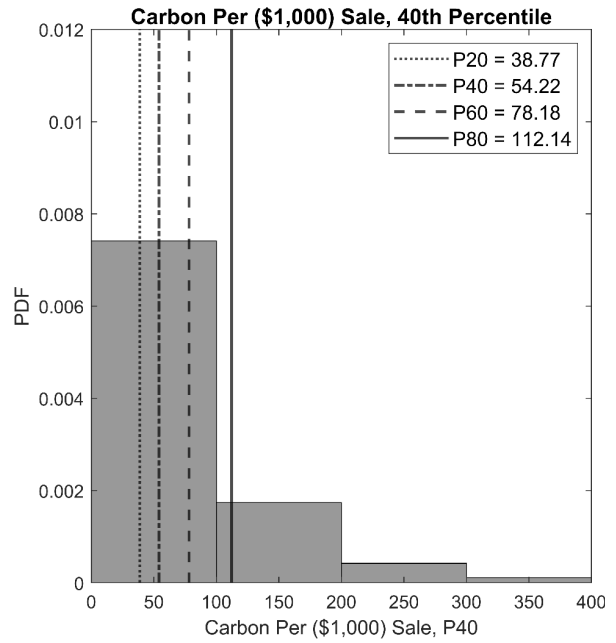
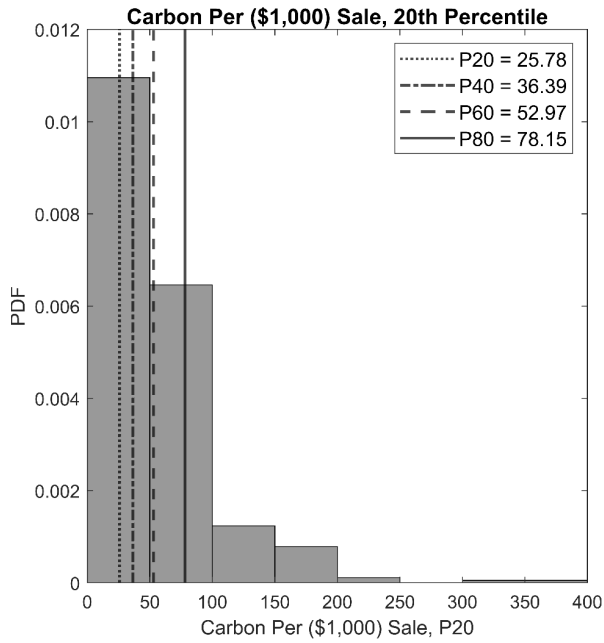


Figure 4: Carbon Per \$1,000 Sale Quintiles, Distribution

To better compare how the dispersions of quintiles vary for each level (i.e., 20th vs 80th quintiles), we constructed boxplots, for each quintile and for each ratio in figures 5-8.¹⁹ The dispersions get wider (when moving from 20th to 80th quintile) for E/Y and C/Y ratios and narrower for f/E and C/E ratio.

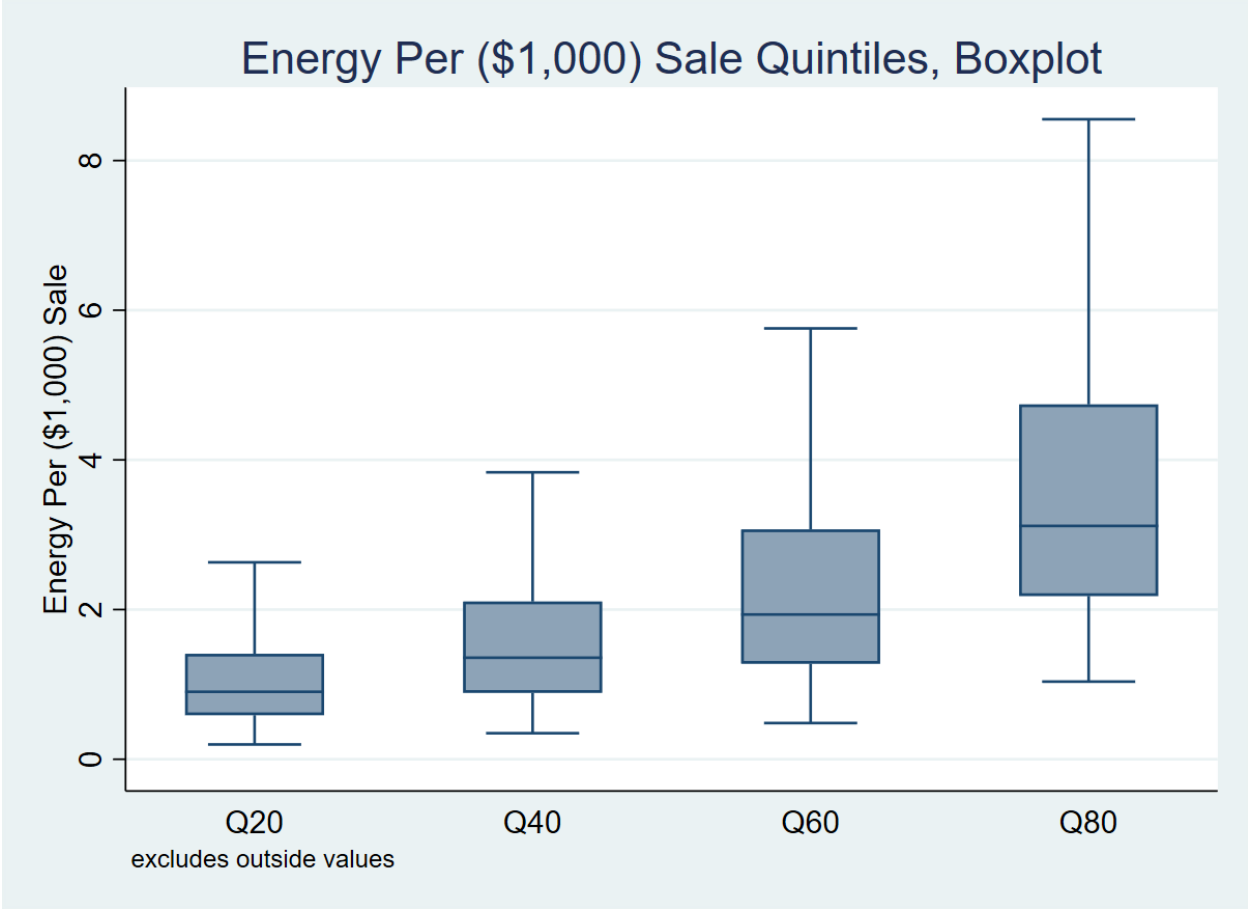


Figure 5: Energy Per \$1,000 Sale Quintiles, Box Plot

¹⁹ To better compare distribution of each quintile, we omitted the outside values in the box plots.

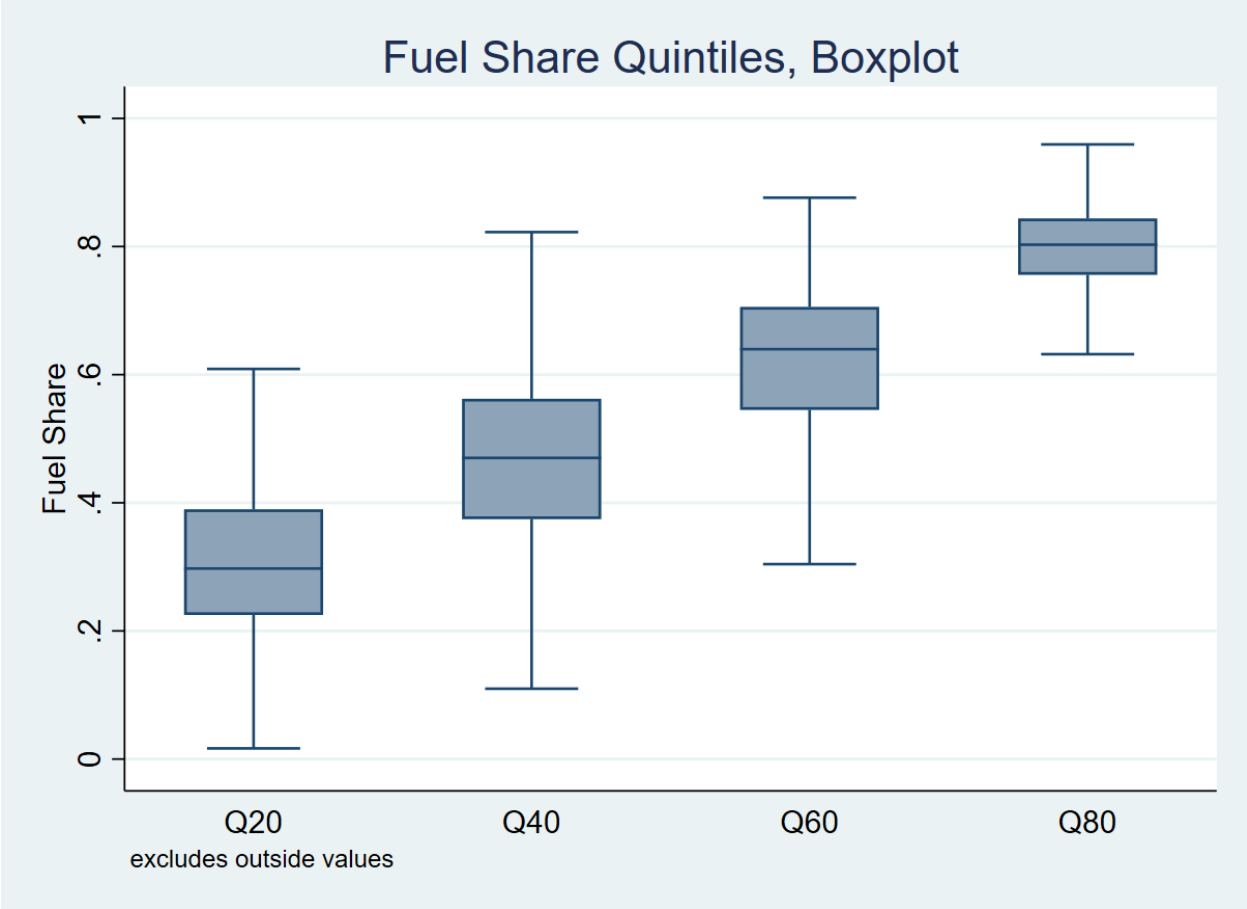


Figure 6: Fuel Share Quintiles, Box Plot

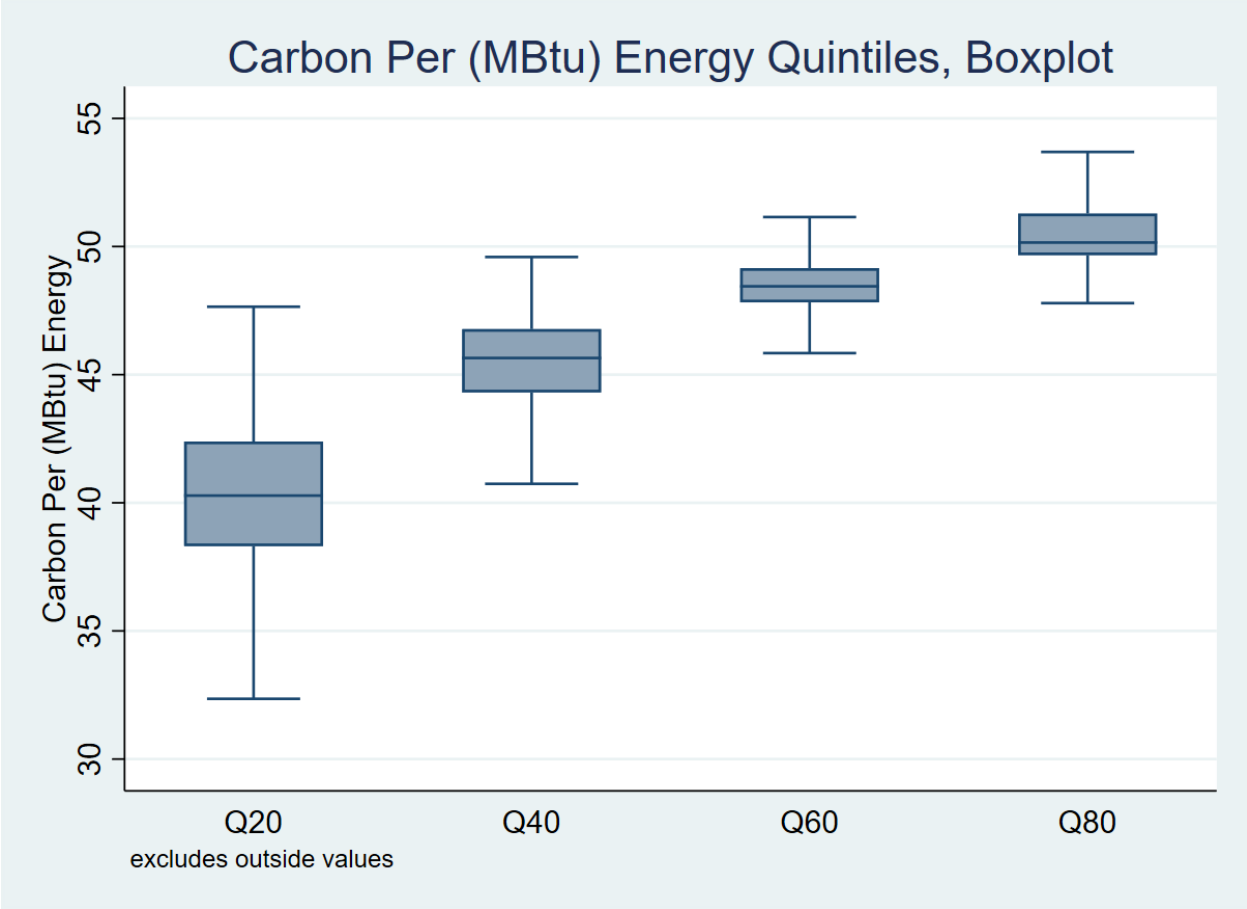


Figure 7: Carbon Per (MBtu) Energy Quintiles, Box Plot

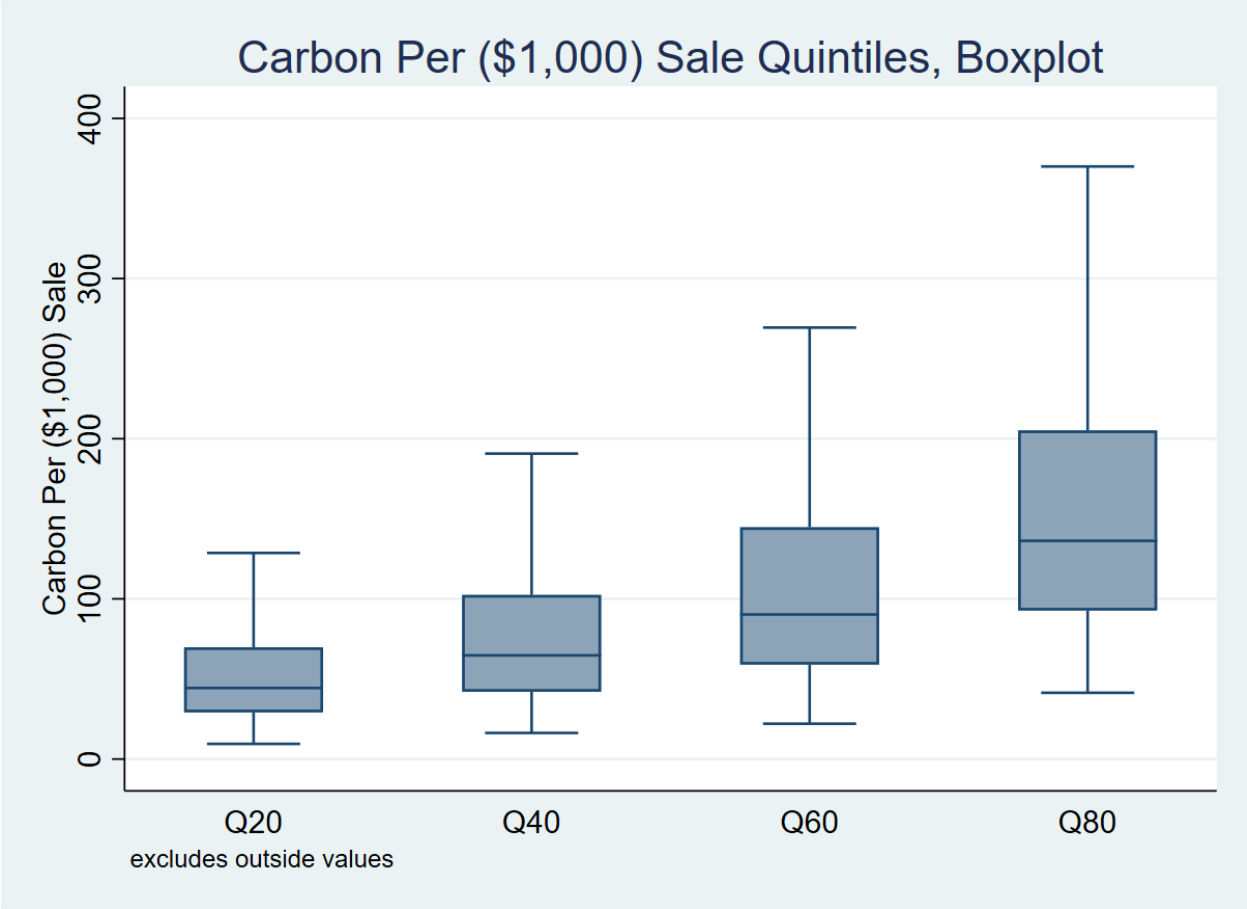


Figure 8: Carbon Per \$1,000 Sale Quintiles, Box Plot

We also constructed figures 9-12 that allow us to see how values increase in the end (i.e., for the very large values). In Figures 9-12, we sorted the quintile numbers from smallest to largest and examined how the values change. This analysis is separately done for each quintile and for each ratio. The figures suggest there are some significant increases (in the end, for the largest values) for E/Y , C/E , and C/Y ratios.

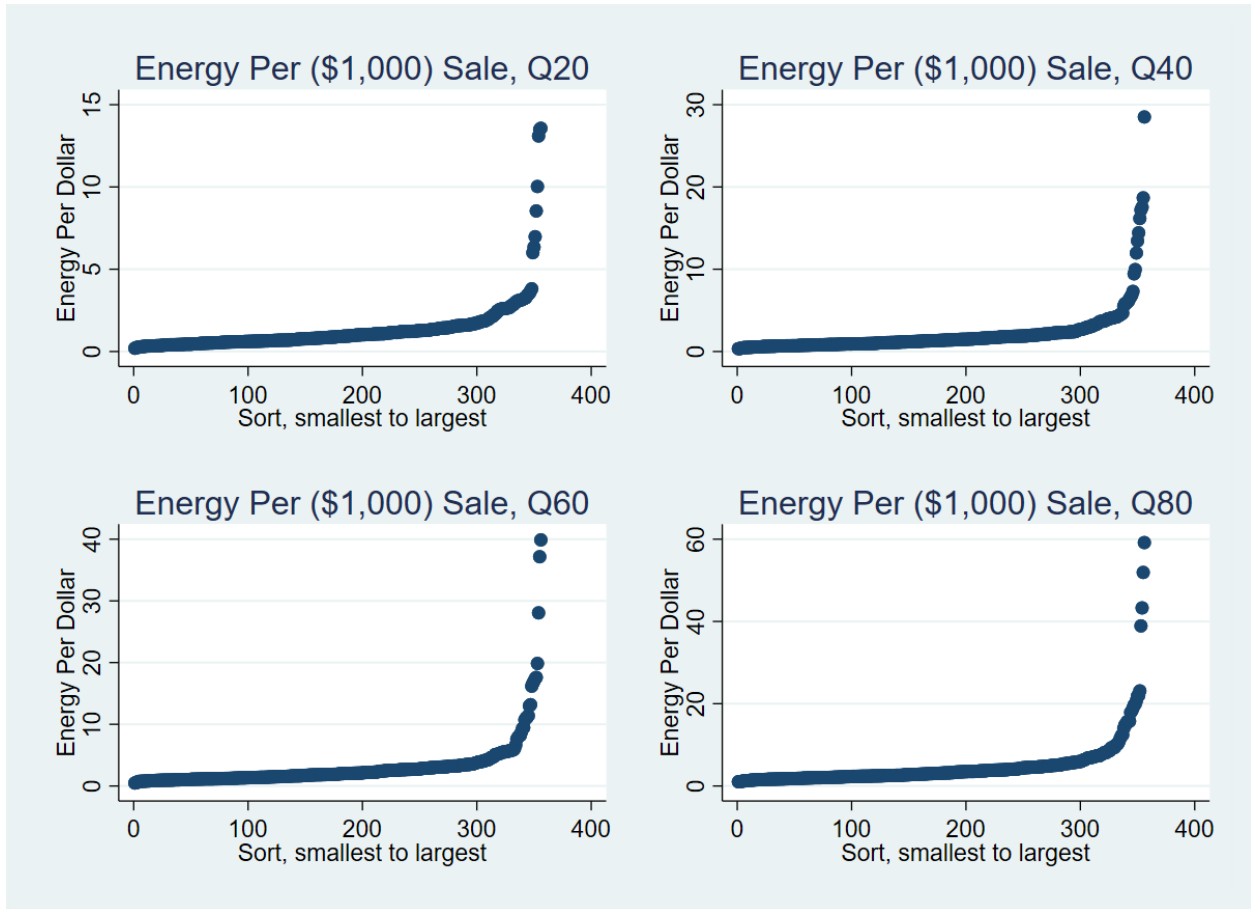


Figure 9: Energy Per \$1,000 Sale Quintiles, Sort

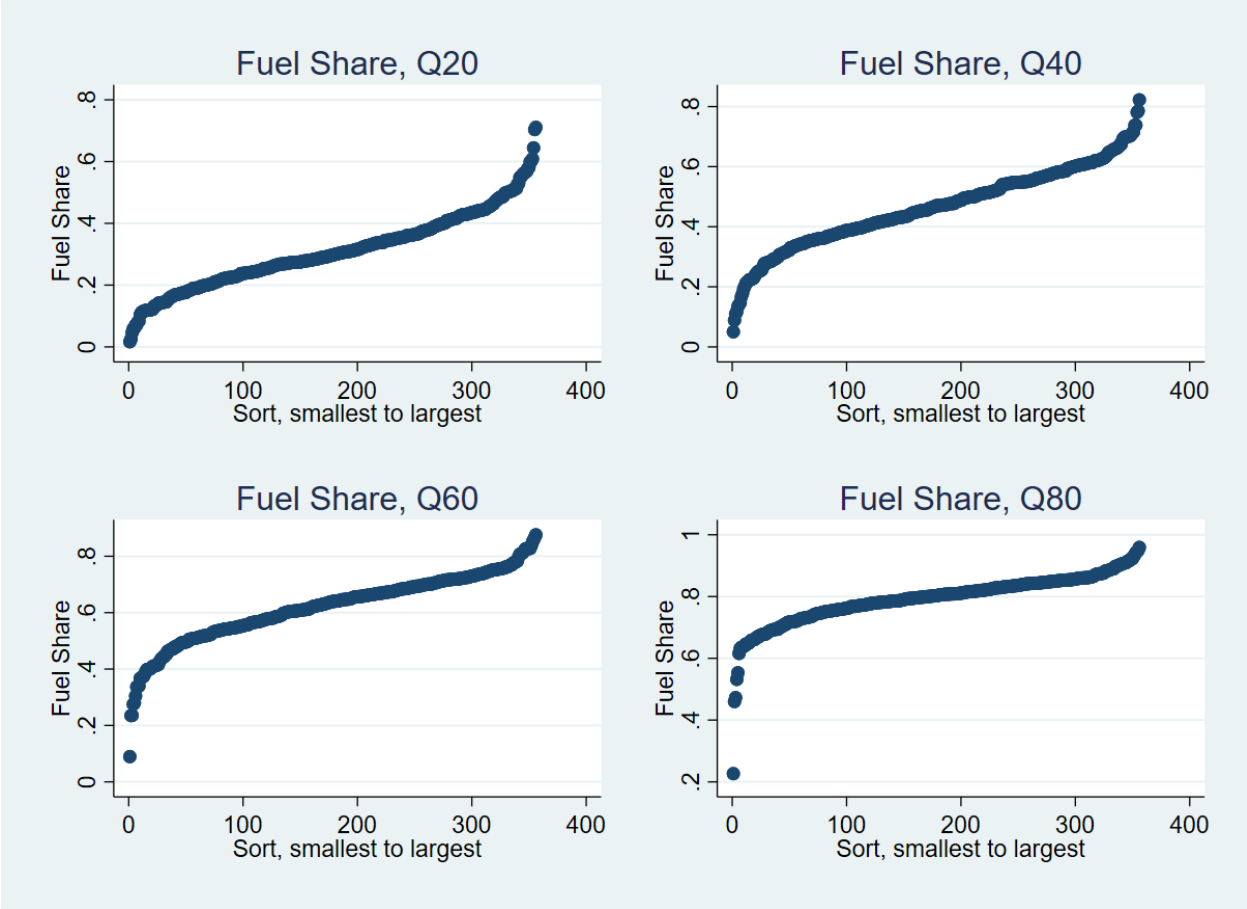


Figure 10: Fuel Share Quintiles, Sort

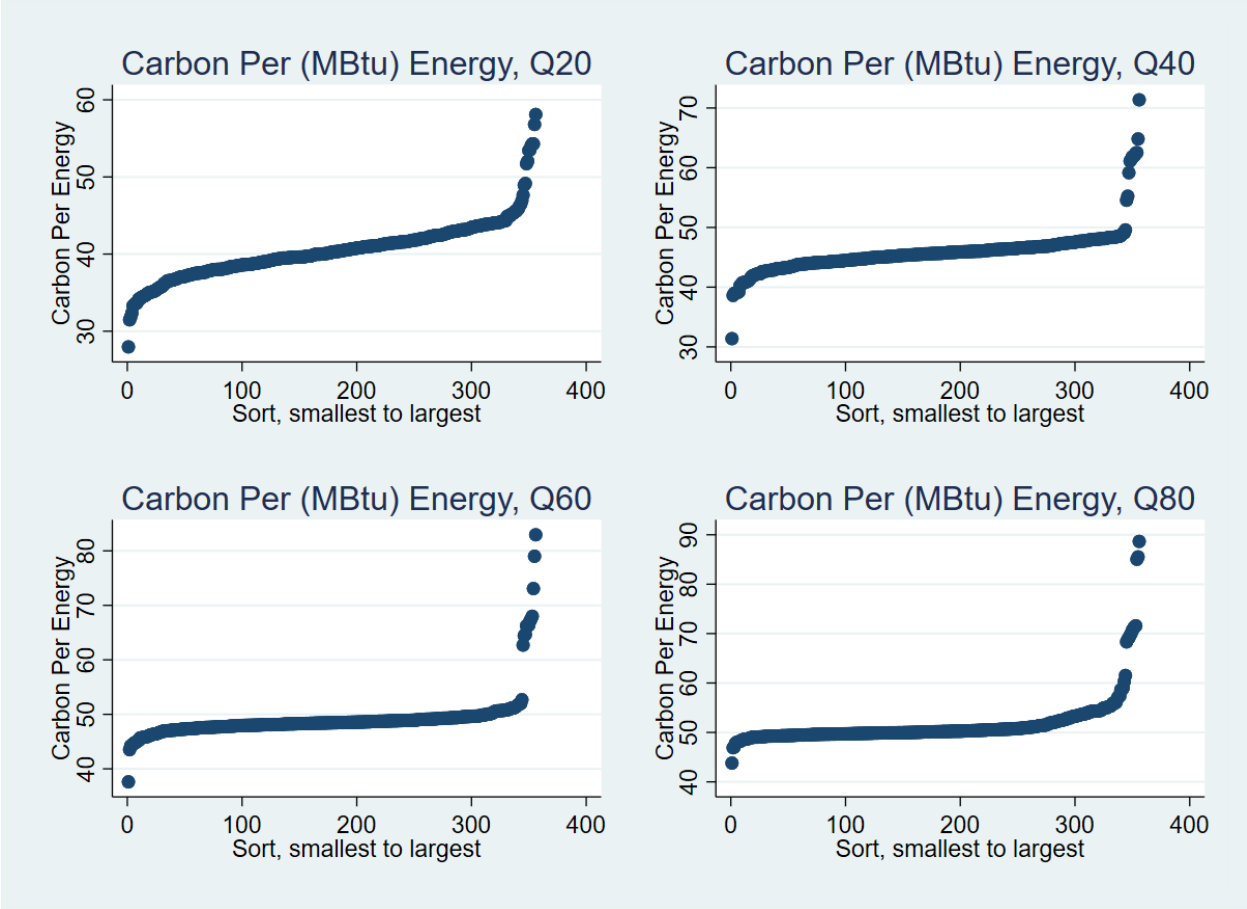


Figure 11: Carbon Per (MBtu) Energy Quintiles, Sort

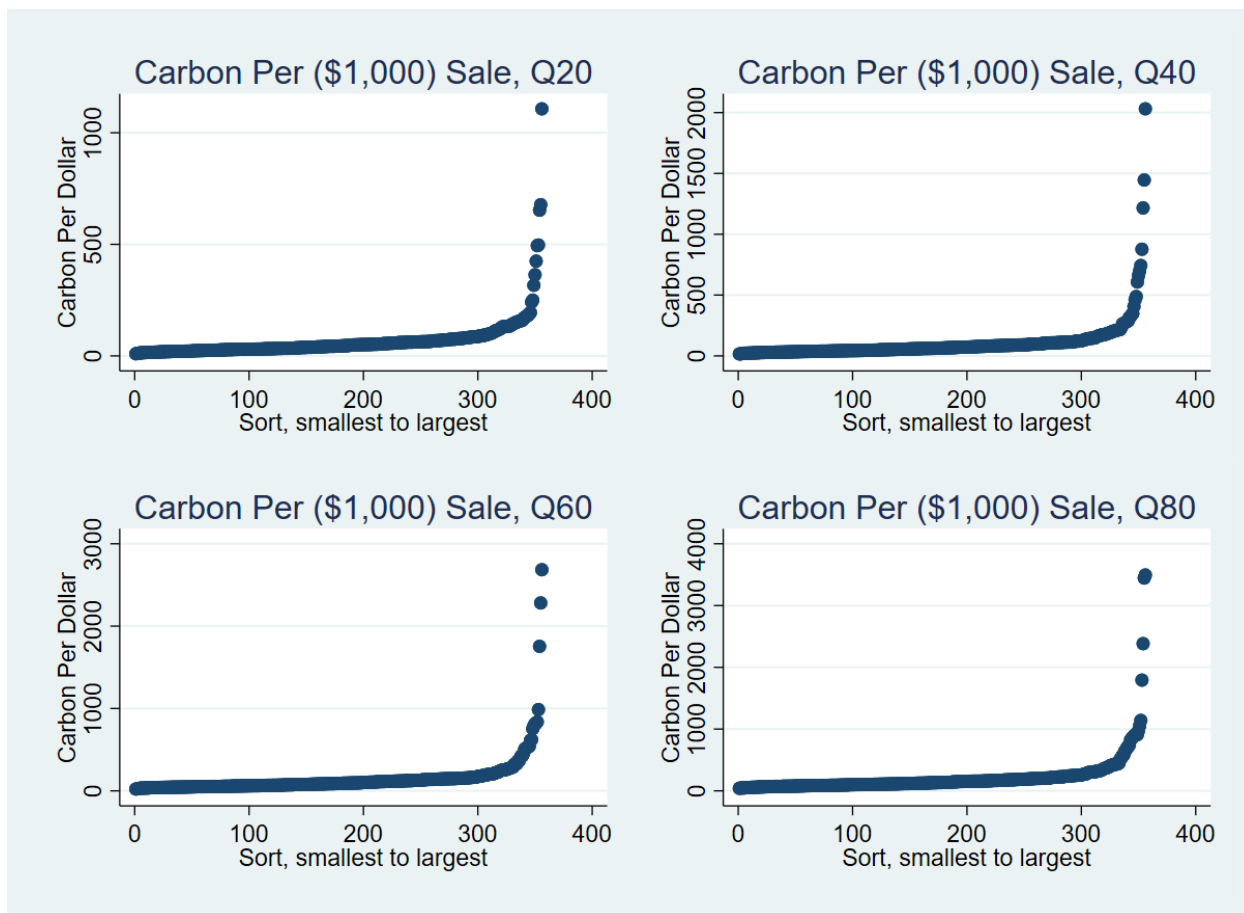


Figure 12: Carbon Per \$1,000 Sale Quintiles, Sort

5.3. Dispersion Patterns

We generated the dispersion measure (80th vs 20th) for each ratio and examined how the dispersions change for different industries. For example, for energy intensity ratio, we would like to compare the dispersions between industries with higher energy intensity levels and those with lower levels, by using the median value. Because the median (Q50) was not disclosed from the Census, we used the 60th percentile instead. In each figure (Figures 13-16), we plotted the dispersion (defined as $\log(Q80/Q20)$)

against the $\log(Q60)$ for each ratio.²⁰ We first checked the energy per \$1,000 sale ratio (in Figure 13). While we might expect that more energy intensive industries have lower dispersion, we do not find any clear pattern. This may be due to outliers in some industries that increase the dispersion. Some NAICS codes like fertilizers and petrochemicals include plants that primarily produce upstream, energy intensive products along with downstream low intensity products. This analysis cannot isolate those effects.²¹ In Figure 14, we do find the dispersion in fuel share use is larger for industries that use less fuel. We then check the carbon emission (Figures 15 and 16) and do not find any clear pattern. A similar problem with outliers in some energy intensive sectors may exist in this ratio as well.

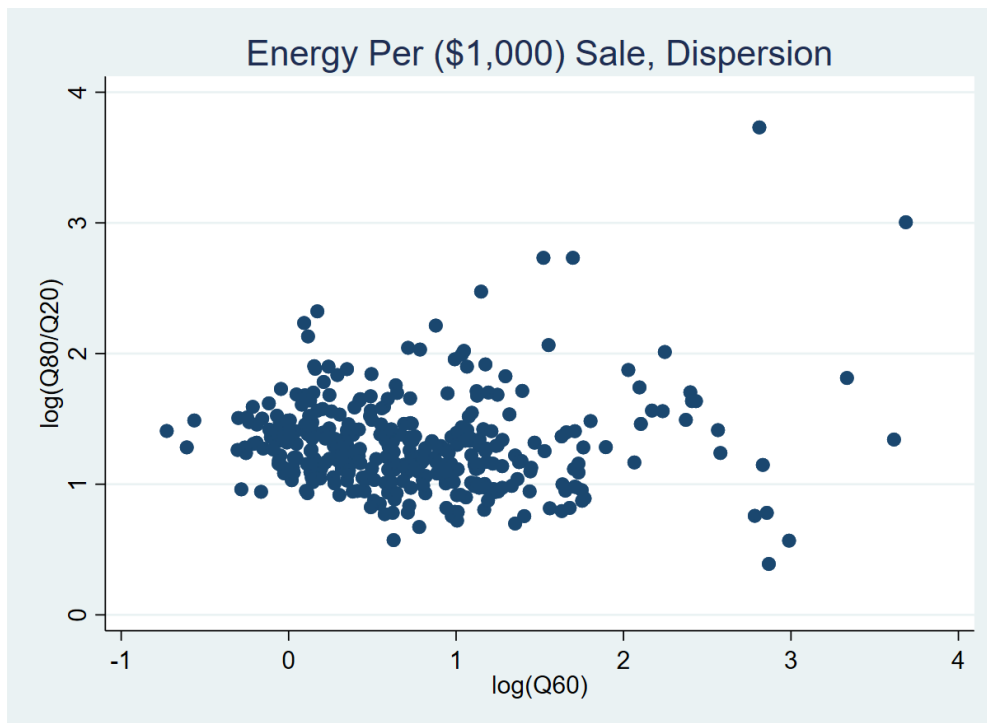


Figure 13: Energy Per \$1,000 Sale Quintiles, Dispersion

²⁰ The dispersion patterns are similar if we used $\log(Q40)$ instead of $\log(Q60)$.

²¹ Some other high energy-intensive industries with high energy dispersion are Lime Manufacturing and Industrial Gas Manufacturing.

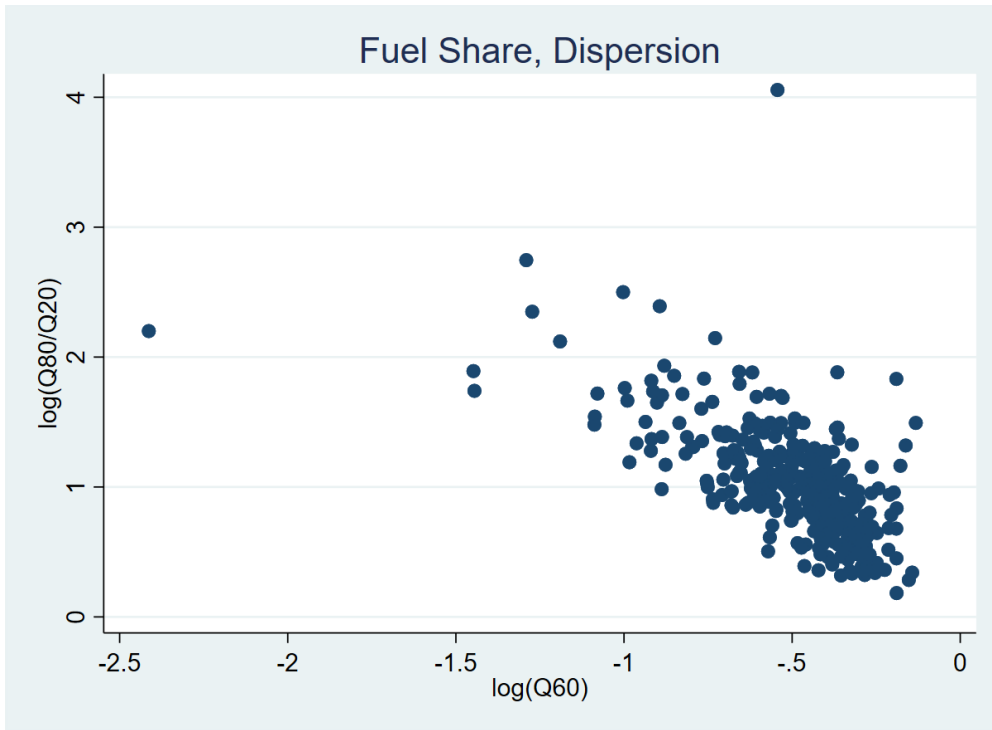


Figure 14: Fuel Share Quintiles, Dispersion

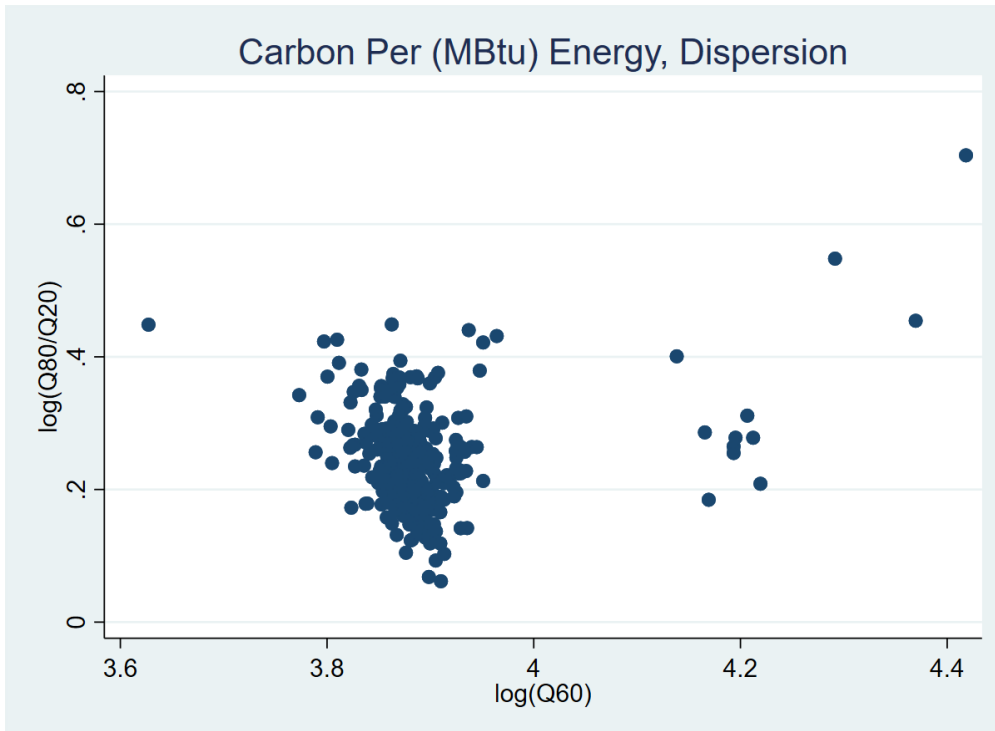


Figure 15: Carbon Per (MBtu) Energy Quintiles, Dispersion

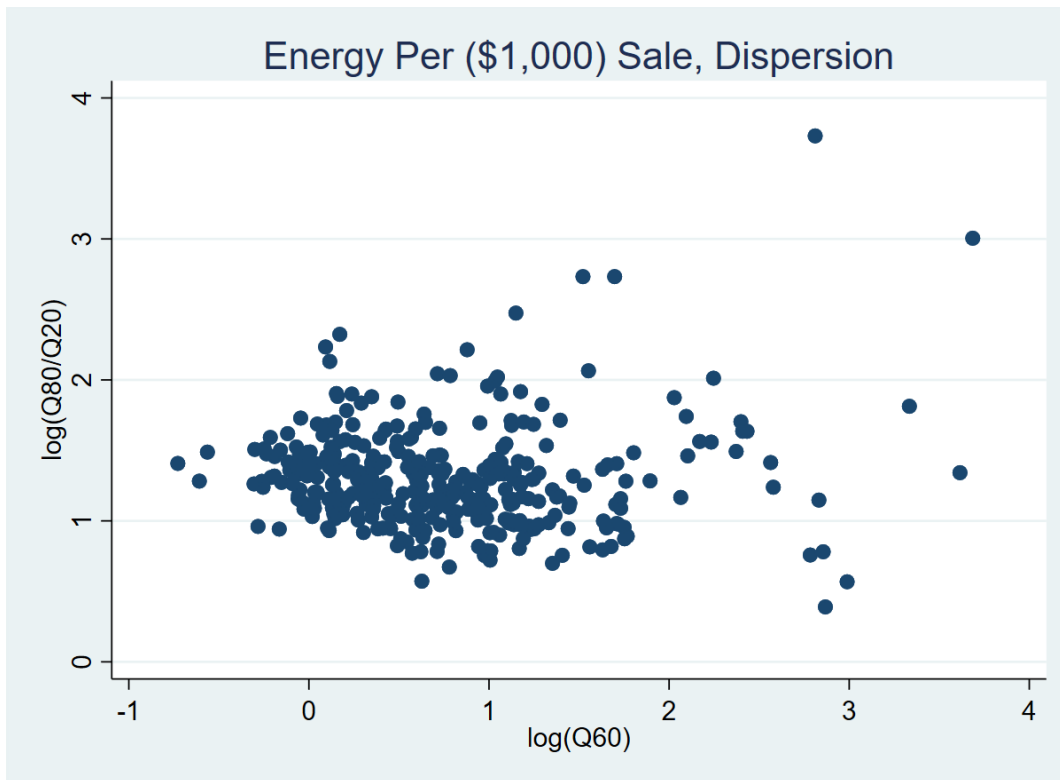


Figure 16: Carbon Per \$1,000 Sale Quintiles, Dispersion

6. Conclusion

The cross-industry histograms document what is already widely “understood,” which is that there are large differences in energy and carbon across different NAICS industries. The dispersion plots do not reveal any specific patterns vis-a-vis sector energy intensity, but clearly the “devil is in the details.” This project provides one of the first glimpses into those details by providing distribution estimates at the six-digit NAICS level. To construct those estimates, multiple imputation was employed to avoid biasing the analysis by dropping non-reported energy and to use the MI to more fully capture the dispersion we seek to understand. Future research may examine more of the underlying drivers for the dispersion and reasons for cross industry variation.

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Appendix: Tables of NAICS Estimates

This section includes the disclosed industry-level imputed quintile estimates. We used Census CMF and MECS data to impute the first three ratios (E/Y , f/E , and C/E). We then used the values of E/Y and C/E to impute the industry-level quintiles of C/Y (with assumption of equal probability for each combination of E/Y and C/E).

Appendix A: Energy Per \$1,000 Production Quintiles

Table 1: Industry-Level E/Y Quintiles

NAICS Code	NAICS Title	20 th E/Y	40 th E/Y	60 th E/Y	80 th E/Y
311111	Dog and Cat Food Manufacturing	0.9475	1.178	1.592	2.724
311119	Other Animal Food Manufacturing	0.9633	1.241	1.57	2.494
311211	Flour Milling	1.371	2.004	2.674	4.221
311212	Rice Milling	1.281	1.929	3.738	5.944
311221	Wet Corn Milling	2.554	6.412	11.01	14.03
311224	Soybean and Other Oilseed Processing	1.622	2.129	2.974	4.462
311225	Fats and Oils Refining and Blending	0.7813	1.116	1.574	2.011
311230	Breakfast Cereal Manufacturing	1.589	2.177	3.867	5.382
311340	Nonchocolate Confectionery Manufacturing	1.686	2.31	2.884	4.145
311351	Chocolate and Confectionery Manufacturing from Cacao Beans	1.575	1.982	2.732	3.937
311352	Confectionery Manufacturing from Purchased Chocolate	1.554	2.133	2.79	3.893
311411	Frozen Fruit, Juice, and Vegetable Manufacturing	1.142	1.878	2.811	4.802
311412	Frozen Specialty Food Manufacturing	1.585	2.133	2.699	3.488
311421	Fruit and Vegetable Canning	1.607	2.051	2.65	3.421
311422	Specialty Canning	1.559	2.05	2.565	3.534
311423	Dried and Dehydrated Food Manufacturing	1.355	2.099	2.933	6.185

311511	Fluid Milk Manufacturing	0.9633	1.304	1.723	2.256
311513	Cheese Manufacturing	1.133	1.387	1.775	2.448
311514	Dry, Condensed, and Evaporated Dairy Product Manufacturing	1.484	2.317	3.123	5.426
311520	Ice Cream and Frozen Dessert Manufacturing	1.139	1.662	2.648	3.537
311611	Animal (except Poultry) Slaughtering	0.867	1.087	1.447	2.76
311612	Meat Processed from Carcasses	1.043	1.296	1.665	2.499
311613	Rendering and Meat Byproduct Processing	3.062	6.859	11.12	15.72
311615	Poultry Processing	0.9302	1.31	1.812	2.37
311710	Seafood Product Preparation and Packaging	0.7486	1.398	2.066	3.926
311811	Retail Bakeries	2.618	3.65	4.758	5.919
311812	Commercial Bakeries	1.7	2.199	2.735	3.498
311813	Frozen Cakes, Pies, and Other Pastries Manufacturing	1.073	1.771	2.551	3.804
311821	Cookie and Cracker Manufacturing	1.604	2.144	2.745	3.524
311824	Dry Pasta, Dough, and Flour Mixes Manufacturing from Purchased Flour	1.225	1.98	2.503	3.595
311830	Tortilla Manufacturing	2.466	3.018	3.868	4.961
311911	Roasted Nuts and Peanut Butter Manufacturing	0.5238	0.9152	1.12	2.089
311919	Other Snack Food Manufacturing	0.9839	1.354	2.644	3.836
311920	Coffee and Tea Manufacturing	0.802	1.155	1.467	2.061
311930	Flavoring Syrup and Concentrate Manufacturing	0.197	0.5504	1.097	1.839
311941	Mayonnaise, Dressing, and Other Prepared Sauce Manufacturing	0.6983	1.01	1.306	2.002
311942	Spice and Extract Manufacturing	0.6327	1.023	1.337	2.382
311991	Perishable Prepared Food Manufacturing	1.078	1.488	1.883	2.608
311999	All Other Miscellaneous Food Manufacturing	1.008	1.398	2.083	3.399
312111	Soft Drink Manufacturing	0.6256	0.9217	1.276	2.065
312112	Bottled Water Manufacturing	1.26	2.058	2.976	4.851
312113	Ice Manufacturing	3.811	9.444	12.99	15.67

312120	Breweries	1.345	1.849	2.56	3.793
312130	Wineries	0.8623	1.359	1.864	3.248
312140	Distilleries	0.5706	1.099	2.041	4.407
312230	Tobacco Manufacturing	0.318	0.5598	1.048	1.718
313110	Fiber, Yam, and Thread Mills	2.827	4.102	5.496	8.635
313210	Broadwoven Fabric Mills	2.049	2.976	3.79	5.499
313220	Narrow Fabric Mills and Schiffli Machine Embroidery	1.578	2.426	3.45	5.753
313230	Nonwoven Fabric Mills	1.455	2.402	3.585	5.551
313240	Knit Fabric Mills	1.95	2.819	3.498	5.016
313310	Textile and Fabric Finishing Mills	2.251	3.228	4.236	6.751
313320	Fabric Coating Mills	1.233	1.826	2.487	3.889
314110	Carpet and Rug Mills	1.051	1.51	2.06	3.705
314120	Curtain and Linen Mills	0.6397	0.9396	1.469	2.538
314910	Textile Bag and Canvas Mills	0.8828	1.307	1.826	3.176
314994	Rope, Cordage, Twine, Tire Cord, and Tire Fabric Mills	1.22	1.821	2.723	4.908
314999	All Other Miscellaneous Textile Product Mills	1.035	1.497	2.203	3.497
315110	Hosiery and Sock Mills	2.576	3.411	4.084	5.485
315190	Other Apparel Knitting Mills	1.068	1.786	2.527	3.784
315210	Cut and Sew Apparel Contractors	0.9	1.403	2.097	3.415
315220	Men's and Boys' Cut and Sew Apparel Manufacturing	0.9027	1.373	2.086	3.9
315240	Women's, Girls', and Infants' Cut and Sew Apparel Manufacturing	0.3867	0.7698	1.417	2.536
315280	Other Cut and Sew Apparel Manufacturing	0.7934	1.3	2.068	3.443
315990	Apparel Accessories and Other Apparel Manufacturing	0.9484	1.276	1.826	2.854
316110	Leather and Hide Tanning and Finishing	0.6818	1.173	1.767	3.349
316210	Footwear Manufacturing	0.5688	0.9182	1.534	2.965
316992	Women's Handbag and Purse Manufacturing	0.6901	1.131	1.896	4.002

316998	All Other Leather Good and Allied Product Manufacturing	0.9376	1.41	2.128	3.675
321113	Sawmills	2.137	2.591	3.216	4.776
321114	Wood Preservation	0.9111	1.421	2.215	3.064
321211	Hardwood Veneer and Plywood Manufacturing	1.27	1.897	2.735	4.665
321212	Softwood Veneer and Plywood Manufacturing	3.131	4.665	5.858	7.633
321213	Engineered Wood Member (except Truss) Manufacturing	1.31	1.873	2.601	4.524
321214	Truss Manufacturing	0.5889	0.8996	1.139	1.756
321219	Reconstituted Wood Product Manufacturing	3.217	5.873	7.884	10.33
321911	Wood Window and Door Manufacturing	0.702	0.9841	1.368	2.258
321912	Cut Stock, Resawing Lumber, and Planing	1.435	2.235	3.107	4.42
321918	Other Millwork (including Flooring)	1.286	1.855	2.556	3.518
321920	Wood Container and Pallet Manufacturing	1.242	1.64	2.038	2.718
321991	Manufactured Home (Mobile Home) Manufacturing	0.4615	0.6668	1.172	3.035
321992	Prefabricated Wood Building Manufacturing	0.6566	0.9192	1.206	1.963
321999	All Other Miscellaneous Wood Product Manufacturing	1.295	1.884	2.557	4.088
322121	Paper (except Newsprint) Mills	6.008	9.962	13.18	20.74
322130	Paperboard Mills	10.03	14.43	17.39	21.9
322211	Corrugated and Solid Fiber Box Manufacturing	1.203	1.628	1.872	2.132
322212	Folding Paperboard Box Manufacturing	1.195	1.527	1.862	2.61
322219	Other Paperboard Container Manufacturing	0.7864	1.101	1.508	2.03
322220	Paper Bag and Coated and Treated Paper Manufacturing	1.207	1.689	2.263	3.061
322230	Stationery Product Manufacturing	0.9336	1.48	2.096	2.972
322291	Sanitary Paper Product Manufacturing	1.073	1.489	2.23	3.008
322299	All Other Converted Paper Product Manufacturing	0.8199	1.522	2.697	5.798
323111	Commercial Printing (except Screen and Books)	1.399	1.985	2.745	4.265

323113	Commercial Screen Printing	1.536	2.257	3.06	4.689
323117	Books Printing	1.574	2.309	3.58	4.912
323120	Support Activities for Printing	1.384	2.013	3.198	5.732
324110	Petroleum Refineries	2.085	2.853	3.469	5.393
324121	Asphalt Paving Mixture and Block Manufacturing	3.279	4.613	5.757	8.518
324122	Asphalt Shingle and Coating Materials Manufacturing	1.042	1.638	2.1	3.439
324191	Petroleum Lubricating Oil and Grease Manufacturing	0.3704	0.7081	1.103	1.989
324199	All Other Petroleum and Coal Products Manufacturing	1.152	1.819	3.073	6.383
325120	Industrial Gas Manufacturing	1.038	3.686	16.63	43.3
325130	Synthetic Dye and Pigment Manufacturing	1.313	2.408	3.65	8.155
325180	Other Basic Inorganic Chemical Manufacturing	3.406	4.2	5.813	12.27
325193	Ethyl Alcohol Manufacturing	13.1	17.54	19.86	23.12
325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing	1.68	3.249	4.036	9.329
325199	All Other Basic Organic Chemical Manufacturing	2.674	3.821	4.612	9.366
325211	Plastics Material and Resin Manufacturing	1.271	2.253	3.357	5.186
325212	Synthetic Rubber Manufacturing	1.459	2.292	3.264	4.706
325220	Artificial and Synthetic Fibers and Filaments Manufacturing	1.826	3.246	5.253	7.385
325311	Nitrogenous Fertilizer Manufacturing	0.6482	1.473	4.58	9.965
325312	Phosphatic Fertilizer Manufacturing	0.6116	1.476	3.157	7.261
325314	Fertilizer (Mixing Only) Manufacturing	0.5545	0.8309	1.151	2.424
325320	Pesticide and Other Agricultural Chemical Manufacturing	0.3613	0.8677	1.276	1.943
325411	Medicinal and Botanical Manufacturing	0.5258	1.185	1.911	2.874
325412	Pharmaceutical Preparation Manufacturing	0.4399	0.7607	1.104	1.887
325413	In-Vitro Diagnostic Substance Manufacturing	0.3508	0.6772	1.007	1.555

325414	Biological Product (except Diagnostic) Manufacturing	0.5613	0.9627	1.527	2.897
325510	Paint and Coating Manufacturing	0.4728	0.7899	1.356	2.19
325520	Adhesive Manufacturing	0.8454	1.225	1.781	2.321
325611	Soap and Other Detergent Manufacturing	0.5532	0.9315	1.627	2.532
325612	Polish and Other Sanitation Good Manufacturing	0.6192	0.9443	1.393	2.378
325613	Surface Active Agent Manufacturing	1.155	1.792	2.211	3.704
325620	Toilet Preparation Manufacturing	0.492	0.7024	1.048	1.822
325910	Printing Ink Manufacturing	0.6454	1.159	1.36	2.172
325920	Explosives Manufacturing	1.001	1.562	2.905	4.119
325991	Custom Compounding of Purchased Resins	1.232	1.686	2.56	3.673
325992	Photographic Film, Paper, Plate, and Chemical Manufacturing	1.034	1.953	3.297	5.67
325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing	0.6887	1.161	1.644	3.063
326111	Plastics Bag and Pouch Manufacturing	1.351	1.834	2.634	3.927
326112	Plastics Packaging Film and Sheet (including Laminated) Manufacturing	1.674	2.389	3.225	4.559
326113	Unlaminated Plastics Film and Sheet (except Packaging) Manufacturing	1.436	2.009	3.034	4.536
326121	Unlaminated Plastics Profile Shape Manufacturing	1.503	2.378	3.482	5.5
326122	Plastics Pipe and Pipe Fitting Manufacturing	1.752	2.327	3.396	4.59
326130	Laminated Plastics Plate, Sheet (except Packaging), and Shape Manufacturing	1.432	1.918	2.68	3.961
326140	Polystyrene Foam Product Manufacturing	1.621	2.394	3.238	5.685
326150	Urethane and Other Foam Product (except Polystyrene) Manufacturing	0.7079	1.096	1.516	2.359
326160	Plastics Bottle Manufacturing	3.004	4.204	5.357	6.812
326191	Plastics Plumbing Fixture Manufacturing	1.024	1.326	2.006	3.167
326199	All Other Plastics Product Manufacturing	1.559	2.128	3.121	4.125
326211	Tire Manufacturing (except Retreading)	1.443	2.28	3.386	4.592

326212	Tire Retreading	1.752	2.808	4.018	5.686
326220	Rubber and Plastics Hoses and Belting Manufacturing	0.8833	1.634	2.986	4.147
326291	Rubber Product Manufacturing for Mechanical Use	1.6	2.115	3.031	4.288
326299	All Other Rubber Product Manufacturing	1.158	1.619	2.1	3.704
327110	Pottery, Ceramics, and Plumbing Fixture Manufacturing	2.846	4.033	5.222	7.364
327120	Clay Building Material and Refractories Manufacturing	3.137	5.822	8.128	17.89
327211	Flat Glass Manufacturing	3.69	7.306	11.39	18.94
327212	Other Pressed and Blown Glass and Glassware Manufacturing	3.117	5.985	9.336	14.82
327213	Glass Container Manufacturing	13.49	16.17	17.6	19.92
327215	Glass Product Manufacturing Made of Purchased Glass	1.851	2.691	3.959	5.958
327310	Cement Manufacturing	13.57	28.51	37.16	51.92
327320	Ready-Mix Concrete Manufacturing	1.068	1.272	1.817	3.875
327331	Concrete Block and Brick Manufacturing	1.694	2.562	3.29	4.063
327332	Concrete Pipe Manufacturing	1.44	1.896	2.181	2.821
327390	Other Concrete Product Manufacturing	0.9933	1.315	1.813	3.02
327410	Lime Manufacturing	2.931	18.68	39.89	59.18
327420	Gypsum Product Manufacturing	8.544	13.45	16.18	18.23
327910	Abrasive Product Manufacturing	0.8402	1.703	2.583	4.579
327991	Cut Stone and Stone Product Manufacturing	1.364	1.867	2.668	4.045
327992	Ground or Treated Mineral and Earth Manufacturing	3.49	6.109	8.195	15.05
327993	Mineral Wool Manufacturing	1.423	4.114	7.605	9.273
327999	All Other Miscellaneous Nonmetallic Mineral Product Manufacturing	2.643	4	5.132	7.178
331110	Iron and Steel Mills and Ferroalloy Manufacturing	2.601	5.534	8.759	12.42

331210	Iron and Steel Pipe and Tube Manufacturing from Purchased Steel	0.9397	1.843	3.082	5.03
331221	Rolled Steel Shape Manufacturing	0.7683	1.482	2.901	5.136
331222	Steel Wire Drawing	1.283	1.997	3.257	4.58
331314	Secondary Smelting and Alloying of Aluminum	2.784	3.834	5.106	10.91
331315	Aluminum Sheet, Plate, and Foil Manufacturing	1.833	3.009	4.344	6.848
331318	Other Aluminum Rolling, Drawing, and Extruding	1.756	2.393	3.433	4.496
331410	Nonferrous Metal (except Aluminum) Smelting and Refining	0.5683	1.269	2.408	5.202
331420	Copper Rolling, Drawing, Extruding, and Alloying	0.8198	1.235	1.82	2.762
331491	Nonferrous Metal (except Copper and Aluminum) Rolling, Drawing, and Extruding	1.219	2.32	3.127	4.669
331492	Secondary Smelting, Refining, and Alloying of Nonferrous Metal (except Copper and Aluminum)	0.6395	1.462	2.813	4.693
331511	Iron Foundries	2.593	4.156	6.649	9.362
331512	Steel Investment Foundries	2.26	2.667	3.921	6.39
331513	Steel Foundries (except Investment)	2.617	3.649	5.557	6.959
331523	Nonferrous Metal Die-Casting Foundries	3.233	4.461	5.771	7.742
331524	Aluminum Foundries (except Die-Casting)	3.164	4.029	5.111	7.003
331529	Other Nonferrous Metal Foundries (except Die-Casting)	1.897	2.669	3.581	5.018
332111	Iron and Steel Forging	2.48	3.695	5.647	7.375
332114	Custom Roll Forming	0.9361	1.287	1.877	2.841
332117	Powder Metallurgy Part Manufacturing	2.688	3.666	5.645	8.552
332119	Metal Crown, Closure, and Other Metal Stamping (except Automotive)	1.045	1.407	2.033	3.12
332215	Metal Kitchen Cookware, Utensil, Cutlery, and Flatware (except Precious) Manufacturing	1.079	1.582	1.981	3.006
332216	Saw Blade and Handtool Manufacturing	1.01	1.452	1.834	3.115
332311	Prefabricated Metal Building and Component Manufacturing	0.6273	0.8206	1.116	1.991

332312	Fabricated Structural Metal Manufacturing	0.5936	0.8621	1.309	2.263
332313	Plate Work Manufacturing	1.244	1.882	2.69	3.805
332321	Metal Window and Door Manufacturing	0.6221	0.8931	1.165	2.055
332322	Sheet Metal Work Manufacturing	0.8311	1.282	1.687	2.74
332323	Ornamental and Architectural Metal Work Manufacturing	0.7741	1.036	1.52	2.606
332410	Power Boiler and Heat Exchanger Manufacturing	0.6747	1.002	1.374	2.061
332420	Metal Tank (Heavy Gauge) Manufacturing	0.766	1.344	2.052	2.923
332431	Metal Can Manufacturing	1.022	1.614	2.48	3.721
332439	Other Metal Container Manufacturing	1.016	1.401	1.845	2.806
332510	Hardware Manufacturing	0.6905	0.9765	1.472	2.39
332613	Spring Manufacturing	1.008	1.439	1.992	3.181
332618	Other Fabricated Wire Product Manufacturing	0.8737	1.241	1.844	2.821
332710	Machine Shops	1.502	2.267	2.978	5.1
332721	Precision Turned Product Manufacturing	1.215	1.8	2.64	3.856
332722	Bolt, Nut, Screw, Rivet, and Washer Manufacturing	1.154	1.544	2.074	3.052
332811	Metal Heat Treating	2.631	4.406	9.456	19.68
332812	Metal Coating, Engraving (except Jewelry and Silverware), and Allied Services to Manufacturers	2.128	3.044	4.258	6.56
332813	Electroplating, Plating, Polishing, Anodizing, and Coloring	3.056	4.319	5.522	8.151
332911	Industrial Valve Manufacturing	0.4954	0.6961	1.047	1.65
332912	Fluid Power Valve and Hose Fitting Manufacturing	0.6467	0.9098	1.345	2.102
332913	Plumbing Fixture Fitting and Trim Manufacturing	0.3065	0.4881	0.8072	1.506
332919	Other Metal Valve and Pipe Fitting Manufacturing	0.627	1.097	1.784	2.387
332991	Ball and Roller Bearing Manufacturing	1.616	2.349	3.069	4.416
332992	Small Arms Ammunition Manufacturing	0.8365	1.323	2.055	3.249

332994	Small Arms, Ordnance, and Ordnance Accessories Manufacturing	0.8706	1.416	1.956	3.459
332996	Fabricated Pipe and Pipe Fitting Manufacturing	0.7713	1.241	1.872	2.682
332999	All Other Miscellaneous Fabricated Metal Product Manufacturing	1.077	1.713	2.388	3.582
333111	Farm Machinery and Equipment Manufacturing	0.4174	0.7071	0.9923	1.656
333112	Lawn and Garden Tractor and Home Lawn and Garden Equipment Manufacturing	0.4787	0.738	0.9644	1.945
333120	Construction Machinery Manufacturing	0.4029	0.6423	0.859	1.439
333131	Mining Machinery and Equipment Manufacturing	0.6775	1.048	1.433	2.046
333132	Oil and Gas Field Machinery and Equipment Manufacturing	0.5233	0.8585	1.152	2.021
333241	Food Product Machinery Manufacturing	0.5072	0.7475	0.9513	1.718
333242	Semiconductor Machinery Manufacturing	0.4482	0.6375	0.9493	1.7
333243	Sawmill, Woodworking, and Paper Machinery Manufacturing	0.4985	0.753	1.148	2.146
333244	Printing Machinery and Equipment Manufacturing	0.9693	1.457	1.793	3.246
333249	Other Industrial Machinery Manufacturing	0.5879	0.9074	1.274	2.45
333314	Optical Instrument and Lens Manufacturing	0.4146	0.8084	1.338	2.599
333316	Photographic and Photocopying Equipment Manufacturing	0.3856	0.6382	1.082	1.927
333318	Other Commercial and Service Industry Machinery Manufacturing	0.4142	0.6194	0.9258	1.663
333413	Industrial and Commercial Fan and Blower and Air Purification Equipment Manufacturing	0.5728	0.8519	1.215	1.762
333414	Heating Equipment (except Warm Air Furnaces) Manufacturing	0.5179	0.6659	0.9434	1.691
333415	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing	0.4786	0.6306	0.7538	1.251
333511	Industrial Mold Manufacturing	1.201	1.706	2.424	3.545
333514	Special Die and Tool, Die Set, Jig, and Fixture Manufacturing	1.13	1.603	2.17	3.381

333515	Cutting Tool and Machine Tool Accessory Manufacturing	1.099	1.588	2.229	3.642
333517	Machine Tool Manufacturing	0.6292	0.9421	1.634	3.006
333519	Rolling Mill and Other Metalworking Machinery Manufacturing	0.4463	0.7719	1.225	2.158
333611	Turbine and Turbine Generator Set Units Manufacturing	0.5864	0.716	1.233	2.356
333612	Speed Changer, Industrial High-Speed Drive, and Gear Manufacturing	0.7651	1.118	1.535	2.444
333613	Mechanical Power Transmission Equipment Manufacturing	0.6904	1.06	1.53	2.459
333618	Other Engine Equipment Manufacturing	0.7143	0.9689	1.318	2.613
333912	Air and Gas Compressor Manufacturing	0.4151	0.5772	0.8103	1.536
333914	Measuring, Dispensing, and Other Pumping Equipment Manufacturing	0.34	0.5067	0.826	1.27
333921	Elevator and Moving Stairway Manufacturing	0.5146	0.6963	0.8483	1.32
333922	Conveyor and Conveying Equipment Manufacturing	0.4739	0.7065	0.9416	1.507
333923	Overhead Traveling Crane, Hoist, and Monorail System Manufacturing	0.3711	0.6082	0.8913	1.532
333924	Industrial Truck, Tractor, Trailer, and Stacker Machinery Manufacturing	0.6014	0.8051	1.019	1.686
333991	Power-Driven Handtool Manufacturing	0.4453	0.691	1.043	1.816
333992	Welding and Soldering Equipment Manufacturing	0.5975	0.9581	1.482	2.923
333993	Packaging Machinery Manufacturing	0.3529	0.5251	0.8539	1.585
333994	Industrial Process Furnace and Oven Manufacturing	0.5362	0.7928	1.032	1.785
333995	Fluid Power Cylinder and Actuator Manufacturing	0.6595	0.8679	1.119	1.674
333996	Fluid Power Pump and Motor Manufacturing	0.5563	0.7882	1.026	1.715
333997	Scale and Balance Manufacturing	0.5794	0.8232	1.175	1.86
333999	All Other Miscellaneous General Purpose Machinery Manufacturing	0.5002	0.8101	1.163	2.021
334111	Electronic Computer Manufacturing	0.3001	0.5414	1.123	2.528

334112	Computer Storage Device Manufacturing	1.28	3.285	4.723	10.09
334118	Computer Terminal and Other Computer Peripheral Equipment Manufacturing	0.6102	0.8464	1.146	2.386
334210	Telephone Apparatus Manufacturing	0.3281	0.5442	0.9554	1.849
334220	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing	0.3464	0.5036	0.77	1.247
334290	Other Communications Equipment Manufacturing	0.4122	0.6279	0.9492	1.8
334310	Audio and Video Equipment Manufacturing	0.3997	0.6781	1.159	2.19
334412	Bare Printed Circuit Board Manufacturing	0.6643	1.361	2.849	5.01
334413	Semiconductor and Related Device Manufacturing	1.267	1.879	2.87	4.804
334416	Capacitor, Resistor, Coil, Transformer, and Other Inductor Manufacturing	0.6862	0.9411	1.407	2.451
334417	Electronic Connector Manufacturing	0.5136	0.7614	1.031	1.527
334418	Printed Circuit Assembly (Electronic Assembly) Manufacturing	0.6236	0.9862	1.521	2.577
334419	Other Electronic Component Manufacturing	0.5329	0.8167	1.228	2.15
334510	Electromedical and Electrotherapeutic Apparatus Manufacturing	0.2342	0.3543	0.5692	1.037
334511	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing	0.4225	0.6035	0.9123	1.498
334512	Automatic Environmental Control Manufacturing for Residential, Commercial, and Appliance Use	0.4311	0.7669	1.233	2.563
334513	Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables	0.3945	0.6171	0.9504	1.714
334514	Totalizing Fluid Meter and Counting Device Manufacturing	0.3324	0.49	0.7902	1.454
334515	Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals	0.3041	0.5027	0.7803	1.378
334516	Analytical Laboratory Instrument Manufacturing	0.4267	0.6239	0.8993	1.661
334517	Irradiation Apparatus Manufacturing	0.2524	0.4651	0.7404	1.139

334519	Other Measuring and Controlling Device Manufacturing	0.4721	0.6842	0.9898	1.766
334614	Software and Other Prerecorded Compact Disc, Tape, and Record Reproducing	1.327	2.288	3.481	7.155
335110	Electric Lamp Bulb and Part Manufacturing	1.021	1.753	3.239	6.944
335121	Residential Electric Lighting Fixture Manufacturing	0.7995	1.153	1.729	3.181
335122	Commercial, Industrial, and Institutional Electric Lighting Fixture Manufacturing	0.4434	0.6726	0.9456	1.775
335129	Other Lighting Equipment Manufacturing	0.4445	0.6637	1.004	1.794
335210	Small Electrical Appliance Manufacturing	0.4421	0.7829	1.137	2.281
335220	Major Household Appliance Manufacturing	0.7139	0.9372	1.315	1.953
335311	Power, Distribution, and Specialty Transformer Manufacturing	0.7454	1.055	1.354	1.866
335312	Motor and Generator Manufacturing	0.5358	0.7074	1.047	1.77
335313	Switchgear and Switchboard Apparatus Manufacturing	0.4134	0.5687	0.7753	1.426
335314	Relay and Industrial Control Manufacturing	0.4077	0.6417	0.911	1.649
335911	Storage Battery Manufacturing	1.815	2.711	3.251	4.792
335912	Primary Battery Manufacturing	1.418	2.294	3.083	4.495
335921	Fiber Optic Cable Manufacturing	0.6412	0.9408	1.245	2.472
335929	Other Communication and Energy Wire Manufacturing	0.6158	0.8582	1.156	1.701
335931	Current-Carrying Wiring Device Manufacturing	0.3437	0.6242	0.933	1.578
335932	Noncurrent-Carrying Wiring Device Manufacturing	0.9149	1.206	1.647	2.595
335991	Carbon and Graphite Product Manufacturing	1.934	3.484	5.526	7.891
335999	All Other Miscellaneous Electrical Equipment and Component Manufacturing	0.4229	0.682	1.187	2.018
336111	Automobile Manufacturing	0.3334	0.4773	0.7373	1.178
336112	Light Truck and Utility Vehicle Manufacturing	0.288	0.3803	0.5443	1.038
336120	Heavy Duty Truck Manufacturing	0.2665	0.3473	0.4829	1.089
336211	Motor Vehicle Body Manufacturing	0.4991	0.699	0.9653	1.547

336212	Truck Trailer Manufacturing	0.6183	0.8406	1.109	1.597
336214	Travel Trailer and Camper Manufacturing	0.3302	0.5821	0.827	1.417
336310	Motor Vehicle Gasoline Engine and Engine Parts Manufacturing	0.7587	1.085	1.808	3.963
336320	Motor Vehicle Electrical and Electronic Equipment Manufacturing	0.5785	0.9153	1.361	2.166
336330	Motor Vehicle Steering and Suspension Components (except Spring) Manufacturing	0.7928	1.125	1.431	2.351
336340	Motor Vehicle Brake System Manufacturing	0.5952	0.9777	1.744	2.893
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing	0.59	0.8612	1.344	2.037
336360	Motor Vehicle Seating and Interior Trim Manufacturing	0.3594	0.8366	1.269	2.403
336370	Motor Vehicle Metal Stamping	0.8175	1.105	1.554	2.337
336390	Other Motor Vehicle Parts Manufacturing	0.587	0.8151	1.146	2.077
336411	Aircraft Manufacturing	0.5064	0.9411	1.292	2.403
336412	Aircraft Engine and Engine Parts Manufacturing	0.5992	0.9478	1.417	2.205
336413	Other Aircraft Parts and Auxiliary Equipment Manufacturing	0.6917	0.9687	1.39	2.322
336510	Railroad Rolling Stock Manufacturing	0.6076	0.7791	1.319	2.336
336611	Ship Building and Repairing	0.6328	0.8916	1.148	1.809
336612	Boat Building	0.6264	0.8628	1.417	2.573
336991	Motorcycle, Bicycle, and Parts Manufacturing	0.6879	1.051	1.632	3.666
336999	All Other Transportation Equipment Manufacturing	0.6776	1.213	2.192	5.162
337110	Wood Kitchen Cabinet and Countertop Manufacturing	1.1	1.523	1.906	2.79
337121	Upholstered Household Furniture Manufacturing	0.6687	0.8827	1.311	2.433
337122	Nonupholstered Wood Household Furniture Manufacturing	1.219	1.79	2.269	3.528
337124	Metal Household Furniture Manufacturing	0.74	1.059	1.738	3.179
337125	Household Furniture (except Wood and Metal) Manufacturing	1.069	1.579	2.354	4.041

337127	Institutional Furniture Manufacturing	0.8314	1.07	1.417	2.325
337211	Wood Office Furniture Manufacturing	1.077	1.34	1.634	2.456
337212	Custom Architectural Woodwork and Millwork Manufacturing	0.8811	1.288	1.645	2.702
337214	Office Furniture (except Wood) Manufacturing	0.6923	0.8984	1.207	1.966
337215	Showcase, Partition, Shelving, and Locker Manufacturing	1.213	1.671	2.055	2.797
337910	Mattress Manufacturing	0.4475	0.7062	0.9944	1.979
337920	Blind and Shade Manufacturing	0.5757	0.7737	1.14	2.021
339112	Surgical and Medical Instrument Manufacturing	0.4203	0.7529	1.131	1.927
339113	Surgical Appliance and Supplies Manufacturing	0.3344	0.5617	0.8886	1.688
339114	Dental Equipment and Supplies Manufacturing	0.5053	0.9385	1.64	3.191
339115	Ophthalmic Goods Manufacturing	0.6972	0.9324	1.245	2.237
339116	Dental Laboratories	1.074	1.504	2.242	3.52
339910	Jewelry and Silverware Manufacturing	0.8042	1.221	1.993	3.469
339920	Sporting and Athletic Goods Manufacturing	0.6859	1.082	1.49	2.398
339930	Doll, Toy, and Game Manufacturing	1.116	1.717	2.457	3.984
339940	Office Supplies (except Paper) Manufacturing	0.7731	1.186	1.846	3.199
339950	Sign Manufacturing	0.8747	1.143	1.576	2.465
339991	Gasket, Packing, and Sealing Device Manufacturing	0.8532	1.19	1.885	2.721
339992	Musical Instrument Manufacturing	1.215	1.762	2.414	3.915
339993	Fastener, Button, Needle, and Pin Manufacturing	1.153	1.699	2.233	3.103
339994	Broom, Brush, and Mop Manufacturing	0.616	0.972	1.491	2.543
339995	Burial Casket Manufacturing	1.282	1.855	2.565	3.844
339999	All Other Miscellaneous Manufacturing	0.9171	1.211	1.668	2.576
311213	Malt Manufacturing	1.845	3.973	6.069	8.132
311314	Cane Sugar Manufacturing	1.188	1.849	2.953	4.501
311512	Creamery Butter Manufacturing	0.82	1.555	2.261	2.938

325110	Petrochemical Manufacturing	3.541	6.654	10.723	15.75
332112	Nonferrous Forging	2.332	2.995	4.218	6.002
332993	Ammunition (except Small Arms) Manufacturing	0.76	1.821	5.461	11.68
336213	Motor Home Manufacturing	0.252	0.413	1.187	2.572
336414	Guided Missile and Space Vehicle Manufacturing	0.427	0.694	0.973	1.263
336419	Other Guided Missile and Space Vehicle Parts and Auxiliary Equipment Manufacturing	0.516	0.862	1.43	2.22
336992	Military Armored Vehicle, Tank, and Tank Component Manufacturing	0.357	0.486	1.165	2.395
311313	Beet Sugar Manufacturing	6.349	17.21	28.06	38.92
322110	Pulp Mills	6.976	11.98	16.98	21.98

Appendix B: Fuel Share Quintiles

Table 2: Industry-Level *F/E* Quintiles

NAICS Code	NAICS Title	20 th F/E	40 th F/E	60 th F/E	80 th F/E
311111	Dog and Cat Food Manufacturing	0.5012	0.6195	0.7017	0.7971
311119	Other Animal Food Manufacturing	0.4153	0.5474	0.6637	0.8076
311211	Flour Milling	0.1037	0.2301	0.4147	0.7168
311212	Rice Milling	0.2626	0.4247	0.6479	0.8738
311221	Wet Corn Milling	0.4986	0.6103	0.7194	0.7989
311224	Soybean and Other Oilseed Processing	0.5563	0.6729	0.725	0.7767
311225	Fats and Oils Refining and Blending	0.4284	0.6491	0.717	0.7684
311230	Breakfast Cereal Manufacturing	0.4297	0.6264	0.7168	0.811
311340	Nonchocolate Confectionery Manufacturing	0.4846	0.65	0.7494	0.829
311351	Chocolate and Confectionery Manufacturing from Cacao Beans	0.3904	0.5989	0.753	0.8523
311352	Confectionery Manufacturing from Purchased Chocolate	0.4857	0.6596	0.7513	0.8491
311411	Frozen Fruit, Juice, and Vegetable Manufacturing	0.3156	0.4975	0.6104	0.7293

311412	Frozen Specialty Food Manufacturing	0.338	0.4625	0.6023	0.8075
311421	Fruit and Vegetable Canning	0.5502	0.6472	0.7203	0.7827
311422	Specialty Canning	0.5603	0.6666	0.746	0.826
311423	Dried and Dehydrated Food Manufacturing	0.5684	0.6624	0.7586	0.8506
311511	Fluid Milk Manufacturing	0.2743	0.3681	0.4925	0.7011
311513	Cheese Manufacturing	0.421	0.5433	0.6164	0.743
311514	Dry, Condensed, and Evaporated Dairy Product Manufacturing	0.4858	0.6113	0.7122	0.8019
311520	Ice Cream and Frozen Dessert Manufacturing	0.2826	0.4317	0.6061	0.9039
311611	Animal (except Poultry) Slaughtering	0.4094	0.4969	0.5647	0.6782
311612	Meat Processed from Carcasses	0.3379	0.4666	0.5719	0.683
311613	Rendering and Meat Byproduct Processing	0.5663	0.7377	0.8273	0.8889
311615	Poultry Processing	0.2803	0.375	0.4791	0.6932
311710	Seafood Product Preparation and Packaging	0.378	0.5479	0.7191	0.8631
311811	Retail Bakeries	0.4899	0.6136	0.7553	0.8444
311812	Commercial Bakeries	0.4588	0.5433	0.6318	0.8012
311813	Frozen Cakes, Pies, and Other Pastries Manufacturing	0.3035	0.4297	0.551	0.7098
311821	Cookie and Cracker Manufacturing	0.483	0.5782	0.6744	0.7662
311824	Dry Pasta, Dough, and Flour Mixes Manufacturing from Purchased Flour	0.2743	0.4528	0.6037	0.8344
311830	Tortilla Manufacturing	0.4607	0.5672	0.6571	0.7821
311911	Roasted Nuts and Peanut Butter Manufacturing	0.3317	0.4707	0.6702	0.8494
311919	Other Snack Food Manufacturing	0.5639	0.7024	0.7803	0.8543
311920	Coffee and Tea Manufacturing	0.478	0.5854	0.7048	0.8313
311930	Flavoring Syrup and Concentrate Manufacturing	0.3364	0.5129	0.6511	0.7717
311941	Mayonnaise, Dressing, and Other Prepared Sauce Manufacturing	0.3661	0.4769	0.6043	0.7682
311942	Spice and Extract Manufacturing	0.3953	0.5181	0.6544	0.8061
311991	Perishable Prepared Food Manufacturing	0.4356	0.5509	0.6903	0.8447

311999	All Other Miscellaneous Food Manufacturing	0.4551	0.5723	0.6868	0.8115
312111	Soft Drink Manufacturing	0.2444	0.3504	0.5577	0.8086
312112	Bottled Water Manufacturing	0.1195	0.2794	0.5388	0.7846
312113	Ice Manufacturing	0.1441	0.5005	0.827	0.8999
312120	Breweries	0.4282	0.5625	0.6782	0.7794
312130	Wineries	0.3783	0.5205	0.6572	0.8188
312140	Distilleries	0.3532	0.5249	0.6856	0.825
312230	Tobacco Manufacturing	0.2892	0.4876	0.7028	0.8068
313110	Fiber, Yarn, and Thread Mills	0.0833	0.1664	0.3042	0.6941
313210	Broadwoven Fabric Mills	0.1312	0.2238	0.3716	0.6935
313220	Narrow Fabric Mills and Schiffli Machine Embroidery	0.2571	0.3944	0.5715	0.7675
313230	Nonwoven Fabric Mills	0.1451	0.2774	0.4784	0.7596
313240	Knit Fabric Mills	0.2279	0.4358	0.5525	0.6862
313310	Textile and Fabric Finishing Mills	0.5023	0.6136	0.6835	0.7522
313320	Fabric Coating Mills	0.4256	0.5545	0.6814	0.7695
314110	Carpet and Rug Mills	0.2949	0.5497	0.6706	0.7359
314120	Curtain and Linen Mills	0.3553	0.5103	0.6647	0.8159
314910	Textile Bag and Canvas Mills	0.4104	0.6048	0.7565	0.8586
314994	Rope, Cordage, Twine, Tire Cord, and Tire Fabric Mills	0.1654	0.3318	0.5343	0.7619
314999	All Other Miscellaneous Textile Product Mills	0.3834	0.5474	0.6943	0.8091
315110	Hosiery and Sock Mills	0.2694	0.3759	0.4797	0.6483
315190	Other Apparel Knitting Mills	0.4016	0.575	0.7171	0.8147
315210	Cut and Sew Apparel Contractors	0.3575	0.564	0.7203	0.838
315220	Men's and Boys' Cut and Sew Apparel Manufacturing	0.3276	0.5559	0.7383	0.8609
315240	Women's, Girls', and Infants' Cut and Sew Apparel Manufacturing	0.4694	0.6088	0.7204	0.8109
315280	Other Cut and Sew Apparel Manufacturing	0.409	0.6052	0.754	0.8764

315990	Apparel Accessories and Other Apparel Manufacturing	0.4365	0.606	0.7158	0.8085
316110	Leather and Hide Tanning and Finishing	0.2799	0.4159	0.5555	0.7201
316210	Footwear Manufacturing	0.2226	0.4153	0.6257	0.8309
316992	Women's Handbag and Purse Manufacturing	0.2496	0.4342	0.5865	0.752
316998	All Other Leather Good and Allied Product Manufacturing	0.3501	0.499	0.638	0.7939
321113	Sawmills	0.1437	0.2194	0.3373	0.6715
321114	Wood Preservation	0.3078	0.4762	0.6742	0.8613
321211	Hardwood Veneer and Plywood Manufacturing	0.1742	0.3369	0.4969	0.7005
321212	Softwood Veneer and Plywood Manufacturing	0.1894	0.4555	0.5405	0.7299
321213	Engineered Wood Member (except Truss) Manufacturing	0.1913	0.3518	0.5682	0.8531
321214	Truss Manufacturing	0.3797	0.5485	0.7121	0.8051
321219	Reconstituted Wood Product Manufacturing	0.3002	0.4515	0.5365	0.8084
321911	Wood Window and Door Manufacturing	0.2213	0.3562	0.5154	0.7848
321912	Cut Stock, Resawing Lumber, and Planing	0.1501	0.3596	0.5457	0.8167
321918	Other Millwork (including Flooring)	0.2183	0.3903	0.6034	0.8983
321920	Wood Container and Pallet Manufacturing	0.3604	0.507	0.6654	0.7774
321991	Manufactured Home (Mobile Home) Manufacturing	0.2035	0.3727	0.6118	0.9078
321992	Prefabricated Wood Building Manufacturing	0.3354	0.4844	0.6402	0.7448
321999	All Other Miscellaneous Wood Product Manufacturing	0.2975	0.4527	0.6306	0.8281
322121	Paper (except Newsprint) Mills	0.3969	0.5422	0.6475	0.7674
322130	Paperboard Mills	0.4769	0.5823	0.66	0.7723
322211	Corrugated and Solid Fiber Box Manufacturing	0.4291	0.5517	0.6236	0.7315
322212	Folding Paperboard Box Manufacturing	0.1892	0.361	0.5111	0.6715
322219	Other Paperboard Container Manufacturing	0.2246	0.3691	0.4943	0.6465
322220	Paper Bag and Coated and Treated Paper Manufacturing	0.3459	0.4998	0.611	0.8155

322230	Stationery Product Manufacturing	0.1154	0.288	0.5188	0.6938
322291	Sanitary Paper Product Manufacturing	0.1107	0.2276	0.4824	0.9468
322299	All Other Converted Paper Product Manufacturing	0.3326	0.4946	0.6586	0.7958
323111	Commercial Printing (except Screen and Books)	0.28	0.4772	0.6684	0.8503
323113	Commercial Screen Printing	0.3861	0.5468	0.6931	0.8379
323117	Books Printing	0.2103	0.397	0.6942	0.9035
323120	Support Activities for Printing	0.3052	0.5172	0.6989	0.8562
324110	Petroleum Refineries	0.4981	0.6134	0.7171	0.8615
324121	Asphalt Paving Mixture and Block Manufacturing	0.4515	0.701	0.8269	0.8908
324122	Asphalt Shingle and Coating Materials Manufacturing	0.5049	0.6222	0.7158	0.7853
324191	Petroleum Lubricating Oil and Grease Manufacturing	0.442	0.598	0.6945	0.7732
324199	All Other Petroleum and Coal Products Manufacturing	0.3627	0.5033	0.68	0.835
325120	Industrial Gas Manufacturing	0.01661	0.1181	0.5807	0.9593
325130	Synthetic Dye and Pigment Manufacturing	0.4321	0.5817	0.7188	0.8205
325180	Other Basic Inorganic Chemical Manufacturing	0.4365	0.7136	0.7805	0.833
325193	Ethyl Alcohol Manufacturing	0.7109	0.7856	0.8276	0.8542
325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing	0.3733	0.6204	0.8276	0.8611
325199	All Other Basic Organic Chemical Manufacturing	0.472	0.62	0.7465	0.8273
325211	Plastics Material and Resin Manufacturing	0.2457	0.4064	0.6114	0.8328
325212	Synthetic Rubber Manufacturing	0.3374	0.6026	0.7358	0.8367
325220	Artificial and Synthetic Fibers and Filaments Manufacturing	0.2115	0.3997	0.5466	0.7608
325311	Nitrogenous Fertilizer Manufacturing	0.2378	0.358	0.4704	0.6781
325312	Phosphatic Fertilizer Manufacturing	0.3454	0.5478	0.7304	0.8751
325314	Fertilizer (Mixing Only) Manufacturing	0.4124	0.6041	0.7416	0.8389
325320	Pesticide and Other Agricultural Chemical Manufacturing	0.3916	0.5253	0.6977	0.8425

325411	Medicinal and Botanical Manufacturing	0.4433	0.5772	0.6641	0.7742
325412	Pharmaceutical Preparation Manufacturing	0.303	0.4496	0.6541	0.8839
325413	In-Vitro Diagnostic Substance Manufacturing	0.2548	0.3916	0.5994	0.8698
325414	Biological Product (except Diagnostic) Manufacturing	0.3263	0.4344	0.5324	0.7862
325510	Paint and Coating Manufacturing	0.3149	0.4843	0.6726	0.8516
325520	Adhesive Manufacturing	0.4018	0.5577	0.6735	0.8563
325611	Soap and Other Detergent Manufacturing	0.4164	0.5718	0.683	0.801
325612	Polish and Other Sanitation Good Manufacturing	0.3074	0.4741	0.6581	0.8432
325613	Surface Active Agent Manufacturing	0.5064	0.6088	0.7021	0.8076
325620	Toilet Preparation Manufacturing	0.3612	0.5629	0.7124	0.8603
325910	Printing Ink Manufacturing	0.3293	0.5205	0.7841	0.885
325920	Explosives Manufacturing	0.4101	0.562	0.7189	0.8419
325991	Custom Compounding of Purchased Resins	0.1426	0.2484	0.4058	0.7423
325992	Photographic Film, Paper, Plate, and Chemical Manufacturing	0.3089	0.5188	0.722	0.882
325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing	0.4454	0.5792	0.7198	0.8221
326111	Plastics Bag and Pouch Manufacturing	0.06066	0.1098	0.28	0.6356
326112	Plastics Packaging Film and Sheet (including Laminated) Manufacturing	0.1215	0.2256	0.4011	0.6896
326113	Unlaminated Plastics Film and Sheet (except Packaging) Manufacturing	0.1142	0.1933	0.3687	0.6648
326121	Unlaminated Plastics Profile Shape Manufacturing	0.07096	0.1778	0.4091	0.7756
326122	Plastics Pipe and Pipe Fitting Manufacturing	0.0461	0.0886 7	0.2751	0.7183
326130	Laminated Plastics Plate, Sheet (except Packaging), and Shape Manufacturing	0.1729	0.2569	0.4436	0.6904
326140	Polystyrene Foam Product Manufacturing	0.4133	0.5696	0.6618	0.7463
326150	Urethane and Other Foam Product (except Polystyrene) Manufacturing	0.2217	0.3433	0.4946	0.7813
326160	Plastics Bottle Manufacturing	0.0251	0.0503 8	0.08952	0.2266

326191	Plastics Plumbing Fixture Manufacturing	0.2427	0.331	0.4719	0.659
326199	All Other Plastics Product Manufacturing	0.05871	0.1347	0.3669	0.7152
326211	Tire Manufacturing (except Retreading)	0.3262	0.415	0.5064	0.7697
326212	Tire Retreading	0.3466	0.5232	0.7303	0.818
326220	Rubber and Plastics Hoses and Belting Manufacturing	0.3282	0.4723	0.6352	0.7985
326291	Rubber Product Manufacturing for Mechanical Use	0.1924	0.3215	0.4419	0.6756
326299	All Other Rubber Product Manufacturing	0.2745	0.4026	0.5353	0.781
327110	Pottery, Ceramics, and Plumbing Fixture Manufacturing	0.5996	0.7013	0.7526	0.828
327120	Clay Building Material and Refractories Manufacturing	0.581	0.7072	0.7627	0.8415
327211	Flat Glass Manufacturing	0.4288	0.6317	0.7696	0.8584
327212	Other Pressed and Blown Glass and Glassware Manufacturing	0.4355	0.6401	0.7382	0.8331
327213	Glass Container Manufacturing	0.5117	0.5849	0.6291	0.757
327215	Glass Product Manufacturing Made of Purchased Glass	0.1844	0.3403	0.5869	0.8201
327310	Cement Manufacturing	0.601	0.7157	0.7761	0.8436
327320	Ready-Mix Concrete Manufacturing	0.6089	0.7383	0.7988	0.8747
327331	Concrete Block and Brick Manufacturing	0.5293	0.6576	0.756	0.8164
327332	Concrete Pipe Manufacturing	0.5492	0.6347	0.7015	0.7555
327390	Other Concrete Product Manufacturing	0.5776	0.6948	0.7514	0.8215
327410	Lime Manufacturing	0.2056	0.6857	0.8762	0.9153
327420	Gypsum Product Manufacturing	0.6444	0.8225	0.8668	0.9065
327910	Abrasive Product Manufacturing	0.2859	0.4858	0.6774	0.8246
327991	Cut Stone and Stone Product Manufacturing	0.5047	0.6737	0.7366	0.8174
327992	Ground or Treated Mineral and Earth Manufacturing	0.5273	0.6993	0.7637	0.8523
327993	Mineral Wool Manufacturing	0.3798	0.5487	0.6904	0.8059

327999	All Other Miscellaneous Nonmetallic Mineral Product Manufacturing	0.442	0.7002	0.776	0.8474
331110	Iron and Steel Mills and Ferroalloy Manufacturing	0.2555	0.4196	0.6305	0.8461
331210	Iron and Steel Pipe and Tube Manufacturing from Purchased Steel	0.1423	0.3215	0.567	0.793
331221	Rolled Steel Shape Manufacturing	0.2253	0.3794	0.5843	0.8036
331222	Steel Wire Drawing	0.2157	0.3635	0.5426	0.8017
331314	Secondary Smelting and Alloying of Aluminum	0.5132	0.6984	0.8076	0.8606
331315	Aluminum Sheet, Plate, and Foil Manufacturing	0.3606	0.5715	0.6735	0.7941
331318	Other Aluminum Rolling, Drawing, and Extruding	0.2856	0.4215	0.6019	0.7491
331410	Nonferrous Metal (except Aluminum) Smelting and Refining	0.2627	0.4628	0.7067	0.8451
331420	Copper Rolling, Drawing, Extruding, and Alloying	0.1333	0.2925	0.463	0.6619
331491	Nonferrous Metal (except Copper and Aluminum) Rolling, Drawing, and Extruding	0.3518	0.5555	0.7018	0.8432
331492	Secondary Smelting, Refining, and Alloying of Nonferrous Metal (except Copper and Aluminum)	0.273	0.4705	0.6407	0.8438
331511	Iron Foundries	0.08073	0.1469	0.2358	0.4601
331512	Steel Investment Foundries	0.2467	0.3329	0.4115	0.6596
331513	Steel Foundries (except Investment)	0.2382	0.32	0.4163	0.7684
331523	Nonferrous Metal Die-Casting Foundries	0.3468	0.5001	0.6165	0.7714
331524	Aluminum Foundries (except Die-Casting)	0.3545	0.4949	0.6073	0.7982
331529	Other Nonferrous Metal Foundries (except Die-Casting)	0.1759	0.2824	0.3985	0.6319
332111	Iron and Steel Forging	0.4226	0.5941	0.7065	0.8533
332114	Custom Roll Forming	0.2251	0.3774	0.5656	0.7783
332117	Powder Metallurgy Part Manufacturing	0.1816	0.37	0.5511	0.7623
332119	Metal Crown, Closure, and Other Metal Stamping (except Automotive)	0.244	0.3535	0.4711	0.6814
332215	Metal Kitchen Cookware, Utensil, Cutlery, and Flatware (except Precious) Manufacturing	0.2918	0.4559	0.5742	0.73
332216	Saw Blade and Handtool Manufacturing	0.2686	0.4181	0.5751	0.792

332311	Prefabricated Metal Building and Component Manufacturing	0.2894	0.454	0.6465	0.8582
332312	Fabricated Structural Metal Manufacturing	0.3518	0.4952	0.6705	0.8556
332313	Plate Work Manufacturing	0.3042	0.4763	0.6459	0.8398
332321	Metal Window and Door Manufacturing	0.3127	0.4459	0.6393	0.8635
332322	Sheet Metal Work Manufacturing	0.3607	0.5438	0.727	0.8354
332323	Ornamental and Architectural Metal Work Manufacturing	0.4315	0.5957	0.7389	0.8525
332410	Power Boiler and Heat Exchanger Manufacturing	0.2581	0.3885	0.5148	0.7637
332420	Metal Tank (Heavy Gauge) Manufacturing	0.3525	0.4774	0.6416	0.8157
332431	Metal Can Manufacturing	0.1682	0.2822	0.3739	0.5532
332439	Other Metal Container Manufacturing	0.4266	0.5468	0.6606	0.7788
332510	Hardware Manufacturing	0.3109	0.4333	0.5661	0.755
332613	Spring Manufacturing	0.2736	0.4239	0.5695	0.7498
332618	Other Fabricated Wire Product Manufacturing	0.296	0.4315	0.5639	0.7718
332710	Machine Shops	0.3446	0.5499	0.7292	0.8742
332721	Precision Turned Product Manufacturing	0.1909	0.3386	0.5576	0.789
332722	Bolt, Nut, Screw, Rivet, and Washer Manufacturing	0.2702	0.3873	0.5058	0.7085
332811	Metal Heat Treating	0.3459	0.5945	0.733	0.8218
332812	Metal Coating, Engraving (except Jewelry and Silverware), and Allied Services to Manufacturers	0.3468	0.5491	0.6628	0.7972
332813	Electroplating, Plating, Polishing, Anodizing, and Coloring	0.4398	0.5697	0.6726	0.7935
332911	Industrial Valve Manufacturing	0.1958	0.3063	0.4504	0.7227
332912	Fluid Power Valve and Hose Fitting Manufacturing	0.1168	0.212	0.399	0.7196
332913	Plumbing Fixture Fitting and Trim Manufacturing	0.2048	0.3828	0.5219	0.6695
332919	Other Metal Valve and Pipe Fitting Manufacturing	0.2003	0.3447	0.5808	0.8462
332991	Ball and Roller Bearing Manufacturing	0.2268	0.3976	0.5095	0.7741
332992	Small Arms Ammunition Manufacturing	0.4165	0.5616	0.6874	0.8344

332994	Small Arms, Ordnance, and Ordnance Accessories Manufacturing	0.3018	0.4894	0.6688	0.7957
332996	Fabricated Pipe and Pipe Fitting Manufacturing	0.339	0.4879	0.6421	0.8079
332999	All Other Miscellaneous Fabricated Metal Product Manufacturing	0.3751	0.5428	0.7157	0.8528
333111	Farm Machinery and Equipment Manufacturing	0.2708	0.4024	0.5581	0.7563
333112	Lawn and Garden Tractor and Home Lawn and Garden Equipment Manufacturing	0.2789	0.3906	0.5068	0.7341
333120	Construction Machinery Manufacturing	0.2834	0.4317	0.5667	0.6942
333131	Mining Machinery and Equipment Manufacturing	0.2662	0.4116	0.6078	0.8003
333132	Oil and Gas Field Machinery and Equipment Manufacturing	0.214	0.3554	0.5143	0.7469
333241	Food Product Machinery Manufacturing	0.2304	0.3844	0.6062	0.809
333242	Semiconductor Machinery Manufacturing	0.07126	0.141	0.2351	0.4727
333243	Sawmill, Woodworking, and Paper Machinery Manufacturing	0.2737	0.4177	0.5534	0.7529
333244	Printing Machinery and Equipment Manufacturing	0.2311	0.3809	0.6089	0.8714
333249	Other Industrial Machinery Manufacturing	0.2553	0.3965	0.5882	0.7881
333314	Optical Instrument and Lens Manufacturing	0.2246	0.4392	0.697	0.8854
333316	Photographic and Photocopying Equipment Manufacturing	0.3532	0.5832	0.7397	0.8655
333318	Other Commercial and Service Industry Machinery Manufacturing	0.2495	0.4125	0.6236	0.8415
333413	Industrial and Commercial Fan and Blower and Air Purification Equipment Manufacturing	0.242	0.3639	0.5206	0.7334
333414	Heating Equipment (except Warm Air Furnaces) Manufacturing	0.3316	0.4366	0.5788	0.7592
333415	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing	0.2032	0.2926	0.464	0.7865
333511	Industrial Mold Manufacturing	0.1192	0.2541	0.4667	0.7462
333514	Special Die and Tool, Die Set, Jig, and Fixture Manufacturing	0.1804	0.3482	0.5554	0.7855
333515	Cutting Tool and Machine Tool Accessory Manufacturing	0.1566	0.3408	0.5897	0.8459

333517	Machine Tool Manufacturing	0.2787	0.4492	0.6469	0.8538
333519	Rolling Mill and Other Metalworking Machinery Manufacturing	0.2268	0.3698	0.5183	0.6911
333611	Turbine and Turbine Generator Set Units Manufacturing	0.1346	0.2936	0.518	0.888
333612	Speed Changer, Industrial High-Speed Drive, and Gear Manufacturing	0.1618	0.2662	0.3819	0.6157
333613	Mechanical Power Transmission Equipment Manufacturing	0.1625	0.252	0.3993	0.6388
333618	Other Engine Equipment Manufacturing	0.2609	0.3938	0.5475	0.7538
333912	Air and Gas Compressor Manufacturing	0.2017	0.2979	0.5082	0.8141
333914	Measuring, Dispensing, and Other Pumping Equipment Manufacturing	0.1758	0.285	0.4522	0.651
333921	Elevator and Moving Stairway Manufacturing	0.2844	0.4063	0.5919	0.7859
333922	Conveyor and Conveying Equipment Manufacturing	0.2686	0.3905	0.5451	0.7707
333923	Overhead Traveling Crane, Hoist, and Monorail System Manufacturing	0.3154	0.5018	0.6382	0.7285
333924	Industrial Truck, Tractor, Trailer, and Stacker Machinery Manufacturing	0.2991	0.3961	0.5511	0.75
333991	Power-Driven Handtool Manufacturing	0.1857	0.3306	0.5235	0.7267
333992	Welding and Soldering Equipment Manufacturing	0.3369	0.5826	0.7675	0.8731
333993	Packaging Machinery Manufacturing	0.2396	0.388	0.5783	0.7999
333994	Industrial Process Furnace and Oven Manufacturing	0.2758	0.4312	0.5785	0.7865
333995	Fluid Power Cylinder and Actuator Manufacturing	0.1458	0.2155	0.3369	0.6405
333996	Fluid Power Pump and Motor Manufacturing	0.1185	0.2383	0.3922	0.5317
333997	Scale and Balance Manufacturing	0.2765	0.4187	0.5422	0.7019
333999	All Other Miscellaneous General Purpose Machinery Manufacturing	0.2406	0.4216	0.6412	0.829
334111	Electronic Computer Manufacturing	0.2691	0.4725	0.6607	0.8351
334112	Computer Storage Device Manufacturing	0.1415	0.3541	0.6938	0.93
334118	Computer Terminal and Other Computer Peripheral Equipment Manufacturing	0.3942	0.5464	0.6852	0.836

334210	Telephone Apparatus Manufacturing	0.4156	0.6538	0.8145	0.9108
334220	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing	0.2115	0.3443	0.5428	0.7941
334290	Other Communications Equipment Manufacturing	0.3991	0.5966	0.7637	0.8905
334310	Audio and Video Equipment Manufacturing	0.3247	0.5155	0.6845	0.8151
334412	Bare Printed Circuit Board Manufacturing	0.1907	0.4251	0.6274	0.8489
334413	Semiconductor and Related Device Manufacturing	0.2417	0.4071	0.7243	0.9103
334416	Capacitor, Resistor, Coil, Transformer, and Other Inductor Manufacturing	0.176	0.3367	0.5315	0.753
334417	Electronic Connector Manufacturing	0.1742	0.3111	0.4872	0.7232
334418	Printed Circuit Assembly (Electronic Assembly) Manufacturing	0.1692	0.3741	0.6114	0.7795
334419	Other Electronic Component Manufacturing	0.1988	0.3715	0.5764	0.7957
334510	Electromedical and Electrotherapeutic Apparatus Manufacturing	0.2378	0.4098	0.6228	0.798
334511	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing	0.1449	0.2781	0.5871	0.7942
334512	Automatic Environmental Control Manufacturing for Residential, Commercial, and Appliance Use	0.2908	0.5408	0.7685	0.9229
334513	Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables	0.24	0.453	0.6684	0.8603
334514	Totalizing Fluid Meter and Counting Device Manufacturing	0.2002	0.3612	0.5125	0.6769
334515	Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals	0.2867	0.4637	0.6563	0.8506
334516	Analytical Laboratory Instrument Manufacturing	0.2389	0.4447	0.6566	0.8412
334517	Irradiation Apparatus Manufacturing	0.3106	0.5116	0.6665	0.8023
334519	Other Measuring and Controlling Device Manufacturing	0.2667	0.4703	0.6908	0.8228
334614	Software and Other Prerecorded Compact Disc, Tape, and Record Reproducing	0.3643	0.6295	0.8207	0.9498
335110	Electric Lamp Bulb and Part Manufacturing	0.3487	0.5774	0.7352	0.9181
335121	Residential Electric Lighting Fixture Manufacturing	0.3817	0.5534	0.6996	0.8136

335122	Commercial, Industrial, and Institutional Electric Lighting Fixture Manufacturing	0.3553	0.5414	0.7099	0.8288
335129	Other Lighting Equipment Manufacturing	0.3662	0.5134	0.6461	0.7817
335210	Small Electrical Appliance Manufacturing	0.2372	0.4144	0.6097	0.8458
335220	Major Household Appliance Manufacturing	0.2787	0.4073	0.5088	0.6467
335311	Power, Distribution, and Specialty Transformer Manufacturing	0.2739	0.3952	0.5359	0.7824
335312	Motor and Generator Manufacturing	0.1971	0.3602	0.5365	0.7197
335313	Switchgear and Switchboard Apparatus Manufacturing	0.3229	0.4699	0.6439	0.8549
335314	Relay and Industrial Control Manufacturing	0.2847	0.4478	0.6262	0.8075
335911	Storage Battery Manufacturing	0.2478	0.3619	0.6484	0.9082
335912	Primary Battery Manufacturing	0.2448	0.6174	0.8503	0.916
335921	Fiber Optic Cable Manufacturing	0.3375	0.5135	0.6491	0.8334
335929	Other Communication and Energy Wire Manufacturing	0.1592	0.2839	0.412	0.636
335931	Current-Carrying Wiring Device Manufacturing	0.1906	0.3159	0.4941	0.7797
335932	Noncurrent-Carrying Wiring Device Manufacturing	0.2218	0.3138	0.5178	0.7617
335991	Carbon and Graphite Product Manufacturing	0.2739	0.4602	0.6044	0.8
335999	All Other Miscellaneous Electrical Equipment and Component Manufacturing	0.3011	0.4551	0.6269	0.828
336111	Automobile Manufacturing	0.3713	0.5076	0.6058	0.7807
336112	Light Truck and Utility Vehicle Manufacturing	0.389	0.4997	0.5676	0.7179
336120	Heavy Duty Truck Manufacturing	0.2815	0.4422	0.598	0.7583
336211	Motor Vehicle Body Manufacturing	0.3215	0.4702	0.6347	0.7915
336212	Truck Trailer Manufacturing	0.2537	0.383	0.5622	0.8118
336214	Travel Trailer and Camper Manufacturing	0.3175	0.4271	0.5783	0.7178
336310	Motor Vehicle Gasoline Engine and Engine Parts Manufacturing	0.1964	0.31	0.489	0.7975
336320	Motor Vehicle Electrical and Electronic Equipment Manufacturing	0.22	0.3871	0.5815	0.7403

336330	Motor Vehicle Steering and Suspension Components (except Spring) Manufacturing	0.1691	0.2992	0.4337	0.7523
336340	Motor Vehicle Brake System Manufacturing	0.1191	0.244	0.4119	0.6557
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing	0.1364	0.2528	0.4377	0.7585
336360	Motor Vehicle Seating and Interior Trim Manufacturing	0.171	0.3434	0.5497	0.745
336370	Motor Vehicle Metal Stamping	0.1214	0.2021	0.3399	0.6775
336390	Other Motor Vehicle Parts Manufacturing	0.2245	0.3615	0.4961	0.7314
336411	Aircraft Manufacturing	0.2713	0.4729	0.6772	0.8196
336412	Aircraft Engine and Engine Parts Manufacturing	0.1186	0.2242	0.4271	0.759
336413	Other Aircraft Parts and Auxiliary Equipment Manufacturing	0.2006	0.3148	0.4991	0.8305
336510	Railroad Rolling Stock Manufacturing	0.268	0.359	0.5393	0.7088
336611	Ship Building and Repairing	0.3085	0.4482	0.6096	0.8027
336612	Boat Building	0.2892	0.4775	0.6574	0.7895
336991	Motorcycle, Bicycle, and Parts Manufacturing	0.3762	0.5482	0.6741	0.8488
336999	All Other Transportation Equipment Manufacturing	0.4546	0.6631	0.8082	0.9008
337110	Wood Kitchen Cabinet and Countertop Manufacturing	0.3654	0.51	0.6474	0.7873
337121	Upholstered Household Furniture Manufacturing	0.2781	0.4987	0.7014	0.8647
337122	Nonupholstered Wood Household Furniture Manufacturing	0.3968	0.5666	0.7229	0.8312
337124	Metal Household Furniture Manufacturing	0.3451	0.5088	0.6625	0.8226
337125	Household Furniture (except Wood and Metal) Manufacturing	0.3668	0.5503	0.7068	0.843
337127	Institutional Furniture Manufacturing	0.2641	0.401	0.545	0.7772
337211	Wood Office Furniture Manufacturing	0.2752	0.3878	0.5467	0.7325
337212	Custom Architectural Woodwork and Millwork Manufacturing	0.3066	0.4663	0.6332	0.8089
337214	Office Furniture (except Wood) Manufacturing	0.2973	0.414	0.5284	0.7052
337215	Showcase, Partition, Shelving, and Locker Manufacturing	0.2688	0.423	0.6063	0.7946

337910	Mattress Manufacturing	0.3356	0.5499	0.7252	0.843
337920	Blind and Shade Manufacturing	0.3629	0.586	0.7291	0.8482
339112	Surgical and Medical Instrument Manufacturing	0.2114	0.4285	0.6907	0.8979
339113	Surgical Appliance and Supplies Manufacturing	0.2726	0.43	0.6211	0.803
339114	Dental Equipment and Supplies Manufacturing	0.3087	0.5145	0.6839	0.8103
339115	Ophthalmic Goods Manufacturing	0.3604	0.6078	0.8107	0.9228
339116	Dental Laboratories	0.5116	0.6567	0.7531	0.832
339910	Jewelry and Silverware Manufacturing	0.44	0.6136	0.7442	0.8593
339920	Sporting and Athletic Goods Manufacturing	0.3996	0.5654	0.6991	0.8082
339930	Doll, Toy, and Game Manufacturing	0.4631	0.6267	0.7585	0.8616
339940	Office Supplies (except Paper) Manufacturing	0.3097	0.4711	0.6405	0.8059
339950	Sign Manufacturing	0.4403	0.5998	0.7225	0.8189
339991	Gasket, Packing, and Sealing Device Manufacturing	0.2321	0.355	0.519	0.7831
339992	Musical Instrument Manufacturing	0.4455	0.6069	0.7574	0.874
339993	Fastener, Button, Needle, and Pin Manufacturing	0.2918	0.4213	0.5989	0.7856
339994	Broom, Brush, and Mop Manufacturing	0.1706	0.308	0.5432	0.7564
339995	Burial Casket Manufacturing	0.3753	0.5404	0.6948	0.8426
339999	All Other Miscellaneous Manufacturing	0.4438	0.6014	0.7251	0.8201
311213	Malt Manufacturing	0.449	0.624	0.747	0.818
311314	Cane Sugar Manufacturing	0.316	0.535	0.712	0.848
311512	Creamery Butter Manufacturing	0.501	0.584	0.656	0.717
325110	Petrochemical Manufacturing	0.295	0.621	0.837	0.943
332112	Nonferrous Forging	0.319	0.512	0.667	0.784
332993	Ammunition (except Small Arms) Manufacturing	0.24	0.48	0.685	0.854
336213	Motor Home Manufacturing	0.254	0.382	0.542	0.736
336414	Guided Missile and Space Vehicle Manufacturing	0.183	0.351	0.51	0.66
336419	Other Guided Missile and Space Vehicle Parts and Auxiliary Equipment Manufacturing	0.293	0.456	0.619	0.782

336992	Military Armored Vehicle, Tank, and Tank Component Manufacturing	0.254	0.473	0.669	0.84
311313	Beet Sugar Manufacturing	0.7037	0.781	0.8582	0.9355
322110	Pulp Mills	0.4332	0.5833	0.7333	0.8834

Appendix C: Carbon Per (MBtu) Energy Quintiles

Table 3: Industry-Level C/E Quintiles

NAICS Code	NAICS Title	20 th C/E	40 th C/E	60 th C/E	80 th C/E
311111	Dog and Cat Food Manufacturing	43.69	47.67	50.13	54.32
311119	Other Animal Food Manufacturing	43.97	48.11	50.73	55.02
311211	Flour Milling	36.22	45.66	48.46	52.4
311212	Rice Milling	40.59	44.02	47.18	49.43
311221	Wet Corn Milling	45.77	48.15	49.72	54.39
311224	Soybean and Other Oilseed Processing	44.86	48.26	49.61	54.32
311225	Fats and Oils Refining and Blending	43.14	46.11	48.86	53.68
311230	Breakfast Cereal Manufacturing	43.21	46.66	49.58	55.29
311340	Nonchocolate Confectionery Manufacturing	43.83	47.37	49.39	53.6
311351	Chocolate and Confectionery Manufacturing from Cacao Beans	41.08	46.86	49.69	52.63
311352	Confectionery Manufacturing from Purchased Chocolate	43.61	47.44	50.2	54.42
311411	Frozen Fruit, Juice, and Vegetable Manufacturing	38.19	41.92	44.92	48.54
311412	Frozen Specialty Food Manufacturing	40.55	45.59	48.36	49.6
311421	Fruit and Vegetable Canning	42.96	45.56	47.6	49.85
311422	Specialty Canning	43.79	46.22	47.82	49.94
311423	Dried and Dehydrated Food Manufacturing	42.3	45.34	47.36	49.53
311511	Fluid Milk Manufacturing	36.65	42.12	47.16	49.03
311513	Cheese Manufacturing	41.87	46.66	49.07	53.64

311514	Dry, Condensed, and Evaporated Dairy Product Manufacturing	43.53	46.59	49.31	52.13
311520	Ice Cream and Frozen Dessert Manufacturing	37.85	43.09	47.7	49.96
311611	Animal (except Poultry) Slaughtering	42.46	47.11	48.43	49.98
311612	Meat Processed from Carcasses	40.42	45.03	47.98	49.8
311613	Rendering and Meat Byproduct Processing	45.91	48.41	49.66	50.38
311615	Poultry Processing	40.04	44.72	46.97	49.39
311710	Seafood Product Preparation and Packaging	39.51	44.16	47.63	50.27
311811	Retail Bakeries	43.51	46.99	49.4	52.9
311812	Commercial Bakeries	41.86	45.15	48.47	52.95
311813	Frozen Cakes, Pies, and Other Pastries Manufacturing	38.41	43.41	47.01	50.98
311821	Cookie and Cracker Manufacturing	43.15	46	48.54	53.85
311824	Dry Pasta, Dough, and Flour Mixes Manufacturing from Purchased Flour	40.47	45.8	49.66	53.4
311830	Tortilla Manufacturing	42.69	45.16	47.75	50.46
311911	Roasted Nuts and Peanut Butter Manufacturing	37.98	43.91	48.18	51.15
311919	Other Snack Food Manufacturing	45.55	48.07	49.92	55.02
311920	Coffee and Tea Manufacturing	42.04	45.51	48.91	53.3
311930	Flavoring Syrup and Concentrate Manufacturing	39.98	43.92	47	49.63
311941	Mayonnaise, Dressing, and Other Prepared Sauce Manufacturing	39.62	44.11	48.3	52.55
311942	Spice and Extract Manufacturing	41.85	46.19	49.46	53.89
311991	Perishable Prepared Food Manufacturing	42.1	46.3	49.57	53.44
311999	All Other Miscellaneous Food Manufacturing	43.35	47.28	49.6	54.2
312111	Soft Drink Manufacturing	37.54	43.02	47.59	49.83
312112	Bottled Water Manufacturing	35.21	42.27	47.11	50.26
312113	Ice Manufacturing	40.09	46.9	49.38	50.54
312120	Breweries	40.12	44.5	47.55	49.94
312130	Wineries	36.88	41.02	45.63	49.28

312140	Distilleries	39.62	45.28	48.4	50.25
312230	Tobacco Manufacturing	38.63	43.54	46.33	48.91
313110	Fiber, Yarn, and Thread Mills	32.35	38.62	44.57	49.39
313210	Broadwoven Fabric Mills	33.3	39.01	45.22	49.23
313220	Narrow Fabric Mills and Schiffl Machine Embroidery	37.15	42.23	46.35	49.35
313230	Nonwoven Fabric Mills	35.48	43.1	47.75	50.62
313240	Knit Fabric Mills	35.09	41.47	44.3	47.79
313310	Textile and Fabric Finishing Mills	42.43	45.65	48.43	50.77
313320	Fabric Coating Mills	40.82	44.92	48.65	50.32
314110	Carpet and Rug Mills	44.24	46.32	48.25	49.12
314120	Curtain and Linen Mills	41.45	45.68	48.24	49.84
314910	Textile Bag and Canvas Mills	43.64	47.35	49.07	50.78
314994	Rope, Cordage, Twine, Tire Cord, and Tire Fabric Mills	38	43.33	46.57	48.99
314999	All Other Miscellaneous Textile Product Mills	42.41	46.43	48.41	49.93
315110	Hosiery and Sock Mills	36.31	39.11	44.21	46.91
315190	Other Apparel Knitting Mills	40.72	43.85	46.48	48.69
315210	Cut and Sew Apparel Contractors	36.97	42.88	45.72	48.09
315220	Men's and Boys' Cut and Sew Apparel Manufacturing	40.32	45.04	47.85	49.53
315240	Women's, Girls', and Infants' Cut and Sew Apparel Manufacturing	40.27	44.24	46.4	48.14
315280	Other Cut and Sew Apparel Manufacturing	41.25	45.47	48.02	49.51
315990	Apparel Accessories and Other Apparel Manufacturing	41.32	44.51	47.12	49.34
316110	Leather and Hide Tanning and Finishing	37.26	43.5	46.9	49.33
316210	Footwear Manufacturing	37.64	42.73	47.28	49.78
316992	Women's Handbag and Purse Manufacturing	36.59	43.22	46.68	49.27
316998	All Other Leather Good and Allied Product Manufacturing	39.98	44.59	47.61	49.47

321113	Sawmills	37.46	45.61	49.38	53.69
321114	Wood Preservation	41.6	47.19	49.67	51.33
321211	Hardwood Veneer and Plywood Manufacturing	38.7	44.74	47.57	49.48
321212	Softwood Veneer and Plywood Manufacturing	38.2	42.59	45.93	48.31
321213	Engineered Wood Member (except Truss) Manufacturing	36.61	44.35	47.93	49.99
321214	Truss Manufacturing	43.32	46.78	48.67	50.23
321219	Reconstituted Wood Product Manufacturing	40.51	45.49	48.14	49.47
321911	Wood Window and Door Manufacturing	38.04	44.14	47.84	50.55
321912	Cut Stock, Resawing Lumber, and Planing	38.48	45.28	48.85	50.82
321918	Other Millwork (including Flooring)	39.73	45.93	49.2	51.61
321920	Wood Container and Pallet Manufacturing	42.93	47.33	49.14	50.46
321991	Manufactured Home (Mobile Home) Manufacturing	39.49	45.96	49.12	51.36
321992	Prefabricated Wood Building Manufacturing	40.99	45.69	48.28	50.25
321999	All Other Miscellaneous Wood Product Manufacturing	39.87	45.76	48.89	50.68
322121	Paper (except Newsprint) Mills	39.63	46.54	49.62	57.31
322130	Paperboard Mills	41.11	46.77	48.85	50.56
322211	Corrugated and Solid Fiber Box Manufacturing	43.88	48.32	51.99	54.29
322212	Folding Paperboard Box Manufacturing	39.63	45.39	49.29	52.95
322219	Other Paperboard Container Manufacturing	39.48	45.21	49.97	53.33
322220	Paper Bag and Coated and Treated Paper Manufacturing	42.08	47.65	51.67	54.79
322230	Stationery Product Manufacturing	38.9	45.14	49.15	52.93
322291	Sanitary Paper Product Manufacturing	36.99	45.27	52.68	56.94
322299	All Other Converted Paper Product Manufacturing	41.24	46.66	50.64	54.28
323111	Commercial Printing (except Screen and Books)	39.97	45.45	48.39	49.82
323113	Commercial Screen Printing	41.33	45.94	48.27	49.72
323117	Books Printing	38.48	44.58	48.44	49.89

323120	Support Activities for Printing	40.07	45.58	48.48	49.93
324110	Petroleum Refineries	43.86	46.39	48.47	49.61
324121	Asphalt Paving Mixture and Block Manufacturing	45.56	49.1	50.87	52.49
324122	Asphalt Shingle and Coating Materials Manufacturing	43.83	46.42	48.54	49.64
324191	Petroleum Lubricating Oil and Grease Manufacturing	44.09	46.98	49.15	50.1
324199	All Other Petroleum and Coal Products Manufacturing	44.34	47.74	50.75	60.33
325120	Industrial Gas Manufacturing	36.56	44.63	48.1	50.37
325130	Synthetic Dye and Pigment Manufacturing	44.29	48.61	50.66	53.87
325180	Other Basic Inorganic Chemical Manufacturing	44.97	48.04	49.58	50.81
325193	Ethyl Alcohol Manufacturing	48.93	49.59	50.07	54.23
325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing	44.98	48.32	49.31	51.91
325199	All Other Basic Organic Chemical Manufacturing	44.03	47.58	49.32	50.83
325211	Plastics Material and Resin Manufacturing	39.73	45.6	48.39	50.11
325212	Synthetic Rubber Manufacturing	41.4	46.53	48.63	50.58
325220	Artificial and Synthetic Fibers and Filaments Manufacturing	37.53	42.79	45.93	49.04
325311	Nitrogenous Fertilizer Manufacturing	38.99	43.25	47.1	49.3
325312	Phosphatic Fertilizer Manufacturing	41.41	45.92	48.94	50.43
325314	Fertilizer (Mixing Only) Manufacturing	44.34	48.1	50.65	55.91
325320	Pesticide and Other Agricultural Chemical Manufacturing	44.05	48.04	50.9	57.33
325411	Medicinal and Botanical Manufacturing	40.97	44.15	47.23	49.89
325412	Pharmaceutical Preparation Manufacturing	37.51	43.91	48.35	50.07
325413	In-Vitro Diagnostic Substance Manufacturing	34.83	41.93	47.55	49.59
325414	Biological Product (except Diagnostic) Manufacturing	37.23	43.19	47.4	49.37
325510	Paint and Coating Manufacturing	42.92	48.29	50.66	55
325520	Adhesive Manufacturing	43.16	48.01	50.82	54.26

325611	Soap and Other Detergent Manufacturing	44.04	48.12	51.14	55.31
325612	Polish and Other Sanitation Good Manufacturing	42.45	47.69	50.63	54.95
325613	Surface Active Agent Manufacturing	42.95	46.04	48.87	52.38
325620	Toilet Preparation Manufacturing	43	47.99	51.15	58.64
325910	Printing Ink Manufacturing	43.69	48.51	50.29	54.1
325920	Explosives Manufacturing	45.2	48.12	50.07	54.38
325991	Custom Compounding of Purchased Resins	38.06	45.12	49.22	52.61
325992	Photographic Film, Paper, Plate, and Chemical Manufacturing	40.7	46.59	48.76	50.2
325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing	44.12	48.13	50.87	55.22
326111	Plastics Bag and Pouch Manufacturing	34.18	40.95	47.66	49.69
326112	Plastics Packaging Film and Sheet (including Laminated) Manufacturing	37.38	44.85	48.1	49.75
326113	Unlaminated Plastics Film and Sheet (except Packaging) Manufacturing	34.66	42.66	47.09	49.34
326121	Unlaminated Plastics Profile Shape Manufacturing	33.82	44.15	47.99	50.16
326122	Plastics Pipe and Pipe Fitting Manufacturing	36.71	42.88	46.9	50.13
326130	Laminated Plastics Plate, Sheet (except Packaging), and Shape Manufacturing	37.06	44.16	48.07	49.48
326140	Polystyrene Foam Product Manufacturing	41.62	45.47	48.05	49.66
326150	Urethane and Other Foam Product (except Polystyrene) Manufacturing	38.02	44.06	47.9	49.36
326160	Plastics Bottle Manufacturing	31.48	39.06	45.14	48.19
326191	Plastics Plumbing Fixture Manufacturing	39.2	43.86	47.46	49.54
326199	All Other Plastics Product Manufacturing	35.11	44.1	47.94	50.25
326211	Tire Manufacturing (except Retreading)	40.92	45.67	47.75	49.45
326212	Tire Retreading	42.49	46.46	48.58	49.81
326220	Rubber and Plastics Hoses and Belting Manufacturing	41.45	46.32	48.17	49.65
326291	Rubber Product Manufacturing for Mechanical Use	40.02	46.65	48.59	49.57

326299	All Other Rubber Product Manufacturing	39	44.96	48.4	49.7
327110	Pottery, Ceramics, and Plumbing Fixture Manufacturing	53.52	62.09	66.37	70.68
327120	Clay Building Material and Refractories Manufacturing	45.33	48.53	49.88	51.04
327211	Flat Glass Manufacturing	40.29	45.63	48.01	49.95
327212	Other Pressed and Blown Glass and Glassware Manufacturing	40.82	45.05	47.72	49.56
327213	Glass Container Manufacturing	40.34	46.49	48.49	50.42
327215	Glass Product Manufacturing Made of Purchased Glass	37.09	43.84	47.69	49.72
327310	Cement Manufacturing	54.29	71.37	79.01	85.52
327320	Ready-Mix Concrete Manufacturing	58.1	64.82	67.99	71.58
327331	Concrete Block and Brick Manufacturing	53.44	61.43	66.25	69.65
327332	Concrete Pipe Manufacturing	56.81	61.84	64.67	68.32
327390	Other Concrete Product Manufacturing	54.29	62.53	66.25	70.06
327410	Lime Manufacturing	43.86	55.23	82.95	88.66
327420	Gypsum Product Manufacturing	46.94	48.5	49.33	50.25
327910	Abrasive Product Manufacturing	46.29	54.55	62.7	69.11
327991	Cut Stone and Stone Product Manufacturing	51.72	59.16	64.43	68.85
327992	Ground or Treated Mineral and Earth Manufacturing	54.04	62.44	67.51	71.36
327993	Mineral Wool Manufacturing	42.99	47.18	49.19	50.9
327999	All Other Miscellaneous Nonmetallic Mineral Product Manufacturing	52.05	61.86	67.13	71.06
331110	Iron and Steel Mills and Ferroalloy Manufacturing	43.94	48.3	49.48	52.06
331210	Iron and Steel Pipe and Tube Manufacturing from Purchased Steel	41.81	46.82	48.83	50.54
331221	Rolled Steel Shape Manufacturing	39.18	47.91	49.52	50.48
331222	Steel Wire Drawing	39.38	46.19	48.74	50.35
331314	Secondary Smelting and Alloying of Aluminum	47.65	49.05	49.91	50.68

331315	Aluminum Sheet, Plate, and Foil Manufacturing	42.85	46.64	48.41	49.65
331318	Other Aluminum Rolling, Drawing, and Extruding	40.79	45.87	48.31	49.95
331410	Nonferrous Metal (except Aluminum) Smelting and Refining	40.36	45.58	48.45	50.7
331420	Copper Rolling, Drawing, Extruding, and Alloying	36.19	43.95	48.8	52.27
331491	Nonferrous Metal (except Copper and Aluminum) Rolling, Drawing, and Extruding	41.73	47.46	50.73	54.51
331492	Secondary Smelting, Refining, and Alloying of Nonferrous Metal (except Copper and Aluminum)	43.27	48.39	51.07	55.94
331511	Iron Foundries	40.36	47.72	51.99	61.53
331512	Steel Investment Foundries	38.02	44.9	51.27	59.05
331513	Steel Foundries (except Investment)	40.14	47.75	51.82	58.65
331523	Nonferrous Metal Die-Casting Foundries	42.52	47.26	49.03	50.2
331524	Aluminum Foundries (except Die-Casting)	40.31	46.29	48.81	50.13
331529	Other Nonferrous Metal Foundries (except Die-Casting)	38.4	46.14	49.77	55.92
332111	Iron and Steel Forging	43.72	47.43	48.79	50.08
332114	Custom Roll Forming	40.63	45.92	48.5	49.87
332117	Powder Metallurgy Part Manufacturing	39.49	45.51	48.25	49.66
332119	Metal Crown, Closure, and Other Metal Stamping (except Automotive)	37.74	45.15	48.48	49.62
332215	Metal Kitchen Cookware, Utensil, Cutlery, and Flatware (except Precious) Manufacturing	38.62	44.16	47.39	49.41
332216	Saw Blade and Handtool Manufacturing	37.89	44.71	48.4	49.84
332311	Prefabricated Metal Building and Component Manufacturing	41.82	45.94	48.48	49.82
332312	Fabricated Structural Metal Manufacturing	41.15	46	48.64	49.95
332313	Plate Work Manufacturing	42.62	47.1	48.94	50.2
332321	Metal Window and Door Manufacturing	40.5	45.2	48.27	49.66
332322	Sheet Metal Work Manufacturing	40.96	46.02	48.23	49.8
332323	Ornamental and Architectural Metal Work Manufacturing	42.01	45.92	48.14	49.64

332410	Power Boiler and Heat Exchanger Manufacturing	40.02	45.99	48.11	49.72
332420	Metal Tank (Heavy Gauge) Manufacturing	42.17	46.58	48.36	49.76
332431	Metal Can Manufacturing	35.89	42.09	47.99	49.39
332439	Other Metal Container Manufacturing	42.37	46.39	48.55	49.8
332510	Hardware Manufacturing	38.67	44.4	47.98	49.46
332613	Spring Manufacturing	39.62	46.43	48.87	50.04
332618	Other Fabricated Wire Product Manufacturing	39.94	45.22	48.37	49.88
332710	Machine Shops	41.57	46.78	48.8	50.15
332721	Precision Turned Product Manufacturing	37.78	45.38	48.54	50.2
332722	Bolt, Nut, Screw, Rivet, and Washer Manufacturing	38.4	45.13	48.68	49.92
332811	Metal Heat Treating	43.67	47.86	49.57	50.62
332812	Metal Coating, Engraving (except Jewelry and Silverware), and Allied Services to Manufacturers	41.09	45.9	48.62	49.99
332813	Electroplating, Plating, Polishing, Anodizing, and Coloring	41.75	45.97	48.55	49.94
332911	Industrial Valve Manufacturing	37.58	42.67	47.3	49.29
332912	Fluid Power Valve and Hose Fitting Manufacturing	37.64	45.25	48.32	50.27
332913	Plumbing Fixture Fitting and Trim Manufacturing	35.04	40.25	45.73	48.8
332919	Other Metal Valve and Pipe Fitting Manufacturing	38.71	44.29	48.3	49.74
332991	Ball and Roller Bearing Manufacturing	37.32	43.11	47.64	49.3
332992	Small Arms Ammunition Manufacturing	42.3	46.38	48.41	49.98
332994	Small Arms, Ordnance, and Ordnance Accessories Manufacturing	39.24	44.59	47.7	49.69
332996	Fabricated Pipe and Pipe Fitting Manufacturing	41.08	46.02	48.25	49.69
332999	All Other Miscellaneous Fabricated Metal Product Manufacturing	42.04	46.86	48.81	50.21
333111	Farm Machinery and Equipment Manufacturing	42.45	46.91	48.73	50.66

333112	Lawn and Garden Tractor and Home Lawn and Garden Equipment Manufacturing	41.47	46.02	48.56	50.18
333120	Construction Machinery Manufacturing	41.2	46.36	48.82	50.52
333131	Mining Machinery and Equipment Manufacturing	42.84	47.78	49.16	50.73
333132	Oil and Gas Field Machinery and Equipment Manufacturing	41.01	43.72	47.38	49.15
333241	Food Product Machinery Manufacturing	39.68	46.34	48.7	50.89
333242	Semiconductor Machinery Manufacturing	27.97	31.38	37.61	43.8
333243	Sawmill, Woodworking, and Paper Machinery Manufacturing	38.52	45.07	48.56	50.66
333244	Printing Machinery and Equipment Manufacturing	37.98	46.34	49.12	51.07
333249	Other Industrial Machinery Manufacturing	39	46.08	48.91	51.16
333314	Optical Instrument and Lens Manufacturing	34.58	43.13	47.94	50.01
333316	Photographic and Photocopying Equipment Manufacturing	38.81	44.32	47.6	50.1
333318	Other Commercial and Service Industry Machinery Manufacturing	39.61	45.66	48.82	50.63
333413	Industrial and Commercial Fan and Blower and Air Purification Equipment Manufacturing	39.38	45.42	48.5	50.55
333414	Heating Equipment (except Warm Air Furnaces) Manufacturing	38.22	44.78	47.92	50.02
333415	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing	38.79	44.11	48.1	50.55
333511	Industrial Mold Manufacturing	38.91	47.5	49.39	51.92
333514	Special Die and Tool, Die Set, Jig, and Fixture Manufacturing	43.15	48.35	50.06	53.21
333515	Cutting Tool and Machine Tool Accessory Manufacturing	39.31	47.52	49.51	52.38
333517	Machine Tool Manufacturing	42.13	47.88	49.74	52.05
333519	Rolling Mill and Other Metalworking Machinery Manufacturing	39.65	47.7	49.55	53.1
333611	Turbine and Turbine Generator Set Units Manufacturing	35.02	44.24	48.75	50.73

333612	Speed Changer, Industrial High-Speed Drive, and Gear Manufacturing	38.69	46.45	48.97	51.51
333613	Mechanical Power Transmission Equipment Manufacturing	37.56	45.42	48.56	50.14
333618	Other Engine Equipment Manufacturing	41.58	47	48.99	51.41
333912	Air and Gas Compressor Manufacturing	38.95	45.82	48.86	50.93
333914	Measuring, Dispensing, and Other Pumping Equipment Manufacturing	38.51	43.77	47.51	49.77
333921	Elevator and Moving Stairway Manufacturing	38.66	45.32	47.97	49.95
333922	Conveyor and Conveying Equipment Manufacturing	42.68	47.36	49.29	51.45
333923	Overhead Traveling Crane, Hoist, and Monorail System Manufacturing	41.54	45.84	48.48	50.3
333924	Industrial Truck, Tractor, Trailer, and Stacker Machinery Manufacturing	41.3	46.46	48.73	50.65
333991	Power-Driven Handtool Manufacturing	36.53	44.61	48.25	50.54
333992	Welding and Soldering Equipment Manufacturing	43.54	48.02	49.88	51.39
333993	Packaging Machinery Manufacturing	38.43	45.38	48.6	50.45
333994	Industrial Process Furnace and Oven Manufacturing	39.55	46.59	49.13	51.11
333995	Fluid Power Cylinder and Actuator Manufacturing	37.94	45.82	48.44	50.3
333996	Fluid Power Pump and Motor Manufacturing	36.57	44.35	47.71	49.5
333997	Scale and Balance Manufacturing	39.34	45.33	48.14	50
333999	All Other Miscellaneous General Purpose Machinery Manufacturing	39.42	46.28	48.88	51.05
334111	Electronic Computer Manufacturing	38.04	43.31	46.93	49.35
334112	Computer Storage Device Manufacturing	31.86	42.24	47.59	49.91
334118	Computer Terminal and Other Computer Peripheral Equipment Manufacturing	39.82	43.99	47.4	49.09
334210	Telephone Apparatus Manufacturing	40.7	46.01	48.57	49.89
334220	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing	34.43	40.74	45.87	48.72

334290	Other Communications Equipment Manufacturing	41.69	46.48	48.85	50.04
334310	Audio and Video Equipment Manufacturing	38.38	44.13	47.38	49.25
334412	Bare Printed Circuit Board Manufacturing	35.54	42.6	47.72	49.91
334413	Semiconductor and Related Device Manufacturing	34.88	40.82	47.84	49.66
334416	Capacitor, Resistor, Coil, Transformer, and Other Inductor Manufacturing	33.61	40.82	46.21	49.19
334417	Electronic Connector Manufacturing	34.19	40.38	46.22	48.52
334418	Printed Circuit Assembly (Electronic Assembly) Manufacturing	36.78	44.25	47.67	49.44
334419	Other Electronic Component Manufacturing	35.21	42.24	47.07	49.47
334510	Electromedical and Electrotherapeutic Apparatus Manufacturing	35.68	42.71	46.86	49.16
334511	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing	34.34	41.19	46.11	49.04
334512	Automatic Environmental Control Manufacturing for Residential, Commercial, and Appliance Use	41.07	46.84	49.06	50.25
334513	Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables	39.03	45.05	48.38	49.97
334514	Totalizing Fluid Meter and Counting Device Manufacturing	37.37	42.85	46.41	48.99
334515	Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals	37.05	43.76	47.96	49.79
334516	Analytical Laboratory Instrument Manufacturing	36.79	43.2	47.35	49.26
334517	Irradiation Apparatus Manufacturing	39.55	44.83	47.96	49.29
334519	Other Measuring and Controlling Device Manufacturing	38.23	45.04	48.01	49.8
334614	Software and Other Prerecorded Compact Disc, Tape, and Record Reproducing	42.55	47.45	49.37	50.37
335110	Electric Lamp Bulb and Part Manufacturing	40.4	46.21	48.59	49.94
335121	Residential Electric Lighting Fixture Manufacturing	39.05	44.29	47.26	49.09

335122	Commercial, Industrial, and Institutional Electric Lighting Fixture Manufacturing	39.63	44.66	47.45	49.38
335129	Other Lighting Equipment Manufacturing	39.59	44.4	47.17	49.3
335210	Small Electrical Appliance Manufacturing	37.64	43.98	47.45	49.24
335220	Major Household Appliance Manufacturing	41.02	45.34	47.5	49.11
335311	Power, Distribution, and Specialty Transformer Manufacturing	38.02	44.39	48.34	49.6
335312	Motor and Generator Manufacturing	38.61	44.72	48.12	49.75
335313	Switchgear and Switchboard Apparatus Manufacturing	40.53	46.29	48.93	50.1
335314	Relay and Industrial Control Manufacturing	40.11	45.58	48.36	49.69
335911	Storage Battery Manufacturing	37.52	45.82	48.73	50.03
335912	Primary Battery Manufacturing	42.06	46.69	49.11	50.17
335921	Fiber Optic Cable Manufacturing	37.25	41.72	45.84	48.64
335929	Other Communication and Energy Wire Manufacturing	33.6	39.21	44.72	48.65
335931	Current-Carrying Wiring Device Manufacturing	35.78	44.09	48.11	49.69
335932	Noncurrent-Carrying Wiring Device Manufacturing	40.04	45.74	48.42	49.6
335991	Carbon and Graphite Product Manufacturing	38.1	43.61	48.08	49.91
335999	All Other Miscellaneous Electrical Equipment and Component Manufacturing	37.5	43.32	47.99	49.81
336111	Automobile Manufacturing	41.05	46.85	49.11	52.18
336112	Light Truck and Utility Vehicle Manufacturing	43.93	47.71	49.25	51.94
336120	Heavy Duty Truck Manufacturing	39.55	44.99	48.34	49.92
336211	Motor Vehicle Body Manufacturing	41.35	46.7	48.76	50.25
336212	Truck Trailer Manufacturing	42.41	46.67	48.69	50.33
336214	Travel Trailer and Camper Manufacturing	41.96	46.66	48.7	49.73
336310	Motor Vehicle Gasoline Engine and Engine Parts Manufacturing	38.57	45.84	48.81	51.24
336320	Motor Vehicle Electrical and Electronic Equipment Manufacturing	40.8	45.83	48.68	50.56

336330	Motor Vehicle Steering and Suspension Components (except Spring) Manufacturing	40.75	45.94	48.76	50.98
336340	Motor Vehicle Brake System Manufacturing	41.47	45.65	48.5	49.83
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing	38.61	45.86	48.87	51.1
336360	Motor Vehicle Seating and Interior Trim Manufacturing	43.46	46.78	49.06	51.51
336370	Motor Vehicle Metal Stamping	45.28	48.35	50.52	55.49
336390	Other Motor Vehicle Parts Manufacturing	40.31	45.81	48.58	50.48
336411	Aircraft Manufacturing	39.36	44.03	47.3	49.01
336412	Aircraft Engine and Engine Parts Manufacturing	34.54	42.87	47.63	49.9
336413	Other Aircraft Parts and Auxiliary Equipment Manufacturing	35.34	42.8	47.27	49.65
336510	Railroad Rolling Stock Manufacturing	39.73	46.6	48.74	50.19
336611	Ship Building and Repairing	39.63	43.51	46.7	49.3
336612	Boat Building	39.49	43.79	47.04	49.61
336991	Motorcycle, Bicycle, and Parts Manufacturing	39.75	44.78	48.63	50.39
336999	All Other Transportation Equipment Manufacturing	44.22	47.95	49.67	50.71
337110	Wood Kitchen Cabinet and Countertop Manufacturing	41.01	45.35	47.77	49.65
337121	Upholstered Household Furniture Manufacturing	39.43	45.04	48.14	49.77
337122	Nonupholstered Wood Household Furniture Manufacturing	41.66	46.17	48.47	50.04
337124	Metal Household Furniture Manufacturing	39.58	44.77	48.05	49.87
337125	Household Furniture (except Wood and Metal) Manufacturing	40.89	45.07	47.77	49.63
337127	Institutional Furniture Manufacturing	39.98	45.4	48.29	50.42
337211	Wood Office Furniture Manufacturing	38.14	44.35	47.87	49.86
337212	Custom Architectural Woodwork and Millwork Manufacturing	39.15	44.62	47.97	49.72
337214	Office Furniture (except Wood) Manufacturing	38.75	44.53	48.09	51.44

337215	Showcase, Partition, Shelving, and Locker Manufacturing	38.85	44.95	48.09	49.93
337910	Mattress Manufacturing	40.77	45.51	48	49.89
337920	Blind and Shade Manufacturing	41.48	45.65	48.23	49.77
339112	Surgical and Medical Instrument Manufacturing	37.09	44.5	48.29	50.16
339113	Surgical Appliance and Supplies Manufacturing	38.82	44.42	48.1	50.16
339114	Dental Equipment and Supplies Manufacturing	39.1	44.32	47.57	49.97
339115	Ophthalmic Goods Manufacturing	41.81	46.86	49.25	50.94
339116	Dental Laboratories	42.79	46.03	48.14	50.22
339910	Jewelry and Silverware Manufacturing	41.57	45.72	48.23	50
339920	Sporting and Athletic Goods Manufacturing	40.62	45.05	47.82	50.3
339930	Doll, Toy, and Game Manufacturing	41.59	46.02	48.63	50.79
339940	Office Supplies (except Paper) Manufacturing	39.52	44.9	48.15	50.25
339950	Sign Manufacturing	42.3	45.98	48.21	50.35
339991	Gasket, Packing, and Sealing Device Manufacturing	37.86	44.09	48.31	49.72
339992	Musical Instrument Manufacturing	40.98	46.12	48.6	50.17
339993	Fastener, Button, Needle, and Pin Manufacturing	38.64	44.75	48.15	50.08
339994	Broom, Brush, and Mop Manufacturing	39.7	45.63	48.34	50.4
339995	Burial Casket Manufacturing	44.96	47.95	49.39	50.63
339999	All Other Miscellaneous Manufacturing	41.42	45.47	48.02	50.37
311213	Malt Manufacturing	43.12	47.08	51.423	56.15
311314	Cane Sugar Manufacturing	43.06	46.327	49.243	51.81
311512	Creamery Butter Manufacturing	41.41	43.163	45.763	49.21
325110	Petrochemical Manufacturing	43.17	46.777	49.087	50.1
332112	Nonferrous Forging	39.98	44.46	48.02	50.66
332993	Ammunition (except Small Arms) Manufacturing	41.57	45.643	48.443	49.97
336213	Motor Home Manufacturing	44.01	47.277	49.307	50.1

336414	Guided Missile and Space Vehicle Manufacturing	33.42	38.967	43.513	47.06
336419	Other Guided Missile and Space Vehicle Parts and Auxiliary Equipment Manufacturing	35.71	40.77	44.857	47.97
336992	Military Armored Vehicle, Tank, and Tank Component Manufacturing	44.1	47.487	50.557	53.31
311313	Beet Sugar Manufacturing	49.16	61.12	73.08	85.04
322110	Pulp Mills	46.47	48.83	51.19	53.55

Appendix D: Carbon Per \$1,000 Production Quintiles

Table 4: Industry-Level C/Y Quintiles

NAICS Code	NAICS Title	20 th C/\$	40 th C/\$	60 th C/\$	80 th C/\$
311111	Dog and Cat Food Manufacturing	49.09	58.47	76.67	125.5
311119	Other Animal Food Manufacturing	50.52	62.31	76.36	115.9
311211	Flour Milling	68.6	95.78	123.6	176.8
311212	Rice Milling	61.59	89.79	166.9	253.5
311221	Wet Corn Milling	131.8	316.8	533.6	662.2
311224	Soybean and Other Oilseed Processing	83.52	105	144.3	209.3
311225	Fats and Oils Refining and Blending	39.68	53.91	73.44	90.34
311230	Breakfast Cereal Manufacturing	82.41	106.7	182.7	243.7
311340	Nonchocolate Confectionery Manufacturing	86.11	113.2	137.8	190.5
311351	Chocolate and Confectionery Manufacturing from Cacao Beans	79.53	97.36	129.6	175.4
311352	Confectionery Manufacturing from Purchased Chocolate	80.63	105.9	133.9	178.7
311411	Frozen Fruit, Juice, and Vegetable Manufacturing	52.95	83.23	119.5	194.1
311412	Frozen Specialty Food Manufacturing	77.44	102	124.5	152
311421	Fruit and Vegetable Canning	77.94	96.79	121.8	152.3
311422	Specialty Canning	75.87	97.37	119.4	159.9
311423	Dried and Dehydrated Food Manufacturing	65.35	98.56	134.2	272.9

311511	Fluid Milk Manufacturing	46.15	60.18	74.31	90.81
311513	Cheese Manufacturing	56.59	67.39	83.68	109.5
311514	Dry, Condensed, and Evaporated Dairy Product Manufacturing	74.85	113	147.2	246.2
311520	Ice Cream and Frozen Dessert Manufacturing	55.36	77.75	116.5	145
311611	Animal (except Poultry) Slaughtering	42.53	52.36	68.55	124.9
311612	Meat Processed from Carcasses	50.8	61.42	75.96	107.9
311613	Rendering and Meat Byproduct Processing	152.9	338.9	541.1	745.3
311615	Poultry Processing	44.59	60.94	81.85	101.5
311710	Seafood Product Preparation and Packaging	36.45	65.62	92.67	166.1
311811	Retail Bakeries	133	178.6	225.9	269.9
311812	Commercial Bakeries	85.45	105.1	125.3	153.3
311813	Frozen Cakes, Pies, and Other Pastries Manufacturing	52.15	81.98	112.6	157.5
311821	Cookie and Cracker Manufacturing	81.27	103	127.7	158.1
311824	Dry Pasta, Dough, and Flour Mixes Manufacturing from Purchased Flour	62.67	96.8	116.6	157
311830	Tortilla Manufacturing	120.4	142.5	176.7	219.1
311911	Roasted Nuts and Peanut Butter Manufacturing	25.86	42.07	50.14	86.77
311919	Other Snack Food Manufacturing	51.12	67.09	128.1	180.5
311920	Coffee and Tea Manufacturing	40.63	55.71	67.76	90.94
311930	Flavoring Syrup and Concentrate Manufacturing	9.466	25.53	48.86	77.87
311941	Mayonnaise, Dressing, and Other Prepared Sauce Manufacturing	34.92	47.94	58.7	84.71
311942	Spice and Extract Manufacturing	32.41	49.93	62.63	105.9
311991	Perishable Prepared Food Manufacturing	55.11	72.79	88.41	116.4
311999	All Other Miscellaneous Food Manufacturing	51.85	68.69	99.45	155.4
312111	Soft Drink Manufacturing	30.33	43.02	56.06	84.31
312112	Bottled Water Manufacturing	60.95	94.96	128.7	191.4
312113	Ice Manufacturing	190	461.7	613	703.6

312120	Breweries	65.24	86.79	115.5	162.1
312130	Wineries	40.61	60.76	78.18	127.9
312140	Distilleries	28.04	52.51	93.69	189.6
312230	Tobacco Manufacturing	15.06	25.62	46.21	71.43
313110	Fiber, Yam, and Thread Mills	128.7	173.9	218.8	311.8
313210	Broadwoven Fabric Mills	95.23	124.2	152.6	203.3
313220	Narrow Fabric Mills and Schiffli Machine Embroidery	75.03	110.4	148.5	231.3
313230	Nonwoven Fabric Mills	71.15	112.5	157.8	222.3
313240	Knit Fabric Mills	89.11	121.6	147	195.2
313310	Textile and Fabric Finishing Mills	111.1	154.5	195.7	299.5
313320	Fabric Coating Mills	60.81	87.47	113.6	168.3
314110	Carpet and Rug Mills	51.08	72.27	96.21	168.5
314120	Curtain and Linen Mills	31.27	44.85	67.86	111.6
314910	Textile Bag and Canvas Mills	43.92	63.68	87.09	145.7
314994	Rope, Cordage, Twine, Tire Cord, and Tire Fabric Mills	58	83.62	119.8	202.2
314999	All Other Miscellaneous Textile Product Mills	50.73	71.88	103.2	156.7
315110	Hosiery and Sock Mills	116.7	145.3	164.1	208.4
315190	Other Apparel Knitting Mills	50.58	82.07	112.1	161.2
315210	Cut and Sew Apparel Contractors	42	63.35	91.11	138.4
315220	Men's and Boys' Cut and Sew Apparel Manufacturing	43.8	64.93	95.13	168.3
315240	Women's, Girls', and Infants' Cut and Sew Apparel Manufacturing	18.21	35.39	63.3	108.2
315280	Other Cut and Sew Apparel Manufacturing	38.57	61.76	95.09	150.7
315990	Apparel Accessories and Other Apparel Manufacturing	45.53	59.46	82.23	123.4
316110	Leather and Hide Tanning and Finishing	32.64	54.22	78.07	137.3
316210	Footwear Manufacturing	27.46	42.58	66.94	120.7
316992	Women's Handbag and Purse Manufacturing	32.93	52.01	83.26	162.4

316998	All Other Leather Good and Allied Product Manufacturing	45.34	66.28	96.17	157.1
321113	Sawmills	100.7	120	149.1	202.3
321114	Wood Preservation	45.86	69.88	105.6	137.7
321211	Hardwood Veneer and Plywood Manufacturing	61.38	89.17	123.9	197.4
321212	Softwood Veneer and Plywood Manufacturing	146.8	211.1	253.4	311.7
321213	Engineered Wood Member (except Truss) Manufacturing	63.87	88.43	117.2	186.6
321214	Truss Manufacturing	29.03	43.44	53.71	79.72
321219	Reconstituted Wood Product Manufacturing	156.6	279.6	362.8	449.3
321911	Wood Window and Door Manufacturing	34.34	46.35	61.4	94.16
321912	Cut Stock, Resawing Lumber, and Planing	71.23	107.6	142.9	188.1
321918	Other Millwork (including Flooring)	64.51	90.05	119.1	152.9
321920	Wood Container and Pallet Manufacturing	61.69	80	97.2	123.9
321991	Manufactured Home (Mobile Home) Manufacturing	23.08	32.33	54.61	131.6
321992	Prefabricated Wood Building Manufacturing	32.22	43.9	55.73	86
321999	All Other Miscellaneous Wood Product Manufacturing	64.24	90.93	118.6	177.4
322121	Paper (except Newsprint) Mills	316.6	488.2	621.5	907.9
322130	Paperboard Mills	496.8	698.9	820.6	974.7
322211	Corrugated and Solid Fiber Box Manufacturing	63.65	81.45	91.07	102.5
322212	Folding Paperboard Box Manufacturing	59.55	72.89	85.97	112.5
322219	Other Paperboard Container Manufacturing	40.35	53.97	69.61	87.23
322220	Paper Bag and Coated and Treated Paper Manufacturing	63.87	85.91	109.7	139
322230	Stationery Product Manufacturing	47.3	71.56	96.29	126.7
322291	Sanitary Paper Product Manufacturing	55.66	76.23	103	132.5
322299	All Other Converted Paper Product Manufacturing	42.71	75.86	128	258
323111	Commercial Printing (except Screen and Books)	68.5	94.89	126.4	184.5

323113	Commercial Screen Printing	75.03	107.9	142	206.8
323117	Books Printing	77.16	110.1	162.4	207
323120	Support Activities for Printing	67.9	96.42	147.6	248.6
324110	Petroleum Refineries	102	137.1	162.4	244.7
324121	Asphalt Paving Mixture and Block Manufacturing	168.9	233	284.7	406.2
324122	Asphalt Shingle and Coating Materials Manufacturing	51.04	78.81	98.37	156.1
324191	Petroleum Lubricating Oil and Grease Manufacturing	18.35	34.5	52.3	91.14
324199	All Other Petroleum and Coal Products Manufacturing	62.88	91.22	148.6	296
325120	Industrial Gas Manufacturing	50.87	174.7	753.7	1793
325130	Synthetic Dye and Pigment Manufacturing	68.2	121	178.9	382.3
325180	Other Basic Inorganic Chemical Manufacturing	170.5	206.9	281	574.4
325193	Ethyl Alcohol Manufacturing	677.7	876.5	986.8	1140
325194	Cyclic Crude, Intermediate, and Gum and Wood Chemical Manufacturing	84.59	159.6	195.8	438.3
325199	All Other Basic Organic Chemical Manufacturing	133.5	187.1	221	432.3
325211	Plastics Material and Resin Manufacturing	62.38	107.8	155	224.3
325212	Synthetic Rubber Manufacturing	72.09	110.5	153.2	209.3
325220	Artificial and Synthetic Fibers and Filaments Manufacturing	86.14	147.1	228.1	300.5
325311	Nitrogenous Fertilizer Manufacturing	31.1	68.24	201.6	414
325312	Phosphatic Fertilizer Manufacturing	30.3	71.34	146.9	320.3
325314	Fertilizer (Mixing Only) Manufacturing	29.25	41.66	55.95	112.9
325320	Pesticide and Other Agricultural Chemical Manufacturing	19.32	43.67	62.03	90.24
325411	Medicinal and Botanical Manufacturing	25.39	55.24	85.55	123.2
325412	Pharmaceutical Preparation Manufacturing	21.57	36.1	49.46	78.03
325413	In-Vitro Diagnostic Substance Manufacturing	16.97	31.44	43.36	60.78

325414	Biological Product (except Diagnostic) Manufacturing	27.05	44.82	67.24	118.2
325510	Paint and Coating Manufacturing	24.77	39.64	66.12	101.1
325520	Adhesive Manufacturing	44.13	61.57	86.51	106.9
325611	Soap and Other Detergent Manufacturing	29.21	47.07	79.27	117.7
325612	Polish and Other Sanitation Good Manufacturing	32.42	47.25	67.25	108.4
325613	Surface Active Agent Manufacturing	58.07	86.56	103	166
325620	Toilet Preparation Manufacturing	26.64	35.48	50.96	83.8
325910	Printing Ink Manufacturing	33.44	57.87	66.46	101.2
325920	Explosives Manufacturing	51.85	77.6	140.9	193.4
325991	Custom Compounding of Purchased Resins	62.05	81.6	117.6	155.4
325992	Photographic Film, Paper, Plate, and Chemical Manufacturing	51.01	94.38	155	250.8
325998	All Other Miscellaneous Chemical Product and Preparation Manufacturing	36.23	58.42	80.03	142.5
326111	Plastics Bag and Pouch Manufacturing	63.37	84.95	111.4	150.2
326112	Plastics Packaging Film and Sheet (including Laminated) Manufacturing	81.62	113.4	146.7	190.8
326113	Unlaminated Plastics Film and Sheet (except Packaging) Manufacturing	68.43	92.82	132.1	179
326121	Unlaminated Plastics Profile Shape Manufacturing	73.43	112.3	156.4	220.1
326122	Plastics Pipe and Pipe Fitting Manufacturing	83.47	107.3	148.4	186.2
326130	Laminated Plastics Plate, Sheet (except Packaging), and Shape Manufacturing	69.64	90.7	120.4	163.7
326140	Polystyrene Foam Product Manufacturing	78.93	113.8	148.9	249.7
326150	Urethane and Other Foam Product (except Polystyrene) Manufacturing	34.32	51.66	67.96	98.24
326160	Plastics Bottle Manufacturing	133.6	167.8	210.3	262.9
326191	Plastics Plumbing Fixture Manufacturing	49.45	61.98	89.43	133
326199	All Other Plastics Product Manufacturing	74.72	100.4	139.1	171.9
326211	Tire Manufacturing (except Retreading)	69.88	107.9	156	201

326212	Tire Retreading	85.97	135.2	188.4	255.1
326220	Rubber and Plastics Hoses and Belting Manufacturing	43.07	78.11	139.4	184
326291	Rubber Product Manufacturing for Mechanical Use	78.37	101.9	142.6	188.7
326299	All Other Rubber Product Manufacturing	56.65	77.25	95.86	157.7
327110	Pottery, Ceramics, and Plumbing Fixture Manufacturing	193.8	264.2	328.7	432
327120	Clay Building Material and Refractories Manufacturing	157.9	288.8	396.6	845.3
327211	Flat Glass Manufacturing	180	347.3	525.1	823.8
327212	Other Pressed and Blown Glass and Glassware Manufacturing	151	282.4	425.6	642.6
327213	Glass Container Manufacturing	653	743.4	815.9	910.6
327215	Glass Product Manufacturing Made of Purchased Glass	89.78	126.3	176.6	245.1
327310	Cement Manufacturing	1108	2031	2685	3494
327320	Ready-Mix Concrete Manufacturing	73.13	85.68	118.9	240.8
327331	Concrete Block and Brick Manufacturing	114.5	167.3	205.1	241.4
327332	Concrete Pipe Manufacturing	95.23	121.5	136.1	168.8
327390	Other Concrete Product Manufacturing	67.32	86.14	114.7	178.9
327410	Lime Manufacturing	249.8	1446	2282	3446
327420	Gypsum Product Manufacturing	424.6	661.3	787.4	872.8
327910	Abrasive Product Manufacturing	54.83	104	145.1	234.7
327991	Cut Stone and Stone Product Manufacturing	90.29	118.3	160.7	227.3
327992	Ground or Treated Mineral and Earth Manufacturing	241	406.2	520	889.2
327993	Mineral Wool Manufacturing	70.97	200.7	361.9	422
327999	All Other Miscellaneous Nonmetallic Mineral Product Manufacturing	181.6	263.2	322.9	415.9
331110	Iron and Steel Mills and Ferroalloy Manufacturing	131.4	272.5	425.1	578.2

331210	Iron and Steel Pipe and Tube Manufacturing from Purchased Steel	46.53	89.25	145.5	225.4
331221	Rolled Steel Shape Manufacturing	38.34	72.91	139.9	228.1
331222	Steel Wire Drawing	63.36	96.32	152.1	199.1
331314	Secondary Smelting and Alloying of Aluminum	139.8	190.7	251.3	529
331315	Aluminum Sheet, Plate, and Foil Manufacturing	89.64	144.6	204.1	309
331318	Other Aluminum Rolling, Drawing, and Extruding	85.98	114.4	159.1	197.1
331410	Nonferrous Metal (except Aluminum) Smelting and Refining	28.05	60.75	111.1	226.2
331420	Copper Rolling, Drawing, Extruding, and Alloying	41.14	59.07	81.75	112.8
331491	Nonferrous Metal (except Copper and Aluminum) Rolling, Drawing, and Extruding	63.68	116.2	150.5	210.9
331492	Secondary Smelting, Refining, and Alloying of Nonferrous Metal (except Copper and Aluminum)	33.91	73.88	137.6	217.5
331511	Iron Foundries	144.7	212.5	323	431.7
331512	Steel Investment Foundries	107.2	136.1	181	269.3
331513	Steel Foundries (except Investment)	140	186.1	268.1	329.7
331523	Nonferrous Metal Die-Casting Foundries	160	217.1	274.8	351.2
331524	Aluminum Foundries (except Die-Casting)	156.1	194.6	239.2	307.4
331529	Other Nonferrous Metal Foundries (except Die-Casting)	97.64	130.9	167.8	219
332111	Iron and Steel Forging	122.3	179.3	269.4	338.9
332114	Custom Roll Forming	45.91	61.76	87.16	124.4
332117	Powder Metallurgy Part Manufacturing	131.2	174.9	260	368.6
332119	Metal Crown, Closure, and Other Metal Stamping (except Automotive)	51.14	67.27	93.14	131.6
332215	Metal Kitchen Cookware, Utensil, Cutlery, and Flatware (except Precious) Manufacturing	52.01	73.95	88.76	126.1
332216	Saw Blade and Handtool Manufacturing	49.47	68.58	83.35	130.8
332311	Prefabricated Metal Building and Component Manufacturing	30.75	39.37	51.84	88.19

332312	Fabricated Structural Metal Manufacturing	29.18	41.48	60.91	99.71
332313	Plate Work Manufacturing	61.51	91.41	127.7	172.4
332321	Metal Window and Door Manufacturing	30.37	42.56	53.37	89.02
332322	Sheet Metal Work Manufacturing	40.61	61.26	78.38	120.5
332323	Ornamental and Architectural Metal Work Manufacturing	37.73	49.41	70.47	115.6
332410	Power Boiler and Heat Exchanger Manufacturing	32.89	47.78	63.77	89.86
332420	Metal Tank (Heavy Gauge) Manufacturing	37.47	64.52	96.31	131
332431	Metal Can Manufacturing	49.62	75.55	107.3	147.4
332439	Other Metal Container Manufacturing	49.83	67.41	86.39	125.7
332510	Hardware Manufacturing	33.54	46.15	66.41	100.6
332613	Spring Manufacturing	49.73	69.62	93.46	139
332618	Other Fabricated Wire Product Manufacturing	42.79	59.25	84.55	121.6
332710	Machine Shops	74.11	109.7	140.5	227.9
332721	Precision Turned Product Manufacturing	59.78	86.23	121.5	163.3
332722	Bolt, Nut, Screw, Rivet, and Washer Manufacturing	56.75	74.07	95.07	129.5
332811	Metal Heat Treating	131.5	216.9	455.8	908.9
332812	Metal Coating, Engraving (except Jewelry and Silverware), and Allied Services to Manufacturers	104.6	146.3	197.8	288.5
332813	Electroplating, Plating, Polishing, Anodizing, and Coloring	150.1	207.5	256.7	360.9
332911	Industrial Valve Manufacturing	23.83	32.28	45.65	67.05
332912	Fluid Power Valve and Hose Fitting Manufacturing	31.75	43.4	61.69	88.72
332913	Plumbing Fixture Fitting and Trim Manufacturing	14.39	21.79	33.37	57.48
332919	Other Metal Valve and Pipe Fitting Manufacturing	30.65	52.11	80.44	100.4
332991	Ball and Roller Bearing Manufacturing	78.06	109.8	135.1	180.1
332992	Small Arms Ammunition Manufacturing	41.02	63.51	96.15	145.4

332994	Small Arms, Ordnance, and Ordnance Accessories Manufacturing	42.22	66.66	88.43	146.8
332996	Fabricated Pipe and Pipe Fitting Manufacturing	37.66	59.32	86.98	118.1
332999	All Other Miscellaneous Fabricated Metal Product Manufacturing	53.17	82.94	112.8	160.9
333111	Farm Machinery and Equipment Manufacturing	20.66	34.2	46.91	74.73
333112	Lawn and Garden Tractor and Home Lawn and Garden Equipment Manufacturing	23.56	35.46	44.87	85.97
333120	Construction Machinery Manufacturing	19.94	31.04	40.25	63.74
333131	Mining Machinery and Equipment Manufacturing	33.73	51.23	68.86	93.71
333132	Oil and Gas Field Machinery and Equipment Manufacturing	25.16	40.05	51.21	86.17
333241	Food Product Machinery Manufacturing	25.14	36.05	44.53	75.04
333242	Semiconductor Machinery Manufacturing	17.25	23.18	30.97	51.03
333243	Sawmill, Woodworking, and Paper Machinery Manufacturing	24.63	36.04	52.54	91.1
333244	Printing Machinery and Equipment Manufacturing	48.37	67.98	84.08	139.6
333249	Other Industrial Machinery Manufacturing	29.28	43.87	59.43	106
333314	Optical Instrument and Lens Manufacturing	20.22	37.98	59	103.2
333316	Photographic and Photocopying Equipment Manufacturing	18.74	29.96	48.66	81.16
333318	Other Commercial and Service Industry Machinery Manufacturing	20.52	29.85	42.86	71.91
333413	Industrial and Commercial Fan and Blower and Air Purification Equipment Manufacturing	28.25	40.79	55.93	75.77
333414	Heating Equipment (except Warm Air Furnaces) Manufacturing	25.07	31.49	42.84	71.29
333415	Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment Manufacturing	23.49	28.96	33.85	52.52
333511	Industrial Mold Manufacturing	60.53	83.61	116.1	156.2
333514	Special Die and Tool, Die Set, Jig, and Fixture Manufacturing	57.99	79.7	105.7	156.4

333515	Cutting Tool and Machine Tool Accessory Manufacturing	55.67	77.99	106.8	161.1
333517	Machine Tool Manufacturing	31.88	46.51	78.84	137
333519	Rolling Mill and Other Metalworking Machinery Manufacturing	22.75	37.96	58.89	95.99
333611	Turbine and Turbine Generator Set Units Manufacturing	27	34.26	55.66	95.54
333612	Speed Changer, Industrial High-Speed Drive, and Gear Manufacturing	38.24	54.18	72.07	105.9
333613	Mechanical Power Transmission Equipment Manufacturing	33.96	50.81	70.45	104
333618	Other Engine Equipment Manufacturing	35.69	47.08	62.47	117.1
333912	Air and Gas Compressor Manufacturing	20.63	27.85	37.62	66.16
333914	Measuring, Dispensing, and Other Pumping Equipment Manufacturing	16.46	23.69	36.77	52.92
333921	Elevator and Moving Stairway Manufacturing	25.09	32.55	38.89	56.31
333922	Conveyor and Conveying Equipment Manufacturing	23.77	34.55	44.96	68.55
333923	Overhead Traveling Crane, Hoist, and Monorail System Manufacturing	18.26	29.16	41.33	67.59
333924	Industrial Truck, Tractor, Trailer, and Stacker Machinery Manufacturing	29.77	38.87	47.81	74.85
333991	Power-Driven Handtool Manufacturing	21.89	32.84	47.29	75.14
333992	Welding and Soldering Equipment Manufacturing	30.16	47.43	71.72	135.1
333993	Packaging Machinery Manufacturing	17.41	25.18	39.3	67.52
333994	Industrial Process Furnace and Oven Manufacturing	26.77	38.55	48.61	78.14
333995	Fluid Power Cylinder and Actuator Manufacturing	32.34	41.59	51.86	71.43
333996	Fluid Power Pump and Motor Manufacturing	26.94	37.01	46.19	70.72
333997	Scale and Balance Manufacturing	28.32	39.17	53.92	79.86
333999	All Other Miscellaneous General Purpose Machinery Manufacturing	24.88	39.18	54.43	87.99
334111	Electronic Computer Manufacturing	14.37	25.02	49.45	104.2

334112	Computer Storage Device Manufacturing	62.1	148.1	204.6	384.3
334118	Computer Terminal and Other Computer Peripheral Equipment Manufacturing	29.34	39.54	51.19	101
334210	Telephone Apparatus Manufacturing	16.11	26.15	44.45	81.15
334220	Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing	16.28	22.58	32.16	47.66
334290	Other Communications Equipment Manufacturing	20.33	30.38	44.57	80.22
334310	Audio and Video Equipment Manufacturing	19.24	31.69	51.9	91.61
334412	Bare Printed Circuit Board Manufacturing	32.28	63.55	124.3	199.3
334413	Semiconductor and Related Device Manufacturing	61.54	87.25	121.2	184.7
334416	Capacitor, Resistor, Coil, Transformer, and Other Inductor Manufacturing	31.66	42.47	58.95	92.98
334417	Electronic Connector Manufacturing	24.21	34.3	42.84	57.88
334418	Printed Circuit Assembly (Electronic Assembly) Manufacturing	30.17	46.34	68.34	106.3
334419	Other Electronic Component Manufacturing	25.6	37.65	53.06	84.77
334510	Electromedical and Electrotherapeutic Apparatus Manufacturing	11.19	16.31	24.78	41.37
334511	Search, Detection, Navigation, Guidance, Aeronautical, and Nautical System and Instrument Manufacturing	19.98	27.23	38.48	57.6
334512	Automatic Environmental Control Manufacturing for Residential, Commercial, and Appliance Use	21.35	37.28	58.3	114.1
334513	Instruments and Related Products Manufacturing for Measuring, Displaying, and Controlling Industrial Process Variables	19.34	29.44	43.45	73.09
334514	Totalizing Fluid Meter and Counting Device Manufacturing	15.77	22.39	34.42	59.12
334515	Instrument Manufacturing for Measuring and Testing Electricity and Electrical Signals	14.81	23.69	34.8	56.6
334516	Analytical Laboratory Instrument Manufacturing	20.53	29.02	39.6	67.5
334517	Irradiation Apparatus Manufacturing	12.24	22.02	33.66	48.66

334519	Other Measuring and Controlling Device Manufacturing	23	32.44	45.17	74.73
334614	Software and Other Prerecorded Compact Disc, Tape, and Record Reproducing	66.04	112.1	166.5	325.5
335110	Electric Lamp Bulb and Part Manufacturing	50.16	84.34	151.2	304.7
335121	Residential Electric Lighting Fixture Manufacturing	38.37	53.81	77.6	134.2
335122	Commercial, Industrial, and Institutional Electric Lighting Fixture Manufacturing	21.38	31.54	42.76	75.7
335129	Other Lighting Equipment Manufacturing	21.35	30.94	45.13	76.2
335210	Small Electrical Appliance Manufacturing	21.29	36.61	50.79	94.53
335220	Major Household Appliance Manufacturing	34.37	44.11	60.19	85.17
335311	Power, Distribution, and Specialty Transformer Manufacturing	36.41	50.17	61.17	78.08
335312	Motor and Generator Manufacturing	26.13	33.56	47.53	74.83
335313	Switchgear and Switchboard Apparatus Manufacturing	20.42	27.53	36.3	62.72
335314	Relay and Industrial Control Manufacturing	19.93	30.68	42.03	71.55
335911	Storage Battery Manufacturing	89.39	123.8	150.9	203.7
335912	Primary Battery Manufacturing	70.24	111.5	145.4	201.5
335921	Fiber Optic Cable Manufacturing	30.11	42.35	52.97	98.71
335929	Other Communication and Energy Wire Manufacturing	28.06	37.43	46.6	62.88
335931	Current-Carrying Wiring Device Manufacturing	16.75	29.53	41.89	64.33
335932	Noncurrent-Carrying Wiring Device Manufacturing	44.73	57.75	76.22	112.8
335991	Carbon and Graphite Product Manufacturing	94.4	164.4	245.9	326.7
335999	All Other Miscellaneous Electrical Equipment and Component Manufacturing	20.6	32.09	52.53	82.72
336111	Automobile Manufacturing	16.78	23.22	34.88	52.46
336112	Light Truck and Utility Vehicle Manufacturing	14.49	18.61	26.14	47.95
336120	Heavy Duty Truck Manufacturing	13.05	16.56	22.05	46.62
336211	Motor Vehicle Body Manufacturing	24.63	33.8	45.48	68.93

336212	Truck Trailer Manufacturing	30.51	40.59	52.21	71.81
336214	Travel Trailer and Camper Manufacturing	16.22	28.11	38.93	63.45
336310	Motor Vehicle Gasoline Engine and Engine Parts Manufacturing	37.77	52.31	83.95	170.1
336320	Motor Vehicle Electrical and Electronic Equipment Manufacturing	28.6	44.04	63.15	94.91
336330	Motor Vehicle Steering and Suspension Components (except Spring) Manufacturing	39.36	54.22	66.55	103.1
336340	Motor Vehicle Brake System Manufacturing	29.18	46.86	80.61	127.2
336350	Motor Vehicle Transmission and Power Train Parts Manufacturing	29.36	41.57	62.44	87.51
336360	Motor Vehicle Seating and Interior Trim Manufacturing	17.98	40.66	59.94	109.2
336370	Motor Vehicle Metal Stamping	42.93	55.35	75.81	110.1
336390	Other Motor Vehicle Parts Manufacturing	28.96	39.15	53.13	90.58
336411	Aircraft Manufacturing	24.3	43.9	57.73	101.3
336412	Aircraft Engine and Engine Parts Manufacturing	29.08	44.24	62.1	87.18
336413	Other Aircraft Parts and Auxiliary Equipment Manufacturing	33.31	44.92	60.73	92.45
336510	Railroad Rolling Stock Manufacturing	29.97	37.64	62.03	102.4
336611	Ship Building and Repairing	30.21	41.07	50.68	75.9
336612	Boat Building	30.11	40.03	62.97	108.2
336991	Motorcycle, Bicycle, and Parts Manufacturing	33.94	50.3	74.34	156.8
336999	All Other Transportation Equipment Manufacturing	33.94	59.83	105.9	239.8
337110	Wood Kitchen Cabinet and Countertop Manufacturing	53.37	72.02	87.36	121.7
337121	Upholstered Household Furniture Manufacturing	32.63	41.95	59.86	104.1
337122	Nonupholstered Wood Household Furniture Manufacturing	59.85	85.94	105.8	156.5
337124	Metal Household Furniture Manufacturing	36.1	50.19	78.95	135.7
337125	Household Furniture (except Wood and Metal) Manufacturing	51.86	74.58	107.4	175.4

337127	Institutional Furniture Manufacturing	40.86	51.05	65.15	100.5
337211	Wood Office Furniture Manufacturing	51.29	61.74	73.62	102.8
337212	Custom Architectural Woodwork and Millwork Manufacturing	42.88	60.92	74.5	114.7
337214	Office Furniture (except Wood) Manufacturing	33.9	42.56	54.61	83
337215	Showcase, Partition, Shelving, and Locker Manufacturing	59.23	78.89	93.66	118.9
337910	Mattress Manufacturing	21.82	33.55	45.75	86.31
337920	Blind and Shade Manufacturing	28.12	36.92	52.63	88.89
339112	Surgical and Medical Instrument Manufacturing	20.61	35.79	51.19	80.04
339113	Surgical Appliance and Supplies Manufacturing	16.36	26.6	40.13	71.2
339114	Dental Equipment and Supplies Manufacturing	24.52	44.03	73.75	134.8
339115	Ophthalmic Goods Manufacturing	34.81	45.48	58.94	100.3
339116	Dental Laboratories	52.6	71.77	104.1	157.5
339910	Jewelry and Silverware Manufacturing	39.36	58.28	92.12	152.8
339920	Sporting and Athletic Goods Manufacturing	33.48	51.14	67.95	103.8
339930	Doll, Toy, and Game Manufacturing	55.24	82.6	114.4	176.3
339940	Office Supplies (except Paper) Manufacturing	37.87	56.33	84.09	136.8
339950	Sign Manufacturing	42.92	54.59	73.17	109.7
339991	Gasket, Packing, and Sealing Device Manufacturing	41.7	56.48	84.7	113.2
339992	Musical Instrument Manufacturing	59.81	84.76	112.5	172.5
339993	Fastener, Button, Needle, and Pin Manufacturing	56.41	80.65	101.4	131.3
339994	Broom, Brush, and Mop Manufacturing	30.29	46.46	68.84	110
339995	Burial Casket Manufacturing	63.95	91.08	123.7	179.7
339999	All Other Miscellaneous Manufacturing	44.9	57.53	76.69	113
311213	Malt Manufacturing	98.36	200.9	291	370
311314	Cane Sugar Manufacturing	59.72	89.97	138.5	202.6
311512	Creamery Butter Manufacturing	38.67	70.35	98.77	124.8

325110	Petrochemical Manufacturing	175.3	323.6	506.5	714
332112	Nonferrous Forging	114.4	141.7	190.5	256.1
332993	Ammunition (except Small Arms) Manufacturing	37.26	87.19	252.3	514.1
336213	Motor Home Manufacturing	12.5	20.2	56.6	118.2
336414	Guided Missile and Space Vehicle Manufacturing	19.2	29.57	38.77	47.84
336419	Other Guided Missile and Space Vehicle Parts and Auxiliary Equipment Manufacturing	23.78	37.96	59.47	86.02
336992	Military Armored Vehicle, Tank, and Tank Component Manufacturing	18.44	24.27	56.04	110.5
311313	Beet Sugar Manufacturing	494.4	1217	1755	2383
322110	Pulp Mills	363.7	607.6	837.1	1053