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How the Coronavirus Crisis Affected Japanese Industries: Evidence from the Stock Market[1]

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Abstract

The COVID-19 Crisis has buffeted the Japanese economy. To investigate how industries have been impacted this paper examines the response of sectoral stock returns. The machinery sector has suffered due to its exposure to the macroeconomy. Real estate and tourism have been harmed not by macroeconomic influences but by factors such as the voluntary lockdown and the travel restrictions. Sectors related to health, entertainment, and delivery services gained not because of the macroeconomic environment but because of idiosyncratic advantages. For those sectors such as machinery harmed by macroeconomic factors, the strongest impact has come from the Japanese economy itself rather than the world economy, exchange rates, or oil prices. These findings imply that nurturing the Japanese economy is key to helping Japanese firms recover.

Keywords: Japan, Coronavirus, Stock returns, Economic recovery

JEL classification: G10, I10

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1. Introduction

Japan has taken several steps to limit the spread of COVID-19. In March Prime Minister Abe requested that Japanese schools close. In April the Japanese government imposed a voluntary lockdown. This included asking people to work from home, requesting that non-essential businesses close, and demanding that crowds not assemble at concerts and ballgames. The government also imposed restrictions on travel from abroad. By the end of May it lifted the state of emergency and eased some of the restrictions.

Japan had already suffered two shocks before the Coronavirus Crisis (Shirai, 2020). First the U.S – China trade war and slowing growth in 2019 reduced manufacturing output. Then the consumption tax increase in October 2019 reduced demand. GDP growth equaled -7.3 percent in the fourth quarter of 2019 and -3.4 percent in the first quarter of 2020. A bright spot was a boom in construction, tourism, and real estate development, driven by low interest rates and preparations for the 2020 Tokyo Olympics.

The pandemic and the government's attempts to control it have since roiled the macroeconomy. In April 2020 core machinery orders fell 12 percent from the month before and 9 percent of the workforce was furloughed or for other reasons employed but not working. Between April and June 2020 Japanese business sentiment fell to its lowest level in 11 years. GDP in the second quarter of 2020 is expected to fall by 20 percent (Shirai, 2020).

This paper goes beyond these aggregate numbers to investigate how different parts of the Japanese economy have been affected. To do this it examines the response of Japanese stock prices. These are useful because consistent and comparable data on stock prices are available across industries in a timely manner. In theory stock prices equal the expected present value of future cash flows. Black (1987, p. 113) observed that, "The sector-by-sector behavior of stocks

is useful in predicting sector-by-sector changes in output, profits, or investment. When stocks in a given sector go up, more often than not that sector will show a rise in sales, earnings, and outlays for plant and equipment." Schwert (1990), employing monthly, quarterly, and annual data over the 1889-1988 period. reported that stock returns explain a significant proportion of future industrial production growth. Stock prices thus shed light on how investors expect companies to be affected.

Previous research has investigated how the COVID-19 crisis is affecting asset prices in countries other than Japan. Ramelli and Wagner (2020) investigated the response of U.S. stock returns to the Coronavirus Crisis. They adjusted returns using the capital asset pricing model and the Fama-French (1993) factors. They reported that adjusted returns on U.S. stocks exposed to China initially fell. As the virus spread to Europe and the U.S., they found that stocks of U.S. firms with more debt and less cash did worse than other stocks.

Pagano, Wagner, and Zechner (2020) observed that stocks of firms that are resilient to pandemic risk perform better than non-resilient stocks. They used Koren and Pető's (2020) measure of the degree to which jobs can be done without close personal interactions to measure firms' exposure to the COVID-19 crisis. They classified firms as high resilience if their values are below the median and as low resilience if their values are above the median. Over the 24 February – 20 March 2020 period, they reported that high resilience firms outperformed low resilience firms by 10%.

Chan and Marsh (2020) compared the drop in the Dow Jones Industrial Average (DJIA) during the COVID-19 Crisis with drops during other pandemics and market crashes. They reported that the DJIA fell much more during the current pandemic than during previous episodes such as the 1918 Spanish Flu epidemic. They attributed the large drop during the 2020

crisis to uncertainty arising from the unknown characteristics of the virus, the effects of policies to control the virus on businesses, and the effects of the crisis on global value chains.

Gormsen and Koijen (2020) used dividend futures on U.S. and European stocks to gauge the impact of the crisis on the U.S. economy. As of 9 June 2020, their model forecasted a 9 percentage point (ppt) drop in U.S. dividends over the next year relative to forecasts on 1 January 2020, a 2 percentage point drop in U.S. GDP growth, a 14 percentage point drop in European dividends, and a 3.1 percentage point drop in European GDP. They acknowledged that their model might understate the response because the macroeconomic changes are large relative to historical norms.

This paper investigates how industry stock prices in Japan have fared during the crisis. Sectors such as tourism, real estate, and home construction that did well after manufacturing turned down in 2019 have been hit hard in 2020. The results indicate that these drops have not been driven by macroeconomic factors but rather by sector-specific responses during the crisis.

The next section presents the data and methodology. Section 3 contains the results. Section 4 concludes.

2. Data and Methodology

Figure 1 plots stock prices for the aggregate Japanese stock market from 1 January 2020 until 29 May 2020. It shows that prices fell about 30 percent between 24 February and 16 March. Prices have since rebounded and at the end of May were down about 6 percent relative to their value on 24 February. To investigate how individual sectors have performed, daily returns on 76 sectors are compounded from the beginning of the Japanese stock market fall on 24

February 2020 until the end of May 2020. These sectors are listed in column (1) of Table 1 and compounded returns are listed in column (2).

To investigate how macroeconomic factors affect sectoral returns several variables are employed. There is a long tradition in finance of using the return on the country's overall stock market to control for economy-wide influences such as monetary and fiscal policy that affect industry stock returns (see, e.g., Lintner, 1965). The return on the aggregate Japanese stock market is thus employed. For similar reasons, the return on the world stock market is employed to control for changes in the world economy. There is also a long tradition of estimating the exposure of stock returns to exchange rates (see, e.g., Bodnar, Dumas, and Marston, 2002, and Dominguez and Tesar, 2006). The change in the yen/dollar exchange rate is thus used. Thorbecke (2019) reported that crude oil prices affected Japanese stock returns. For this reason the daily percentage change in the dollar spot price of Dubai crude oil is used. The Dubai price is appropriate since Japan sources much of its oil from the Middle East

Data on sectoral stock returns and the four macroeconomic factors come from the Datastream database. They are available from 1 September 1993 to 29 May 2020.[2] Augmented Dickey-Fuller (ADF) tests on the macro factors permit rejection of the null hypothesis that the series have unit roots. ADF tests on the 76 sectoral returns only yielded one case where the null hypothesis could be rejected. Sectoral returns are thus regressed on the four factors.

The estimated equations take the form:

[2] In some cases, the stock return data are not available until after 1 September 1993. In this case, the data are employed from the first date they become available.

$$\Delta R_{i,t} = \alpha_0 + \alpha_1 \Delta R_{m,Japan,t} + \alpha_2 \Delta R_{m,World,t} + \alpha_3 \Delta(yen/dollar)_t + \alpha_4 \Delta Dubai_t , \quad (1)$$

where $\Delta R_{i,t}$ is the daily change in the log of the price index for Japanese sector *i*, $\Delta R_{m,Japan,t}$ is the change in the log of the price index for Japan's aggregate stock market, $\Delta R_{m,World,t}$ is the change in the log of the price index for the world stock market, $\Delta(\text{yen/dollar})_t$ is the change in the nominal yen per dollar exchange rate, and ΔDubai_t is the change in the log of the spot price for Dubai crude oil.

The results from equation (1) can be used to decompose returns into the portion due to macroeconomic variables and the portion due to sector-specific factors. This decomposition sheds light on whether sectoral differences in performance are driven by the macroeconomic environment (e.g., the slowdown in the world economy) or by idiosyncratic factors affecting individual sectors (e.g., travel restrictions).

3. Results

Table 1 presents the findings for Japanese sectors. The average adjusted R-squared in column (5) is 0.4354, which is good for regressions explaining daily stock returns. In columns (2) through (4) a value less than one implies that one yen invested on 24 February had lost value by 29 May and a value greater than one implies that it had gained value. Column (2) presents the results for the overall stock return in a sector, column (3) for the portion of the return driven by macroeconomic factors, and column (4) for the portion driven by idiosyncratic factors. The rows of the table are ordered from the sector that performed best during this period (health care

services) to the sector that performed worst (crude oil production). The results in the table are also presented graphically in Figure 2.

Sectors related to real estate have suffered. The value for real estate investment trusts (REITs) in column (2) is 0.7021, the value for mortgage finance is 0.7398, the value for real estate is 0.7578, and the value for home construction is 0.8412. To understand these numbers, the value of 0.7021 for REITs indicates that 1 yen invested in real estate investment trusts on 24 February 2020 was only worth 0.7021 yen on 29 May 2020. Examining columns (3) and (4) indicates that real estate has suffered not primarily because of the macroeconomic environment but rather because of other factors. The state of emergency in particular has interfered with real estate transactions.

Sectors related to travel and leisure have also been damaged. The value for casinos and gambling in column (2) is 0.6951, the value for airlines in 0.7190, the value for hotels & motels is 0.8346, and the value for travel & tourism is 0.8977. Column (3) indicates that these losses were not driven primarily by macroeconomic factors. Rather they reflect restrictions on travel that have plagued the industry and also the postponement of the 2020 Tokyo Olympics.

The oil sector has also performed poorly. One yen invested in crude oil production decreased to 0.6697 and one yen in oil equipment & services to 0.7375. Columns (3) and (4) indicate that while macroeconomic factors such as low oil prices have contributed to these losses, more of the contribution has come from other factors. Lockdowns and travel bans have caused demand for oil to collapse and decimated the industry.

The automobile sector and related industries have also been hit. The value for automobiles in column (2) is 0.8335, for automobile parts 0.8652, for iron & steel 0.7333, and for tires 0.8738. For automobiles both the macroeconomic variables and other factors have

contributed equally to the losses. On the macroeconomic front exports have collapsed. On the sector-specific front many dealers remained shut during the emergency.

The electronic office equipment sector has lagged. Its value in column (2) is 0.8152. This reflects the fact that many offices have been closed.

The machinery sector has also suffered. One yen invested in specialized machinery stocks decreased to 0.853, one yen in tool stocks to 0.8842, and one yen in agricultural machinery to 0.8869. Columns (3) and (4) indicate that these losses were driven by macroeconomic factors. The slowdowns in Japan and the rest of the world have frozen demand for machinery.

In addition, banks have underperformed. As Shirai (2020) noted, they extended many real estate loans that are now at risk. In addition, as the macroeconomic downturn and government restrictions are producing bankruptcies, nonperforming loans are set to grow.

On the other hand, sectors related to peoples' health have done well. The value in column (2) for pharmaceuticals is 1.0845, the value for biotechnology is 1.1004, the value for drug retailers is 1.2076, the value for health care providers is 1.321, and the value for health care services is 1.3436. Columns (3) and (4) indicate that these gains were not driven by macroeconomic variables but entirely by idiosyncratic factors. The COVID-19 Crisis has been a boon for health-related industries.

Businesses that provide entertainment and distractions at home have also gained. The value in column (2) for telecommunications equipment (including smartphones) is 1.236, the value for recreational services is 1.1097, the value for recreational products is 1.082, and the value for electronic entertainment is 1.0681. These gains were not driven by macroeconomic

variables but entirely by other factors. As people have huddled at home, their demand for entertainment products has soared.

Delivery services have also benefitted. Their value in column (2) is 1.3146. Again these gains were not driven at all by macroeconomic factors. Delivery services have provided a critical lifeline for those forced to stay at home.

Table 2 focuses on explaining sectors' exposure to macroeconomic variables. Column (2) presents the return to 1 yen invested on 24 February due to macroeconomic factors. Columns (3), (5), (7), and (9) present the sectors' betas to Japanese stock returns, world stock returns, the yen/dollar exchange rate, and crude oil prices, respectively. The sectors are ordered from the one most harmed by macroeconomic factors (oil equipment & services) to the one least harmed (drug retailers).

The table reveals a clear relationship between sectors that performed badly due to macro factors and their exposure to the Japanese stock market. As Figure 3 indicates, there is a tight relationship between these two variables. There is also a relationship between the sectors that performed badly and their exposure to the world stock market. However, exposure to the Japanese stock market is much more important. The average of the 76 Japanese stock market betas in Table 2 is 0.87 while the average of the 76 world stock market betas is 0.009.

The relationship between sectoral performance and the yen/dollar exchange rate is less clear. Commodities such as aluminum and nonferrous metals are harmed when the yen/dollar rate depreciates and manufactured goods such as semiconductors and machinery benefit. Commodities are harmed because they are priced in dollars. A depreciation of the yen/dollar rate (an appreciation of the dollar) means that importing countries can afford to import less.

Manufactured goods, on the other hand, gain price competitiveness and can expand profit margins when the yen depreciates.

The important implication of these findings is that exposure to the Japanese stock market is the primary macroeconomic driver of poor sectoral performance. If the Japanese economy and by extension the Japanese stock market recovers, then those sectors whose performance in Table 2 has been poor could recover.

4. Conclusion

This paper investigates how Japanese sectoral stock returns have performed during the Coronavirus Pandemic. It also investigates whether these responses were driven by macroeconomic or by sector-specific factors. The Japanese machinery sector was harmed by the macroeconomic environment, as the slowdown froze demand for capital goods. The real estate and travel & leisure sectors were harmed by specific influences such as the effects of the voluntary lockdown and travel restrictions on these industries. Electronic office equipment and automobiles have been hit by both the macroeconomic environment (e.g., the slowing world economy) and by idiosyncratic factors (e.g., the closing of auto dealerships). On the other hand, sectors related to peoples' health and their ability to obtain entertainment and goods and services at home have done well. These gains have been driven entirely by sectoral characteristics rather than by macroeconomic changes.

The paper also investigates why sectors were harmed by macroeconomic factors. There is a strong relationship between sectors that have underperformed and those that are exposed to the Japanese stock market. There is also a relationship between these sectors and their exposure to the world stock market, although this link is weaker.

A few policy implications flow from these results. First, the sooner Japan can bring the Coronavirus under control the better for sectors such as real estate and tourism that have suffered from restrictions on personal contacts. Second, a recovery in the Japanese economy would advance sectors that have been harmed by the macroeconomic environment. A recovery in the world economy would also help, but a recovery in Japan matters the most. Nurturing the Japanese economy is thus crucial to helping Japanese firms rebound from this devastating crisis.

Future research should extend this methodology to other countries. It should also use Campbell and Mei's (1993) approach to decompose assets' betas with macroeconomic factors into components due to news about future cash flows, real interest rates, and risk premia. This could shed further light on how investors expect the Coronavirus Crisis to affect different sectors and different countries.

Table 1. Japanese Sector-Specific Returns at the End of May 2020 on 1 Yen Invested on 24 February 2020

(1)	(2)	(3)	(4)	(5)
Sector	Value on May 29th of 1 Yen Invested on February 24th	Value on May 29th Driven by Macroeconomic Factors	Value on May 29th Driven by Other Factors	Adjusted R-squared
Health Care Services	1.3436	0.9835	1.3718	0.0628
Health Care Providers	1.321	0.9756	1.3581	0.1063
Delivery Service	1.3146	0.9488	1.3828	0.385
Telecommunications Equipment	1.236	0.934	1.3132	0.4891
Drug Retailers	1.2076	0.9893	1.219	0.1135
Home Improvement Retail	1.145	0.9598	1.1967	0.1362
Recreational Services	1.1097	0.9667	1.1509	0.3944
Gas, Water, & Multi-utilities	1.1091	0.9753	1.1387	0.2592
Biotechnology	1.1004	0.9485	1.1616	0.1512
Pharmaceuticals	1.0845	0.9641	1.1288	0.5261
Recreational Products	1.082	0.903	1.1712	0.6035
Electronic Entertainment	1.0681	0.9352	1.1313	0.3351
Medical Equipment	1.0314	0.9462	1.0946	0.4401
Computer Services	1.0273	0.9366	1.0949	0.5244
Food Products	1.0225	0.9618	1.0639	0.5371
Medical Equipment & Services	1.0174	0.9473	1.0773	0.4579
Consumer Staples	1.0102	0.9298	1.0787	0.8303
Textile Products	1.0097	0.9231	1.0977	0.4647
Platinum & Precious Metals	0.9923	0.9442	1.0506	0.3138
Medical Supplies	0.9838	0.9674	1.0211	0.2301
Sugar	0.982	0.9641	1.0192	0.1882
Apparel Retailer	0.9801	0.9483	1.0412	0.3596
Toys	0.9781	0.9272	1.0568	0.4167
Household Appliances	0.9748	0.9292	1.0484	0.6051
Security Services	0.9704	0.9556	1.0172	0.3692
Specialty Retail	0.9693	0.9477	1.0281	0.5135
Diversified Retail	0.9684	0.9312	1.0392	0.5915
Leisure Goods	0.9665	0.9155	1.0512	0.7196
Construction Machinery	0.9632	0.9	1.0679	0.5111
Restaurants & Bars	0.9417	0.9783	0.969	0.3204
Farming & Fishing	0.9405	0.9494	0.9955	0.3711
Electrical Components	0.9394	0.8973	1.0446	0.7079
Education Services	0.9386	0.9583	0.9836	0.1431
Consumer Services	0.9386	0.9582	0.9837	0.1431
Soft Drinks	0.9279	0.9682	0.9635	0.3545

Railroads	0.9274	0.9684	0.9636	0.468
Cosmetics	0.9264	0.9691	0.9612	0.3111
Waste & Disposal Services	0.9255	0.953	0.9819	0.165
Construction & Materials	0.9248	0.9716	1.0027	0.7277
Trucking	0.9167	0.953	0.9756	0.5641
Consumer Discretionary Goods	0.9148	0.9335	0.9849	0.9114
Health Care Facilities	0.9127	0.9741	0.9403	0.1406
Electricity	0.9065	0.9612	0.9475	0.2374
Electronic Components	0.9	0.9057	0.9919	0.7875
Travel & Tourism	0.8977	0.9668	0.9335	0.4844
Nonferrous Metals	0.8949	0.888	1.013	0.5428
Distillers & Vintners	0.8919	0.9078	0.9698	0.3548
Brewers	0.8889	0.9563	0.9363	0.375179
Agricultural Machinery	0.8869	0.8996	0.9776	0.4119
Chemicals	0.8857	0.9146	0.9711	0.8004
Machinery: Tools	0.8842	0.8963	0.9949	0.5283
Construction	0.8822	0.929	0.9518	0.5728
Real Estate Services	0.8776	0.9391	0.9339	0.299
Consumer Electronics	0.8738	0.8986	0.9704	0.5779
Tires	0.8738	0.9257	0.948	0.4081
Auto Parts	0.8652	0.9064	0.9572	0.7229
Oil Refining & Marketing	0.8573	0.9122	0.9401	0.2866
Clothing & Accessories	0.8551	0.9304	0.9213	0.563
Aluminum	0.8535	0.8852	0.9717	0.3946
Specialized Machinery	0.853	0.9057	0.9465	0.5829
Home Construction	0.8412	0.9306	0.9097	0.5564
Hotels & Motels	0.8346	0.9462	0.8937	0.2787
Automobiles	0.8335	0.9162	0.9138	0.6728
Banks	0.8289	0.8989	0.9191	0.6827
Electronic Office Equipment	0.8152	0.9147	0.8893	0.5788
Semiconductors	0.7979	0.8906	0.9027	0.5708
Luxury Items	0.7743	0.9037	0.8605	0.4113
Marine Transport	0.7681	0.8878	0.8769	0.4817
Mortgage Finance	0.7578	0.9763	0.7803	0.1376
Real Estate	0.7398	0.9241	0.8059	0.5577
Oil Equipment & Services	0.7375	0.883	0.8437	0.2779
Iron & Steel	0.7333	0.8913	0.8319	0.5919
Airlines	0.719	0.9323	0.7796	0.313
Real Estate Investment Trusts	0.7021	0.9524	0.7442	0.5896

Casinos/Gambling	0.6951	0.9444	0.7407	0.117977
Crude Oil Production	0.6697	0.9018	0.7509	0.3779

Note: Column (2) presents the stock market return as of 29 May 2020 from investing 1 yen in the sector on 24 February 2020. Column (3) presents the portion of the return that can be attributed to the effect of four macroeconomic factors on returns. These factors are 1) the return on the Japanese stock market, 2) the return on the world stock market, 3) the change in the log of the yen/dollar exchange rate, and 4) the change in the log of the dollar spot price of Dubai crude oil. Column (4) presents the portion of returns not explained by these four factors. Column (4) thus includes the effects of other factors on returns such as measures to control the spread of coronavirus.

Source: Datastream database and calculations by the author.

Table 2. Japanese Sector-Specific Exposures to Macroeconomic Variables.

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Sector	Value on May 29th to 1 Yen Invested on Feb. 24 Due to Macroeconomic Factors	Exposure of Sector to Japanese Stock Market	S.E.	Exposure of Sector to World Stock Market	S.E.	Exposure of Sector to Yen/dollar Exchange Rate	S.E.	Exposure of Sector to Price of Dubai Crude Oil	S.E.
Oil Equipment & Services	0.883	1.104***	0.048	0.124**	0.053	-0.045	0.088	-0.001	0.019
Aluminum	0.885	1.200***	0.032	0.008	0.03	-0.136***	0.047	0.022**	0.01
Marine Transport	0.888	1.059***	0.027	0.074**	0.03	0.17***	0.033	0.001	0.009
Nonferrous Metals	0.888	1.138***	0.024	0.143***	0.026	-0.076**	0.033	-0.002	0.008
Semiconductors	0.891	1.173***	0.024	0.148***	0.023	0.179***	0.037	-0.013*	0.008
Iron & Steel	0.891	1.129***	0.023	0.049*	0.026	0.018	0.031	0.006	0.007
Machinery: Tools	0.896	1.074***	0.023	0.114***	0.03	0.141***	0.033	-0.004	0.008
Electrical Components	0.897	1.121***	0.016	0.062***	0.017	0.134***	0.024	0.002	0.005
Consumer Electronics	0.899	1.086***	0.021	0.053**	0.023	0.247***	0.03	-0.001	0.007
Banks	0.899	1.174***	0.022	-0.036	0.02	-0.1***	0.029	0.003	0.006
Agricultural Machinery	0.9	1.173***	0.035	0.04	0.032	0.106**	0.048	0.011	0.01
Construction Machinery	0.9	1.137***	0.029	0.076***	0.027	0.079**	0.038	0.013	0.009
Crude Oil Production	0.902	0.897***	0.03	0.071***	0.024	-0.103***	0.039	0.031***	0.01
Recreational Products	0.903	0.937***	0.02	0.058***	0.019	0.255***	0.028	-0.008	0.007
Luxury Items	0.904	1.004***	0.027	0.047	0.029	0.214***	0.04	-0.012	0.009
Electronic Components	0.906	1.063***	0.012	0.07***	0.013	0.151***	0.018	-0.002	0.004
Specialized Machinery	0.906	1.004***	0.021	0.071***	0.024	0.122***	0.027	-0.002	0.007
Auto Parts	0.906	1.043***	0.019	0.062***	0.018	0.239***	0.024	-0.001	0.006
Distillers & Vintners	0.908	1.025***	0.029	-0.036	0.033	-0.081*	0.043	0	0.01
Oil Refining & Marketing	0.912	0.853***	0.037	0.028	0.038	-0.012	0.043	0.027**	0.011
Chemicals	0.915	1.036***	0.015	0.058***	0.014	0.022	0.02	-0.001	0.004
Electronic Office Equipment	0.915	0.967***	0.024	0.05**	0.021	0.331***	0.031	-0.005	0.007
Leisure Goods	0.916	0.978***	0.014	0.034**	0.015	0.166***	0.019	-0.002	0.005
Automobiles	0.916	1.015***	0.019	0.03*	0.018	0.322***	0.026	-0.006	0.006
Textile Products	0.923	0.961***	0.024	0.002	0.022	0.043	0.029	0.014*	0.008
Real Estate	0.924	1.044***	0.024	0.021	0.028	-0.137***	0.032	0	0.007
Tires	0.926	0.879***	0.027	0.033	0.03	0.384***	0.041	-0.014	0.01
Toys	0.927	0.883***	0.021	0.011	0.026	0.103***	0.03	0.007	0.007
Construction	0.929	0.935***	0.022	-0.007	0.019	-0.126***	0.025	0.01*	0.006
Household Appliances	0.929	0.97***	0.019	0.044**	0.019	0.098***	0.028	-0.003	0.006
Consumer Staples	0.93	0.951***	0.011	0.005	0.013	0.204***	0.017	-0.006	0.004
Clothing & Accessories	0.93	0.806***	0.017	0.013	0.017	0.056**	0.022	0.003	0.006
Home Construction	0.931	0.93***	0.024	-0.007	0.021	-0.022	0.03	0.003	0.007
Diversified Retail	0.931	0.923***	0.018	-0.016	0.02	-0.093***	0.026	0.002	0.005
Airlines	0.932	0.717***	0.026	-0.027	0.026	-0.086***	0.03	0.004	0.008
Consumer Discretionary Goods	0.934	0.913***	0.007	0.006	0.008	0.124***	0.011	-0.003	0.002
Telecommunications Equipment	0.934	1.024***	0.026	0.043*	0.026	-0.079**	0.035	-0.012	0.008
Electronic Entertainment	0.935	0.871***	0.027	0.01	0.029	0.265***	0.041	-0.004	0.009
Computer Services	0.937	1.048***	0.025	-0.014	0.022	-0.107***	0.029	-0.003	0.007
Real Estate Services	0.939	0.963***	0.035	0.014	0.035	-0.04	0.047	-0.004	0.01
Platinum & Precious Metals	0.944	0.954***	0.047	-0.026	0.044	-0.24***	0.061	-0.005	0.012
Casinos/Gambling	0.944	0.688***	0.037	0.011	0.036	0.002	0.071	0.006	0.019
Medical Equipment	0.946	0.755***	0.024	0.041*	0.023	0.173***	0.029	0.011*	0.006

Hotels & Motels	0.946	0.664***	0.024	-0.009	0.034	0.036	0.031	0.007	0.008
Medical Equipment Services	0.947	0.738***	0.022	0.028	0.021	0.151***	0.027	0.01*	0.006
Specialty Retail	0.948	0.766***	0.02	-0.028	0.018	-0.074***	0.023	0.004	0.005
Apparel Retailer	0.948	0.872***	0.026	0.007	0.027	-0.015	0.034	0	0.008
Biotechnology	0.949	0.945***	0.065	-0.054	0.066	-0.248***	0.091	0.021	0.018
Delivery Service	0.949	0.829***	0.022	-0.034	0.023	0.034	0.031	0.005	0.008
Farming & Fishing	0.949	0.675***	0.02	-0.006	0.021	-0.064***	0.025	0.005	0.007
Real Estate Investment Trusts	0.952	1.191***	0.024	0.006	0.033	-0.098***	0.035	0.002	0.007
Waste & Disposal Services	0.953	0.727***	0.033	-0.042	0.035	0.04	0.053	0.012	0.015
Trucking	0.953	0.798***	0.02	-0.045**	0.018	-0.029	0.02	0.006	0.005
Security Services	0.956	0.816***	0.029	-0.02	0.026	-0.038	0.035	-0.002	0.007
Brewers	0.956	0.705***	0.024	0.001	0.021	-0.007	0.029	-0.004	0.006
Consumer Services	0.958	0.667***	0.034	-0.017	0.035	-0.147***	0.05	-0.008	0.012
Education Services	0.958	0.667***	0.034	-0.017	0.035	-0.147***	0.05	-0.008	0.012
Home Improvement Retail	0.96	0.629***	0.03	-0.047	0.027	-0.163***	0.05	0.003	0.01
Electricity	0.961	0.571***	0.029	-0.067*	0.02	-0.082***	0.026	-0.002	0.006
Food Products	0.962	0.663***	0.017	-0.024	0.017	-0.07***	0.021	0.004	0.005
Pharmaceuticals	0.964	0.692***	0.02	-0.023	0.018	0.012**	0.023	0.001	0.005
Sugar	0.964	0.776***	0.028	-0.05*	0.03	-0.13**	0.046	-0.024**	0.01
Recreational Services	0.967	0.729***	0.026	-0.051**	0.022	-0.087***	0.027	0.004	0.007
Travel & Tourism	0.967	0.666***	0.02	-0.065***	0.017	-0.079***	0.021	0.001	0.006
Medical Supplies	0.967	0.544***	0.023	-0.022	0.022	0.084***	0.031	0.004	0.006
Soft Drinks	0.968	0.519***	0.018	-0.022	0.02	0.002	0.021	-0.001	0.006
Railroads	0.968	0.67***	0.02	-0.074***	0.018	-0.087***	0.021	0.001	0.005
Cosmetics	0.969	0.698***	0.023	-0.024	0.02	-0.025	0.031	0.001	0.007
Construction & Materials	0.972	0.93***	0.017	0.019	0.014	-0.065***	0.021	0.009**	0.004
Health Care Facilities	0.974	0.67***	0.04	-0.044	0.047	-0.09	0.059	-0.006	0.016
Gas, Water, & Multi-utilities	0.975	0.565***	0.024	-0.084***	0.024	-0.088***	0.029	0.001	0.008
Health Care Providers	0.976	0.585***	0.038	-0.006	0.039	-0.054	0.049	0.007	0.012
Mortgage Finance	0.976	1.034***	0.1	0.028	0.076	-0.418	0.283	0.032	0.033
Restaurants & Bars	0.978	0.473***	0.02	-0.038**	0.017	-0.06***	0.02	0.001	0.006
Health Care Services	0.984	0.472***	0.042	0.033	0.042	0.002	0.052	0.011	0.013
Drug Retailers	0.989	0.596***	0.036	-0.087***	0.033	-0.072	0.051	0.014	0.012

Note: Column (2) presents the stock market return as of 29 May 2020 from investing 1 yen in the sector on 24 February 2020 that can be attributed to the effect of four macroeconomic factors on returns. These factors are 1) the return on the Japanese stock market, 2) the return on the world stock market, 3) the change in the log of the yen/dollar exchange rate, and 4) the change in the log of the dollar spot price of Dubai crude oil. Columns (3), (5) (7), and (9) present the coefficients from a regression of the sectoral stock returns listed in column (1) on these four factors. The data are daily and typically extend from 1 September 1993 to 29 May 2020. In those cases where data are unavailable starting on 1 September 1993, data are used from the first date they are available and extend to 29 May 2020. Columns (4), (6), (8), and (10) present heteroscedasticity and serial correlation consistent standard errors.

Source: Datastream database and calculations by the author.

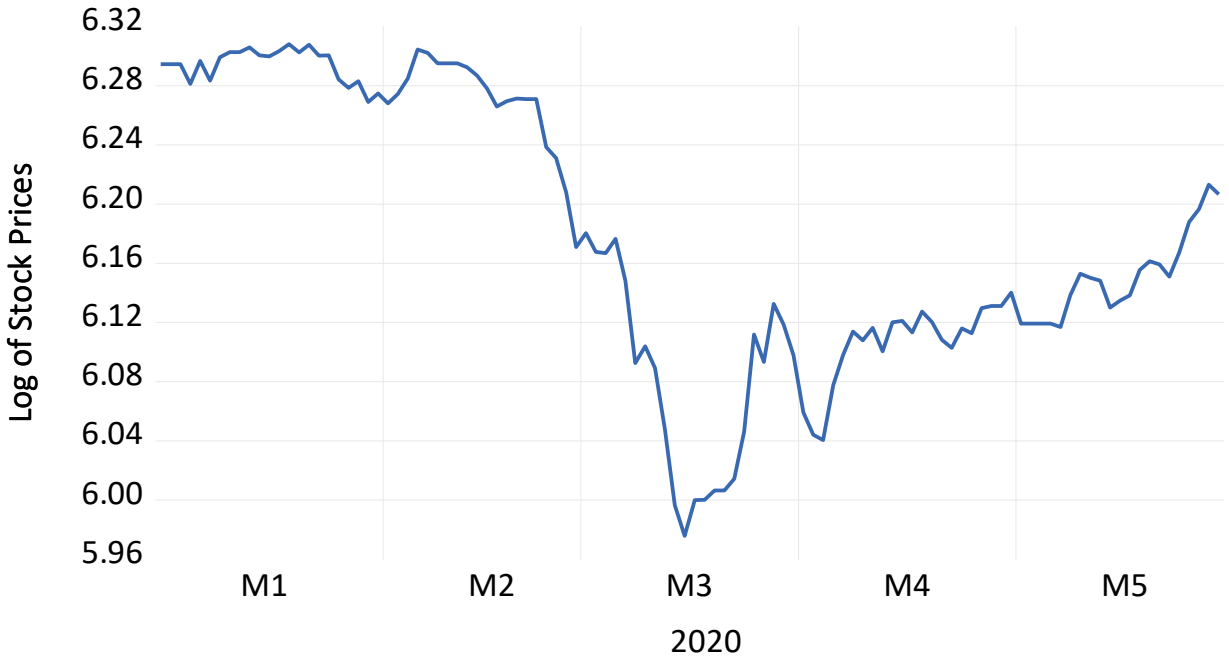

Figure 1. Japanese Aggregate Stock Prices.
Source: Datastream database.

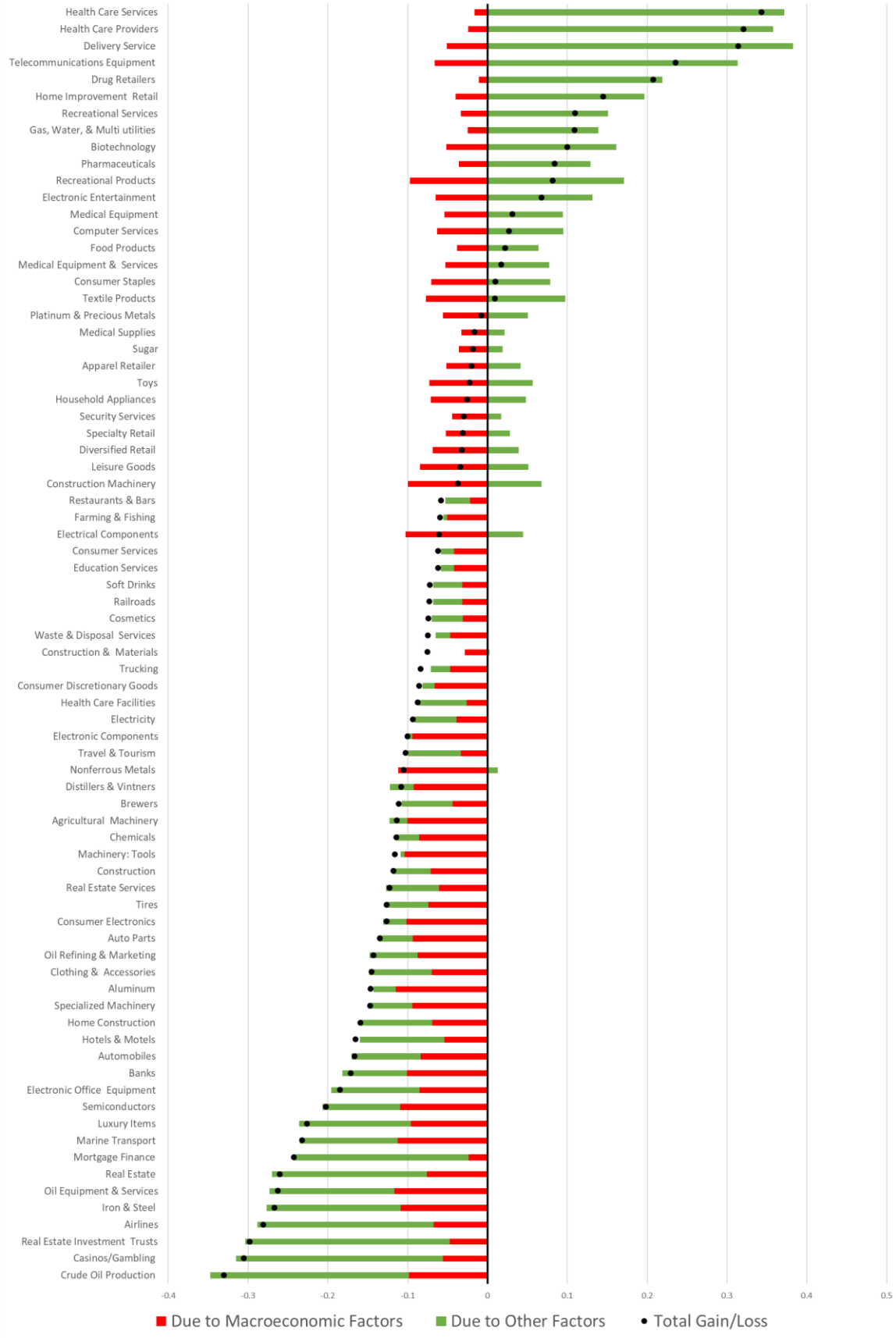
Health Care Services
Health Care Providers
Delivery Service
Telecommunications Equipment
Drug Retailers
Home Improvement Retail
Recreational Services
Gas, Water, & Multi utilities
Biotechnology
Pharmaceuticals
Recreational Products
Electronic Entertainment
Medical Equipment
Computer Services
Food Products
Medical Equipment & Services
Consumer Staples
Textile Products
Platinum & Precious Metals
Medical Supplies
Sugar
Apparel Retailer
Toys
Household Appliances
Security Services
Specialty Retail
Diversified Retail
Leisure Goods
Construction Machinery
Restaurants & Bars
Farming & Fishing
Electrical Components
Consumer Services
Education Services
Soft Drinks
Railroads
Cosmetics
Waste & Disposal Services
Construction & Materials
Trucking
Consumer Discretionary Goods
Health Care Facilities
Electricity
Electronic Components
Travel & Tourism
Nonferrous Metals
Distillers & Vintners
Brewers
Agricultural Machinery
Chemicals
Machinery: Tools
Construction
Real Estate Services
Tires
Consumer Electronics
Auto Parts
Oil Refining & Marketing
Clothing & Accessories
Aluminum
Specialized Machinery
Home Construction
Hotels & Motels
Automobiles
Banks
Electronic Office Equipment
Semiconductors
Luxury Items
Marine Transport
Mortgage Finance
Real Estate
Oil Equipment & Services
Iron & Steel
Airlines
Real Estate Investment Trusts
Casinos/Gambling
Crude Oil Production
-0.4
-0.3
-0.2
-0.1
0
0.1
0.2
0.3
0.4
0.5
Due to Macroeconomic Factors
Due to Other Factors
Total Gain/Loss

Figure 2. Japanese Sector-Specific Returns at the End of May 2020 on 1 Yen Invested on 24 February 2020

Source: Datastream database and calculations by the author.

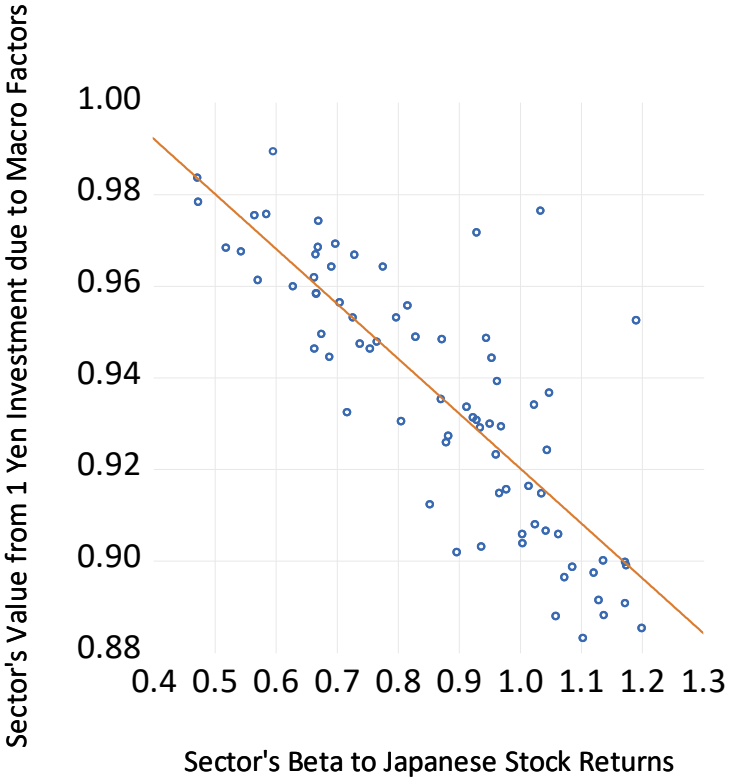

Figure 3. Relationship between Sectors' Performance due to Macro Factors and Their Exposure to Japanese Stock Returns.

Source: Datastream database and calculations by the author.

Note: The vertical axis presents the stock market return as of 29 May 2020 from investing 1 yen in a sector on 24 February 2020 that can be attributed to the effect of four macroeconomic factors on returns. These factors are 1) the return on the Japanese stock market, 2) the return on the world stock market, 3) the change in the log of the yen/dollar exchange rate, and 4) the change in the log of the dollar spot price of Dubai crude oil. The horizontal axis presents the coefficients on the return on the Japanese stock market from a regression of sectoral stock returns on the four factors. The data are daily and typically extend from 1 September 1993 to 29 May 2020. In those cases where data are unavailable starting on 1 September 1993, data are used from the first date they are available and extend to 29 May 2020.

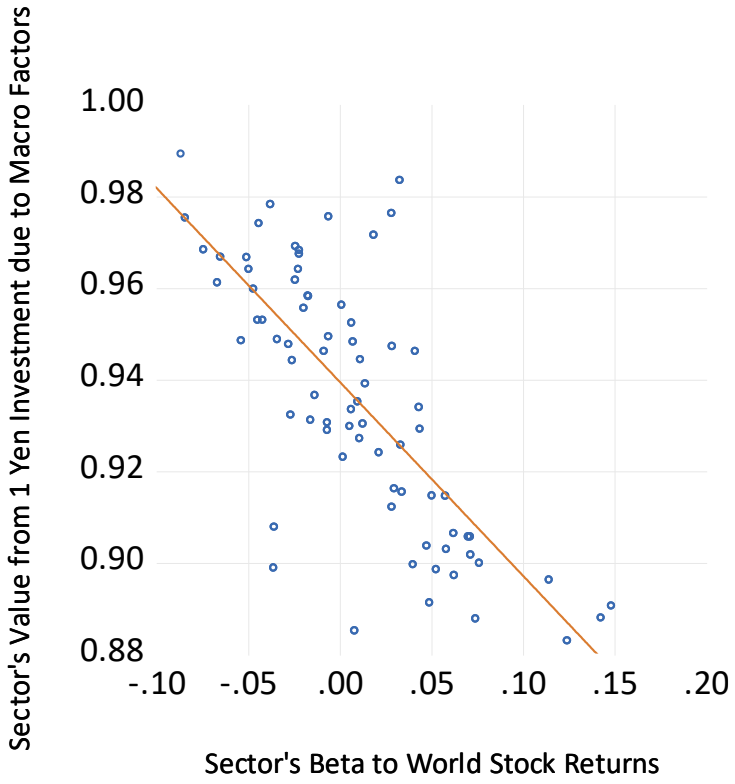

Figure 4. Relationship between Sectors' Performance due to Macro Factors and Their Exposure to World Stock Returns.

Source: Datastream database and calculations by the author.

Note: The vertical axis presents the stock market return as of 29 May 2020 from investing 1 yen in a sector on 24 February 2020 that can be attributed to the effect of four macroeconomic factors on returns. These factors are 1) the return on the Japanese stock market, 2) the return on the world stock market, 3) the change in the log of the yen/dollar exchange rate, and 4) the change in the log of the dollar spot price of Dubai crude oil. The horizontal axis presents the coefficients on the return on the world stock market from a regression of sectoral stock returns on the four factors. The data are daily and typically extend from 1 September 1993 to 29 May 2020. In those cases where data are unavailable starting on 1 September 1993, data are used from the first date they are available and extend to 29 May 2020.

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