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“It’s Gonna be Yuge”: The Impact of Chinese Imports on United States Manufacturing Firm Valuations

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“It’s Gonna be Yuge”: The Impact of Chinese Imports on United States Manufacturing Firm Valuations

submitted to
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Abstract

Throughout the years there has been literature regarding the impacts of Chinese manufacturing on the United States economy. Much of the focus has been centered on macro-economic effects and not firm level impacts. Using trade exposure and data from publically traded manufacturing firms I provide an analysis of the potential effects of increased trade exposure in a highly competitive market. My research aims to measure the impacts of Chinese imports on United States manufacturing companies with low technological barriers to entry. When comparing trade exposure to firm level data I conclude that there is a negative correlation between investment levels and import exposure, but no correlation between imports and firm valuations. My research under no circumstances can imply causation, but it finds areas of correlation that can be used as a foundation for further research.

Acknowledgements

I would like to thank Professor William Lincoln and Professor Janet Smith for their constant help in guiding me toward the completion of my Thesis. Without their help my Thesis would not be where it is today. I would like to thank all my friends for all they have done throughout college, thanks to them I had the best four years of my life. My mom and dad have played such an instrumental part in my academic career and I have made me into the man I am today, and for that I am forever grateful. Thank you to the Cougs, ugh ugh, for giving me a friendships that I will cherish for a lifetime. Lastly I would like to thank Professor Lincoln and Professor Favretto for sparking my interest in international economics and international policy. Their classes inspired me to pick a topic regarding trade with China, and without them my Thesis would not have been nearly as fulfilling.

I Introduction

What impact does China have on the financial metrics of United States manufacturing firms? Ever since the start of the "Trade War", China-United States trade relations have been put under a microscope. Many of the questions about the trade imbalance today are centered on the loss of manufacturing jobs in Middle America.[1] During the 1990's, China lowered their trade barriers and restrictions on foreign direct investment; as a result China experienced dramatic growth in their manufacturing exports, increasing from 2.3% of the world's total in 1991 to 18.3% in 2014. (Autor, Dorn, Hanson, 2016)

There has been considerable research on how increased Chinese competition has impacted employment, innovation, and income in the United States. There has been less research, however, on how increased Chinese competition has impacted financial asset valuations for manufacturing firms. In my research I analyze data to determine if an increase in imports in United States adversely affects valuation metrics for low technology firms.[2]

The tension between China and the United States is near an all-time high. (Gallup) The deterioration in relations is being driven by the trade war with China, placing the world's two largest economies head to head. The United States exposure to

[1] Acemglu, Autor, Dorn, Hanson, Price (2016) concluded that the United States lost 2.0-2.4 million jobs are a consequence of rising Chinese import competition.

[2] During the period of 2002-2011 China's ability to compete with the United State in regards to advance technology manufacturing was limited: "China has benefited from the catch-up advantage, by means of importing advanced technology from industry countries, rather than having to pioneer new technologies" (Zhang. 2016) For this reason I have excluded high tech manufacturing because competition from China is limited. China today is in fact a net tech importer, further showing their limitations in this space. (Lewis, 2019)

Chinese imports increases every year. U.S. goods trade deficit with China stood at $103.1 billion in 2002 and increased by more than 300% to $315.5 billion in 2012. The percentage increase in the trade deficit has slowed with an increase of 33% from 2012 to 2018, and a monetary increase of $104.425 billion. (census.gov) Even though deficits have slowed, the increased exposure to Chinese imports is saturating markets in the United States and hurting U.S. companies as they are unable to compete with the cheap labor costs in China. China has also gained an advantage on United States companies through their policies and practices related to technology transfer and intellectual property. Many have characterized these policies as unreasonable, discriminatory and restrictive to U.S. commerce. (ustr.gov) Both China's cheap labor and political tactics have increased competition in the United States and should theoretically lead to domestic companies experiencing lower valuations due to a smaller moat. Other things remaining constant, as competition increases, margins should decrease and thus reducing the value of firms. The incentives to reinvest in research and development might also be weakened as innovations may be unlikely to increase US manufacturing efficiency enough to compensate for China's lower wages.

In this paper I estimate how increased competition from China affects valuation metrics of United States manufacturing firms that have exposure to Chinese imports. I specifically analyze firms that have low technological barriers to entry in their respective industry. I measured trade exposure by measuring the change in import penetration resulting from an increase in trade exposure with China. I hypothesize that increased exposure to Chinese manufacturing imports will cause valuation metrics to fall, specifically Simple Tobin's *q* (market capitalization of equity to book value of assets). I

additionally expect to find decreases in margins, profits, and levels of investment. Decreasing profitability and decreasing innovation as a result of increased competition[3] leads to manufacturing in the United States having little competitive advantage over their Chinese counterparts. The reduction of profitability and a shrinking technology gap could cause U.S. companies to invest less in themselves, thus lowering their asset value. My hypothesis does not exclusively apply to Simple *q* but also to TEV to EBITDA, market cap and capital expenditures to depreciation and amortization.

My empirical strategy isolates U.S. import growth and analyzes the impact on different financial metrics, specifically financials that can reflect the level of the company's investment. For this reason, I analyze the impact of trade exposure on property plant and equipment, debt, cash, capital expenditures, research and development expenses, EBIT, EBITDA, and revenue. I am trying to see the impact on these variables to better understand how and why certain valuation measures and investment levels are changing due to exposure to Chinese imports. My results show that increased import exposure does not correlate with levels of valuation but does negatively correlate with levels of investment.

The contribution of my thesis is to provide information on how industry exposure to Chinese manufacturing imports may affect Tobin's *q*, TEV/EBITDA, and levels of firm investment. My study is building off the findings from Autor, Dorn, Hanson, Pisano, and Shu (2017) who study increased competition from China. They show that increased trade penetration is stifling innovation through lowering patent production of United

[3]Although competition often leads to innovation, Autor, Dorn, Hanson, Pisano, and Shu (2017) concluded that increased competition from Chinese imports has led to a decrease in patenting.

States manufacturing firms. My work attempts to provide further insights into how trade shocks can impact the financial strength of exposed manufacturing firms through analyzing the change in Tobin's *q* and TEV/EBITDA over time.

II Literature Review

There is a substantial research on how Chinese manufacturing impacts the United States. One strand of literature examines the effects that increased Chinese trade has had on U.S. innovation, as measured through patenting rates for United States manufacturing firms. The existing literature on China's influence on the United States is reviewed in this section.

2.1 Import Exposure from China

The United States felt its exposure to Chinese imports during the early 2000's, when many of the jobs the U.S. gained in manufacturing during the 1990's were eliminated. (Acemglu, Autor, Dorn, Hanson, Price, 2015). Since then, China has considerably impacted the United States job market, in part, through increased import competition. Acemglu, Autor, Dorn, Hanson, and Price estimated that job losses stemming from Chinese import competition is between 2.0-2.4 million jobs over the period of 1999-2011. Although the direct impact of labor is substantial, the indirect impacts of Chinese imports on investments could have potential long-term effects that should be analyzed and not ignored.

In addition to addressing the impact of manufacturing on patenting, Autor, Dorn, Hanson, Pisano, and Shu (2017) also examined the impact on a number of different variables. They concluded that the impact of imports has been statistically significant for global sales, R&D spending, advertising spending, global employment, global capital,

stock market value, book value, and the likelihood that profits increase. This shows the breadth of impact that Chinese manufacturing has on the United States and has sparked a debate of whether the domestic benefits of trade with China have outweighed the cost. There are clearly a wide range of consequences of Chinese trade on United States companies other than just the contraction of employment (Autor, Dorn, Hanson, Price 2015) as sales, profitability, and investment have also contracted. These contractions may result in serious economic consequences down the line and even a further downturn in U.S. manufacturing. The rewards for innovation in United States manufacturing are now substantially less than they have been historically as exporters like China require technology transfers for foreign direct investment and then compete on production with lower wages.

Autor, Dorn, and Hanson (2016) try and address the question of where trade is costly to the U.S. and where trade can be beneficial. This can help explain the importance of trade in the United States today, where there is room for growth, and which industries may become less competitive and profitable in the future. There is no doubt that trade has shaped China's economy tremendously and helped lift hundreds of millions of Chinese men and women out of poverty but that development has also changed the labor market in the United States substantially. Even though there appears to be no net decrease on employment as a whole, employment has fallen drastically in industries exposed to import competition from China. (Autor, Dorn, Hanson 2016) A worker's wage is a strong indicator of their position's vulnerability when exposed to trade competition. As a result, lower-wage employees experience a larger reduction in both annual and lifetime earnings when exposed to increases in trade. (Autor, Dorn, Hanson 2016) The impact that trade

has on the United States' economy and labor force make it an important topic to continually research. If there is an impact on the value of the companies that provide those jobs, could this also lead to adverse effect on employment for United States manufacturing firms as they reduce labor in order to increase profit? This is a potential area of investigation as the labor force becomes more exposed to technological advancement over time.

2.2 China, FDI, and IPR

One of the largest drivers in China's rise to becoming a manufacturing power was the country's ability to attract foreign direct investment (FDI).[4] China remains the largest recipient of FDI among developing countries. FDI is a major driver of trade, investment, and tax revenue generation. (China Investment Policy: An Update, Davies, 2013). While granting foreign investors access to China's market has previously provided many benefits to the investor's state of origin, those benefits may not be available for much longer. China is currently experiencing rising labor costs and shortages of skilled labor. In addition to those workforce challenges, there are fears of protectionist investment policies emerging as practices develop that appear to be discriminatory to foreign owned companies. (Davies, 2013). This becomes particularly troubling as American companies would not be able to offset the damage of increased imports by relocating factories to China. Although they still have the ability to relocate to countries other than China, being prohibited from the world's most robust labor force could have potential negative impacts. China's policies on foreign investors and foreign companies may create a further divide in trade relations as incentives decrease for foreign entities to innovate if their

[4] See appendix figure7

potential gains could be threatened by discriminatory policies in China. As a result China's policies on foreign direct investment and treatment of foreigners may make it difficult for China to expand their manufacturing toward capital intensive industries, potentially creating safety for high tech manufacturing in the United States.

The discriminatory policies are not the only FDI issue investors in China may face going forward. One of the other major concerns for foreign investors is intellectual property rights (IPR) protection (Davies 2013). If property rights are not protected in Chinese markets then innovation may become less likely. This may stifle growth in high tech sectors as many countries and companies refuse to bring their latest technology to markets in China where it could be most utilized. (Davies 2013) If companies are at threat of losing exclusive rights to their ideas then the willingness to innovate may lessen. Although this issue is not presented as a reason for a decline in U.S. patenting, it is something that should be considered when discussing deterrents for innovation.

Aside from their investment policies, the Chinese manufacturing industry has adopted practices that create an unfair and uncompetitive manufacturing environment. China's dumping measures have made it nearly impossible for foreign companies to compete with the artificially low prices of Chinese manufacturing firms. Some manufacturing firms in China have been flooding the world economy with products at uncompetitive prices made possible by government subsidies. (The Dark Side of China's Economic Rise, Wuttke, 2017). A lack of competition has stifled research and innovation as certain industries are become less and less profitable: "As companies in industries characterized by overcapacity face low profit margins, they lack sufficient funds for

R&D projects, which leads to less innovation." (Wuttke 2017). The industries that have been damaged significantly by overcapacity are steel, aluminum, paper, and chemicals. In my research I hope to examine whether or not low technology manufacturing industries have experienced lower valuations in Tobin's *q*.

When researching scholarly articles on China, it is clear that there are factors other than cheap labor and increased manufacturing capacity that have potentially stifled innovation. The aforementioned issues regarding FDI and IPR have also damaged incentives for further technological development. When examining China and United States economic relations, the actions that China takes or does not take in regard to protecting other nations should be considered when evaluating the potential effects in regard to manufacturing companies. My research will not explicitly touch on these issues but it is important to keep in mind alternative factors that may affect investment of United States firms exposed to Chinese exports.

2.3 Tobin's *q*

Tobin's *q* was originally created for macro-economics and originally defined as the market value of a firm's assets divided by their replacement value. (Bartlett, Partnoy 2018). This metric was used as a tool to determine if more or less investment was needed. In this paper I am using what is known as Simple *q*, which instead of a measure for firm investment, is a measure of market-to-book ratio. Simple *q* is "bias upward by research and development, brand management, and human capital." (Bartlett, Partnoy, 2017). Chinese import exposure has been found to lower research and development expenses, (Autor, Dorn, Hanson, Pisano and Shu, 2017) for this reason I hypothesize that I should find a decrease in Simple *q* in my data. Lindenberg and Ross (1981) discovered that

Tobin's *q* is high when the firm has valuable intangible assets in additional to physical capital, such as monopoly power, goodwill, a stock of patents, or good managers. I expect that manufacturing firms should see a decrease in physical capital and stock of patents, and therefore I should expect to see a decrease in Simple *q* in my research. Working with Simple *q* in my research will help answer how exposure to Chinese manufacturing has impacted assets.

Bartlett and Partnoy (2017) point out that Simple *q* has limitations and is not always the best valuation measure. Firms with high market-to-book ratios are likely to generate relatively low future returns to shareholders. Additionally, they found that Simple *q* is inversely affected by financial performance: "Simple *q* is inversely associated with the following year's annual returns on both a gross and risk adjusted basis." (Bartlett and Partnoy, 2017). On this basis, Simple *q* increases should be an indicator of poor future financial performance. Although that is a broad generalization, it highlights the issues of using just Simple *q* as a valuation metric for my data. Due to potential complications with Simple *q* outlined in Bartlett and Partnoy, I have also decided to look at enterprise value to EBITDA as another valuation metric.

2.4 Literature Expansion

Although the impact of Chinese exports on the United States is well documented, the research on the impact of valuation and financial metrics is limited. My aim is to expand the understanding of how Chinese exports have influenced company valuations. I am going to analyze both the numerator and denominator of Simple *q* and analyze the potential reasons for why the valuation has changed. I will also examine the market value and book value separately to see if either one of those have been significantly impacted

by exposures to Chinese exports. My research investigates only low capital-intensive industries and does not include sectors with high barriers to entry. For companies where much of the value is tied to the patent and thus the good cannot be easily replicated, i.e. semiconductors and pharmaceuticals, I removed them from the sample since import penetration should not increase competition for their product.

III Data

I started my data construction matching the trade data categories to corresponding SIC codes in order to properly account for increased import penetration. In my second step, I composed a list of metrics for companies with manufacturing SIC codes and matched the corresponding trade penetration with the companies trading metrics. The data shows the effect of increased import penetration on different valuation and financial metrics.

3.1 International Trade Data

From 1984 to 1990, China's share of world exports increased from 1.2% to 1.9%, from 1991 to 1999, their world share of exports doubled to 4.0% of the world manufacturing exports. (Autor, Dorn, Hanson, Pisano and Shu, 2017). This number increased to 18.8% by 2013. The reasons for massive increases in Chinese exports during the 1900's and 2000's stems from the rapid increase in foreign direct investment[5] and entrance into the World Trade Organization in 2001. I have measured trade exposure by measuring the change in trade in the manufacturing sector and matching that to a

[5] Appendix Figure 7

company that is in the same sector. This has allowed me to match each company with the trade increase of that year.

I extracted my data for international trade from the World Bank World Integrated Trade Solution Database spanning from 2002 to 2011. This gives a breakdown of imports by sector, which I then matched to the corresponding firms SIC number using the SEC code list. I chose this year range for three reasons, to match the similar time frames from other academic studies on Chinese imports, to correspond with China's fast increase in global share of exports and to eliminate distortions in the valuations from the tech bubble.

3.2 Simple Tobin's *q*, Firm-Level Data and Other Financial Metrics

I used the Compustat database and compiled public information from all manufacturing stocks between 2002 and 2011 with corresponding low technology SIC codes.[6] When doing this I pulled a number of different variables to measure the financial impact trade exposure has had on a number of different financial metrics over the 9-year period I am evaluating. The metrics I am evaluating include changes in: market value to assets, enterprise value to EBITDA, market cap, capital expenditure to depreciation and amortization, revenue, EBIT, EBIT margin, EBITDA, EBITDA margin, research and development expense, research and development expense margin, capital expenditure, capital expenditure to EBITDA, total assets, property plant and equipment, debt, and cash and short term investments. I also use a vector of variables to control for the manufacturing industry, company size, and impacts from the Great Recession.

[6] See Appendix for SIC codes used

Table 1: Summary Statistics for Regression Variables

	Count	Mean	Variance	StDev	Minimum	Maximum	Sum
				Valuation Metrics			
Δ Trade	3308	13314.540	166000000.00	12874.70	-11075.16	39439.67	44000000.00
Δ Tobins Q	3308	-0.034	136817.70	369.89	-15032.76	15045.59	-111.28
Δ Market Value	3308	285.467	32200000.00	5678.89	-128254.00	94522.66	944323.00
Δ TEV to EBITDA	3291	2.238	37892.47	194.66	-4522.14	4540.95	7365.35
Δ Capex to D&A.	3282	-0.003	11.65	3.41	-118.53	111.42	-11.28
				Sales, Profit, and Expenditures			
Δ Revenue	3308	281.956	24500000.00	4954.56	-149507.00	91948.00	932710.30
Δ EBIT	3308	44.650	1243570.00	1115.16	-40051.00	15405.00	147702.40
Δ EBIT Margin	3308	0.230	1974.50	44.44	-1171.66	1132.30	759.40
Δ EBITDA	3308	51.357	1315580.00	1146.99	-40513.00	16726.00	169888.10
Δ EBITDA Margin	3308	0.220	1902.74	43.62	-1138.27	1142.02	728.88
Δ R&D Expense	3308	1.154	2493.83	49.94	-1495.00	647.00	3817.41
Δ R&D Expense Percent	3308	-0.036	198.18	14.08	-515.18	475.61	-117.94
Δ Capital Expenditure	3308	15.841	59237.14	243.39	-1972.00	6888.00	52401.18
Δ Capex to EBITDA	3291	0.213	138.02	11.75	-245.93	503.41	702.12
				Balance Sheet Items			
Δ Debt	3308	15.049	132319.70	363.76	-5915.00	5098.00	49782.19
Δ Cash	3308	32.146	413353.10	642.93	-21145.00	12509.00	106338.70
Δ PPE	3308	74.443	1741143.00	1319.52	-8417.00	60432.00	246257.80
Δ Asset	3308	206.439	5676192.00	2382.48	-47059.00	69187.00	682901.20
				Company Size			
Small Cap	3308	0.841	0.13	0.37	0.00	1.00	2783.00
Mid Cap	3308	0.134	0.12	0.34	0.00	1.00	443.00
Large Cap	3308	0.025	0.02	0.16	0.00	1.00	82.00
				Industry			
Chemicals	3308	0.059	0.06	0.24	0.00	1.00	196.00
Metals	3308	0.100	0.09	0.30	0.00	1.00	331.00
Machinery and Electronics	3308	0.761	0.18	0.43	0.00	1.00	2516.00
Plastic and Rubber	3308	0.080	0.07	0.27	0.00	1.00	265.00

The issue with pulling the data from Compustat is that it often lacked full information for a number of variables, including total assets, which made the selection biased toward larger companies as the missing information was mostly for the smaller companies. The data set also did not account for mergers and acquisitions, changes from public to private, or bankruptcies. This made it difficult to determine what was influencing particular jumps in valuation metrics.

Additionally, it was difficult to distinguish which companies developed high-tech products. Import penetration of high-tech products should be minimal, as China's ability to produce certain high-tech products during this time is limited. (Lewis, 2019) The one industry that I was able to account for is the healthcare industry but Compustat was not able to distinguish which healthcare companies have products with high technological barriers to entry and which ones do not. As a result, I eliminated healthcare firms entirely from my sample to create a dataset that more accurately represents manufacturing companies that are exposed to Chinese imports.

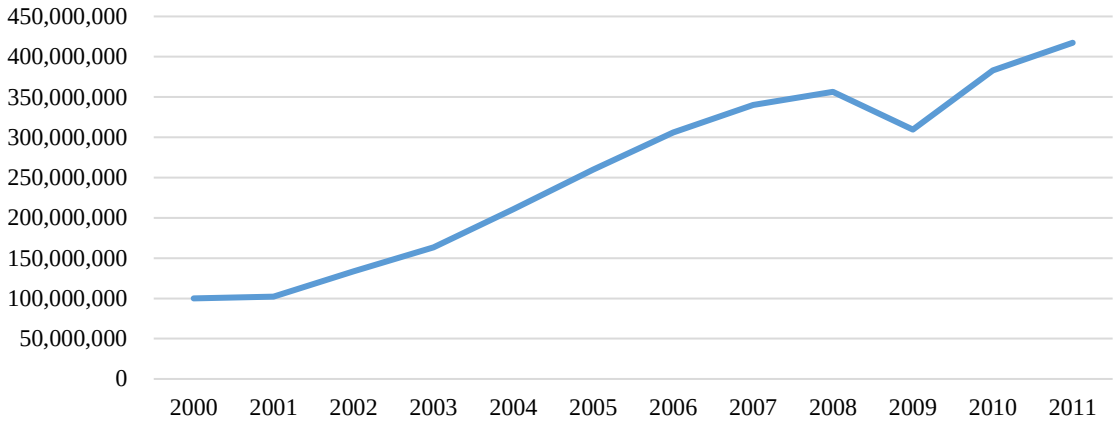
Lastly, the most important deficiency with Compustat for my purposes, is that it only accounts for publicly traded companies. Privately held firms still account for a majority of companies in America (McKinsey & Company), as a result I am missing a substantial amount of data. The largest issue I ran into with the data I was able to obtain was that the World Bank trade database did not break down their trade imports into Harmonized System (HS) codes which are much more specific and would have allowed me to better match import penetration to each firm. This made my measurements less accurate because I could not more specifically target import penetration by the specific sector, instead I had to use data that was not as precise as it could have been. HS codes do not come without flaws as they classify products based solely on their physical characteristics while SIC codes care classifications of business activities that incorporate both product characteristics and type of economic activity. (Pierce and Schott. 2012) There were also issues that could not be controlled. Unknown variables, such as the state of the market, made it hard to fully distinguish what impact Chinese imports is having and what impact is caused by the bears and bulls of the stock market. I attempted to

address these stock market distortions by eliminating years prior to 2002 to account for the tech bubble. Finally, the data cannot account for economic drivers. In my data I attempt to control for these variables but in some cases that may not be enough to fully eliminate their impact.

3.3 Trends in Import Penetration and Financial Data

When evaluating Figure 1, it is clear that the increase in trade from China from imported goods has increased drastically over the 9 period. There was the same dollar value increase from 1991 to 1999, as there was from 2000 to 2003. The dollar value tripled during the span of 2001 to 2006. As a result, the impact penetration in the early 2000's is expected to Simple *q* and other financial metrics relative to later years.

Figure 1: Total Trade Imports from China (Numbers in Thousands)



As you can see from Figure 2, even as import penetration increases the market to book ratio increases from .96 to 1.54. This represents an increase of 60%. This could relate to the findings in Bartlett and Partnoy (2017) in regards to increases in Simple *q*

valuation as inversely associated with the following year's annual returns. This means that profitability of companies decrease in later years, the value of Simple q should increase over the same time frame. The growth in Simple *q* from my data is driven by a more rapid acceleration in market value in comparison to value of assets as shown in figure 3.

Figure 2: Simple *q*

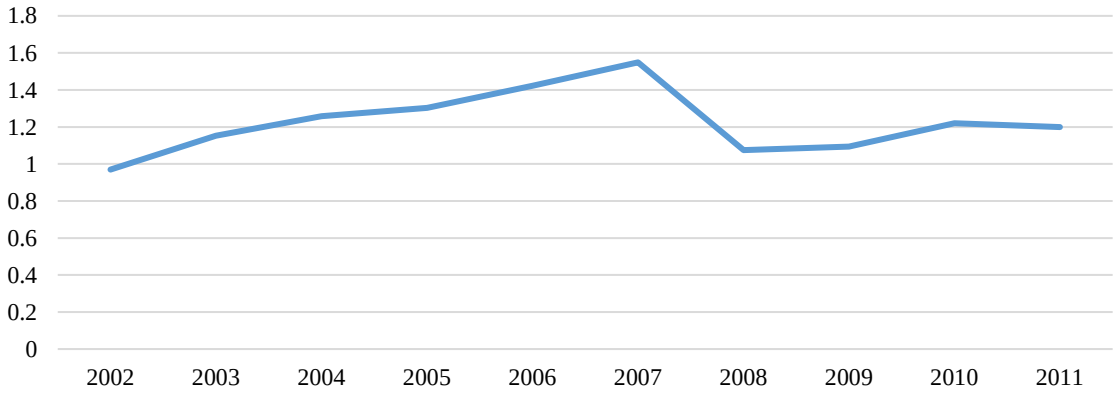
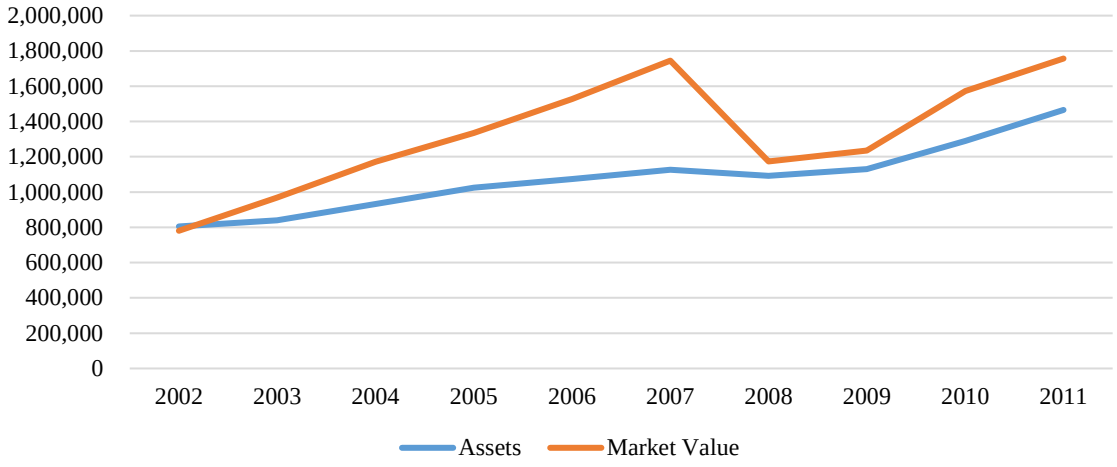


Figure 3: Total Asset Value and Total Market Value of Firms in Sample



I` also examine at the trends in enterprise value to EBITDA in my sample. Figure 4 shows a decline in the valuation metric. There are a number of factors that could have influenced this, such as projected revenue growth and changes in capital structure, and it is consistent with what I expected to find in my hypothesis.

Figure 4: Enterprise Value to EBITDA

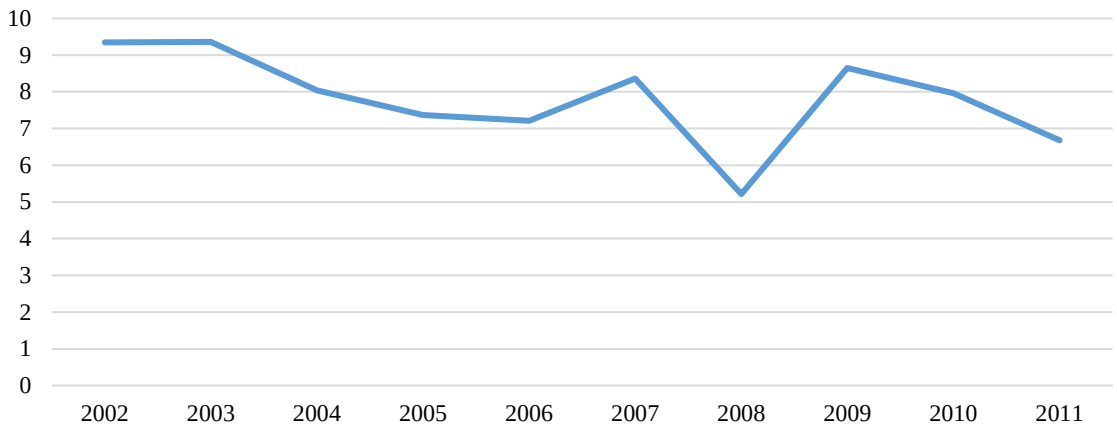
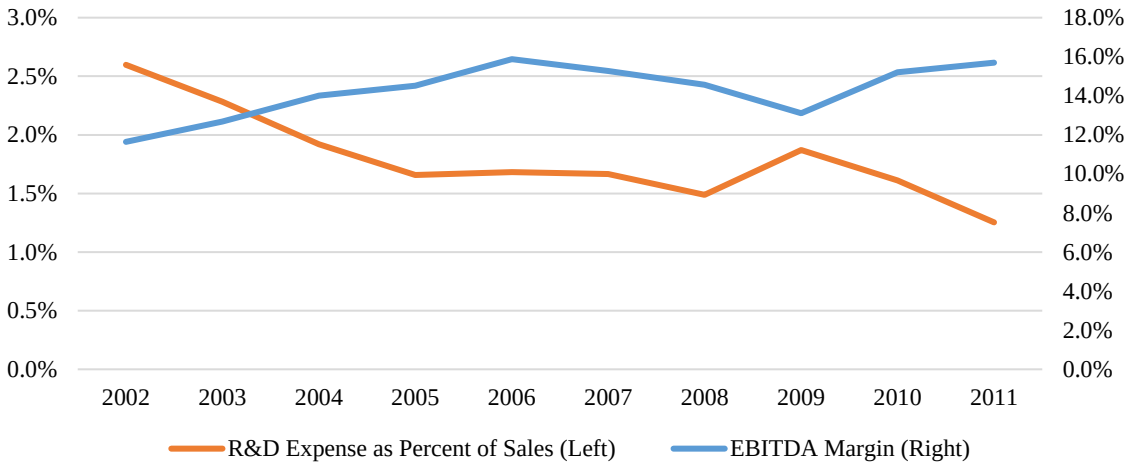


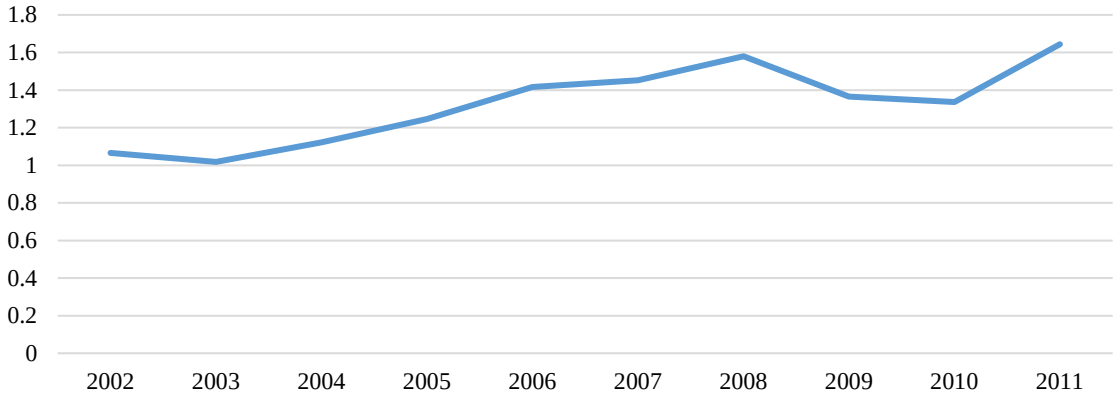
Figure 5 shows a decrease in research and development expenses which would coincide with the findings found in Autor, Dorn, Hanson, Pisano, and Shu (2017), but an increase in the EBITDA margin. This is something I did not expect to find because I expected that increased competition would be associated with lower levels of profitability. There is also a chance that import exposure did little to impact domestic profits, as there are many variables that affect firm performance.

Figure 5: R&D Expense Percent and EBITDA Margin



I also investigate levels of investment, as depreciation outpacing capital expenditures can be a sign of an unhealthy firm. Figure 6 shows capex to depreciation and amortization increases, a trend that indicates companies are continue to spend on invested capital even as import exposure increases.

Figure 6: Capital Expenditure to Depreciation and Amortization



IV Empirical Strategies and Main Results

I estimated the impact of changes in industry exposure to imports from China on the changes of Simple q at the firm level. The baseline regression used for my data is as followed.

$$\Delta Q_{irt} = \alpha_t + \beta \Delta I_{rt} + X_{ir} + e_{irt}$$

ΔQ is the change in Simple q for each individual firm i in industry r during the annual change from the previous year for year t. ΔI_{rt} is the change in imports. X is a vector of variables used to control for specific factors that may cause Simple q to change, which includes the recession and three different company sizes. X changes depending on which subset of data I am running. I used this formula to evaluate a number of additional metrics, replacing ΔQ with different valuation and financial metrics.

My empirical strategy comes with some concerns. My ability to accurately measure ΔI_{rt} as it corresponds to a specific SIC code is limited. The causes of changes in imports are also difficult to determine. U.S. demand shocks could influence trade penetration, which it did 2008 during the Great Recession, but also trade wars and product substitutes from other countries can have an impact. Similar issues arise with changes in Tobin's q and TEV to EBITDA. The decrease in the metrics can be related to other industry factors unrelated to import exposure, such as U.S. demand for domestic products or GDP growth. My empirical model has its flaws but my research is aimed at capturing correlation and not causation, which my model is capable of doing.

4.1 Restate Hypothesis

Prior to my research, I believed that the manufacturing sectors increased exposure to Chinese imports would lower firm valuations and show decreases in margins and investment. As patenting output is lower for U.S. manufacturing firms, I hypothesized that this would also lower investment levels in the manufacturing industries I am evaluating. If there were lower levels of investment and increased competition, I expected to see lower valuation metrics. The valuation metric I emphasize is Simple *q*. The metric may change depending on the study but almost always acts as some variation of market value of assets to market value of equity. My hypothesis is centered on the theory that increased competition from Chinese manufacturing firms will lower valuations of U.S. firms in exposed markets. My research also looks at margins, expenditures, and valuation metrics in firms with low technological barriers to entry.

4.2 Regression Results

My regression results are split into four different categories and control for four different variables. The categories I regressed were split in to valuation metrics (Table 1), sales and profit margins (Table 2), expenditures (Table 3), and balance sheet items (Table 4). My regressions controlled for four different variables: recession and different company sizes. Company size was split into small cap, mid cap, and large cap firms.[7] I controlled for the onset of the Great Recession because public companies took a financial hit for reasons unrelated to trade exposure and the data should better capture the correlation of Chinese imports on United States manufacturing firms with the absence of

[7] Small cap firms were determined by having a market cap smaller than $2 billion. Mid cap was determined through having a market cap between $2 and $20 billion. Large cap was determined by having a market cap larger than $20 billion.

data from the changes in 2008 to 2009. I controlled for company size to better control for multinational firms. A large company should, in theory, be more capable of moving their manufacturing abroad as they have the capital to do so, while smaller companies may be limited in their ability to move manufacturing locations. Additionally large companies have advantages such as brand recognition that may help further limit the impact of Chinese imports.

Table 2: Regression on Valuation Metrics

	A. Valuation			
From 2002-2011	Δ Tobins Q (Market to Book)	Δ Market Value	Δ TEV to EBITDA	Δ Capex to D&A.
Δ U.S. Industry Exposure to	0.0004559	.0025843	.0001721	.00000634
Chinese Imports	(.0004996)	(.0076713)	(.0002637)	(.00000463)
Mean Outcome Variable	-0.0336399	285.4655	2.238026	-.00334366
Observations	3,308	3,308	3,291	3,282
	No Recession Year			
Δ U.S. Industry Exposure to	.0007156	.0031255	.0001104	.00000623
Chinese Imports	(.0006545)	(.0095165)	(.0003416)	(.0000048)
Mean Outcome Variable	-0.0801074	295.8479	2.994422	0.0148027
Observations	2,981	2,981	2,966	2,957
	Small Cap			
Δ U.S. Industry Exposure to	.0005507	0.0020565 ***	.0001826	.0000066
Chinese Imports	(.0005987)	(.0006508)	(.0003151)	(.0000055)
Mean Outcome Variable	-0.05064	-9.914943	2.801086	-0.014864
Observations	2,783	2,783	2,770	2,761
	Mid Cap			
Δ U.S. Industry Exposure to	.00000178	.0190252	.0001209	.00000497 ***
Chinese Imports	(.000002)	(.0115708)	(.000141)	(.00000163)
Mean Outcome Variable	0.0613309	349.2336	-0.829461	0.0623648
Observations	443	443	739	439
	Large Cap			
Δ U.S. Industry Exposure to	.000000136	.114755	-.0000575	.00001
Chinese Imports	(.00000574)	(.3037195)	(.0000623)	(.00000445)
Mean Outcome Variable	0.0302552	9965.925	-0.3601168	0.0290528
Observations	82	82	82	82
		* p<0.10	** p<0.05	*** p<0.01

Table 3: Regression on Financial Metrics

From 2002-2011	Δ Revenue	Δ EBIT	Δ EBIT Margin	Δ EBITDA	Δ EBITDA Margin
			B. Sales and Profit		
Δ U.S. Industry Exposure to	-.0021299	.0009238	.0000326	.0005076	.000032
Chinese Imports	(.0066928)	(.0015063)	(.00006)	(.0015494)	(.0000589)
Mean Outcome Variable	281.9559	44.65006	0.2265659	51.35675	0.2203397
Observations	3,308	3,308	3,308	3,308	3,308
			No Recession Year		
Δ U.S. Industry Exposure to	-.0355838 ***	-.0044272 ***	0.0000405	-.0050672 ***	.0000409
Chinese Imports	(.0064944)	(.0013523)	(.0000778)	(.0014539)	(.0000764)
Mean Outcome Variable	466.3791	78.46952	0.2436907	84.93215	0.228418
Observations	2,981	2,981	2,981	2,981	2,981
			Small Cap		
Δ U.S. Industry Exposure to	.0006747	.0003407 ***	.0000387	.0003197 ***	.000038
Chinese Imports	(.0006176)	(.0000864)	(.0000719)	(.0000852)	(.0000706)
Mean Outcome Variable	20.69503	1.169794	0.2709886	1.623958	0.2602806
Observations	2,783	2,783	2,783	2,783	2,783
			Mid Cap		
Δ U.S. Industry Exposure to	.00684	.0060759 ***	.00000147 ***	.0058561 ***	.0000012 ***
Chinese Imports	(.0150129)	(.0017972)	(.000000233)	(.0018336)	.00000023
Mean Outcome Variable	606.6782	60.53385	0.0097264	69.71086	0.0084566
Observations	443	443	443	443	443
			Large Cap		
Δ U.S. Industry Exposure to	-.0007553	.0179165	.0000004	.0061439	.0000001
Chinese Imports	(.259796)	(.0614104)	(.0000003)	(.0628985)	(.0000002770
Mean Outcome Variable	7394.604	1434.516	0.0113903	1640.082	0.0094688
Observations	82	82	82	82	82
			* p<0.10	** p<0.05	*** p<0.01

Table 4: Regression on Expenditures

From 2002-2011	Δ R&D Expense	Δ R&D Expense Percent	Δ Capital Expenditure	Δ Capex to EBITDA
		C. Expenditures		
Δ U.S. Industry Exposure to	.0001583 **	-.0000123	-.0004684	.000011
Chinese Imports	(.0000674)	(.000019)	(.003287)	(.0000159)
Mean Outcome Variable	1.153993	-.0356543	15.84074	0.2155468
Observations	3,308	3,308	3,308	3,291
		No Recession Year		
Δ U.S. Industry Exposure to	.0000432	.00000786	-.0015051 ***	.00000924
Chinese Imports	(.0000814)	(.0000243)	(.0004128)	(.0000208)
Mean Outcome Variable	2.076491	-.079415	19.39228	0.246571
Observations	2,981	2,981	2,981	2,966
		Small Cap		
Δ U.S. Industry Exposure to	.0000408	-.0000148	.0000584	.0000132
Chinese Imports	(.0000128)	(.0000228)	(.0000369)	(.0000191)
Mean Outcome Variable	0.255613	-0.0420722	0.3299572	0.2596116
Observations	2,783	2,783	2,783	2,770
		Mid Cap		
Δ U.S. Industry Exposure to	.0005618	-.00000034 ***	.0006329	-.0000021
Chinese Imports	(.00003385)	(.00000005)	(.0003651)	(.0000021)
Mean Outcome Variable	-3.857713	-0.001574	14.43049	-0.0190211
Observations	443	443	443	443
		Large Cap		
Δ U.S. Industry Exposure to	.0027278	-.0000002 **	-.0157696	.0000007
Chinese Imports	(.0018796)	(.00000001)	(.0126587)	(.0000009)
Mean Outcome Variable	58.71956	-0.0019547	549.8805	-.014279
Observations	82	82	82	82
		* p<0.10	** p<0.05	*** p<0.01

Table 5: Regression on Balance Sheet Items

	D. Balance Sheet Items			
From 2002-2011	Δ Debt	Δ Cash	Δ PPE	Δ Asset
Δ U.S. Industry Exposure to	-.0008817	-.0008	-.0048992 **	-.0028873
Chinese Imports	(.0004911)	(.0008684)	(.0017805)	(.003218)
Mean Outcome Variable	15.04903	32.14592	74.44312	206.4393
Observations	3,308	3,308	3,308	3,308
	No Recession Year			
Δ U.S. Industry Exposure to	-.0009264	-.0022341 **	-.0081663 ***	-.0092297 *
Chinese Imports	(.0005952)	(.0009011)	(.0022608)	(.0041779)
Mean Outcome Variable	11.84282	19.45973	74.93995	226.247
Observations	2,981	2,981	2,981	2,981
	Small Cap			
Δ U.S. Industry Exposure to	-.0000529	-.0000211	-.0001623	.0005649
Chinese Imports	(.0001619)	(.0001114)	(.0000981	(.000521)
Mean Outcome Variable	0.7250733	0.5134768	2.945474	2.93675
Observations	2,783	2,783	2,783	2,783
	Mid Cap			
Δ U.S. Industry Exposure to	-.0045682 **	-.0034163	-.0029626 **	.0019978
Chinese Imports	(.0020065)	(.0019244)	(.0011791)	(.0051269)
Mean Outcome Variable	88.4038	90.8319	61.95663	400.7707
Observations	443	443	443	443
	Large Cap			
Δ U.S. Industry Exposure to	-.0017709	.0059289	-.1382563 *	-.0307194
Chinese Imports	(.0159208)	(.0339602)	(.0697812)	(.1198465)
Mean Outcome Variable	104.8955	788.6726	2568.461	6063.254
Observations	82	82	82	82
		* p<0.10	** p<0.05	*** p<0.01

My results containing my entire data set showed two areas of statistical significance. Changes in research and development expenses and changes in property plant and equipment, both significant at the five percent level. I ran a separate regression removing changes from 2008 to 2009 in order to account for the Great Recession. This eliminated the issue of a single year experiencing both great declines in valuation and trade due to an extraneous variable. This regression contained a number of statistically

significant results. Changes in revenue, EBIT, EBITDA, capital expenditure, and property plant and equipment are all significant at the one percent level. Changes in cash is significant at the five percent level and changes in assets is significant at the ten percent level. My small cap sample is significant at the one percent level for changes in market value, EBIT, and EBITDA. Mid cap is significant at the one percent level for changes in capital expenditure to depreciation and amortization, EBIT, EBIT margin, EBITDA, EBITDA margin, research and development expense percent. Mid cap is also significant at the five percent level for changes in debt and property plant and equipment. The large cap sample is significant at the five percent level for changes in research and development expense percent and significant at the ten percent level for changes in property plant and equipment.

4.3 Analysis

My main regression that includes all data from the years of 2002 to 2011 shows no significant change in Tobin's *q* and other valuation metrics. My results did show that companies on average spend $158 more on research and development for every additional million dollars in industry import exposure from China. This is a different result than what was found in Autor, Dorn, Hanson, Pisano, and Shu (2017). Their results showed a decrease in expenses. Possible explanations for this difference are different samples and different sampling period. Additionally, even though the correlation was positive, the change in expense percent on average was negative. This is because large companies increased their research significantly more than small companies, as percentages are weighted equally and total expense is more heavily influenced by company size. This finding is also consistent with the idea that increased competition

forces companies to have to innovate. The other variable of significance is changes in property plant and equipment. Here I found that on average for every additional million dollars in industry import exposure, the company's property plant and equipment declined by $4,899. This would imply that companies are investing less as competition increases. This could be a factor in lower levels of profitability leading to lower levels of cash available for investment.

When regressing my data on trade exposure excluding data from the Great Recession, the results statistically significant declines in value with increased import exposure for changes in revenue, EBIT, EBITDA, capital expenditures, cash and short term investments, PPE and assets. On average a company experiences a decreases of $35,584 in revenue, $4,427 in EBIT, $5,067 in EBITDA, $1,505 in capital expenditure for each additional million increase import penetration from China. Company balance sheets also experience a decline. On average a company experiences a decline of $2,234 in cash and short term investments, $8,186 in property plant and equipment, and $9,229 in assets for an additional million in import penetration. The changes in sales, profitability, and expenditure numbers are particularly interesting because they are not felt in the valuation metrics. I would expect to see valuations go down if sales, profitability, and investment go down. Although changes in profitability, sales, and expenditures are not felt in valuation metrics they are seen on the balance sheet through lower levels of cash, PPE and Assets. This could be due to either lower levels of investment and profitability leading to lower asset levels through not generating enough profit to cover their previous balance sheet levels or a result of increased competition making it so an additional dollar of investment leads to less than an additional dollar of

output. These areas of statistical significance show a number of trends that should lead to lower levels of valuation, but even with declining revenue and margins companies are not experiencing a decrease in market cap, Tobin's *q*, or enterprise value to EBITDA in relation to increased import exposure.

When running my regressions, I made sure to account for company size so that I could better understand the impact of trade on companies. I isolated these factors so I could compare the company sizes to each other and also account for extraneous variables that can occur due to company size. Small cap companies are positively statistically significant in changes in market cap, EBIT, and EBITDA while mid cap companies are not statistically significant in changes in market cap, but is positively significant in changes in EBIT, EBIT margin, EBITDA and EBITDA margin. Large cap companies experienced no statistical changes in regards to valuation metrics, sales, and profits. These results to not correspond with my hypothesis. I expected to find a decrease in valuations and investment, and even when accounting for company size my results did not show a negative correlation. One area that did support my hypothesis is negative statistical significance for research and development expenses. Large and mid-cap companies experienced a decline in changes in research and development expense, which is consistent with the findings in Autor, Dorn, Hanson, Pisano, and Shu (2017). Overall even when splitting up my data by company size, I do not find results consistent with my hypothesis in regards to valuation, but I did find results consistent with hypothesis in relations to lower levels of investment. See tables 1 through 4 for the entirety of my regression results.

Although my results did not find any significant changes in valuation metrics, the absence of change also provides valuable insights. Increase trade exposure will produce both winners and losers, but on average Chinese imports appear to have no effect. Even though the United States has lost jobs as a result of Chinese imports (Autor, Dorn, Hanson, 2016), companies are benefits from cheaper inputs even though many have been forced to downsize. This might make it so companies in the short run might be hit due to a readjustment period, but in the long run there should be no long lasting effects on low technology manufacturing firms. These findings coincide with the basic fundamentals of capitalism, companies adjust to new obstacles and in the long run they maximize their profits.

My findings also show that market cap and assets are highly correlated.[8] This would explain why changes in assets are statistically significant with trade but Simple *q* is not. Market cap and assets are moving together and canceling out the effects. I am experiencing a similar issue with my TEV to EBITDA multiple. Changes in EBITDA are positively correlated with changes in cash and short term investments, and market cap. Although debt is not correlated, two of major factors making up enterprise value are making it so the effects are canceling each other out and thus I am experiencing no statistical significance in my valuation metrics.

4.4 Limitations and Caveats

There are several concerns I have with my data in this regression. The first being that matching the import exposure to specific industry codes is not as precise as I would

[8] See appendix for Correlation Matrix

like it to be. I had issues getting import data on specific SIC codes. The second issue is that Compustat did not include whether certain companies went bankrupt or which companies got bought out. Bankrupted companies would have had the largest impact on my data set. There were over 200 companies in my data set that did not have data for the whole time period. Eliminating them would bias my data toward successful firms so my ability to incorporate the proper data for bankrupted firms was limited. The largest limitation of the data is the exclusion of private firms. There is nothing that could have been done about this but this larger data set would have given me more accurate results.

Using financial metrics also created a set of issues. There are so many external factors that can drive financial valuations. The overall state of the stock market is most likely the biggest driver in valuations. Figures 2 and 6 both show valuation metrics declining in 2008 due to the state of the economy and market as a whole. This makes it difficult to isolate what factors are truly influencing the valuation metrics. This additionally created a problem because trade also declined, meaning that both the valuation and trade would be positively correlated that year due to reasons unrelated to import penetration. I controlled for this by removing the changes from 2008 to 2009 from my data but the effects may have lingered longer than just one year. These macro-economic factors severely limited how my data can be interpreted, since macroeconomic changes cause a wide array of effects.

Some companies on my list benefitted from Chinese imports due to having lower input costs while other companies were harmed due to their outputs being unable to compete with Chinese prices. I was unable to determine variables that would predict

which manufacturing firms benefitted and which firms were harmed. Additional research could shed light on this issue.

Because of the issues with my data and valuation metrics my results can do little other than show correlation. Correlation can be valuable when evaluating potential impacts of international trade on United States company investment and public valuations but under no circumstances can my data be used to imply any sort of causation. The results may also reflect spurious associations because of omitted variables, such as, government tax laws, cost of debt, and GDP growth to name a few. Table 6 shows that GDP growth has a large impact on my data. Because of these extraneous variables my data can under no conditions imply causation but instead can lay ground work for further research.

V Conclusion

Does increased import competition have an effect on valuation metrics? My research suggests that the answer is no. Although valuation metrics are unaffected, my analysis did find instances of reduced profits, reduced research and development, and reduced capital expenditure when accounting for the Great Recession. These results point to Chinese imports being associated with impacts on low tech United States manufacturing firms but these changes are not reflected in Simple q or TEV to EBITDA metrics.

The relationships between imports and investment and research reflect the opposite sign to what I expected. It is often anticipated that increased competition will make firms want to spend additional funds on investment and research so they can better

compete in the future but instead the opposite occurred. This could be a result that greater competition in manufacturing could lead to a decline in profitability, which my regression found in some cases, that then reduces the incentives to invest in research and development (Dasgupta and Stiglitz, 1980). This could also be that the additional expenditure on investment and research does not yield enough return to warrant additional spending.

My results show that some firms experience decreases in profitability and expenditures associated with imports, but causation is not implied; for other firms there is no such correlation.

VI Appendix

Table 6: Correlation Matrix for Data

Correlation Metrix for Data

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
(1) Δ Trade	1.00000									
(2) Δ GDP Growth	0.63800***	1.00000								
(3) Δ Tobins Q	0.01590	0.02050	1.00000							
(4) Δ Market Value	0.00616	0.05110**	0.00016	1.00000						
(5) Δ TEV to EBITDA	0.01120	0.00631	0.00320	0.00172	1.00000					
(6) Δ Capex to D&A.	0.02390	0.02770	-0.01880	0.00142	-0.00843	1.00000				
(7) Δ Revenue	-0.00571	0.08880***	-0.00001	0.32700***	-0.00185	0.00572	1.00000			
(8) Δ EBIT	0.01060	0.08100***	-0.00000	0.47400***	-0.00094	0.00468	0.91700***	1.00000		
(9) Δ EBIT Margin	0.00951	0.01380	-0.00033	0.00068	0.00031	-0.01120	-0.00022	-0.00047	1.00000	
(10) Δ EBITDA	0.00582	0.07770***	-0.00000	0.49500***	-0.00097	0.00412	0.91600***	0.99700***	-0.00048	1.00000
(11) Δ EBITDA Margin	0.00949	0.01340	-0.00033	0.00068	0.00019	-0.01170	-0.00024	-0.00050	1.00000***	-0.00050
(12) Δ R&D Expense	0.04100*	0.05150**	-0.00013	0.19200***	-0.00109	0.00298	0.19200***	0.14000***	0.00233	0.15400***
(13) Δ R&D Expense Percent	-0.01140	-0.01340	-0.00085	-0.00002	0.00014	0.02440	0.00011	-0.00002	-0.66600***	-0.00001
(14) Δ Capital Expenditure	-0.02500	0.03260	-0.00005	0.14100***	-0.00318	0.02210	0.40200***	0.32400***	-0.00024	0.35600***
(15) Δ Capex to EBITDA	0.01200	0.00900	0.00090	-0.00015	0.77500***	-0.00959	-0.00167	-0.00046	-0.00009	-0.00073
(16) Δ Debt	-0.03380	-0.04360*	-0.00021	0.00552	0.00270	-0.00306	0.00377	-0.03000	-0.00010	-0.00520
(17) Δ Cash	-0.01610	0.03970*	-0.00000	0.33500***	0.00107	-0.00115	0.52700***	0.60500***	-0.00018	0.59700***
(18) Δ PPE	-0.04810**	-0.00359	-0.00003	0.24100***	-0.00080	0.00313	0.31500***	0.23600***	-0.00027	0.28800***
(19) Δ Asset	-0.01700	0.03120	-0.00014	0.58500***	-0.00104	0.00444	0.50700***	0.48500***	-0.00036	0.52800***
(20) Recession	-0.59100***	-0.85300***	0.00042	-0.00544	-0.01180	-0.01610	-0.11300***	-0.09180***	-0.00112	-0.08860***

Variables	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
(1) Δ Trade										
(2) Δ GDP Growth										
(3) Δ Tobins Q										
(4) Δ Market Value										
(5) Δ TEV to EBITDA										
(6) Δ Capex to D&A.										
(7) Δ Revenue										
(8) Δ EBIT										
(9) Δ EBIT Margin										
(10) Δ EBITDA										
(11) Δ EBITDA Margin	1.00000									
(12) Δ R&D Expense	0.00235	1.00000								
(13) Δ R&D Expense Percent	-0.67300***	0.00082	1.00000							
(14) Δ Capital Expenditure	-0.00024	0.22400***	0.00018	1.00000						
(15) Δ Capex to EBITDA	-0.00012	0.00841	0.00002	-0.00571	1.00000					
(16) Δ Debt	-0.00008	0.16600***	-0.00003	-0.01500	0.00562	1.00000				
(17) Δ Cash	-0.00019	0.02900	0.00013	-0.08810***	0.00114	-0.01800	1.00000			
(18) Δ PPE	-0.00026	0.11600***	0.00015	0.67400***	-0.00171	0.23400***	-0.10600***	1.00000		
(19) Δ Asset	-0.00036	0.36100***	0.00020	0.57200***	-0.00087	0.35700***	0.20900***	0.76400***	1.00000	
(20) Recession	-0.00069	-0.056000**	0.00946	-0.04430*	-0.00855	0.02590	-0.03450*	-0.00117	-0.02570	1.00000

* p<0.05 ** p<0.01 *** p<0.001

Figure 7: Foreign Direct Investment into China (Wuttke, 2017)

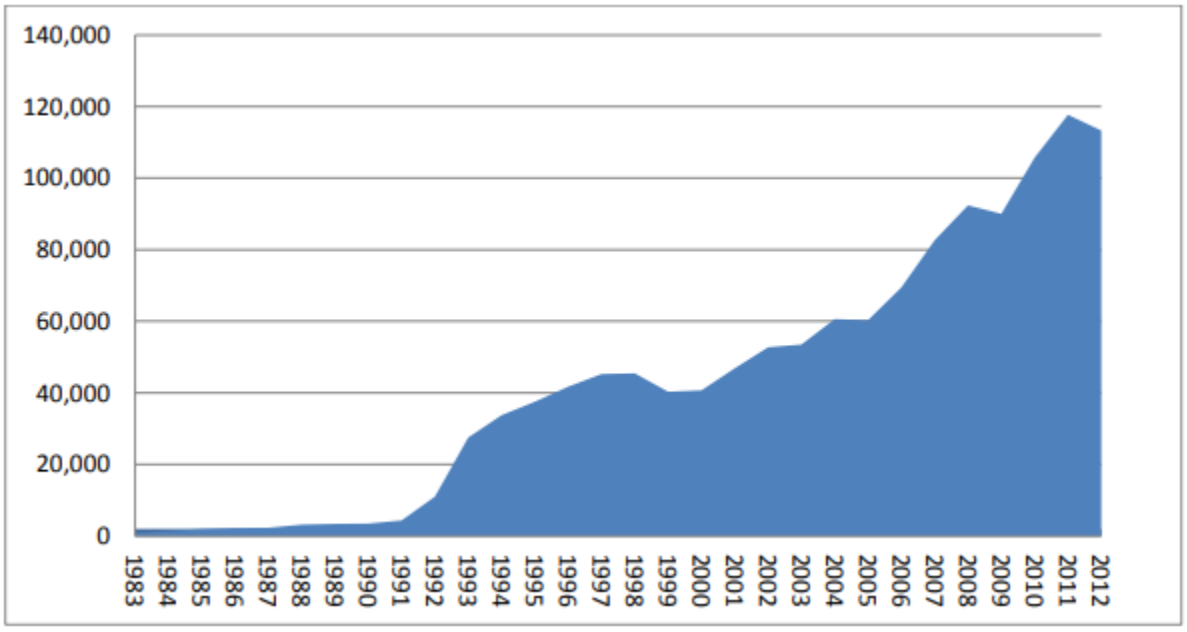
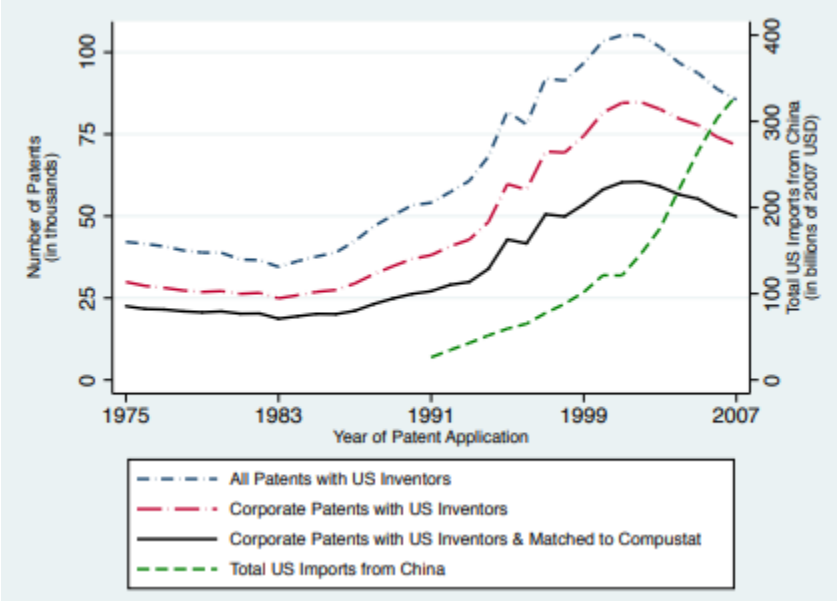


Figure 8: Patenting and trade exposure (Autor, Dorn, Hanson, Pisano, Shu, 2017



SIC Codes for Computstat Data:

2111 2321 2322 2323 2325 2326 2329 2331 2335 2337 2339 2341 2342 2353 2361 2369
2371 2381 2384 3385 2386 2387 2389 2911 2951 2952 2992 2999 3011 3021 3052 3053
3061 3069 3081 3082 3083 3084 3085 3086 3087 3088 3089 3143 3144 3149 3151 3312
3313 3315 3316 3317 3321 3322 3324 3325 3331 3334 3339 3341 3351 3353 3354 3355
3356 3357 3363 3364 3365 3366 3369 3398 3399 3411 3412 3421 3423 3425 3429 3431
3432 3433 3441 3442 3443 3444 3446 3448 3449 3451 3452 3462 3463 3465 3466 3469
3471 3479 3482 3483 3484 3489 3491 3492 3493 3494 3495 3496 3497 3498 3499 3511
3519 3523 3524 3531 3532 3533 3534 3535 3536 3537 3541 3542 3543 3544 3545 3546
3547 3548 3549 3522 3553 3554 3555 3556 3559 3561 3562 3563 3564 3565 3566 3567
3568 3569 3571 3572 3575 3577 3578 3579 3581 3582 3585 3586 3589 3592 3593 3594
3596 3599 3612 3613 3612 3624 3625 3629 3631 3633 3634 3635 3639 3641 3643 3644
3645 3646 3647 3648 3651 3652 3661 3663 3669 3671 6374 3675 3676 3677 3678 3679
3691 3692 3694 3695 3699

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