IPO FAILURE RISK BY INDUSTRY, AUDITOR INDUSTRY SPECIALIZATION, AND AUDIT FEES

By

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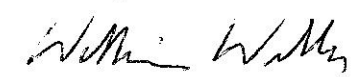

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ABSTRACT: This paper expands the extant literature on IPO failure risk in researching whether significant differences exist between industries in the risk of failure within 5 years of an IPO. I base my test of IPO failure risk on a model developed by Demers and Joos in their paper titled "IPO Failure Risk" (2007). I further explore which of the Big 4 audit firms specialize in those industries found to be risky according to the Demers/Joos model, and lastly determine whether firms that are *not* specialists in a risky industry charge higher audit fees to audit clients in that given industry. In providing industry-specific IPO risk analysis, this paper broadens the audit profession's knowledge base for accurately assessing audit risk and for appropriately setting audit fees.

Keywords: *IPO failure risk, auditor specialization, audit fees, industry classification*

Data Availability: *The data are available from public sources identified in the paper.*

I. Introduction

IPO failure risk, auditor specialization, and audit fees are all highly talked-about topics in the realm of accounting research today. The assessment of IPO companies is important to many different stakeholder groups, particularly since the failure rate of IPOs has continuously increased over time.[1] As more and more firms enter the public market, it is vital for auditors to remain knowledgeable of the risk quality of their clients to adequately prepare for engagements, make strategic business decisions, and to accurately estimate how much in audit fees to charge specific clients.

Elizabeth Demers and Philip Joos explore some of the factors that contribute to IPO failure in their paper titled "IPO Failure Risk" (2007). They develop an IPO failure prediction model using various accounting and other IPO-related variables, finding that significant differences can be observed between high tech and nontech firm subsamples. This suggests that risk of failure is affected by the industry of the specific firm, whether it is classified as high tech or nontech. I extend this study by observing the trends of IPO failure risk within 5 years of going public for individual industries using a unique industry classification. I predict and show statistically significant differences in IPO failure risk between particular industries.

Furthermore, I explore auditor concentration over the 1990-2010 period to examine how the Big 4 audit firms appear to manage their IPO-client portfolios in relation to risk of failure. Assuming that auditors are in business to make money, it seems reasonable that the Big 4 would strategically fill their client portfolios in a way that mitigates risk, or that they would control for such risk by including a risk premium in the audit fees charged to risky clients.[2] Thus, auditors may be observed to act as specialists in those industries found to be risky, mitigating risk through expertise, or auditors may take on risky clients in industries in which they are not specialists, controlling for risk by charging higher fees.

The purpose of this paper is to not only expand the extant literature on IPO failure risk based on industry specific analyses, but to apply the results to the area of auditor specialization trends. My research is based primarily on the foundations of others' work, but this paper does in fact document new and interesting trends for today's accounting audience. Prior literature shows that auditors' knowledge of their client's industry enables them to better assess audit risk.[3] Therefore, a better understanding of industry-specific risk associated with IPO clients will no doubt benefit the auditing profession.

I have three basic research questions that are answered in the course of this paper. In expanding the IPO failure risk model developed by Demers and Joos, I come to my first research question: (1) Are there significant differences between industries in the risk of failure within 5 years of an IPO? I next examine how such industry risk is reflected in both auditor specialization and audit fees, leading to my second and third research questions: (2) Which Big 4 audit firms are specialists in the risky industries determined from testing RQ1? and (3) For those firms that are *not* specialists in a risky industry, do they charge higher audit fees to audit clients in that given industry?

Based on the Demers and Joos paper, as well as other extant literature on the subject of IPO failure risk, I form the following three hypotheses in response to my three research questions:

H1: Significant differences will be observable between specific industry subsamples in the risk of failure within five years of an IPO within the 1990-2010 time period.

H2a: Big 4 auditor specialization will be more common in industries where risk of failure within five year of an IPO is highest during the 1990-2010 time period.

H2b: For those Big 4 firms who take on clients in risky industries where they are not specialists, higher audit fees will be charged, as observed post 2002 to 2010.

The balance of this paper is as follows: Section II provides a discussion of the sample selection and descriptive statistics, Section III details the results from testing my three hypotheses, and Section IV includes my conclusion and final remarks.

II. Sample Selection, Descriptive Statistics

The sample of firms used is from the Securities Data Corp. (SDC) New Issues database with a selection of all U.S. IPOs from January 1990-December 2010. I exclude rights issues, unit offerings, spin-offs, Real Estate Investment Trusts (REITs), American Depository Receipts (ADRs), and financial institutions. This results in a total sample of 1,962 firms.

Using a binary logit regression where failure = 1, it is found that 602 firms (30.68%) were delisted within five years of going public during the 1990-2010 time period, (see Table 1). It is relevant to note that delisting is used here as a proxy for failure; it is thus possible that a firm that delisted within five years of an IPO simply returned to being privately-held rather than delisting as a result of bankruptcy.

Table 1

Binary Logit Regression for Period 1990-2010

Ordered Value	Failure	Total Frequency	% of Total Sample
1	0	1,360	69.32%
2	1	602	30.68%

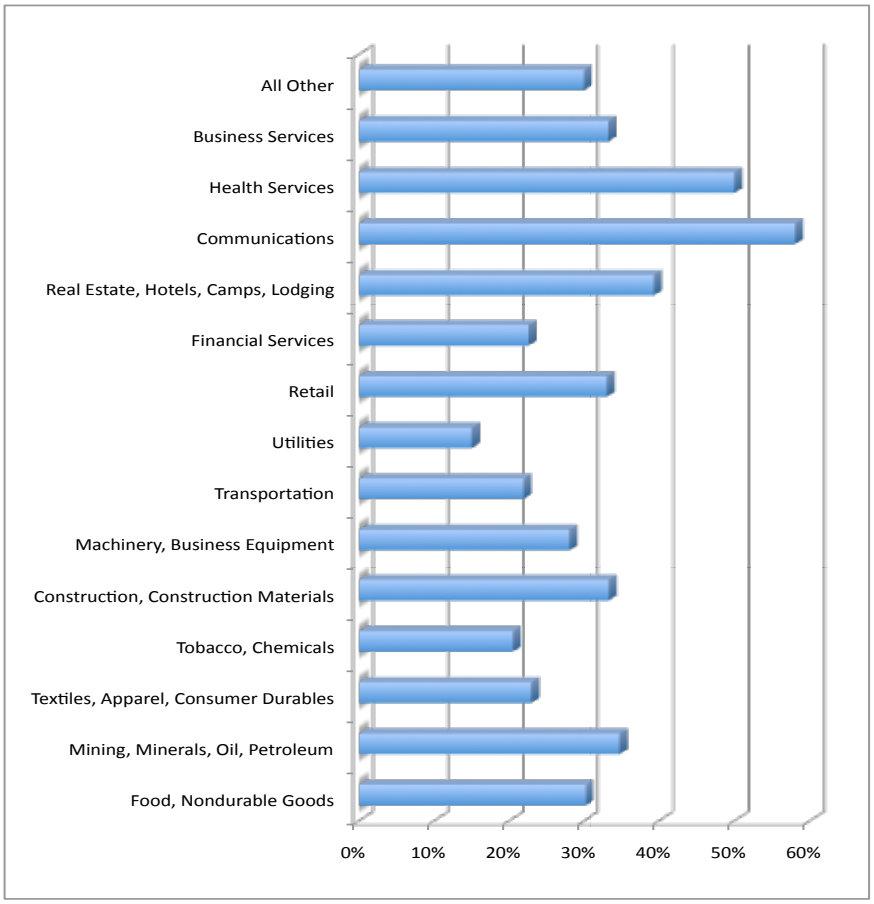
I classify the total of 1,962 firms observed into 15 subsamples based on my own unique industry classification scheme that is based somewhat on Fama and French's 17-industry portfolio.[4] My classification is generally the same, but I forced all industries with the same first 2-digits of its SIC code to be in the same industry subsample (see Appendix). Table 2 lists each of these 15 industry subsamples by name and with corresponding statistics such as number of U.S. IPOs from 1990-2010 with a Big 4 auditor in that industry, failure frequency, and overall failure rate.

Table 2

Industry Classification for Period 1990-2010

	Industry Name	# U.S. IPOs with BigN Auditor	Failure Frequency	% Failure
1	Food, Nondurable Goods	53	16	30.19%
2	Mining, Minerals, Oil, Petroleum	46	16	34.78%
3	Textiles, Apparel, Consumer Durables	48	11	22.92%
4	Tobacco, Chemicals	132	27	20.45%
5	Construction, Construction Materials	51	17	33.33%
6	Machinery, Business Equipment	350	98	28.00%
7	Transportation	64	14	21.88%
8	Utilities	20	3	15.00%
9	Retail	121	40	33.06%
10	Financial Services	262	59	22.52%
11	Real Estate, Hotels, Camps, Lodging	28	11	39.29%
12	Communications	100	58	58.00%
13	Health Services	52	26	50.00%
14	Business Services	478	159	33.26%
15	All Other	157	47	29.94%
	Total	1,962	602	30.68%

Figure 1 below depicts the failure rate for each of the 15 industry subsamples in graphical form:



It already appears from the descriptive statistics displayed in Table 2 and Figure 1 that there are significant differences between industries in the risk of failure within five years of an IPO. Communications, Health Services, and Real Estate have the highest rates of failure with 58%, 50%, and 39.29%, respectively, whereas Utilities, Chemicals, and Transportation have the lowest rates of failure with 15%, 20.45%, and 21.88%, respectively. This matches generalized expectations since these three high-risk industries tend to be more volatile in relation to macroeconomic conditions, whereas these three low-risk industries are usually less volatile, as they require much more government regulation.

III. Results

In testing H1, I use a simplified version of the Demers and Joos model for predicting IPO failure risk. The five controls used for the model include "size" as a control for the relative firm size, "cm_rank" to control for underwriter quality using the Carter-Manaster underwriter reputation ranking, "vcdummy" as an indicator variable set equal to 1 if the firm is venture capitalist-backed at the time of the IPO, "firstdayret" representing first day initial returns, calculated as closing price on the IPO date less the offer price as a percent of the offer price, and lastly "offer_price" as the IPO offer price adjusted according to the Consumer Price Index on that date.

Tables 3 and 4 display the results of running the regression for testing H1. Table 3 reveals an overall significance in risk of IPO failure between specific industries, as shown in the satisfied convergence criterion for the model and the highly significant results from testing the null hypothesis. These results show that H1 is true; there are significant differences between particular industries in the risk of failure within five years of an IPO.

Table 3

Binary Logit Regression Procedure for Period 1990-2010

Model Convergence Status

Convergence criterion (GCONV=1E-8) satisfied.

Model Fit Statistics

Criterion	Intercept Only	Intercept and Covariates
AIC	2421.305	2277.425
SC	2426.887	2389.06
-2 Log L	2419.305	2237.425

Testing Global Null Hypothesis: BETA=0

Test	Chi-Square	DF	Pr > ChiSq
Likelihood	181.88	19	<.0001
Score	174.0504	19	<.0001
Wald	154.6756	19	<.0001

Table 4 summarizes the results of testing H1 by industry, revealing which specific industries hold significant results in their risk of IPO failure. Namely, industries 2, 4, 11, 12, 13, and 15 had significantly different failure rates. These industries are, in the same order, "Mining, Minerals, Oil, Petroleum," "Tobacco, Chemicals," "Real Estate, Hotels, Camps, Lodging," "Communications," "Health Services," and "All Other." Four of these industries with significantly different failure risk also represent the four industries with the highest rates of failure within five years of IPO: Communications (58%), Health Services (50%), Real Estate (39.29%), and Mining (34.78%).

Table 4

Analysis of Maximum Likelihood Estimates

Parameter	DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept	1	0.8113	0.2664	9.2742	0.0023
ind1	1	0.2056	0.3641	0.319	0.5722
ind2	1	0.6874	0.3711	3.4311	0.064
ind3	1	-0.2897	0.4005	0.5233	0.4694
ind4	1	-0.6324	0.2901	4.7511	0.0293
ind5	1	0.4458	0.3612	1.5233	0.2171
ind6	1	-0.2183	0.2204	0.9811	0.3219
ind7	1	-0.0501	0.3611	0.0192	0.8897
ind8	1	-0.6958	0.6826	1.0393	0.308
ind9	1	0.1851	0.2694	0.4721	0.492
ind10	1	0.1396	0.2446	0.3256	0.5683
ind11	1	0.8975	0.4442	4.0815	0.0434
ind12	1	1.6249	0.2824	33.1011	<.0001
ind13	1	0.9499	0.3397	7.8203	0.0052
ind14	1	0.0511	0.2101	0.0593	0.8076
size	1	-0.2308	0.0397	33.7243	<.0001
cm_rank	1	-0.1022	0.0318	10.3532	0.0013
vcdummy	1	0.2366	0.1174	4.0642	0.0438
firstdayret	1	0.3505	0.3165	1.2265	0.2681
offer_price	1	-0.0117	0.00621	3.566	0.059

As seen in Tables 3 and 4, these results show that there are in fact significant differences between specific industries in the risk of failure within five years of an IPO, making H1 true. The model overall has significant results, and more specifically, Industry 2 (Mining), 11 (Real Estate), 12 (Communications), and 13 (Health Sciences) are all found to have significantly *high* failure rates. In testing H2a, I examine the auditor concentration by Big 4 firm throughout the 1990-2010 time period to see if auditors specialize in these four significantly high-risk industries. Tables 5 and 6 summarize my testing of H2a. Table 6 shows the "specialist" in each industry as determined by which audit firm has the greatest percentage of IPO clients in that given industry subsample.

I separated the 1,962 firms into three orders based on failure rate to better analyze the results for testing H2a. Order 1 represents low risk (17.39% failure rate), order 2 medium risk (33.05% failure rate), and order 3 high risk (43.32% failure rate). The statistics for each of these orders is shown in Table 5, revealing significant results for orders 1 and 3. There is a significant correlation between industry failure risk and auditor

specialization for both the low and high-risk order subsamples, making H2a true for low and high-risk industries.

Table 5

Orders - Correlation Procedure for Period 1990-2010

Order 1

Simple Statistics

Variable	N	Mean	Std Dev
fail_est	414	0.17386	0.07389
indspec	414	0.27907	0.09669

Pearson Correlation Coefficients, N = 414
Prob > |r| under H0: Rho=0

	fail_est	indspec
fail_est	1	0.23315
Estimated Probability		<.0001
indspec	0.23315	1
Estimated Probability	<.0001	

Order 2

Simple Statistics

Variable	N	Mean	Std Dev
fail_est	1368	0.33045	0.10033
indspec	1368	0.28212	0.09319

Pearson Correlation Coefficients, N = 1368
Prob > |r| under H0: Rho=0

	fail_est	indspec
fail_est	1	0.02207
Estimated Probability		0.4146
indspec	0.02207	1
Estimated Probability	0.4146	

Order 3

Simple Statistics

Variable	N	Mean	Std Dev
fail_est	180	0.43319	0.10783
indspec	180	0.28374	0.11058

Pearson Correlation Coefficients, N = 180
Prob > |r| under H0: Rho=0

	fail_est	indspec
fail_est	1	0.20381
Estimated Probability		0.0061
indspec	0.20381	1
Estimated Probability	0.0061	

For the entire market of IPO firms audited by the Big 4 throughout the 1990-2010 time period, it appears that PwC and Ernst & Young lead with 32.72% and 29.71% of the market, respectively. The spread in market share between the four firms ranges from industry to industry with a maximum spread of 40.38% in the "Health Services" industry where Ernst & Young audited over 50% of all such U.S. IPOs from 1990-2010. This was one of the industries where tests for H1 revealed significant results in its high risk of failure within five years of an IPO. Ernst & Young appears to have chosen a strategy of industry specialization to mitigate risk through expertise in the high-risk "Health Services" industry. This is just one example, then, of the significant correlation between failure risk and auditor specialization in the high-risk industry order.

Table 6

Auditor Specialization for Period 1990-2010

	Industry Name	Deloitte	Ernst & Young	KPMG	PwC	Spread
1	Food, Nondurable Goods	18.87%	16.98%	28.30%	35.85%	18.87%
2	Mining, Minerals, Oil, Petroleum	28.26%	30.43%	19.57%	21.74%	10.87%
3	Textiles, Apparel, Consumer Durables	14.58%	35.42%	20.83%	29.17%	20.83%
4	Tobacco, Chemicals	10.61%	48.48%	15.15%	25.76%	37.88%
5	Construction, Construction Materials	19.61%	43.14%	7.84%	29.41%	35.29%
6	Machinery, Business Equipment	16.57%	26.00%	13.43%	44.00%	30.57%
7	Transportation	21.88%	31.25%	18.75%	28.13%	12.50%
8	Utilities	20.00%	35.00%	25.00%	20.00%	15.00%
9	Retail	25.62%	26.45%	21.49%	26.45%	4.96%
10	Financial Services	22.14%	27.10%	26.72%	24.05%	4.96%
11	Real Estate, Hotels, Camps, Lodging	25.00%	21.43%	17.86%	35.71%	17.86%
12	Communications	21.00%	28.00%	23.00%	28.00%	7.00%
13	Health Services	11.54%	51.92%	19.23%	17.31%	40.38%
14	Business Services	14.64%	26.57%	20.29%	38.49%	23.85%
15	All Other	21.02%	30.57%	17.83%	30.57%	12.74%
	Total	18.14%	29.71%	19.42%	32.72%	14.58%

The other high-risk industries besides "Health Services", as determined in testing H1, have either small or moderate spreads in Table 4. Communications, for example, has one of the lowest spreads of 7%, but this is most likely due to the fact that the Communications industry has been highly regulated until fairly recently, leaving the industry with less risk factors than might exist otherwise. The remaining two, significantly high-risk industries have similarly small spreads: "Mining, Minerals, Oil, Petroleum" with 10.87% and "Real Estate, Hotels, Camps, Lodging" with 17.86%.

Overall, the results reveal a significant correlation between failure risk and auditor specialization for both the low and high-risk order subsamples. Auditors then do appear to respond to low and high-risk industry clients in a systematic way to account for risk through specialization. As seen with Ernst & Young in the "Health Services" industry, it is clear that Big 4 auditors do practice specialization in high-risk industries to mitigate risk through expertise.

Furthermore, it is interesting to note that Ernst & Young holds a substantial share of the market for the Health Services, Utilities, Construction, and Chemicals industries, whereas PwC holds the lion's share in the Food, Machinery, Real Estate, and Business Services industries. Neither Deloitte nor KPMG specialize in any of the IPO industry

subsamples as taken from the 1990-2010 time period. It may then be postulated that these two firms control for IPO failure risk in charging higher audit fees rather than mitigating risk through expertise like Ernst & Young and PwC appear to do.

H2b tests the validity of this postulation by estimating the significance of a model where audit fees serves as the dependent variable and firm size, failure estimate, and industry specialization serve as the independent variables. A regression of this model gave the results as summarized in Table 7.

Table 7

Audit Fees Regression for Period 1990-2010

Fit Statistics

R-square	0.3247
Root MSE	0.9794
Denominator DF	405

Tests of Model Effects

Effect	Num DF	F Value	Pr > F
Model	3	46.29	<.0001
Intercept	1	847.68	<.0001
size	1	98.98	<.0001
fail_est	1	0.6	0.4377
indspec	1	0.48	0.4892

Estimated Regression Coefficients

Parameter	Estimate	Standard Error	t Value	Pr > |t|
Intercept	10.3986581	0.35715778	29.12	<.0001
size	0.3777009	0.03796463	9.95	<.0001
fail_est	0.4697253	0.60466273	0.78	0.4377
indspec	-0.3503081	0.50609319	-0.69	0.4892

Table 7 shows insignificant results for both the failure estimate and industry specialization variables, indicating that there is no significant correlation between these independent variables and audit fees. Moreover, auditors who are not specialists in high-risk industries apparently do not charge a risk premium with significant consistency to reveal a correlation between audit fees and auditor specialization. This result contradicts my expectations, making H2b false.

Apparently audit fees are not significantly dependent on relative audit risk nor are they a function of auditor specialization. Basic reasoning and common-knowledge risk management strategy dictates that audit fees *should* depend on risk and auditor specialization. It would not be wise to take on a risky client unless the auditor (1) is a specialist and can mitigate risk through its expertise, or (2) charges a risk premium in addition to the regular audit fees. H2b's test results are thus surprising in nature.

Lastly, these results indicate a need for change in the audit profession. Given that the Big 4 are capable of determining industry risk and are in business to make money, it would only make sense that they alter their business strategy to one where audit fees *are*

dependent on industry failure risk and auditor specialization. Otherwise, those audit firms that are not specialists in a given high-risk industry are not practicing effective controls in mitigating risk through charging a risk premium in addition to regular audit fees.

IV. Summary and Conclusion

While the Demers and Joos paper examines how IPO failure risk differs between high tech and nontech industry subsamples, very little has been documented in the extant literature on how this risk differs between specific industries. I use a unique, 15-industry classification to assess the relative risk of failure within five years of an IPO. I find that significant differences do exist between industry subsamples, making H1 true. Industries 2, 4, 11, 12, 13, and 15 all have significant differences in their failure rates.

Further examination in testing H2a reveals that auditors do practice specialization in particular industry subsamples. A significant correlation is found between failure risk and auditor specialization for both the low and high-risk orders. H2a is thus found to be true. Ernst & Young appears to use the specialization technique of risk mitigation in high-risk industries, namely in "Health Services." The results show that the Big 4 do in fact systematically match-up with industries based on their risk quality.

Lastly, I find that for those firms that are not industry specialists, they do not necessarily charge a risk premium in addition to normal audit fees. No significant correlation is found between audit fees, industry specialization, and failure risk, causing my H2b to be false. This result is surprising and counterintuitive; thus, future research may serve a purpose in better understanding the relationship between audit fees, industry-specific risk, and auditor specialization.

[1]Fama and French, 2004: the probability that a newly listed firm will survive during the first 10 years fell from 61.0% in the 1973 subsample to just 37.0% in the 1991 subsample; seasoned firms also showed a decrease in survival rate from 60.6% to 46.9%

[2]Venkataraman, Weber, and Willenborg, 2008: their findings support the notion that audit fees reflect both effort and time spent on the engagement, as well as a premium to cover litigation risk

[3]Hogan and Jeter, 1998: evidence suggests that investing in specialization yield positive returns as audit firms continue to seek specialization in both regulated and non-regulated industries

[4]See Fama and French's 17-industry portfolio: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/

V. Appendix

Industry Classification
2010

Industry #		Industry Name	# U.S. Firms
1	Food, Nondurable Goods		
	0100-0199	Agric production - crops	283,654
	0200-0299	Agric production - livestock	136,711
	0700-0799	Agricultural services	321,578
	0900-0999	Fishing, hunting & trapping	6,146
	2000-2099	Food and kindred products	44,750
	5100-5199	Wholesale trade - nondurable goods	323,355
	Total		1,116,194
2	Mining, Minerals, Oil, Petroleum		
	1000-1099	Metal mining	1,307
	1200-1299	Bituminous coal	2,644
	1400-1499	Mining and quarrying non-metalic minerals	7,161
	1300-1389	Oil and gas extraction	33,174
	2900-2999	Petroleum refining	5,172
	Total		49,458
3	Textiles, Apparel, Consumer Durables		
	2200-2299	Textile mill products	14,335
	2300-2399	Apparel, finished products from fabrics and similar materials	40,999
	3100-3199	Leather and leather products	5,010
	2510-2599	Furniture and fixtures	22,917
	3000-3099	Rubber and miscellaneous plastic products	24,374
	3910-3996	Miscellaneous manufacturing industries	97,155
	Total		204,790
4	Tobacco, Chemicals		
	2100-2199	Tobacco products	716
	2800-2899	Chemicals and allied products	36,149
	Total		36,865
5	Construction, Construction Materials		
	0800-0899	Forestry	11,780
	1500-1549	Building construction, general contractors and operative builders	624,125
	1600-1699	Heavy construction - not building contractors	69,704
	1700-1799	Construction - special contractors	999,293
	2400-2499	Lumber and wood products, except furniture	68,164
	3200-3299	Stone, clay, glass, and concrete products	36,457
	3410-3499	Fabricated metal products, except machinery and transport equipment	65,076
	3300-3399	Primary metal industries	13,472
	Total		1,888,071

6	Machinery, Business Equipment		
	3510-3599	Industrial and commercial machinery and computer equipment	106,728
	3600-3699	Electronic, electrical equipment and components, except computer equipment	47,130
	3810-3873	Measure/analyze/control instruments; photo/medical/optical goods; watches/clocks	32,140
	Total		185,998
7	Transportation		
	3710-3799	Transportation equipment	27,246
	4000-4013	Railroad-line haul	4,864
	4100-4199	Local, suburban transit and interurban highway passenger transport	61,612
	4200-4231	Motor freight transportation	284,119
	4400-4499	Water transport	17,775
	4500-4599	Air transportation	19,684
	4600-4699	Pipelines, except natural gas	1,673
	4700-4789	Transportation services	149,794
	Total		566,767
8	Utilities		
	4900-4991	Electric, gas, and sanitary services	69,122
	Total		69,122
9	Retail		
	5210-5271	Building materials, hardware, garden supply, mobile home dealers	148,448
	5300-5399	General merchandise stores	77,301
	5400-5499	Food Stores	351,318
	5600-5699	Retail - appparel and accessory stores	256,362
	5700-5750	Home furniture, furnishings, and equipment stores	297,963
	5800-5890	Eating and drinking places	770,861
	5900-5999	Miscellaneous Retail	978,768
	Total		2,881,021
10	Financial Services		
	6010-6099	Depository institutions	135,948
	6100-6199	Non-depository credit institutions	158,290
	6200-6299	Security and commodity brokers	107,781
	6300-6399	Insurance carriers	43,023
	6400-6411	Insurance agents	255,679
	6700-6799	Holding and other investment offices	261,209
	Total		961,930
11	Real Estate, Hotels, Camps, Lodging		
	6500-6553	Real estate	872,046
	7000-7041	Hotels, rooming houses, camps, and other lodging places	131,228
	Total		1,003,274

12	Communications		
	4810-4899	Communications	157,987
	Total		157,987
13	Health Services		
	8000-8099	Health services	944,781
	Total		944,781
14	Business Services		
	7300-7399	Business services	1,920,547
	Total		1,920,547
15	All Other		
	2600-2699	Paper and allied products	13,602
	2700-2799	Printing, publishing, and allied industries	158,111
	5010-5099	Wholesale trade - durable goods	568,247
	7200-7299	Personal services	779,414
	5510-5599	Automotive dealers and gasoline service stations	347,083
	7500-7549	Automotive repair, services, and parking	466,435
	7600-7699	Miscellaneous repair services	282,531
	7800-7841	Motion pictures	121,873
	7900-7999	Amusement and recreation services	340,922
	8300-8399	Social services	434,609
	8700-8748	Engineering, accounting, research, management, and related services	976,609
	8200-8299	Educational services	0
	Total		4,489,436

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