Zombie Asset Pricing *

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December 22, 2023

Abstract

Persistent credit distortions warp equity returns. Japan's low momentum premium arises from banks providing subsided credit to "zombie firms." Controlling for zombies revives the momentum effect in Japan. Zombie-adjusted momentum doubles the unadjusted momentum Sharpe ratio, commands a positive price of risk, and is unspanned by other factors. Value, too, conforms closer to international results. Zombies rely on their banking relationships, and zombie losers' outsized bank betas push down momentum. Syndicated loan data confirm that companies with forbearance-inclined bank lenders drive low momentum.

*I am grateful to Gary Gorton and Tobias Moskowitz for their valuable advice and feedback. I would also like to thank Stefano Giglio, Bryan Kelly, Andrew Metrick, Chase Ross, the Yale Macrofinance Reading group, and seminar participants at Yale and the Federal Reserve Board for their comments and suggestions.

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1 Introduction

Beginning in the 1990s, Japanese banks restructured loans to insolvent borrowers—zombie firms—to avoid recognizing non-performing loans and their associated capital write-downs. Banks rolled over loans many times in an environment of regulatory forbearance, leading to persistent credit distortions. The persistence and prevalence of zombies suppressed macro outcomes. I show empirically that existence of zombies distort asset pricing premiums in Japan. Controlling for zombies in constructing common asset pricing factors aligns Japan's asset premiums with international results.

Correcting for zombies revives momentum in Japan. Momentum in Japan is viewed as too low compared to international counterparts. Japan's low momentum is a long-cited concern leading some to question whether momentum is more generally a spurious result. Excluding zombies doubles Japan's momentum premium and Sharpe ratio. Excising zombies also reduces the value premium toward the global average. Combined, Japanese momentum and value are consistent with other developed markets' premiums only after controlling for zombies.

Bank lending underlies the zombie distortion of asset pricing premiums. Japanese zombies exist because banks forbear on their loans. Zombies—and especially zombie losers—are high bank beta stocks. When bank returns are high, momentum plummets. Bank lending relationships extracted from syndicated loans show that the distorted value and momentum premia come from companies with forbearance-inclined bank lenders.

I examine the effect of zombies on Japanese momentum and value in five ways. First, zombie-adjusted value and momentum premiums fall in line with global averages. Removing zombies from the sample doubles the momentum Sharpe ratio. Value decreases with zombies removed, and the zombie-adjusted value and momentum premiums retain a strong negative correlation.

Second, I use syndicated loan data to identify companies that borrow from forbearance-inclined banks. Companies that borrow only from forbearance-inclined Japanese banks are more likely to have the opportunity to become zombies. These firms have high value and low momentum and drive the same result overall in Japan. In contrast, international banks should be less forbearance-inclined, and I show that their Japanese borrowers have value and momentum premiums closer to international averages. I show that firms with international lead arrangers have value and momentum premiums near international equity premiums, while firms with more forbearance-inclined lenders have value and momentum premiums like zombies.

Third, I show that momentum commands a positive price of risk only after adjusting for zombies. I construct zombie-adjusted factors and use the zombie-adjusted factors in cross-sectional pricing tests. The zombie-adjusted momentum factor—constructed by either controlling for zombies or dropping zombies—commands a positive price of risk. Fourth, I show that other common factors do not span my zombie-adjusted factors; other factors span vanilla momentum without the zombie adjustment.

Finally, I argue that momentum is low because of zombies' bank-dependence. Zombies are more sensitive to bank returns than non-zombies. Zombie losers have particularly high bank beta. When banks have strong returns, zombie losers outperform and drive down zombie momentum. Non-zombie winners and losers have similar bank beta, so non-zombie momentum is less affected by bank return fluctuations. I show that the best 20 months of bank returns—5.5% of the sample—account for nearly 40% of the difference between zombie momentum and non-zombie momentum.

Combined, the results show that persistent credit distortions change long-run asset pricing premiums. In times of market stress, such as during the Covid-19 pandemic, it may be important to support firms in the short-run; however, over a longer horizon, failure to resume a normal competitive process and the regular churn of firms can lead to the continued existence of zombies. These firms' returns distort common asset pricing premiums like momentum because their returns covary with bank returns.

Related Literature

This paper contributes to the literature on zombie credit. In Japan, the lost decade of the 1990s turned into more than two lost decades because of low productivity growth (Hayashi and Prescott, 2002). Underlying the productivity problems were zombies. Japanese banks evergreened loans to weak firms to avoid losses on their bank balance sheets, with more troubled firms more likely to receive bank credit (Peek and Rosengren, 2005). Caballero et al. (2008) show that zombies have negative externalities for healthy firms because zombies reduce the profits of healthy firms and lower investment and employment growth for non-zombies. Zombies had large macro effects on Japan's productivity growth and altered the competitive process.

Zombies exist outside of Japan. Andrews et al. (2017) document an increase of zombie firms in OECD countries since the mid-2000s, and they show that the zombies' survival attenuates labor productivity growth. Banerjee and Hofmann (2022) show a rise of zombies in 14 advanced economies since the late 1980s, and they attribute the increase to reduced financial pressure in the form of lower interest rates. Acharya et al. (2020) show how zombie credit has a disinflationary effect by creating excess production capacity, increasing supply, and lowering prices. Schivardi et al. (2019), Bonfim et al. (2020), and Blattner et al. (2019) show the role of bank lending relationships to zombie firms in Italy and Portugal.

My paper also adds to the literature on value and momentum. Asness et al. (2013) find a robust negative correlation between value and momentum across many markets and asset classes. The low momentum effect in Japan leads some to hesitate including momentum in asset pricing models and to question whether momentum is a spurious result more generally. Asness (2011) shows that the pairing of low momentum with the strong outperformance of value in Japan highlights the negative covariance of value and momentum in Japan to explain the poor performance of momentum.

2 Data

I use Japanese market data and accounting data from Datastream and Worldscope. The data cover 1979 to 2018 and consist of the universe of Japanese stocks in Datastream and Worldscope. I restrict my sample to companies with a book value in the previous six months and at least 12 months of return history, and I exclude financials (including REITs) and stocks that have a share price less than $1 at the start of each month.

To compare my results to international value and momentum premiums, I follow Asness et al. (2013) and restrict the data to a sample of liquid stocks. Each month, I sort stocks by market capitalization in descending order. Starting with the largest market capitalization stock, I include all stocks until the cumulative market capitalization is 90% of the total market capitalization for that month.

Identifying Zombies I identify zombies following Caballero et al. (2008): I compare a firm's actual interest payment, $R_{i,t}$, to an estimated lower-bound $R^{\star}_{i,t}$. The lower-bound stands for the interest payments a firm i could expect if it borrowed at no spread to the prime rate at time t:

$$R^{\star}_{i,t} = r^{s}_{t-1} S_{i,t-1} + \left(\frac{1}{5} \sum_{j=1}^{5} r^{\ell}_{t-j} \right) L_{i,t-1} \tag{1}$$

where $S_{i,t}$ is short-term debt and $L_{i,t}$ is long-term debt, and r^{s}_{t} and r^{ℓ}_{t} are the Bank of Japan's short-term and average long-term prime rates, which reflect the prime lending rate at which principal banks lend.

I construct the interest-rate gap, $X_{i,t}$, as the difference between the actual interest payment and the lower bound, scaled by the total debt:

$$X_{i,t} \equiv \frac{R_{i,t} - R^{\star}_{i,t}}{B_{i,t-1}} = r_{i,t} - r^{\star}_{i,t}. \tag{2}$$

In principle, only the highest-quality companies should borrow at effective rates near the prime rate, and most corporate borrowers would expect to borrow at a nontrivial spread to the prime rate. Following Caballero et al. (2008), I define companies with an interest-rate gap below 0 as *crisp* zombies, and companies borrowing near the prime rate—those with an interest-rate gap of 0 to 50 bps—as *fuzzy* zombies. I lag the interest-rate gap by six months to match the accounting data lag and ensure the balance sheet data are in the investors' information set.

Zombies-ness is persistent, and switches from zombie to non-zombie or vice versa occur roughly 1.5% of the time. The interest-rate gap is uncorrelated with firm size. Before removing small and illiquid stocks to restrict the sample to a liquid sample, size has a correlation of -0.1% with the interest-rate gap, a correlation of 4.8% with an indicator for crisp zombie, and a correlation of 3.8% with an indicator for crisp or fuzzy zombie. Cleaning the dataset to the liquid set of stocks increases the share of zombies from 20% to 48%.

Combined, crisp and fuzzy zombies make up 50% to 60% of firms in the high and low value and momentum terciles (Table A.1). There are more zombies in high value stocks and past loser stocks. Table A.2 shows the returns of each leg of the value and momentum premiums. Dropping zombies increases the returns of both winners and losers, but the improvement is smaller for losers. Value (P3) exceeds growth (P1) in all three datasets, and the the value premium decreases with zombies removed because the growth tercile return increases while the value tercile remains more stable.

Dropping zombies does not change the strong negative correlation between value and momentum. Table A.3 shows that value and momentum premiums have a correlation coefficient of -0.62 for the premiums and -0.65 for the strategies, compared to -0.60 and -0.66 with zombies included.

Value and Momentum Premium and Strategy Factors Value and momentum premium and strategy factors are created using sorts based on the underlying signals. For value, I use the ratio of the book value of equity to the market value of equity, where I lag book value by six months. For momentum, I sort based on the past 12-month cumulative return, with the most recent month skipped to account for the 1-month short-term reversal. I construct premium and strategy factors in the same way as Asness et al. (2013).

The value premium factor is constructed by sorting the liquid set of stocks into three equal-sized groups (called High, Middle, and Low) based on book-to-market. The value premium is the value-weighted return of the High portfolio minus the Low portfolio. The momentum premium is created analogously, sorting based on past return rather than book-to-market.

The strategy factors use zero-cost, signal-weighted portfolios, which dampens the impact of outliers. The strategy factor return for each signal $S \in (\text{value}, \text{momentum})$ is

$$r_t^S = \sum_i w_{it}^S r_{it} \tag{3}$$

where the weight for each security $i = 1, \ldots, N$ at time t is

$$w_{it}^S = c_t \underbrace{\left(rank(S_{it}) - \frac{1}{N} \sum_i rank(S_{it}) \right)}_{x_{it}} \tag{4}$$

where the weights sum to zero for each period and c_t is a scaling factor to make the portfolio scaled to one dollar long and one dollar short.

Zombie-Adjusted Value and Momentum Factors I adjust the standard value and momentum factors, *HML* and *WML*, to account for zombies. I create HML_{ZA} and WML_{ZA}, the zombie-adjusted factors, in two ways: first, by dropping zombies from the sample before forming the factors using the conventional method; and second, by triple-sorting to control for zombie-ness. Each of the zombie-adjusted factors can be constructed with zombies as crisp and fuzzy varieties or as crisp zombies alone. Either process yields similar asset pricing results.

First, I drop zombies from the sample and split the data into equal groups by value (High, Middle, Low) and size (Small, Big). I construct six double-sorted portfolios: High/Big, High/Small, Middle/Big, Middle/Small, Low/Big, Low/Small. I use the portfolio returns to calculate the zombie-adjusted value factor according to the following equation:

$$HML_{ZA} = \frac{\text{High/Small} + \text{High/Big}}{2} - \frac{\text{Low/Small} + \text{Low/Big}}{2}. \tag{5}$$

I construct WML_{ZA} using the same method. After dropping zombies, the data are split into equal groups by past returns (Winner, Middle, Loser) and size (Small, Big). I form six double-sorted portfolios and calculate the zombie-adjusted momentum factor:

$$WML_{ZA} = \frac{\text{Winner/Small} + \text{Winner/Big}}{2} - \frac{\text{Loser/Small} + \text{Loser/Big}}{2}. \tag{6}$$

Second, I keep zombies in the data and control for them in the factor creation. I sort the data into equal groups by value (H, M, L), momentum (W, M, L), size (S, B), and zombie-ness (Z, N). I form triple-sorted portfolios using the value, size, and zombie-ness sorts; and I form triple-sorted portfolios using the momentum, size, and zombie-ness sorts. I use the triple-sorted portfolios to construct the zombie-adjusted factors:

$$HML_{ZA} = \frac{\text{H/S/Z} + \text{H/S/N} + \text{H/B/Z} + \text{H/B/N}}{4} - \frac{\text{L/S/Z} + \text{L/S/N} + \text{L/B/Z} + \text{L/B/N}}{4} \tag{7}$$

and

$$WML_{ZA} = \frac{\text{W/S/Z} + \text{W/S/N} + \text{W/B/Z} + \text{W/B/N}}{4} - \frac{\text{L/S/Z} + \text{L/S/N} + \text{L/B/Z} + \text{L/B/N}}{4}. \tag{8}$$

Syndicated Loans Data I use data from Loan Pricing Corporation (LPC) Dealscan, which has data on Japanese firms' syndicated loans beginning in 1988, to establish lending relationships between banks and borrowers. I match the Datastream tickers to Compustat data using ISIN, and I link the Compustat data to Dealscan data using the Roberts Dealscan-Compustat Linking Database, which links the data at the facility, or loan tranche, level. The method matches 38% of Japanese loans to a specific Datastream ticker, and 59% of my liquid Datastream data has at least one syndicated loan.

I use the Dealscan data to classify the lead arranger for each loan, and I sort my data based on firms with only Japanese lead arrangers and firms that have international lead arrangers. There are multiple syndicated loans for many firms, and I consider the Japanese borrower-lender relationship to start from the earliest syndicated loan date and calculate value and momentum for firms with only Japanese lead arrangers. Over the same period, I calculate value and momentum for firms that have international lead arrangers.

I also classify firms with capital injection lead arrangers based on the earliest syndicated loan date, and I calculate value and momentum for those firms and all the remaining firms over the same period.

3 Empirical Results

3.1 Zombie-Adjusted Value and Momentum

Table 1 shows the returns to the value and momentum premiums and the signal-weighted strategies, calculated separately for the full dataset of liquid stocks and with zombies removed. All returns are in annualized terms. In the full data, Japan's momentum premium is 0.96%, and the value premium is 11.45%. The value premium and strategy are statistically significant, while the momentum counterparts are statistically indistinguishable from zero. Removing crisp zombies doubles the momentum premium and Sharpe ratio and nearly doubles the momentum strategy return and Sharpe ratio. Momentum grows even more after dropping both crisp and fuzzy zombies. Value, in turn, decreases with zombies removed. The premiums maintain their strong negative correlation even after removing zombies.

Japan's anomalies line up with the global average after I control for zombies. Table 2 compares value and momentum in Japan to the premiums and strategies abroad. The Global Average is the equal-weighted mean of the premium and strategy in the U.S., the U.K., and continental Europe; the Global Stocks row shows the value and momentum strategy factors as calculated by Asness et al. (2013). Momentum jumps from about 10% of the global numbers to 40% when adjusting for zombies. Value also moves closer to global figures, declining from more than three times the global average. Figure 2 shows this graphically. Value in Japan is exceptionally large, while momentum is exceptionally low, both in average returns and Sharpe ratios. The asset pricing premiums place Japan in the bottom-right of the graph for both the premium and strategy. All the other countries are above the 45-degree line, meaning that momentum exceeds value. After adjusting for zombies, Japan's strategy and premium factors move toward the 45-degree line.

Correcting for zombies estimates what asset premiums would look like under fewer credit distortions. However, credit distortions also have negative externalities for non-zombie firms (Caballero et al. (2008)). Counterfactual returns for non-zombies, in a world without zombies, are unobservable.

3.2 Syndicated Loan Lending Relationships

Zombies arise from regulatory forbearance in Japan, so zombies' subsidized credit should come from Japanese lenders. International lenders like U.S.-based J.P. Morgan have neither the incentive nor the implicit government support to lend at subsidized rates to Japanese firms. Thus, comparing firms with only Japanese lenders to firms with international lenders classifies firms using a related, but distinct, zombie-ness measure. Using syndicated loan data, I classify firms by their lending relationships. I find that firms with forbearance-inclined lenders drive Japan's high value and low momentum premiums.

Syndicated loans are large loans provided by a group of lenders. Typically, one bank is the lead arranger; that bank is often the largest lender in the group and plays a leading role in negotiating the contract. I sort my data based on firms with only Japanese lead arrangers and firms with international lead arrangers and calculate value and momentum for those companies. Separately, I identify firms that borrowed from one of the 21 financial institutions that received capital injections from the Japanese government in March 1998 based on the Financial Function Stabilization Act.[1] I expect that banks that needed capital injections were those most likely to forbear on their loans.

Table 3 shows the value and momentum premium for these subsets. Firms with only Japanese lead arrangers have negative momentum, and value is double the global average. In contrast, firms with international lead arrangers have a momentum Sharpe ratio more than quadruple the full-sample premium. Classifying firms based on their lead arrangers' capital injection status gives comparable results: firms without capital injections, who presumably have less forbearance, have lower value and higher momentum.

[1]These 21 capital injections totaled ¥1.8 trillion, with most of the banks taking ¥100 billion in subordinated debt, the amount the healthiest bank (Bank of Tokyo Mitsubishi) was willing to take. But this amount was “far less" than the amount needed to restore capital for most banks (Hoshi and Kashyap, 2010), and there was price discrimination with each bank having a different interest rate.

3.3 Zombie-Adjusted Cross-Sectional Pricing

I adjust the standard value and momentum factors, *HML* and *WML*, to account for zombies. I create zombie-adjusted factors HML_{ZA} and WML_{ZA} in two ways. First, I drop zombies from the sample before forming the factors using the conventional method. Second, I triple-sort to control for zombie-ness.

I calculate the price of risk for a risk factor using the portfolio returns and a two-step procedure. First, I estimate each portfolio i's beta to the risk factor using time-series regressions of each portfolio's excess return on the factor:

$$R^e_{i,t} = \alpha_i + \beta'_{i,f}\mathbf{f}_t + \varepsilon_{i,t},\ i = 1, \ldots, N,\ \ t = 1, \ldots, T, \tag{9}$$

where $\mathbf{f}_t$ is a vector of risk factors. Then I run a cross-sectional regression of portfolio excess returns on the betas estimated in Equation 9:

$$\mathbb{E}[R^e_{i,t}] = \lambda_0 + \hat{\beta}'_{i,f}\lambda_f + \xi_i,\ i = 1, \ldots, N, \tag{10}$$

where λ_f gives the factors' prices of risk.

Table 4 shows the price of risk from cross-sectional regressions of 25 size-and-book-to-market portfolios in Japan. The first three columns use unadjusted factors. Column 1 is CAPM; column 2 is the Fama–French 3-factor model; column 3 is the Carhart 4-factor model, which includes momentum, *WML*. The regressions begin in November 1990, the first observation for *WML* in Japan. The results with the unadjusted factors show that momentum does not have a significant price of risk. I use zombie-adjusted factors HML_{ZA} and WML_{ZA} in the remaining columns. In columns 4 to 7, I remove zombies to construct the factors, and in columns 8 to 11, I triple-sort zombies to construct the factors.

Adjusting for zombies recovers compensation for momentum risk. The price of risk for WML_{ZA} is positive and significant in the cross-sectional regressions. The time-series results are similar for the Fama–French factors and the zombie-adjusted factors. The mean average pricing errors are similar, and the GRS p-values tend to be large and fail to reject the null that the alphas are jointly zero; thus, in both cases, we fail to reject the model.

Adjusting for zombies aligns the portfolios' average excess returns with the portfolios' betas to value and momentum factors. Figure 3 shows the portfolios' betas to value and momentum factors. The betas to the Fama–French momentum factor fluctuate only slightly between portfolios, even though the portfolios' expected returns vary substantially. Betas to zombie-adjusted factors appear to capture the variation: the betas monotonically increase moving from growth to value stocks within a size group. If the price of risk is positive and constant, as estimated in cross-sectional regressions, the betas should vary as expected returns increase. The zombie adjustment slightly dampens value betas.

Figure 4 plots the portfolios' betas to the momentum and value factors against the portfolios' average excess returns. The betas to the zombie-adjusted momentum factor line up better with expected returns. The slope is statistically indistinguishable from zero using the Fama–French momentum factor WML to calculate the portfolios' betas. But the betas to WML_{ZA} have a significantly positive slope.[2]

3.4 Spanning Tests

Spanning tests show whether a factor's economic content is contained in a linear combination of other factors. Table 5 shows the factor spanning tests. Each row of the table is a separate regression. Panel A shows the spanning tests for the unadjusted Fama–French factors. The results show that other factors span momentum, implying that momentum does not need to be included in the model. Panel B uses zombie-adjusted factors HML_{ZA} and WML_{ZA}, constructed by dropping crisp zombies. Panel C drops crisp and fuzzy zombies. Panel D uses the triple-sort method discussed in Section 2 and controls for crisp zombies, and Panel E triple-sorts crisp and fuzzy zombies.

The significant intercept on WML_{ZA} in all four panels shows that other factors do not span zombie-adjusted momentum, and the results support the inclusion of momentum in the model. The spanning tests also highlight the negative covariance between value and momentum: the zombie adjustment does not affect the negative covariance between value

[2]The slope is significant regardless of whether I drop zombies or triple-sort zombies in the construction of WML_{ZA}.

and momentum.

Quality The spanning results are robust to adding a quality factor. Controlling for zombies is not just a reincarnation of controlling for the quality or profitability anomaly.

Caballero et al. (2008) classify zombie firms based on their interest-rate gap, rather than by operating characteristics like productivity or profitability metrics. They show that zombies tend to be low productivity firms. Since quality factors are closely related to profitabilty, one might think that adding a quality factor may change the results. I show that zombie-adjusted factors are not spanned by common quality factors in Japan.

Table A.4 adds the three Japanese quality factors—*RMW* (Robust Minus Weak), *QMJ* (Quality Minus Junk) and *BAB* (Betting Against Beta)—individually to the spanning tests. Each value in the table represents the intercept or t-statistic from a regression of the labeled factor on the other four factors in the panel and column. For example, the first coefficient is the intercept from the regression of the market factor on *SMB*, *HML*, *WML*, and *RMW*. The last coefficient is the intercept from the regression of *BAB* on the market factor, *SMB*, HML_{ZA}, and WML_{ZA}, where HML_{ZA} and WML_{ZA} are constructed by triple-sorting crisp and fuzzy zombies. Panel A shows that the unadjusted Japanese momentum factor is spanned by the other factors. Panels B, C, D and E use different forms of the zombie-adjusted value and momentum factors to show that zombie-adjusted momentum, WML_{ZA}, is not spanned by quality.

3.5 Zombies' Bank Betas Drives Momentum

Regulatory forbearance leads to zombies and low momentum. Zombies have higher beta to bank returns than non-zombies, and zombie losers have particularly high bank beta. When banks have high returns, zombie losers have high returns, driving down momentum. I find that the best 20 months of bank returns—5.5% of the sample— account for nearly 40% of the difference between zombie momentum and non-zombie momentum.

Zombie Bank Beta Zombies have higher bank beta than non-zombies. Bank distress translates to concern about the underlying funding for zombie firms and has a differential effect between zombie and non-zombies returns.

I sort firms into five equal-sized groups based on the interest-rate gap and construct daily value-weighted portfolios. The non-zombie portfolio consists of firms with the largest interest-rate gaps, and firms in the zombie portfolio have the most negative interest-rate gaps. Table A.7 regresses the portfolio returns on daily bank returns. When banks have weak returns, or weak returns relative to the market, zombies also have lower returns.[3] Appendix A shows that zombies in Europe also have higher bank beta than non-zombies.

Zombie Losers' High Bank Beta Drives Low Momentum There is also a differential effect *within* zombies: zombie losers have higher bank beta than zombie winners. When banks have strong returns, zombie losers have outsized returns, driving down zombie momentum. Non-zombies winners and losers have similar bank beta, so non-zombie momentum is not affected by strong bank returns. I find that the best 20 months of bank returns (5.5% of the sample) account for nearly 40% of the difference between zombie momentum and non-zombie momentum.

I study the difference between zombie and non-zombie momentum:

$$\begin{aligned} \textit{MomDiff} &= \text{Zombie Momentum} - \text{Non-zombie Momentum} \\ &= (\text{Zombie Winners} - \text{Zombie Losers}) \\ &- (\text{Non-zombie Winners} - \text{Non-zombie Losers}). \end{aligned} \tag{11}$$

Zombie and non-zombie winners and losers are constructed using the same breakpoints (the cutoffs used for the full data). In this way, the overall momentum series combines value-weighted zombie and non-zombie momentum.

Table A.5 shows that zombie losers have a higher bank beta than the other legs; and Panel C shows that when banks outperform relative to the market, zombie losers also outperform. Table A.6 shows that zombie losers have strong returns on top bank return months. Strong zombie loser returns lead zombie momentum to perform poorly, and the gap

[3] I use the Nikkei 225 returns for the market return. For the daily Japanese bank return, I use a value-weighted return of all Japanese stocks in Datastream in the industry "Banks". All daily returns are in log terms.

between zombie and non-zombie momentum significantly widens in the top 20 best bank return months.

Figure A1 shows the cumulative difference between zombie and non-zombie momentum returns, and the cumulative difference in the 20 months with the largest bank returns. Figure A2 plots the contribution of the 20 months to the overall difference. The results show that the top 20 months, which constitute 5.5% of the sample, contribute over 40% of the difference between zombie momentum and non-zombie momentum.

4 Conclusion

Zombies, the consequences of persistent credit distortions, confound asset pricing premiums in Japan. Zombies make value and momentum in Japan look different from their international counterparts. Controlling for zombies allows Japanese value and momentum to look more similar to value and momentum internationally and revives a positive price of risk for the Japanese momentum factor. Japanese momentum is particularly affected by zombies. Without adjusting for zombies, Japanese momentum is very low because zombie losers' high bank beta leads to declines in zombie momentum in months with strong bank returns. Bank lending relationships are at the core of the credit distortions, and firms with zombie-inclined lenders have more distorted asset premiums than firms with international lenders.

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5 Tables

Dataset	Full Data	Drop Crisp Zombies	Drop Crisp + Fuzzy Zombies	Random Half	Random Other Half
VALUE PREMIUM					
Mean	11.45	10.15	8.03	10.88	12.15
(t-statistic)	(4.46)	(3.87)	(2.97)	(3.83)	(4.63)
Std Dev	15.24	15.63	16.27	16.89	15.49
Sharpe	0.75	0.65	0.49	0.64	0.78
VALUE STRATEGY					
Mean	9.57	9.10	7.76	9.36	9.31
(t-statistic)	(4.17)	(3.63)	(2.97)	(4.09)	(3.72)
Std Dev	13.74	15.00	15.74	13.71	14.97
Sharpe	0.70	0.61	0.49	0.68	0.62
MOMENTUM PREMIUM					
Mean	0.96	2.72	2.82	0.42	1.99
(t-statistic)	(0.31)	(0.84)	(0.86)	(0.12)	(0.65)
Std Dev	19.17	19.94	20.29	21.08	18.78
Sharpe	0.05	0.14	0.14	0.02	0.11
MOMENTUM STRATEGY					
Mean	0.93	1.82	2.94	0.67	1.16
(t-statistic)	(0.35)	(0.66)	(1.04)	(0.25)	(0.42)
Std Dev	16.66	17.08	17.31	16.92	17.28
Sharpe	0.06	0.11	0.17	0.04	0.07

Table 1: Value and Momentum in Japan. Table presents the average return, t-statistic of the average return, the standard deviation of returns, and the Sharpe ratio for the value premium, value strategy, momentum premium, and momentum strategy factors. Statistics are computed from monthly returns and reported as annualized numbers. See the text for details on the factors' construction.

	Mean				Sharpe Ratio			
	Value Premium	Momentum Premium	Value Strategy	Momentum Strategy	Value Premium	Momentum Premium	Value Strategy	Momentum Strategy
INTERNATIONAL								
U.S.	1.16	3.71	2.37	5.89	0.10	0.25	0.16	0.36
Europe	3.07	5.50	2.84	7.43	0.28	0.38	0.28	0.56
U.K.	3.73	8.20	4.02	9.65	0.28	0.51	0.29	0.61
Global Average	2.66	5.80	3.08	7.66	0.22	0.38	0.24	0.51
Global Factor			4.21	6.14			0.39	0.50
JAPAN								
Full Data	10.96	0.64	9.66	0.59	0.59	0.05	0.63	0.10
Drop Crisp	9.59	2.49	9.16	1.51	0.60	0.12	0.60	0.09
Drop Crisp Fuzzy	7.38	2.60	7.75	2.69	0.45	0.13	0.48	0.15
JAPAN VS. INTERNATIONAL								
Ratio (relative to Global Average)								
Full Data	4.13×	0.11×	3.14×	0.08×	2.67×	0.14×	2.61×	0.20×
Drop Crisp	3.61×	0.43×	2.98×	0.20×	2.74×	0.33×	2.49×	0.17×
Drop Crisp Fuzzy	2.78×	0.45×	2.52×	0.35×	2.02×	0.33×	2.01×	0.30×
Ratio (relative to Global Factor)								
Full Data			2.29×	0.10×			1.61×	0.20×
Drop Crisp			2.17×	0.25×			1.53×	0.18×
Drop Crisp Fuzzy			1.84×	0.44×			1.23×	0.31×

Table 2: Global Comparison of Value and Momentum. Table presents the average return in percent and the Sharpe ratio for the value premium, value strategy, momentum premium, and momentum strategy factors internationally. Japan's factors are calculated with crisp zombies removed and crisp and fuzzy zombies removed. International data are from the AQR website, including the Global Average (calculated as the equal-weighted average of the U.S., the U.K., and Europe premiums or strategies) and the Global Strategy Factor. Ratios are calculated as the Japan statistics divided by the Global Average or the Global Factor. Statistics are computed from monthly returns and reported as annualized numbers. See the text for details on the factors' construction.

Dataset	Full Data	Firms with Only Japanese Lead Arrangers	Firms with International Lead Arrangers	Firms with Capital Injection Lead Arrangers	Firms without Capital Injection Lead Arrangers
Value Premium					
Mean	6.61	16.72	6.18	14.22	3.45
(t-statistic)	(1.78)	(3.63)	(1.53)	(3.44)	(0.83)
Std Dev	15.89	18.91	17.39	17.14	18.00
Sharpe	0.42	0.88	0.36	0.83	0.19
Momentum Premium					
Mean	0.79	−4.68	4.20	−1.33	3.94
(t-statistic)	(0.20)	(−1.01)	(0.93)	(−0.33)	(0.94)
Std Dev	17.29	20.97	19.58	17.91	18.18
Sharpe	0.05	−0.22	0.21	−0.07	0.22

Table 3: Value and Momentum for Japanese Firms Classified by Syndicated Loan Lending Relationships. Table presents the average return in percent, t-statistic of the average return, the standard deviation of returns, and the Sharpe ratio for the value premium, value strategy, momentum premium, and momentum strategy factors. Statistics are calculated separately for firms in the full liquid sample from Asness et al. (2013), for firms with only Japanese lead arrangers, firms with international lead arrangers, firms with capital injection lead arrangers, and firms without capital injection lead arrangers. Statistics are computed from monthly returns and reported as annualized numbers. See the text for details on the samples and factors' construction.

Prices of Risk: $\mathbb{E}[R^e_{i,t}] = \lambda_0 + \hat{\beta}'_{i,f}\lambda_f$											
	Unadjusted Factors			Drop Crisp		Drop Crisp + Fuzzy		Triple-Sort Crisp		Triple-Sort Crisp + Fuzzy	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Intercept	0.205	-0.397	-0.093	-0.533	0.125	-0.628	0.050	-0.534	-0.110	-0.536	-0.042
	(0.27)	(-0.64)	(-0.15)	(-0.8)	(0.2)	(-0.91)	(0.08)	(-0.81)	(-0.17)	(-0.81)	(-0.06)
	(0.27)	(-0.61)	(-0.14)	(-0.77)	(0.17)	(-0.87)	(0.06)	(-0.77)	(-0.15)	(-0.77)	(-0.06)
$Mkt - Rf$	-0.012	0.461	0.181	0.592	-0.012	0.688	0.067	0.591	0.196	0.592	0.132
	(-0.01)	(0.67)	(0.26)	(0.81)	(-0.02)	(0.92)	(0.09)	(0.82)	(0.27)	(0.82)	(0.19)
	(-0.01)	(0.64)	(0.25)	(0.79)	(-0.01)	(0.88)	(0.08)	(0.79)	(0.25)	(0.78)	(0.17)
SMB		0.185	0.186	0.176	0.182	0.175	0.179	0.180	0.194	0.178	0.191
		(1.02)	(1.03)	(0.97)	(1)	(0.97)	(0.99)	(1)	(1.07)	(0.98)	(1.05)
		(1.02)	(1.02)	(0.97)	(0.99)	(0.97)	(0.97)	(1)	(1.06)	(0.98)	(1.04)
HML		0.309	0.318								
		(1.87)	(1.93)								
		(1.85)	(1.91)								
WML			0.774								
			(1.26)								
			(1.17)								
HML_{ZA}				0.628	-0.246	0.702	-0.214	0.554	-0.046	0.560	-0.085
				(1.81)	(-0.67)	(1.81)	(-0.54)	(1.95)	(-0.14)	(1.92)	(-0.26)
				(1.75)	(-0.65)	(1.75)	(-0.5)	(1.88)	(-0.13)	(1.85)	(-0.24)
WML_{ZA}					1.690		1.880		1.217		1.344
					(2.58)		(2.71)		(1.76)		(1.98)
					(2.34)		(2.37)		(1.59)		(1.78)
Ann. R.P. ↑	0.00	0.00	0.43	0.00	2.32	0.00	2.16	0.00	1.73	0.00	1.86
TS GRS p-value	0.12	0.16	0.20	0.10	0.07	0.17	0.31	0.08	0.02	0.10	0.05
MAPE (%)	0.16	0.11	0.11	0.12	0.12	0.12	0.10	0.13	0.15	0.13	0.14
TS Avg R^2	0.77	0.92	0.93	0.91	0.92	0.91	0.92	0.92	0.92	0.92	0.92
Quarters (T)	332	332	332	332	332	332	332	332	332	332	332
Portfolios (N)	25	25	25	25	25	25	25	25	25	25	25

Table 4: Cross-Sectional Regressions with Zombie-Adjusted Factors. Table presents the cross-sectional pricing results for the 25 Fama–French monthly portfolios, which are double-sorted on size and book-to-market. The regressions test if the portfolios are priced by the Japanese Fama–French factors and zombie-adjusted factors, which are adjusted by dropping crisp zombies, dropping crisp and fuzzy zombies, triple-sorting crisp zombies, and triple-sorting crisp and fuzzy zombies. See the text for additional details on the factors. Coefficients are the price of risk estimates, and Fama–MacBeth and GMM t-statistics are reported. Intercept is included in each regression but omitted from the table. Ann. Risk Premium ($\sigma^\beta \times \lambda$) is the annualized increase in expected risk premium associated with a one standard deviation increase in the portfolio's beta to the momentum factor. TS GRS p-value is the p-value of the Gibbons–Ross–Shanken test of whether the pricing errors are jointly zero. MAPE is the mean absolute pricing error. TS Avg R^2 is the average time-series R^2.

Panel A: Fama–French Factors					
	Intercept	$Mkt - R_f$	SMB	HML	WML
$Mkt - R_f$	0.251		0.173	-0.453	-0.280
	(0.86)		(1.91)	(-4.36)	(-4.11)
SMB	0.099	0.064		0.119	-0.039
	(0.56)	(1.91)		(1.84)	(-0.91)
HML	0.335	-0.121	0.086		-0.200
	(2.24)	(-4.36)	(1.84)		(-5.81)
WML	0.281	-0.175	-0.065	-0.466	
	(1.23)	(-4.11)	(-0.91)	(-5.81)	
Panel B: Zombie-Adjusted Factors, Drop Crisp Zombies					
	Intercept	$Mkt - R_f$	SMB	HML_{ZA}	WML_{ZA}
$Mkt - R_f$	0.446		0.146	-0.408	-0.353
	(1.48)		(1.61)	(-4.47)	(-4.15)
SMB	0.157	0.054		-0.015	-0.050
	(0.85)	(1.61)		(-0.26)	(-0.94)
HML_{ZA}	0.847	-0.141	-0.014		-0.661
	(4.93)	(-4.47)	(-0.26)		(-18.30)
WML_{ZA}	0.797	-0.141	-0.054	-0.764	
	(4.28)	(-4.15)	(-0.94)	(-18.3)	
Panel C: Zombie-Adjusted Factors, Drop Crisp and Fuzzy Zombies					
	Intercept	$Mkt - R_f$	SMB	HML_{ZA}	WML_{ZA}
$Mkt - R_f$	0.371		0.152	-0.378	-0.318
	(1.24)		(1.68)	(-4.56)	(-3.89)
SMB	0.148	0.056		-0.005	-0.039
	(0.82)	(1.68)		(-0.09)	(-0.76)
HML_{ZA}	0.731	-0.158	-0.005		-0.684
	(3.87)	(-4.56)	(-0.09)		(-17.66)
WML_{ZA}	0.696	-0.139	-0.046	-0.713	
	(3.60)	(-3.89)	(-0.76)	(-17.66)	
Panel D: Zombie-Adjusted Factors, Triple-Sort Crisp Zombies					
	Intercept	$Mkt - R_f$	SMB	HML_{ZA}	WML_{ZA}
$Mkt - R_f$	0.502		0.169	-0.504	-0.427
	(1.69)		(1.89)	(-5.3)	(-5.11)
SMB	0.082	0.064		0.071	-0.015
	(0.44)	(1.89)		(1.17)	(-0.29)
HML_{ZA}	0.815	-0.156	0.058		-0.578
	(5.09)	(-5.30)	(1.17)		(-15.87)
WML_{ZA}	0.693	-0.173	-0.016	-0.752	
	(3.73)	(-5.11)	(-0.29)	(-15.87)	
Panel E: Zombie-Adjusted Factors, Triple-Sort Crisp and Fuzzy Zombies					
	Intercept	$Mkt - R_f$	SMB	HML_{ZA}	WML_{ZA}
$Mkt - R_f$	0.484		0.163	-0.502	-0.417
	(1.63)		(1.82)	(-5.34)	(-5.02)
SMB	0.102	0.062		0.052	-0.024
	(0.56)	(1.82)		(0.86)	(-0.45)
HML_{ZA}	0.773	-0.159	0.043		-0.587
	(4.77)	(-5.34)	(0.86)		(-16.21)
WML_{ZA}	0.691	-0.171	-0.026	-0.757	
	(3.71)	(-5.02)	(-0.45)	(-16.21)	

Table 5: Spanning Tests for Zombie-Adjusted Factors. Table presents time-series regressions at the monthly level. The regressions test if each factor is spanned by other factors. Panel A uses the Fama–French factors. Panels B, C, D, and E use the zombie-adjusted factors HML_{ZA} and WML_{ZA}, created by dropping crisp zombies, dropping crisp and fuzzy zombies, triple-sorting crisp zombies, and triple-sorting crisp and fuzzy zombies. t-statistics using robust standard errors are reported in parentheses.

6 Figures

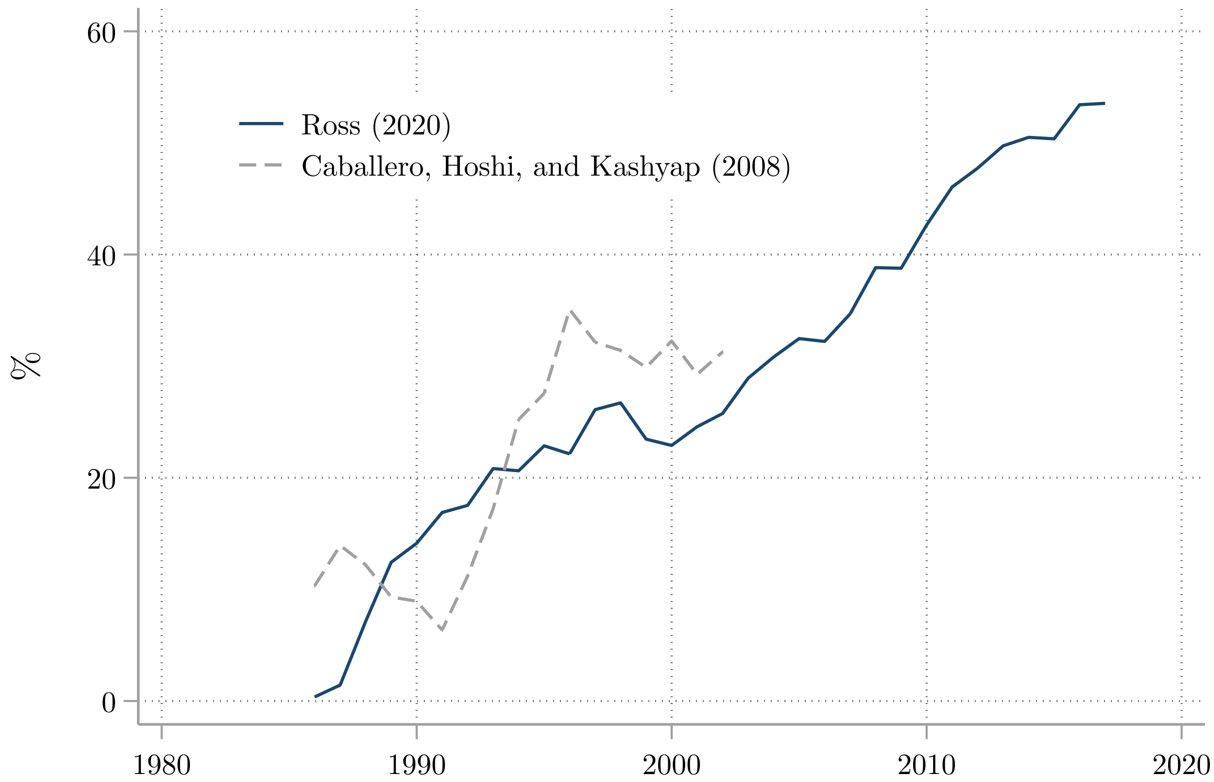

Figure 1: Percentage of Zombie Firms in Japan. Figure compares the percentage of Japanese zombies in the data and the zombie percentage from Caballero et al. (2008). Zombies are identified on a monthly basis, and the plotted percentage is the annual average.

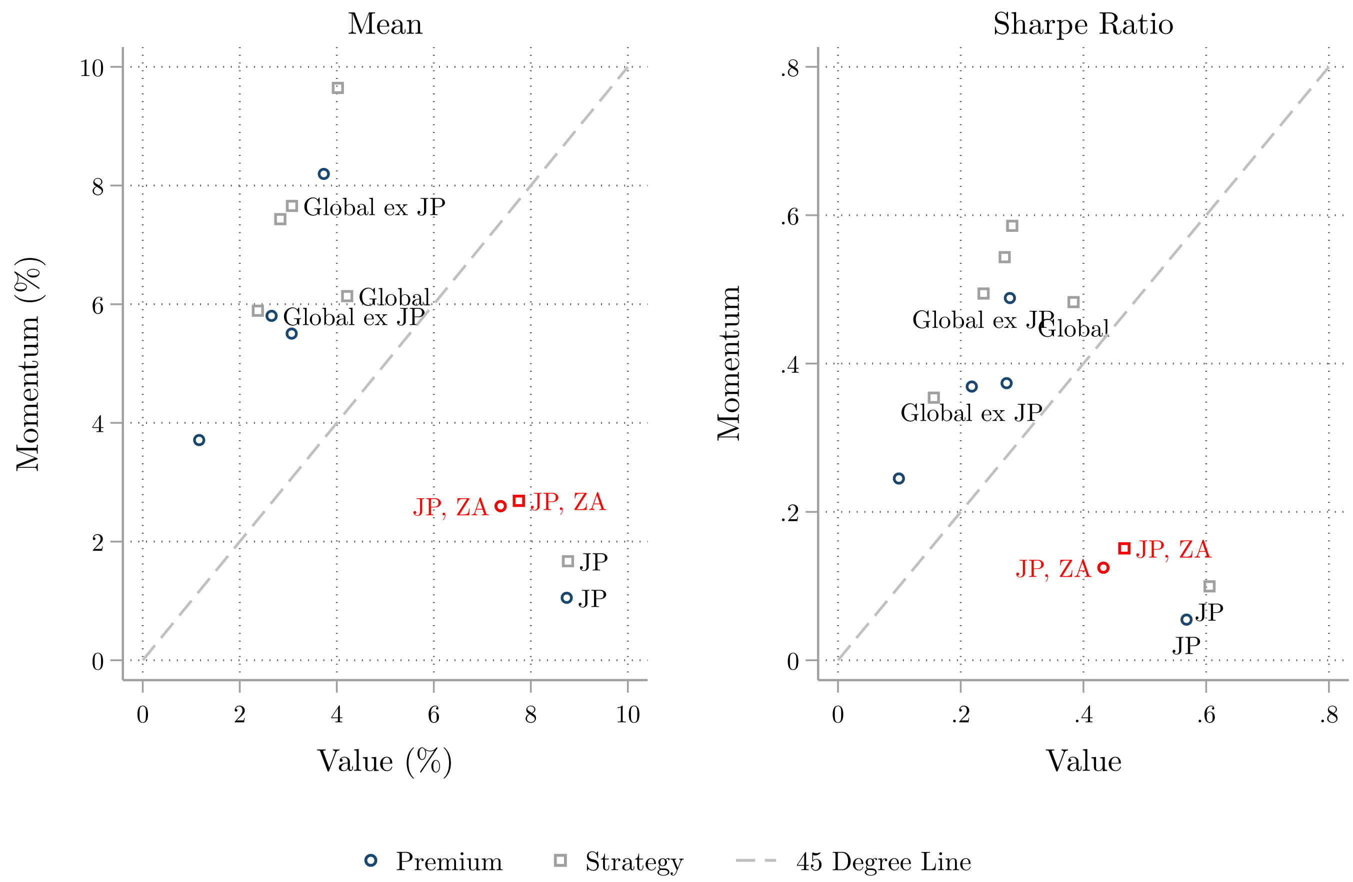

Figure 2: Global Comparison of Value and Momentum. Figure shows the average returns and Sharpe ratios for value and momentum premiums and strategies in the U.S., Europe, U.K., and Japan. See the text for details on the factors' construction. Left panel plots the average returns, and right panel plots the Sharpe ratio. International statistics are calculated using data from the AQR website. Statistics are computed from monthly returns and reported as annualized numbers.

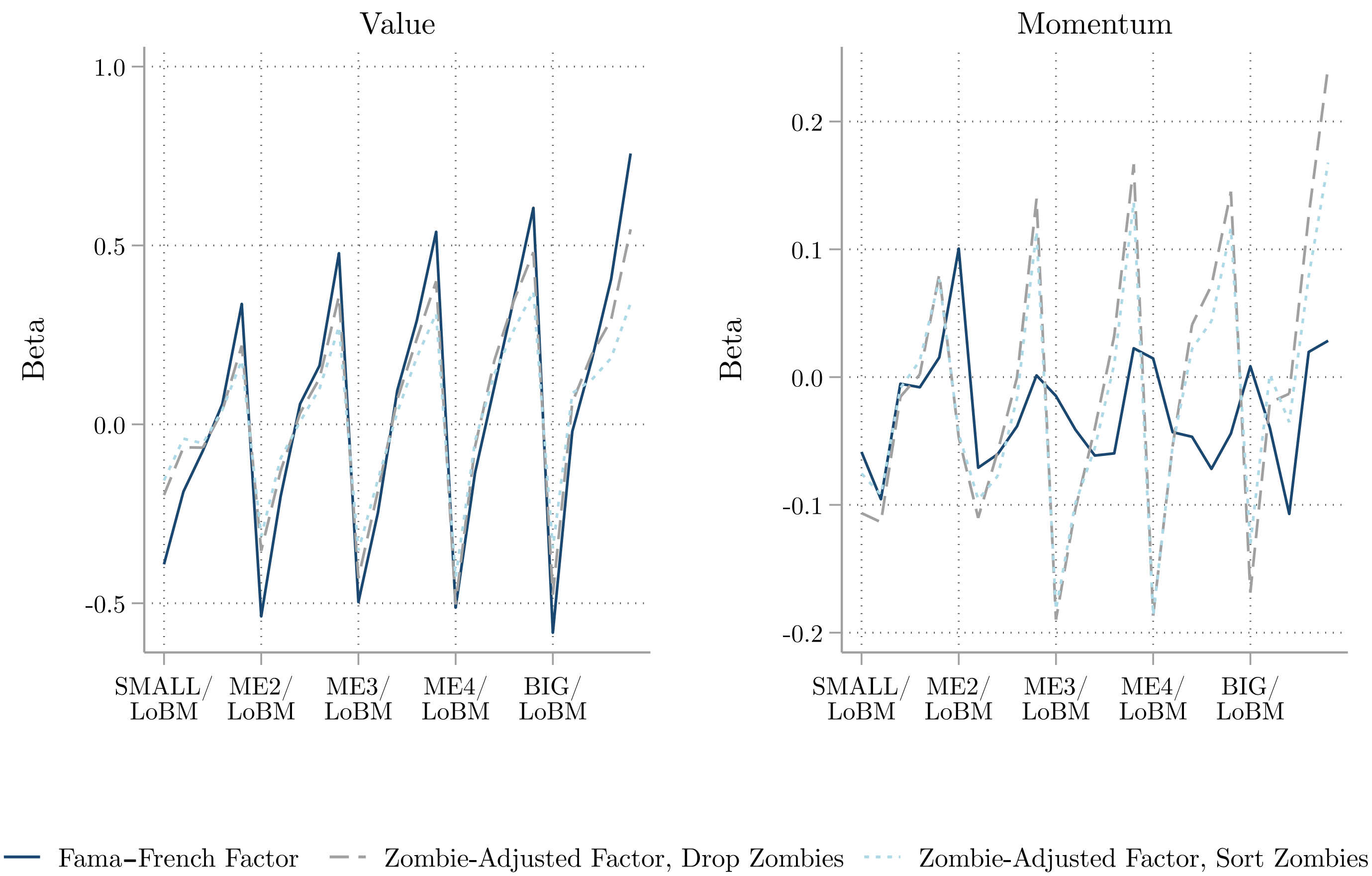

Figure 3: Value and Momentum Betas. Figure shows the betas of the 25 Fama–French portfolios to value and momentum factors. Betas are estimated using the four-factor model. Left panel plots betas to the value factors, HML and HML_{ZA}. Right panel plots betas to the momentum factors, WML and WML_{ZA}. Zombie-adjusted factors, HML_{ZA} and WML_{ZA}, are constructed by dropping zombies and triple-sorting zombies.

Figure 4: Securities Market Line for Value and Momentum. Figure shows the betas of the 25 Fama–French portfolios to value and momentum factors and the portfolios' expected returns. Betas are estimated using the four-factor model. Top panel plots betas to the value factors, HML and HML_{ZA}. Bottom panel plots betas to the momentum factors, WML and WML_{ZA}. Zombie-adjusted factors, HML_{ZA} and WML_{ZA}, are constructed by dropping zombies and triple-sorting zombies.

Appendices

A European Zombies

Event Study Since the Global Financial Crisis, zombies have been on the rise in Europe. I identify European zombies following the method described in Section 2. Since the short-term and long-term prime rates are not available, I use the European Central Bank rate on the marginal lending facility, which offers overnight credit to banks.

Similar to Japan in 1997, European event studies show that bad news for banks leads to lower abnormal returns for firms receiving subsidized credit from banks compared to non-zombies. Upon the announcement of additional government support, zombies have positive abnormal returns relative to non-zombies. Three early Global Financial Crisis events in Europe illustrate the divergence in abnormal returns.

On August 9, 2007, BNP Paribas—France's largest bank, the Eurozone's second-largest bank by market value, and the world's third-largest bank by assets—froze three mortgage-related investment funds that totaled €1.6 billion ($2.2 billion). BNP's suspension of redemptions sparked credit concerns both in Europe and worldwide as the TED and LIBOR-OIS spreads saw sharp upward moves, and many viewed the event as the start of the Global Financial Crisis reaching European markets. Figure A3 shows the cumulative abnormal returns for zombies and non-zombies after the event. Zombies suffered lower abnormal returns.

On September 14, 2007, the British bank Northern Rock faced an old-fashioned bank run with depositors lining the streets outside of retail branches. The event was the first run on a British bank in 140 years (since Overend & Gurney in 1866) and occurred despite the Bank of England's announcement the previous day that it would intervene and provide emergency support as the lender of last resort. Depositors withdrew an estimated one billion pounds or around 4% of retail deposits (Slater, 2007). At that time, just 31,700 pounds per person were guaranteed by deposit insurance: more specifically, the first 2000 pounds were fully insured, and then 90% up to 35,000 pounds. On September 17, the U.K. government announced that it would guarantee all deposits at Northern Rock and would provide guarantees for other banks that faced difficulties. This intervention stemmed the bank run, and later, deposit insurance was raised. Figure A3 shows the cumulative abnormal returns around the Northern Rock events. Zombies had negative abnormal returns immediately after the bank run; but after the September 17 announcement of government support, zombies had strong positive abnormal returns while non-zombie returns fluctated more closely with market returns.

In September 2008, global sentiment about the financial system was extremely low as funding liquidity dried up following the collapse of Lehman Brothers on September 15, and the LIBOR-OIS spread spiked to over 300 bps. On September 28, Fortis, Belgium's largest bank, was partially nationalized, and the next day, on September 29, zombie cumulative abnormal returns in Europe dropped even lower as Congress failed to pass the U.S. Emergency Economic Stabilization Act of 2008 TARP bill to inject $700 billion of capital injections. Zombies faced strong negative abnormal returns after the event. Markets continued to view the financial system as fragile, and the LIBOR-OIS remained elevated.

On October 8, the British government announced a £500 billion bank rescue package, and the Federal Reserve, European Central Bank, Bank of England, Bank of Canada, Swedish Riksbank, and Swiss National Bank cut rates. On October 10, the U.S. government announced equity purchases of banks as part of the Emergency Economic Stabilization Act. After the large government interventions, zombie cumulative abnormal returns appeared to recover.

Bank Betas I show that zombies have higher bank beta than non-zombies, even controlling for the market return, in Europe and Japan. The result is driven by the post-crisis period after markets are more sensitive to the link between zombies and their underlying funding.

Similar to the method for the Japanese event study, I sort European firms into five equal-sized groups based on the interest-rate gap and construct daily value-weighted portfolios. The non-zombie portfolio consists of firms with the largest interest-rate gap, and the zombie portfolio holds the firms with the most negative interest-rate gap.

Table A.7 shows that the European zombie portfolio has higher bank beta than the non-zombie portfolio. And when banks outperform the market, zombies outperform non-zombies, which is driven by the post-crisis period. In Table A.8, I regress daily individual stock returns on bank returns relative to the market return. After the first crisis events for Japan and Europe, zombies have higher beta to bank outperformance than non-zombies.

B Appendix Tables

Value	Total	Crisp	Fuzzy
P1	54	44	10
P2	61	49	12
P3	63	52	11

Momentum	Total	Crisp	Fuzzy
P1	63	51	12
P2	61	50	11
P3	55	44	11

Table A.1: Average Percentage of Zombies. Table shows the average percent of zombies in each tercile of the value and momentum sorts. P1 refers to the lowest tercile, and P3 is the highest tercile.

	P1 (Growth)	P3 (Value)	Value Premium
Full Data	0.03	11.49	11.45
Drop Crisp Zombies	1.40	11.67	10.15
Drop Crisp and Fuzzy Zombies	2.90	11.15	8.03
	P1 (Losers)	**P3 (Winners)**	**Momentum Premium**
Full Data	4.87	5.87	0.96
Drop Crisp Zombies	4.62	7.45	2.72
Drop Crisp and Fuzzy Zombies	5.06	8.01	2.82

Table A.2: Components of Value and Momentum Premiums. Table shows value-weighted portfolio returns. P1 refers to the lowest tercile, and P3 is the highest tercile.

	Premium	Strategy
Full Data (VME)	-0.60	-0.66
Full Data	-0.59	-0.65
Drop Crisp Zombies	-0.62	-0.66
Drop Crisp and Fuzzy Zombies	-0.62	-0.65

Table A.3: Value and Momentum Correlation. Table shows the correlation between value and momentum premiums and strategies. The value and momentum premiums and strategies are constructed using the full data, dropping crisp zombies, and dropping crisp and fuzzy zombies. The first line of the table uses the updated premium and strategy factors from Asness et al. (2013) that are available on the AQR website.

Panel A: Fama–French Factors

	Intercept		Intercept		Intercept
$Mkt - Rf$	0.416	$Mkt - Rf$	0.574	$Mkt - Rf$	0.252
	(-1.49)		(2.43)		(0.86)
SMB	0.148	SMB	0.245	SMB	0.027
	(-0.83)		(1.39)		(0.16)
HML	0.405	HML	0.451	HML	0.337
	(-2.92)		(2.87)		(2.25)
WML	0.194	WML	0.196	WML	0.171
	(-0.85)		(0.82)		(0.77)
RMW	0.225	QMJ	0.376	BAB	0.280
	(-2.24)		(2.90)		(1.32)

Panel B: Zombie-Adjusted Factors, Drop Crisp Zombies

	Intercept		Intercept		Intercept
$Mkt - Rf$	0.687	$Mkt - Rf$	0.744	$Mkt - Rf$	0.478
	(-2.38)		(3.14)		(1.58)
SMB	0.253	SMB	0.309	SMB	0.061
	(-1.38)		(1.70)		(0.34)
HML_{ZA}	0.918	HML_{ZA}	0.932	HML_{ZA}	0.873
	(-5.76)		(5.18)		(5.11)
WML_{ZA}	0.844	WML_{ZA}	0.823	WML_{ZA}	0.766
	(-4.49)		(4.10)		(4.09)
RMW	0.321	QMJ	0.474	BAB	0.391
	(-3.09)		(3.53)		(1.76)

Panel C: Zombie-Adjusted Factors, Drop Crisp and Fuzzy Zombies

	Intercept		Intercept		Intercept
$Mkt - Rf$	0.557	$Mkt - Rf$	0.616	$Mkt - Rf$	0.393
	(-1.96)		(2.62)		(1.31)
SMB	0.221	SMB	0.277	SMB	0.071
	(-1.23)		(1.55)		(0.40)
HML_{ZA}	0.799	HML_{ZA}	0.742	HML_{ZA}	0.746
	(-4.49)		(3.70)		(3.94)
WML_{ZA}	0.719	WML_{ZA}	0.672	WML_{ZA}	0.655
	(-3.68)		(3.21)		(3.38)
RMW	0.257	QMJ	0.397	BAB	0.315
	(-2.47)		(2.93)		(1.42)

Panel D: Zombie-Adjusted Factors, Triple-Sort Crisp Zombies

	Intercept		Intercept		Intercept
$Mkt - Rf$	0.749	$Mkt - Rf$	0.793	$Mkt - Rf$	0.524
	(-2.64)		(3.36)		(1.76)
SMB	0.166	SMB	0.230	SMB	-0.012
	(-0.90)		(1.27)		(-0.07)
HML_{ZA}	0.889	HML_{ZA}	0.892	HML_{ZA}	0.834
	(-5.97)		(5.29)		(5.21)
WML_{ZA}	0.736	WML_{ZA}	0.672	WML_{ZA}	0.627
	(-3.91)		(3.32)		(3.38)
RMW	0.343	QMJ	0.483	BAB	0.382
	(-3.26)		(3.61)		(1.73)

Panel E: Zombie-Adjusted Factors, Triple-Sort Crisp and Fuzzy Zombies

	Intercept		Intercept		Intercept
$Mkt - Rf$	0.730	$Mkt - Rf$	0.751	$Mkt - Rf$	0.508
	(-2.59)		(3.20)		(1.71)
SMB	0.188	SMB	0.244	SMB	0.010
	(-1.03)		(1.35)		(0.06)
HML_{ZA}	0.848	HML_{ZA}	0.825	HML_{ZA}	0.794
	(-5.67)		(4.82)		(4.9)
WML_{ZA}	0.736	WML_{ZA}	0.653	WML_{ZA}	0.636
	(-3.91)		(3.22)		(3.41)
RMW	0.332	QMJ	0.462	BAB	0.373
	(-3.20)		(3.46)		(1.69)

Table A.4: Spanning Tests with Quality Factors. Table presents the intercepts and t-statistics from monthly time-series regressions of each factor on the other four factors in the column. For example, the first coefficient is the intercept from the regression of the market factor on *SMB*, *HML*, *WML*, and RMW. The last coefficient is the intercept from the regression of BAB on the market factor, *SMB*, HML_{ZA}, and WML_{ZA}, where HML_{ZA} and WML_{ZA} are constructed by triple-sorting crisp and fuzzy zombies.

Panel A: Bank Beta

	Non-zombie Winners		Non-zombie Losers		Zombie Winners		Zombie Losers	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Bank Return	0.528***	0.501***	0.624***	0.614***	0.584***	0.557***	0.683***	0.675***
	(9.26)	(7.45)	(9.62)	(8.89)	(8.30)	(7.31)	(10.70)	(9.73)
N	374	374	374	374	374	374	373	373
Adj. R^2	0.33	0.36	0.45	0.45	0.39	0.42	0.47	0.47
Year FE	No	Yes	No	Yes	No	Yes	No	Yes

Panel B: Market Beta

	Non-zombie Winners		Non-zombie Losers		Zombie Winners		Zombie Losers	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Market Return	0.574***	0.527***	0.691***	0.681***	0.582***	0.539***	0.672***	0.654***
	(7.76)	(6.70)	(8.97)	(8.24)	(7.25)	(6.45)	(8.76)	(7.69)
N	374	374	374	374	374	374	373	373
Adj. R^2	0.22	0.24	0.31	0.29	0.22	0.24	0.26	0.23
Year FE	No	Yes	No	Yes	No	Yes	No	Yes

Panel C: Bank Beta, Controlling for Market Beta

	Non-zombie Winners		Non-zombie Losers		Zombie Winners		Zombie Losers	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Bank Return−Market Return	0.233***	0.242**	0.267***	0.276***	0.292***	0.296***	0.349***	0.360***
	(3.68)	(3.62)	(4.32)	(4.19)	(4.77)	(4.59)	(5.44)	(5.30)
N	374	374	374	374	374	374	373	373
Adj. R^2	0.05	0.13	0.07	0.09	0.08	0.15	0.11	0.13
Year FE	No	Yes	No	Yes	No	Yes	No	Yes

Table A.5: Bank Beta and Market Beta for Momentum Legs. Table presents time-series regressions at the monthly level. The dependent variable is the value-weighted portfolio return. Independent variables are the bank return, the market return, and the difference between the bank return and market return. Intercept is included in each regression but omitted from the table. t-statistics using robust standard errors are reported in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Panel A: Returns in Top Bank Return Months

	Zombie−Non-zombie Momentum	Zombie Momentum	Non-zombie Momentum	Zombie Winners	Zombie Losers	Non-zombie Winners	Non-zombie Losers
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\mathbb{I}$(Top Bank Return)	−0.024*	−0.056***	−0.032*	0.082***	0.131***	0.078***	0.108***
	(−2.16)	(−3.88)	(−2.25)	(5.53)	(8.93)	(5.27)	(8.93)
N	360	360	360	360	360	360	360
Adj. R^2	0.01	0.05	0.01	0.08	0.18	0.07	0.14

Panel B: Returns in Top Market Return Months

	Zombie−Non-zombie Momentum	Zombie Momentum	Non-zombie Momentum	Zombie Winners	Zombie Losers	Non-zombie Winners	Non-zombie Losers
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\mathbb{I}$(Top Market Return)	−0.012	−0.028	−0.016	0.057***	0.082***	0.050***	0.066***
	(−0.93)	(−1.75)	(−1.35)	(4.07)	(4.93)	(3.63)	(4.60)
N	360	360	360	360	360	360	360
Adj. R^2	0.00	0.01	0.00	0.04	0.07	0.03	0.05

Panel C: Returns in Top Bank Return Months and Top Market Return Months

	Zombie−Non-zombie Momentum	Zombie Momentum	Non-zombie Momentum	Zombie Winners	Zombie Losers	Non-zombie Winners	Non-zombie Losers
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\mathbb{I}$(Top Bank Return)	−0.022*	−0.053***	−0.031*	0.076***	0.123***	0.074***	0.102***
	(−1.98)	(−3.54)	(−2.10)	(5.29)	(8.27)	(5.03)	(8.73)
$\mathbb{I}$(Top Market Return)	−0.010	−0.022	−0.012	0.049***	0.068***	0.042***	0.054***
	(−0.71)	(−1.33)	(−1.03)	(3.84)	(4.47)	(3.37)	(4.51)
N	360	360	360	360	360	360	360
Adj. R^2	0.01	0.06	0.01	0.11	0.23	0.09	0.17

Table A.6: Returns in Months with Top Bank and Market Performance. Table presents time-series regressions at the monthly level. The dependent variable is the value-weighted portfolio return. Zombie momentum is the zombie winners portfolio minus the zombie losers portfolio. Non-zombie momentum is the non-zombie winners portfolio minus the non-zombie losers portfolio. Independent variables are indicators for the top bank return months and top market return months. $\mathbb{I}$(Top Bank Return) = 1 if the month is a top 20 bank return month, and 0 otherwise. $\mathbb{I}$(Top Market Return) = 1 if the month is a top 20 market return month, and 0 otherwise. Intercept is included in each regression but omitted from the table. t-statistics using robust standard errors are reported in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Panel A: Europe

	Zombie	Non-zombie	Zombie−Non-zombie	Zombie−Non-zombie		
				Full Sample	Pre-crisis	Post-crisis
	(1)	(2)	(3)	(4)	(5)	(6)
Bank Return	0.778***	0.534***	0.244***			
	(36.78)	(19.54)	(15.82)			
Bank Return−Market Return				0.343***	−0.084	0.482***
				(5.69)	(−0.94)	(12.61)
N	4,804	4,804	4,804	4,726	1,647	2,054
Adj. R^2	0.89	0.63	0.38	0.18	0.00	0.54
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Panel B: Japan

	Zombie	Non-zombie	Zombie−Non-zombie	Zombie−Non-zombie		
				Full Sample	Pre-crisis	Post-crisis
	(1)	(2)	(3)	(4)	(5)	(6)
Bank Return	0.551***	0.526***	0.060**			
	(17.16)	(15.71)	(2.98)			
Bank Return−Market Return				0.068**	0.151*	0.046**
				(3.33)	(3.15)	(2.88)
N	8,958	8,392	8,392	7,854	2,623	4,505
Adj. R^2	0.38	0.36	0.01	0.00	0.01	0.00
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Table A.7: Bank Betas in Europe and Japan. Table presents time-series regressions at the daily level. The dependent variable is the value-weighted portfolio return. Firms are sorted into five equal-sized groups based on the interest-rate gap; the zombie portfolio consists of firms with the most negative interest-rate gap, and the non-zombie portfolio consists of firms with the largest interest-rate gap. Independent variables are the domestic bank return, alone and relative to the market return. Intercept is included in each regression but omitted from the table. t-statistics using robust standard errors are reported in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Crisis Event	Europe BNP		Japan Sanyo	
	(1) Return	(2) Return	(3) Return	(4) Return
Bank Return−Market Return	0.093	0.094	−0.304**	−0.305**
	(1.51)	(1.51)	(−3.39)	(−3.43)
(Bank Return−Market Return)×$\mathbb{I}$(Zombie)	−0.063*	−0.0621*	−0.253**	−0.251**
	(−2.19)	(−2.12)	(−2.86)	(−2.86)
(Bank Return−Market Return)×$\mathbb{I}$(Post)	0.219*	0.216*	0.276**	0.277**
	(2.79)	(2.73)	(2.78)	(2.80)
(Bank Return−Market Return)×$\mathbb{I}$(Zombie) × $\mathbb{I}$(Post)	0.210**	0.206*	0.263**	0.261**
	(3.01)	(2.85)	(2.88)	(2.89)
Constant	−0.000	0.001***	0.000	−0.000***
	(−0.09)	(14.34)	(0.07)	(−24.86)
N	10,879,694	10,879,694	4,227,802	4,227,802
Adj. R^2	0.00	0.00	0.01	0.01
Year FE	No	Yes	No	Yes

Table A.8: Bank Beta Relative to Market Beta After Crises. Table presents time-series regressions at the daily level. The dependent variable is return. Independent variables include the domestic market return and bank return, alone and interacted with indicator variables. $\mathbb{I}$(Zombie) = 1 if the firm is a zombie, and 0 otherwise. $\mathbb{I}$(Post) = 1 if the date is after the BNP event or Sanyo event, and 0 otherwise. t-statistics using robust standard errors are reported in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

C Appendix Figures

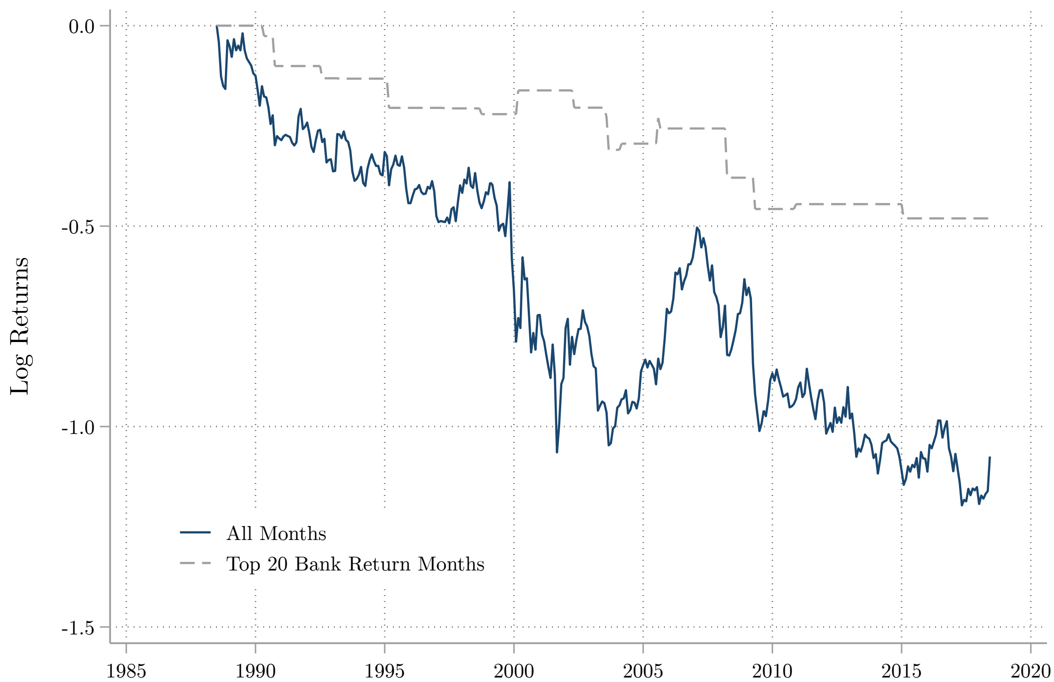

Figure A1: Cumulative Difference in Zombie and Non-zombie Momentum

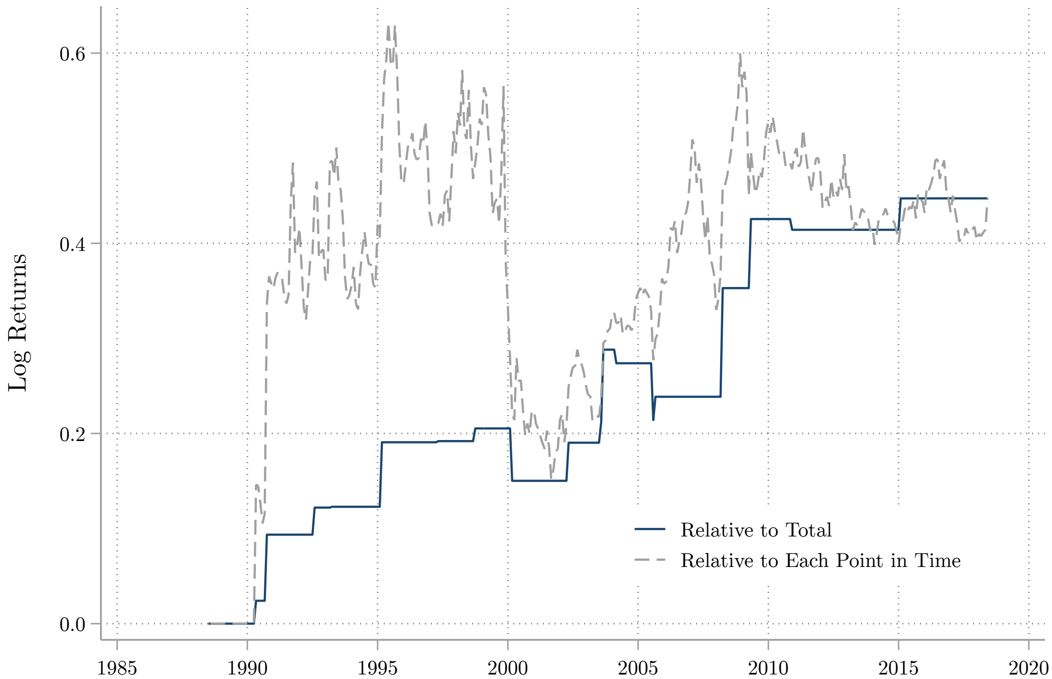

Figure A2: Contribution of Top 20 Bank Return Months, Relative to Cumulative Difference

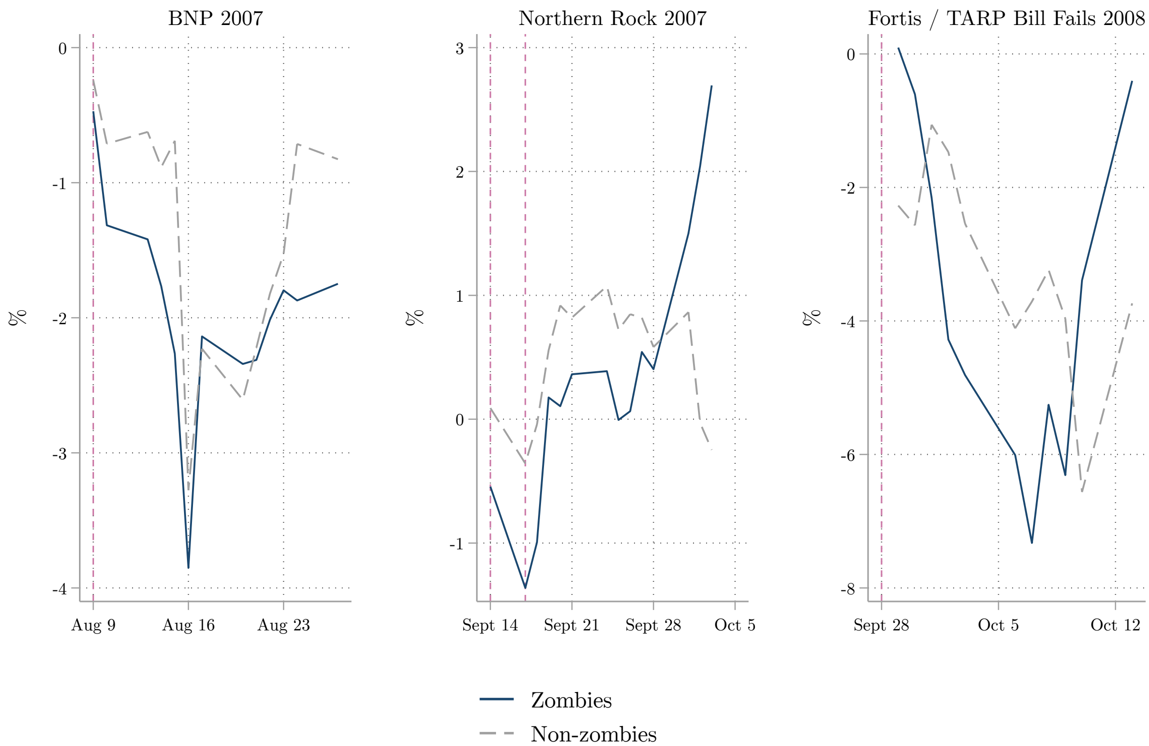

Figure A3: Cumulative Abnormal Returns in Europe. Figure shows the value-weighted cumulative abnormal returns for zombies and non-zombies after three events in the Global Financial Crisis.