THE PRICE OF CONTROL: AN EMPIRICAL INVESTIGATION OF THE CONTROL PREMIUM IN M&A TRANSACTIONS, PRE AND POST THE FINANCIAL CRISIS OF 2007/2008.

by

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ABSTRACT

DAVID DIETZ. The Price of Control: An empirical investigation of the control premium in M&A transactions, pre and post the financial crisis of 2007/2008.
(Under the direction of DR. CRAIG A. DEPKEN II)

This paper investigates the control premium in change of control transactions. It has taken a large-scale approach to the subject while also adding a pre- and post-crisis perspective. A regression model is built based on financial theory and previous research on control premiums. The regression model has the control premium as the dependent variable and explanatory variables that are likely to influence the control premium. The regression model is applied to two sets of M&A transactions from different time periods: pre-crisis (2000-2004) and post-crisis (2010-2014) as well as the pooled data from both periods. The paper finds the control premium is positive and significant and is explained largely by the presence of horizontal synergy, between acquirer and target, and is higher in private than public companies. The biggest contribution of this paper is the discovery that the control premium decreased by 22.47% after the great recession compared to before the crisis. Two discoveries in particular are worth mentioning. First, during the financial crisis the control premium fell much more drastically in the US-Canada region than in the rest of the world. Second, the control premium on private companies has almost tripled in size post-crisis.

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INTRODUCTION

In an M&A transaction, the target company will typically be valued either by its discounted future cash flows or for privately owned firms by some measure of income multiples. Public firms can be valued by simply multiplying the share price with the number of shares outstanding. These valuation techniques are used to estimate the value of the equity of the target, or the market capitalization. However, the valuation of the target's market capitalization does not account for any premium paid when the buyer takes over control of the firm, that is, the value the buyer places on the target on a stand-alone basis. This implies that the valuation of a target in an M&A transaction that involves change of control of the target should be adjusted for the value of control. This concept, referred to as the Control Premium, is the focus of this study.

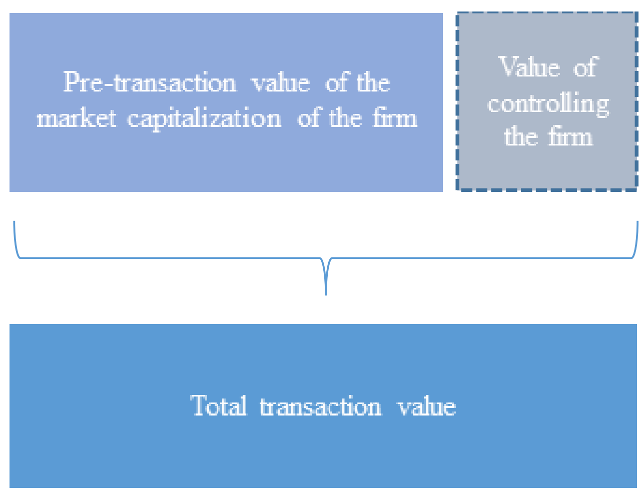

FIGURE 1: Illustration of the control premium

Rather than attempt to estimate a general size of the control premium, this study empirically researches how market- and firm-specific characteristics influence the control premium. This paper also explores how the impact and significance of these characteristics have changed over time by including data of M&A transactions before and after the global financial crisis in 2007-2008.

1.2 Research question:

This project empirically investigates the so-called control premium when a change of ownership occurs. The following specific questions are addressed:

- What does current research on the area of the control premium suggest?
- How do company and transaction specific characteristics influence the control premium?
- Which of these characteristics have a measurable impact on the control premium while remaining statistically significant?
- Have the global financial crisis of 2007/2008 had an impact on the magnitude and significance of the variables affecting the control premium?
- How do the estimates of this paper compare to the previous research on the area?

RESEARCH APPROACH

2.1 Structure and Scope of the Research

This paper constructs a regression model that analyses and explains the variation in control premiums based on market- and firm-specific variables. The explanatory variables are selected on the basis of their theoretical relevance as well as their applicability in previous research on the subject. This implies that the selection process is not directed towards choosing a model that statistically fit the data best, by excluding variables with insignificant estimates. This may give us less information about variables that could have otherwise been significant had the model been fitted to the data and had insignificant variables been excluded. Though this could perhaps have yielded more powerful estimates about certain variables, it would also have risked making the estimates biased. Therefore the model is selected based on theoretical relevance and all variables are reported, significant or not. After careful consideration these variables will be selected to construct the regression model. The model will then be applied to transaction data from before and after the financial crisis as well as the data from both time periods pooled together. The estimates of the model are then analyzed which will allow us to conclude upon the impact of these different variables on the control premium and answer the research questions of this paper.

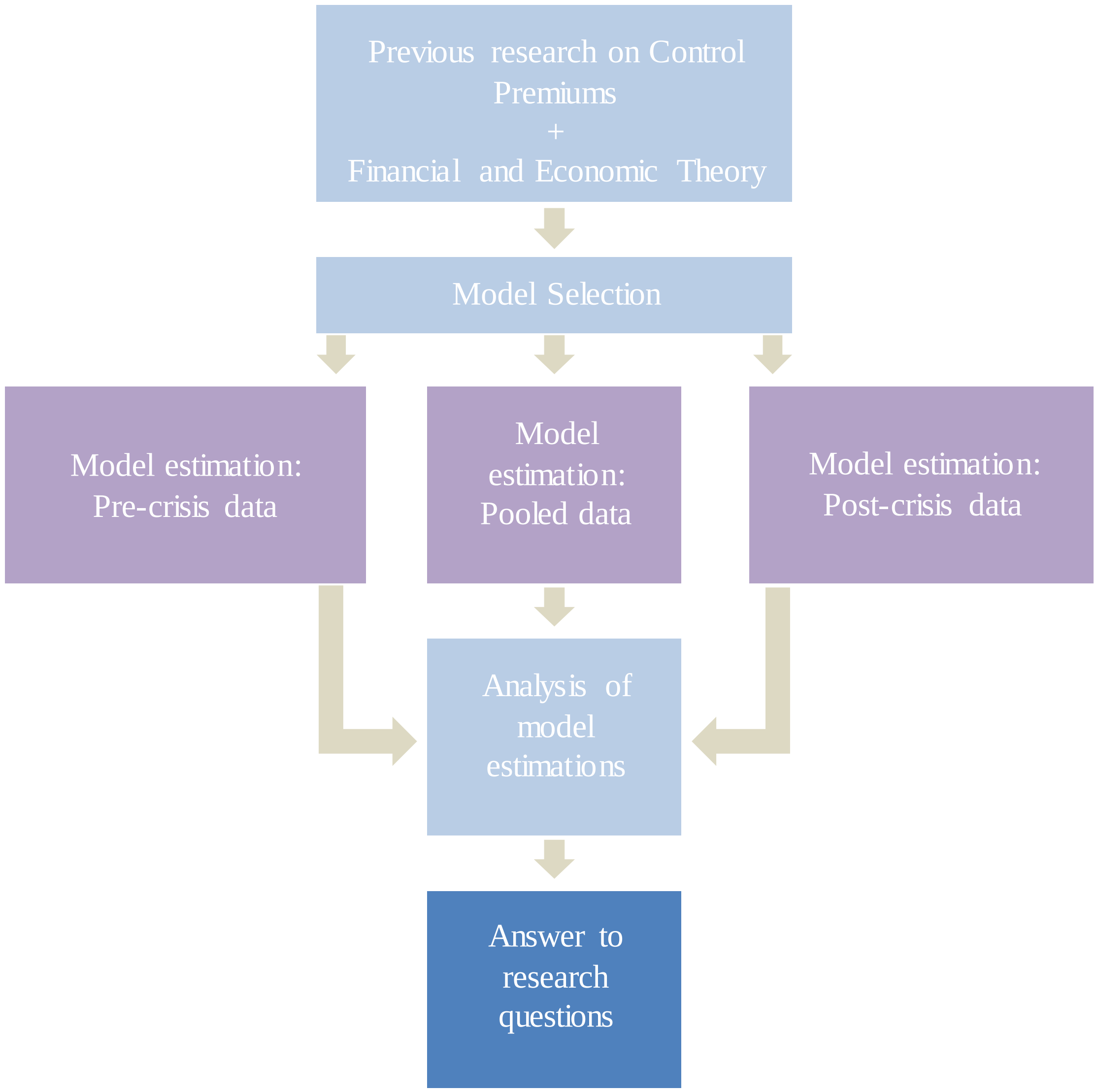

FIGURE 2: Thesis structure

2.2 Data and Restrictions

The data used in this paper are extracted from the S&P CapitalIQ database and are subject to a number of filters to ensure quality and consistency as well as ensuring the data fit to the scope of the project.

2.2.1 Screening criteria

The data used in this paper have been subject to the following screening criteria:

- Implied Enterprise Value/EBITDA (x) > 0;
- Implied Enterprise Value/EBIT (x) > 0;
- Total Transaction Value > 0;
- Transaction Status: Closed;
- Announcement date pre-crisis: 1/1/2000-12/31/2004;
- Announcement date post-crisis: 1/1/2010-12/31/2014;
- Transaction Type: Mergers & Acquisition;
- Company is either public or private.

These screening criteria allow us to include only transaction data of firms with a positive firm value which is an assumption of the most common valuation techniques, where the target result is measured by EBIT and EBITDA. We also screen for transactions from the two different time periods we wish to investigate. The transaction type of Mergers & Acquisition ensures that our data will have no noise from initial public offerings or other transaction types. The rest of the screening criteria ensure that the data contain information that is crucial to the paper.

2.2.2 Manipulation of data

To allow for the model estimation a number of variables have been calculated or transformed in the data to be eligible for quantitative analysis. How these variables have been transformed and why will be described in section 3.3.

To adjust for outliers both datasets from pre- and post-financial crisis have been adjusted by dropping the most extreme observations of the dependable variable from the upper and lower 2.5% transactions.

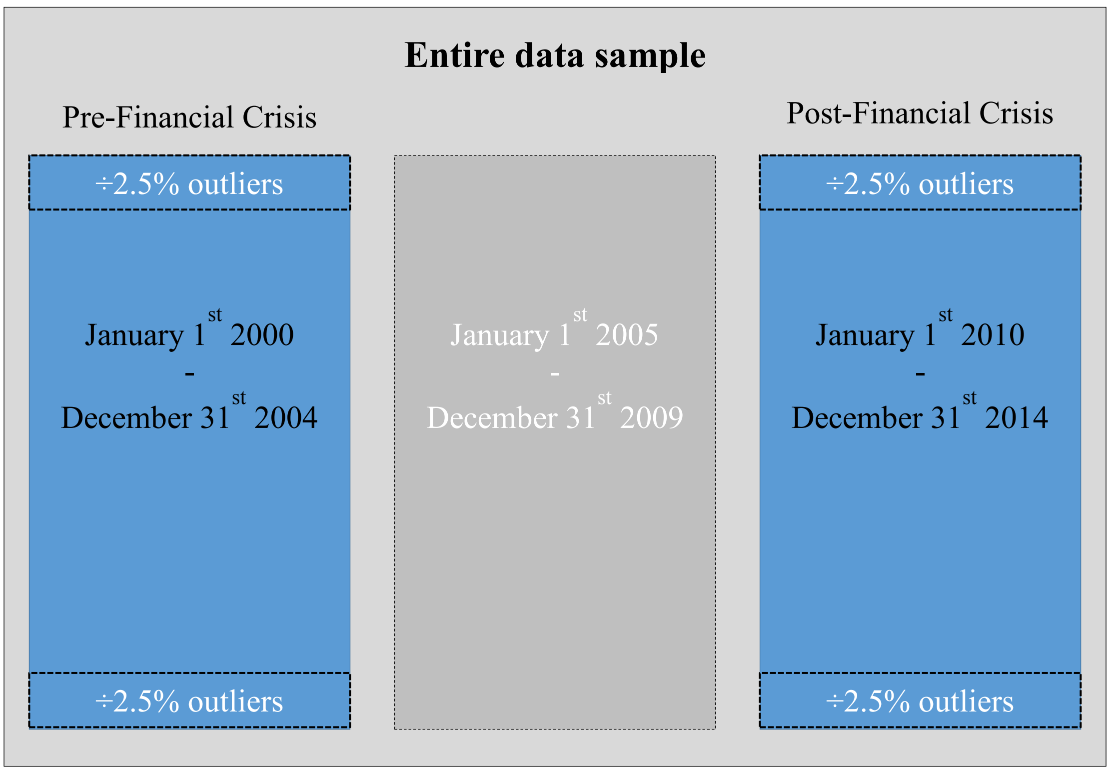

FIGURE 3: Visual overview of data

THE CONTROL PREMIUM

3.1 Previous Research on the Control Premium

When a shareholder obtains a controlling stake in a firm the average stock price paid will often be higher than when a shareholder obtains a non-controlling stake. This difference in price is referred to as the control premium. An acquirer of a target may be interested in obtaining control over the company as it grants the right to elect the board of directors, decide on the structure and level of dividends, replace the current management, make strategic decisions for the company, engage in Mergers & Acquisition transactions, or divesting on behalf of the company, as well as choosing the suppliers and business partners of the firm. Control premiums can be empirically observed as transactions of targets that undergo a shift of control will often increase in share price due to the large quantity of stocks traded. Since the price of a stock is determined by supply and demand, the increase in demand caused by the buyer acquiring a large percentage of the shares push up the price to a level higher than prior to the transaction.

When a single shareholder has full control of a company without owning the entire equity of the company, an agency problem between the controlling shareholder and the minority shareholders will occur since the controlling stakeholder will not bear the full consequence of his actions. This was found to have a significant influence on firm values according to Hanouna, Sarin and Shapiro (2001) who found that shareholders are prone to exercise control over corporate decisions, which is disproportionate to their shareholdings. Jensen and Meckling (1976) also found that when ownership and control are separated, significant agency costs are suffered by the company. The intrinsic value of control in regards to the agency problem stems from the private benefits of control, also referred to as self-dealing. As shown by Sansing (1999) controlling a firm may provide the option to gain private benefits through expropriation of wealth from non-controlling shareholders.

To what extent a majority shareholder can take advantage of minority shareholders varies with investor-protection laws that protect minority shareholders that differ by country. Generally, countries with weaker investor-protection laws allow a bigger potential for expropriation of minority stakeholders which causes the value of control to increase. However, Bennedsen and Nielsen (2008) show that a disproportional ownership structure improves incentives to monitor management. This gives the controlling shareholder an incentive to reduce management inefficiencies at a low cost. The decreasing cost of monitoring management has an overall positive influence on firm value. Slusky and Caves (1991) also mention that synergies that occur when corporate control is obtained will increase the value of the firm.

The size of the control premium has been found to increase with business and financial synergies, the potential for reducing managerial inefficiencies in the target as well as the presence of a rival bidder (Slusky and Caves, 1991). The paper also finds that the agency problem explains more than twice as much of the variation in the control premium as business and financial synergies does.

As made evident by previous research, some papers point to a controlling shareholder leading to a higher firm value whereas others point to a controlling shareholder leading to lower firm value. However, they all seem to agree that obtaining control of a firm comes at a premium.

Finnerty and Emery (2004) were able to empirically observe the control premium in that firms with diffuse ownership undergoing a change of control transaction carry a premium of 25%. The paper also refers to three studies (Stulz, Walkling, and Song, 1990; Nathan, and O'Keefe, 1989; Lease, McConnell, and Mikkelson, 1983) that also show that corporate control has significant value.

Obtaining a general measurement of the value of corporate control can be difficult as it often varies dramatically based on company specific characteristics. Doidge (2003) mentions two different methods to determine the size of the control premium. The first method applies the practice of analyzing firms with dual class shares, comparing the shares granting a higher number of votes to those granting a lower number of votes. The control premium is calculated as the difference in the price for these two of shares. The second approach is transaction based and examines the empirical premium paid in a share block-transaction where a change of control occurs.

3.2 Definition and Measurement

Measuring the size of the control premium can be seen as a method of measuring the value of corporate control. When attempting to estimate the control premium empirically, the control premium is to a large extent subject to endogeneity issues and can easily be biased.

To explain the control premium a similar approach as the one used by Finnerty and Emery (2004) will be used. Specifically, define the control premium as the difference between the acquisition price and the market price, in a change-of-control transaction, given by:

$$\text{Control Premium} = \frac{(\text{Acquisition Price} - \text{Market Price})}{\text{Market Price}} \quad (1)$$

Where the 'acquisition price' is the actual share price of the target in a control shifting transaction and the 'market price' is the share price prior to the announcement of the transaction. A control shifting transaction is defined as a transaction where the acquirer owns less than 50% of the target pre-transaction and owns more than 50% of the target post-transaction. However, since the control premium in equation (1) will incorporate all factors of an acquisition premium, the equation does not reflect the pure control premium but is influenced by other acquisition premiums as market rumor premium, synergy premium, illiquidity discount, and other variables.

This paper will attempt to isolate and examine the behavior of the control premium based on company- and transaction specific characteristics. Using a similar approach as that of Finnerty and Emery (2004), this paper will examine the control premium by using the '30-day bid premium' as the measure for the control premium. The 30-day bid premium is defined as the percentage added to the implied stock price 30 days prior to the transaction required to reach the final transaction value:

$$\text{Transaction value} = (1 + (30 - \text{day bid premium}))(\text{Stand alone Market Cap}) \quad (2)$$

The considerations going into choosing the 30-day bid premium as opposed to a longer or shorter time span, is that the 30-day bid premium captures the current market situation without being overly biased by possible transaction rumors, and thereby indicates the pre-transaction price with the least amount of noise.

When running a simple univariate summary statistics on our two datasets keeping the 30-day bid premium as our analyzed variable and creating a dummy-variable for change of control in the transactions, we obtain the statistics in Table 1 and 2.

TABLE 1: Pre-crisis average 30-day bid premium

Sectors - Pre-crisis	Shift of Control?	Mean	Median	Lower 95%	Upper 95%	n
Overall	No Yes	17.29 35.21	9.02 29.53	14.75 33.36	19.81 37.06	633 1,349
Consumer Discretionary	No Yes	20.50 36.30	11.35 31.10	15.09 32.08	25.91 40.52	145 270
Consumer Staples	No Yes	15.94 34.18	7.53 28.95	8.23 28.23	23.64 40.13	49 109
Energy	No Yes	11.71 29.71	12.48 26.24	-5.72 24.88	29.13 34.55	22 150
Financials	No Yes	16.55 26.85	7.34 20.93	7.09 20.26	26.00 33.44	54 83
Healthcare	No Yes	13.69 31.68	5.03 25.38	2.52 26.46	24.86 36.89	34 128
Industrials	No Yes	15.46 36.95	8.05 29.55	9.96 32.26	20.97 41.64	114 241
Information Technology	No Yes	13.79 44.61	9.36 40.03	5.27 39.47	22.30 49.76	50 197
Materials	No Yes	19.77 33.81	10.27 29.43	13.20 26.13	26.33 41.48	91 101
Telecommunication Services	No Yes	15.14 35.91	7.32 24.84	4.07 22.76	26.21 49.07	35 33
Utilities	No Yes	20.20 25.42	3.71 25.40	6.26 14.68	34.15 36.15	39 37

TABLE 2: Post-crisis average 30-day bid premium

Sectors - Post-crisis	Shift of Control?	Mean	Median	Lower 95%	Upper 95%	n
Overall	No Yes	10.25 31.29	5.11 28.42	9.29 29.96	11.22 32.62	2,868 1,837
Consumer Discretionary	No Yes	8.23 31.46	4.11 27.31	6.40 28.27	10.07 34.65	554 323
Consumer Staples	No Yes	11.35 29.83	7.85 27.96	8.83 25.02	13.87 34.64	327 139
Energy	No Yes	7.96 25.93	2.37 25.33	4.22 21.55	11.70 30.30	159 128
Financials	No Yes	9.77 27.32	4.15 25.13	6.67 22.09	12.86 32.56	294 140
Healthcare	No Yes	11.67 35.68	2.94 31.20	7.61 31.92	15.73 39.45	182 201
Industrials	No Yes	11.21 31.00	6.98 27.65	8.86 27.82	13.56 34.19	509 311
Information Technology	No Yes	11.79 34.86	4.48 32.24	8.56 31.90	15.01 37.83	358 351
Materials	No Yes	11.69 30.29	6.39 29.60	8.42 25.42	14.96 35.16	301 162
Telecommunication Services	No Yes	12.41 32.35	6.45 25.00	5.28 19.03	19.53 45.66	64 33
Utilities	No Yes	4.98 20.49	2.09 13.30	0.80 11.98	9.16 28.99	119 49

In the 2000-2004 sample, the 30-day bid premium when a shift of control occurs has a mean of 35.21 % which is highly different from when no shift of control occurs at a mean of only 17.29 %. The two 95% confidence intervals of the mean of the 30-day bid premiums, separated by change of control do not overlap. Even though the mean 30-day bid premium is more than twice as large when a shift of control occurs, it is still fairly high in the absence of a control shift. This supports our expectations that the 30-day bid premium will contain the entire transaction premium and not just the pure control premium.

Looking at the more recent data from 2010-2014, premiums have fallen to a mean of 31.29 % when a shift of control occurs and to a mean of 10.25% when no shift of control occurs. It is interesting to note that the 30-day bid premium has fallen independent of our method of measurement, as both mean, median and confidence interval of the premium has fallen in both time periods.

As initially suspected, the 30-day bid premium must contain more information than the pure control premium and thus we should condition on other variables before it can be used to measure the pure control premium. An obvious explanation for why a transactions would include a transaction premium is if it were driven by synergies between the target and the buyer.

This paper will apply a modified version of the approach utilized by Finnerty and Emery (2004) and the 30-day bid premium is used in a regression model examining the control premium, where Equation (1) will define the dependent variable. Throughout the model selection process we will pick the included variables based on financial theory and evaluate the variables based on significance and relevance against the bid premium, expecting that the model will yield significantly different estimates of the control premiums depending on whether control changes in a given transaction or not.

The regression model used in this paper will contain more variables than previous studies in this field, since it is based on a large number of transactions selected randomly instead of prior papers like Hanouna, Sarin and Shapiro (2001) where a carefully selected and smaller peer group was used. The main motivation for including more variables in the model is to control for variation in size, synergy effects, size of the board, size of the traded companies, and sector-related premiums and discounts.

3.3 Discussion of Explanatory Variables

The following section provides a discussion of each variable included in the regression model to explain the acquisition premium. After the evaluation of the variables based on their theoretical relevance, the model is estimated.

Change of control over target

When attempting to explain the control premium, the most important transaction specific characteristic will be whether there is a change of control over the asset. We could take two different approaches when isolating the control premium from the acquisition premium via change of control. We could:

1. Only include transaction data in our model where control changes.
2. Create a dummy variable for change of control to be included as an explanatory variable.

This paper uses the second approach as the first would neglect any information in transactions where control does not change. Our definition of a change of control as mentioned in section 3.1 happens when a buyer pre-transaction owns less than 50% of the target and post-transactions owns more than 50% of the target. In the event that the transaction causes a change of control a dummy variable, CTRL, will take the value of one and zero otherwise.

Hypothesis**:** If an acquirer obtains a controlling stake in a target, the control premium will increase, ceteris paribus.

Public or Private company

Investor-protection laws protecting minority shareholders are more extensive and regulated for public companies than they are for private. This creates a stronger incentive for obtaining control in a private company than a public one. Also, as mentioned in section 3.1, the ownership structures of public companies are on average more dispersed than that of private companies. This means large block holders are a more frequent occurrence in private companies. Large block holders have a stronger bargaining position when receiving a tender offer, which drives up the control premium in transactions of private companies, compared to public ones. Public companies are in general more liquid than private companies, since they are listed on an effective secondary market. The value of liquidity will have a positive influence on firm value and a negative impact on control premium. Therefore, a dummy variable is included in the model that distinguishes between public and private companies. If the target is a private company, the dummy variable PRIV will take the value of one and zero otherwise.

Hypothesis: If target is privately owned the acquisition premium will increase, ceteris paribus.

Synergy

As mentioned in section 3.2, synergies are a strong motivator for many transactions and can have significant influence on the size of the control premium. A synergy is present when two merging companies create additional value to make up a higher total value than the simple sum of both firms. Therefore, the value from synergy is expected to play a significant role in the control premium. Measuring synergy can be done in many ways, but it is tricky to estimate precisely by a general rule. In this model, a proxy for horizontal synergies is a match of the sector of the buyer and the target. In the event that the buyer and the target share the same sector, the dummy variable, SYN, takes the value of one and zero otherwise.

Hypothesis: In the event of a synergy, the size of the acquisition premium will increase, ceteris paribus.

Transaction size

The size of the transaction can influence the size of the control premium. The larger a company is the more complicated a transaction process will be which may contribute to an increase in control premium. However, by the same logic applied to the scenario of public and private companies, larger companies often have more dispersed ownership and more liquid assets, which will often drive down the control premium. By adding dummy variables for different transaction sizes, we seek to capture the influence on liquidity's effect on control premium not explained by the public/private characteristic. The variables for transaction size are as follows:

TABLE 3: Variables for transaction size

Variable	Notation
Transaction < 50 mUSD	SMALL_TRANS*
50 mUSD ≤Transaction ≤ 500 mUSD	MED_TRANS
Transaction > 500 mUSD	LARGE_TRANS

*The omitted category in the regression model

Hypothesis: There will be cross sectional differences in the influence of transaction size on the acquisition premium, where larger transactions will have a lower acquisition premium.

Board Size of the Target

Eisenberg et al. (1998), researched optimal board size and found that at seven or more board members, the efficiency of the decision making process of the board starts to decline. A high or a small numbered board could therefore cause a decrease in value of a firm, but an increase in the control premium in the transaction. The intuition is that an inefficient board will leave room for improvements for the acquirer, causing the acquirer to have to pay a premium for the target due to the value of the potential improvement. However, a large numbered board can have the opposite effect on the control premium. This is because the often long decision-making process of firms with a larger board can lead to a lower bid accepted because of diminished negotiation power of board. To correct for corporate governance in the model, we will divide the size of boards into three groups with approximately a third of the distribution of board sizes in each category.

TABLE 4: Board size variables

Variable	Notation
1-5 Board members	SMALL_BRD*
6-8 Board members	MED_BRD
9+ Board members	LARGE_BRD

* The omitted category in the regression model

Hypothesis: We expect small and large boards to be less efficient than medium boards and therefore have a bigger potential for improvement, which will increase the size of the acquisition premium. We expect targets with a medium board to have a lower acquisition premium than those of the two other categories.

Industry Variables

This paper compares companies across different industries, which is why an industry classification variable should be included in the model. This variable seeks to measure the differences between companies based on their industry of operation. It is expected that the average transaction premium from certain industries differ from that of others. This hypothesis is supported by Pratt (2001), who argues that more dynamic industries, such as highly technology-based industries, have an above-average control premium, due to a shorter reaction time and a higher degree of adaptability. Pratt also argues that since the management of these more dynamic industries is often required to be highly skilled they demand more attention and monitoring than their more static alternatives. Across industries, companies differ in how well-governed and well-managed they are compared to the average company, which leads to a restructuring potential for firms looking to acquire the company and make it more profitable. The potential for optimization varies with maturity and the type of firms in the different industries and increase the control premium of firms that are poorly governed or managed. Since business risk and growth rates differ across industries, they may also influence the control premium; companies with high growth rates are expected to display a higher control premium in transactions. In the regression, a dummy variable for each industry is included in the model. Industries are divided into ten sectors based on SIC codes provided by CapitalIQ. The consumer discretionary industry is the reference industry. Please see Table 5 for an overview of the industry classifications:

TABLE 5: Industry dummy variables

Variable	Notation
Consumer Discretionary	CONSDISC*
Consumer Staples	CONS
Energy	ENGY
Financials	FIN
Healthcare	HLC
Industrials	IND
Information Technology	IT
Materials	MAT
Telecommunication Services	TEL
Utilities	UTY

* The omitted category in the regression model

Hypothesis: The more static and capital-intensive an industry, the lower the acquisition premium. The more dynamic and the higher the growth rate of an industry, the higher the acquisition premium.

Geographic region

The control premium is expected to vary with country-specific risk and growth depending on the geographic region of the target. Not only does country specific risk and growth influence the control premium, according to Djankov, La Porta, Lopez-de-Silanes and Shleifer (2005) investor-protection differs by country and also has a significant effect on corporate valuations. Since the degree of investor-protection relates to how well minority shareholder rights are protected against abuse from the controlling shareholder, this becomes essential when attempting to estimate the control premium.

The motivation to include investor-protection in the model stems from the theories of Bennedsen and Nielsen (2008) as well as Slusky and Caves (1991). In a country with a high level of investor-protection measured on the anti-director index, the controlling owners of a company will most likely not engage in self-dealing activities, but will have easier access to exploit minority shareholders. However, the management will be able to divert resources from the company when investor-protection is low.

This model groups transactions by their geographical areas of the target. Though this is not as precise as a separate variable for every single country in the world, it should still behave as a reasonable proxy for country specific factors. Geographic region variables are defined as following:

TABLE 6: Geographic region variables

Variable	Notation
USA & Canada	USCAN*
Europe	EUR
Asia Pacific	ASIA
Africa & Middle east	AFRME
Latin America & Caribbean	LAC

* The omitted category in the regression model

Hypothesis: When the investor-protection of non-controlling shareholders is low, the acquisition premium will increase. We expect to find a higher acquisition premium in geographic regions with lower investor-protection and more country-specific risk.

For an overview of the explanatory variables included in the model, please see Table 7.

TABLE 7: Summary table

Variable	Hypothesis	Expected impact	Measurement
Intercept	Average transaction premium is positive.	+	Response dummies and base levels.
Change of control over target	A control premium is paid when control changes.	+	Dummy variable for change of control.
Private Company dummy	Control is worth more in private companies due to lower investor-protection.	+	Dummy variable for change of control.
Synergy	When synergy is present, buyer will pay higher acquisition premium.	+	Horizontal synergy based on industry.
Transaction size	Larger transactions lead to higher premiums	+/-	Small: 0-50 Mil$ Medium: 50-500 Mil$ Large: 500+ Mil$
Board size of target	A small or a large bard will on average cause a higher acquisition premium than that of a medium board.	+/-	Small board: 1-5 members. Medium board: 6-8 members. Large board: 9+
Industry Variables	There are cross-sectional differences across industries.	+/-	Dummy variables for each of the 10 sectors.
Geographic region	There are cross-sectional differences across geographic regions.	+/-	Dummy variables for each of the 5 regions.

3.4 Model Selection

Based on Table 7 our model is specified as:

$$\text{TP} =$$

$$\beta_1 + \beta_2 CTRL + \beta_3 PRIV + \beta_4 SYN + \beta_5 \text{MED\_TRANS} +$$

$$\beta_6 \text{LARGE\_TRANS} + \beta_7 \text{MED\_BRD} + \beta_8 \text{LARGE\_BRD} + \beta_9 CONS + \beta_{10} ENGY +$$

$$\beta_{11} FIN + \beta_{12} HLC + \beta_{13} IND + \beta_{14} IT + \beta_{15} \text{MAT} + \beta_{16} TEL + \beta_{17} \text{UTY} + \beta_{18} \text{EUR} +$$

$$\beta_{19} \text{ASIA} + \beta_{20} \text{AFRME} + \beta_{21} \text{LAC} + \text{u}_\text{i}$$

Where:

The intercept represents the premium for transactions characterized by: No change of control, Publicly traded, No synergy, Small transaction size, Small board size, Consumer Discretionary sector in the US & Canada region, taking place in 2000 (or 2010).

CP: Is measured by 30-bid premium.

CTRL: Dummy for change of Control over target

PRIV: Dummy for Privately owned target

SYN: Dummy for horizontal Synergy between buyer and target

MED_TRANS: Dummy for 50 mUSD ≤ Transactions ≤ 500 mUSD

LARGE_TRANS: Dummy for Transaction > 500 mUSD

MED_BRD: Dummy for target board size of 6-8 members

LARGE_BRD: Dummy for target board size of 9+ members

CONS: Dummy for Consumer Staples Industry

ENGY: Dummy for Energy Industry

FIN: Dummy for Financials Industry

HLC: Dummy for Healthcare Industry

IND: Dummy for Industrials Industry

IT: Dummy for Information Technology Industry

MAT: Dummy for Materials Industry

TEL: Dummy for Telecommunication Services Industry

UTY: Dummy for Utilities Industry

EUR: Dummy for Europe

ASIA: Dummy for Asia Pacific

AFRME: Dummy for Africa & Middle East

LAC: Dummy for Latin America & Caribbean

$u_{i:}$ Is the error term of the residuals

3.5 Estimation of the Basic Models

Applying the model to different periods of data we estimate three models:

- Pre-crisis. Containing data from 2000-2004
- Post-crisis. Containing data from 2010-2014
- Pooled. Containing data from pre- and post-crisis pooled together.

The model is estimated in detail in Appendix A and summarized in table 8.

TABLE 8: Initial model estimation:

Variable	Expected impact	Pre-Crisis est. & sign.	Post-Crisis est. & sign.	Pooled Data est. & sign.
Intercept	+	21.24999 <.0001	6.10528 0.0002	12.32123 <.0001
Change of control over target	+	12.4047 <.0001	10.89405 <.0001	11.98347 <.0001
Private Company dummy	+	5.15819 0.0033	15.11325 <.0001	11.51557 <.0001
Synergy	+	5.9623 0.0002	5.41862 <.0001	5.89209 <.0001
Medium Transaction	+	2.17724 0.268	1.20128 0.2163	1.90696 0.032
Large Transaction	+	-1.90549 0.4092	-0.47259 0.7135	-1.21778 0.2794
Medium Board	-	-1.15233 0.5596	-0.38897 0.684	-1.1377 0.1907
Large board	+/-	-1.55247	-1.01963	-1.61786

		0.4604	0.3107	0.0776
Consumer Staples	+/-	-2.40366	0.20086	-0.54335
		0.4436	0.8949	0.6994
Energy	-	-10.57027	-3.22818	-5.05983
		0.0009	0.0752	0.0015
Financials	-	-6.26744	-0.92495	-2.42915
		0.0573	0.5535	0.0947
Healthcare	+	-7.40944	2.12416	-0.80846
		0.0177	0.1918	0.5837
Industrials	+/-	-0.11749	1.41885	1.04104
		0.9612	0.2684	0.3685
Information Technology	+	3.07186	2.19784	2.55178
		0.258	0.1012	0.0382
Materials	-	-0.40851	0.32257	0.19701
		0.8901	0.8317	0.8866
Telecommunication Services	+	-2.03001	3.07347	1.46528
		0.6516	0.2821	0.5421
Utilities	-	-2.56291	-6.35737	-5.20116
		0.5483	0.0048	0.0108
Europe	+/-	-11.73904	-2.43252	-7.22239
		<.0001	0.055	<.0001
Asia Pacific	+/-	-10.71677	0.05864	-4.84335
		<.0001	0.9623	<.0001
Africa & Middle east	+/-	-11.12079	-1.68736	-6.23474
		0.0093	0.4	0.0006
Latin America & Caribbean	+/-	-2.1361	-3.25433	-6.50933
		0.7319	0.1237	0.0014
F-test		2.36	55.65	68.95
Pr > F		<.0001	<.0001	<.0001
R-Square		0.1044	0.1920	0.1714
Adj R-Square		0.0953	0.1886	0.1689
Obs		1,982	4,705	6,687

It can be seen that the R^2 of the models are low at only 0.1044, 0.1920 and 0.1714. However, many of the variables are highly significant and behave as expected based on theory. Goldberger also states that when working with OLS, the R^2 is not a strong indication of the performance of the model (Gujarati 2003). It is noteworthy that the F-test for the post-crisis model as well as the model for the pooled data are much higher than the F-test for the pre-crisis model. The models overall show significant F-tests at the 1% level of significance, which is another strong indicator that the significance of the estimates of the models are satisfactory. Taking a look at the distribution of the fitted residuals of all three models from Appendix A, they are not perfectly normally distributed as they are skewed to the left, but as our data set is large and the data have been picked randomly, we can assume normal distribution in the residuals according to the central limit theorem. Based on the significant variables, the significant F-test, and the distribution of the residuals we accept the model as adequate.

Looking at the intercept case for transactions without a change control all three models are significant at the 1% level. Pre-crisis the model estimates a transaction premium of 21.25% based on the response variables. The intercept of the post-crisis model, is much smaller at 6.11% compared to the pre-crisis intercept. Looking at the post-crisis estimates for geographic regions, these are also much smaller and less negative than in the pre-crisis model. This is strong evidence that the drastic drop in the intercept is caused by a large drop in the size of the acquisition premium in the US-Canadian area. Since the global financial crisis hit first and hardest in the US, it seems to make intuitive sense that the control premium has dropped significantly in this region. To put it differently, based on the models' estimates, the transaction premium in the US Canadian region is now worth less than before the crisis.

Looking at the dummy for change of control all three models yield positive and significant estimates at the 1% level, which is in line with the hypothesis for change of control and strong evidence of the value of control. With pre-crisis value of 12.4%, the change of control in a transaction explains 12.4 percent points of the 30-day bid premium. The 12.4% represents the pure control premium after adjusting for every other variable in the model. In the post-crisis model the control premium is 10.9% and has dropped by 1.5 percent point or12% during the crisis. The lowering of the control premium reflects the effects of the financial crisis as buyers of companies are generally willing to pay a smaller premium in control shifting transactions, which makes intuitive sense.

The target being privately owned has a positive influence on the acquisition premium at the 1% level of significance across all models, which is in line with our hypothesis of the of control being more valuable in private companies due to the stricter investor-protection regulations of listed firms. What is interesting to notice is that the impact of the post-crisis model's estimate at 15.11% is almost three times larger than the estimate of 5.16% before the crisis. Though the overall acquisition premium has decreased from pre- to post-crisis, it has increased for private companies, perhaps due to an increase in regulation of listed firms following the crisis.

The dummy for horizontal synergies positively influences the premium and is significant at the 1% level across all models. Synergy is a strong driver of M&A

transactions and was predicted to be positive and significant, which also reveals that the measurement of horizontal synergy was able to explain what we expected based on theory. The synergy variable yields a smaller estimate at 5.42% post-crisis than it did pre-crisis at 5.96%. The cause of the drop could be explained by behavioral finance which would argue that investors are becoming more risk averse after the crash and seek to diversify their investments more than before. Either way, the influence of synergy on the acquisition premium is positive and significant as we would expect based on theory and intuition.

None of the variables for transaction size are significant at the 1% level. Though it is possible that transaction size does not influence acquisition premium, it is more likely that the influence it has was described better by the CTRL variable making the transaction size insignificant to the acquisition premium. Even though the estimates of transaction size are not significant in the model, the large transactions influence the acquisition premium negatively both pre- and post-crisis, which is what we expected in our hypothesis. Looking at the pooled model, the medium sized transactions now yield significant results at the 5% level and suggest that these are traded at a higher acquisition premium than the small transactions. One explanation could be that a medium transaction is more likely to involve a control shift than a small transaction, and since the control premium is measured in percent and is relative to the value of the targets' equity, this number will be higher than for a small transaction. However, for a large transaction the estimate is in line with our hypothesis though it is still not significant.

The board size yielded insignificant results across all sizes and models but suggests that small boards had a higher acquisition premium than medium and large boards. One advantage of pooling the data is that it may contain more information which will result in more power in the statistical tests. The variable for large boards is now significant at the 10% level and the variable for medium boards is significant at the 20% level. Though these estimates are far from significant enough to draw any conclusions, the negative estimate of medium and large boards, imply that the companies with small boards holding less than six members are traded at a higher acquisition premium as expected from the hypothesis.

As expected, the premium varied drastically across sectors, but with only one significant estimate in the pre-crisis model, for the Energy sector which influenced the acquisition premium negatively by more than 10.57%. In the post-crisis model the Energy sector is significant at the 10% level and has a negative influence on the acquisition premium as it did in our pre-crisis model. The pooled model suggested an overall negative significant estimate for Energy which is what we expected from a static sector. The Utility sector yields a significant and negative estimate in the post-crisis model but is insignificant in the pre-crisis model. In the pooled model the Utility sector shows overall significance with a negative impact, which is in line with our hypothesis for a static sector. The highly dynamic Information Technology sector is insignificant pre- and post-crisis but is significant at the 5% level in the pooled model. Information Technology has an overall positive impact on the transaction premium which is as expected from a dynamic sector.

As for the geographic regions, it is interesting that the negative influence on the acquisitions premium in Europe and Asia is highly significant with large values both over 10% pre-crisis. As it would be bold to attempt to explain variations in the acquisition premium across continents, we simply note that all geographic regions have a lower acquisition premium than the United States & Canada pre-crisis. As for the post-crisis estimates only Europe has a significant impact on the acquisition premium at the 10% significance level. It is negative compared to the intercept as it was pre-crisis. Though all other estimates are insignificant post-crisis another interesting observation can be made about the values. Post-crisis, all geographic estimates, except for Latin America & Caribbean, are much lower than pre-crisis as compared to the US-Canadian region. The fact that the estimate for Latin America & Caribbean is at a similar level as pre-crisis, as compared to the US-Canadian region, may suggest that the acquisition premium of the two geographic regions are correlated. Overall, the most notable change in the acquisition premium across geographic areas is the drastic drop in the US-Canadian region as seen in the drop in the estimate of the intercept. In the pooled data all variables for geographic regions are significant at the 1% level and negatively influence the acquisition premium compared to the intercept due to the large overall acquisition premium of the US-Canada region. Other than variation across regions, the biggest takeaway from the variables explaining geographic regions is that US and Canada has a higher acquisition premium than the rest of the world.

Overall the model provides high quality results. The intercept, change of control, private ownership and synergy variables all had positive and significant influence on the acquisition premium, which we expected to be the best explainers of the behavior of the acquisition premium.

3.6 Initial Models Estimated by Year

With the interesting findings of section 3.5 a model is now estimated for every year, resulting in a total of 10 models, summarized across 2000-2004 in Table 9 and 2010-2014 in Table 10 and estimated in detail in Appendix B.

TABLE 9: Initial model 2000-2004

Variable	2000	2001	2002	2003	2004
Intercept	17.65 0.02	32.30 <.0001	11.84 0.12	19.81 0.00	8.81 0.10
Change of control over target	25.39 <.0001	15.50 0.00	14.64 0.00	5.20 0.17	6.22 0.08
Private Company dummy	4.58 0.31	6.28 0.14	11.50 0.02	5.07 0.16	5.61 0.06
Synergy	7.37 0.06	3.03 0.48	0.45 0.91	1.37 0.67	10.51 0.00
Medium Transaction	5.52 0.33	-4.94 0.34	2.23 0.62	5.10 0.18	0.60 0.86
Large Transaction	-2.55 0.68	-12.18 0.04	-7.12 0.23	5.03 0.30	-1.22 0.75
Medium Board	-1.08 0.83	-2.86 0.58	-6.86 0.17	9.59 0.02	-1.08 0.75
Large board	1.69 0.77	-7.39 0.18	-2.68 0.59	-0.42 0.92	2.00 0.58
Consumer Staples	-9.48 0.21	-1.96 0.81	-6.10 0.43	7.83 0.23	-2.03 0.70
Energy	-13.53 0.09	-10.56 0.12	-1.16 0.89	-18.48 0.01	-7.10 0.25
Financials	-7.39 0.37	-8.88 0.25	2.91 0.76	-2.35 0.72	-10.78 0.05
Healthcare	-15.75	-5.90	1.59	-10.28	4.14

	0.03	0.44	0.85	0.09	0.47
Industrials	-1.45	-3.47	1.82	-3.45	2.63
	0.80	0.60	0.75	0.46	0.55
Information Technology	4.05	8.54	4.91	0.39	5.00
	0.52	0.24	0.51	0.94	0.25
Materials	3.59	-0.29	9.63	-4.25	-4.07
	0.66	0.97	0.15	0.49	0.41
Telecommunication Services	1.35	6.08	2.77	-17.08	1.31
	0.93	0.63	0.82	0.06	0.84
Utilities	-19.14	7.90	12.42	-25.58	6.46
	0.11	0.46	0.19	0.00	0.41
Europe	-9.34	-10.90	-3.78	-10.37	-4.18
	0.15	0.02	0.42	0.00	0.21
Asia Pacific	-12.91	-13.77	-3.70	-6.39	-2.77
	0.25	0.06	0.58	0.18	0.50
Africa & Middle east	6.80	9.68	-3.50	-13.98	-12.14
	0.76	0.46	0.69	0.08	0.07
Latin America & Caribbean	10.50	20.64	-36.42	6.13	1.82
	0.51	0.27	0.05	0.75	0.83
F-test	2.61	2.24	2.15	3.05	2.61
Pr > F	0.0002	0.0019	0.0034	<.0001	0.0002
R-Square	0.12	0.11	0.13	0.13	0.10
Adj R-Square	0.07	0.06	0.07	0.09	0.06
Obs	414	383	299	417	469

TABLE 10: Initial model 2010-2014

Variable	2010	2011	2012	2013	2014
Intercept	10.98 0.00	12.12 0.00	6.17 0.07	1.38 0.70	0.67 0.86
Change of control over target	12.71 <.0001	14.10 <.0001	8.79 0.00	7.64 0.00	9.35 <.0001
Private Company dummy	5.33 0.00	4.10 0.04	4.23 0.02	8.51 <.0001	5.06 0.01
Synergy	14.75 <.0001	14.27 <.0001	14.17 <.0001	16.67 <.0001	10.85 <.0001
Medium Transaction	3.10 0.16	-4.66 0.04	4.45 0.04	0.07 0.97	2.27 0.31
Large Transaction	-4.25 0.13	-7.46 0.01	3.42 0.21	1.46 0.62	7.95 0.01
Medium Board	0.18 0.93	1.85 0.43	0.34 0.87	-0.89 0.66	-1.40 0.49
Large board	-2.45 0.29	1.42 0.56	-1.32 0.57	-3.56 0.10	1.55 0.47
Consumer Staples	-1.62 0.67	-1.43 0.71	3.87 0.25	-1.60 0.60	0.60 0.85
Energy	-2.32 0.57	-5.36 0.21	0.82 0.84	-0.47 0.91	-6.22 0.12
Financials	-2.34 0.52	-5.37 0.16	-2.99 0.41	2.33 0.49	0.33 0.91
Healthcare	-1.51 0.68	0.10 0.98	6.56 0.06	8.23 0.02	-6.26 0.07
Industrials	0.72 0.81	1.63 0.59	3.25 0.26	-0.22 0.94	0.73 0.78
Information Technology	2.00 0.53	0.29 0.92	4.43 0.13	3.80 0.19	-0.65 0.83
Materials	-1.13 0.75	-0.33 0.93	6.15 0.05	-3.03 0.36	-0.84 0.80
Telecommunication Services	14.84 0.02	-4.09 0.54	4.37 0.52	-1.77 0.77	7.14 0.28
Utilities	-13.50 0.01	-9.43 0.07	-5.50 0.29	-0.26 0.96	-3.61 0.46

Europe	-5.94 0.03	-5.55 0.05	-1.73 0.53	0.36 0.90	2.30 0.47
Asia Pacific	-4.74 0.07	-0.93 0.75	-0.65 0.81	4.53 0.11	2.50 0.43
Africa & Middle east	-5.70 0.22	0.75 0.88	-5.48 0.19	1.06 0.81	2.83 0.51
Latin America & Caribbean	-13.96 0.01	-15.34 0.00	1.95 0.73	1.63 0.73	7.94 0.06
F-test	15.06	10.24	10.99	12.18	8.50
Pr > F	<.0001	<.0001	<.0001	<.0001	0.0002
R-Square	0.25	0.18	0.19	0.20	0.20
Adj R-Square	0.23	0.16	0.18	0.19	0.19
Obs	925	946	938	938	975

Some of the models have higher F-tests than others, but all ten models yield adequate estimates based the significant F-tests. Though some of the models yield highly significant results with respect to a variable, others do not. Looking at the geographic regions across model, in spite of insignificant parameters, there seems to be an overall positive trend across geographic regions compared to the intercept, all going from mostly negative values to only positive values by 2013. However, the intercept, change of control, private ownership and synergy variables all have positive estimates across every model with estimates being significant at the 1% in almost all of the models. Noteworthy is the intercept at 2013 and 2014 that are insignificant and much lower than the estimates of the previous models. Due to the overall power of the models when predicting these four variables and since they are accepted as the best explainers of the behavior of the acquisition premium, their values over time have been plotted in Figure 4 and 5.

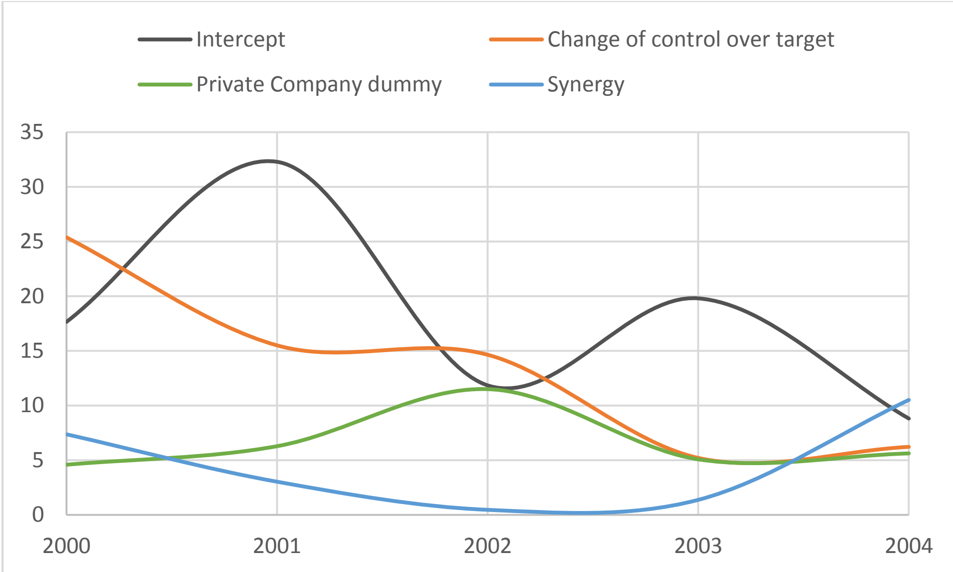

FIGURE 4: Estimates 2000-2004

Figure 4 shows the intercept is the most volatile variable with an overall falling trend, most likely caused by the fall of the acquisitions premium in the US-Canadian region, throughout the period. The control premium is falling from more than 25% to a little over 5% by the end of the period. Synergy has the lowest impact throughout the pre-crisis period but finishes with the highest impact in 2004. Private ownership is the most stable variable in the period of analysis.

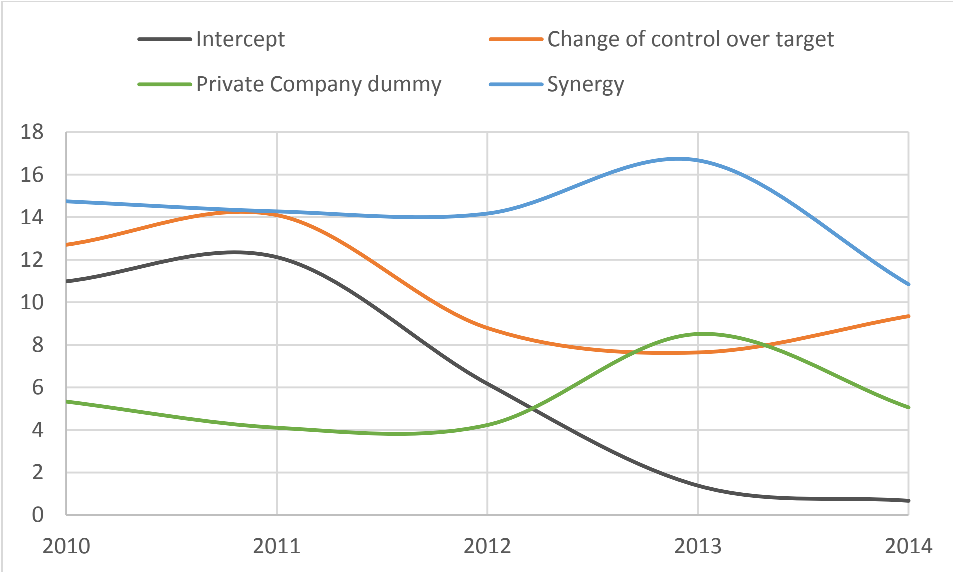

FIGURE 5: Estimates 2010-2014

In the second period plotted in Figure 5 the intercept keeps falling until it is less than 1% in 2014, still driven by the dropping acquisition premium in the US-Canadian region. The control premium is more stable than in the previous period, but at a much lower level. The impact of synergy has continuously risen and is at a higher and more stable level than in previous period, which indicates synergy now plays a larger role in explaining acquisition premiums than before the crisis. The variable for private ownership is at a similar level as pre-crisis which is different from the estimation of the initial model. However, the private dummy yields the least significant estimates of all the plotted variables, which may explain the unexpected estimates.

3.7 Estimation of the Extended Models

Given the estimates of the initial models this section adds interaction terms, by including two new variables to the model defined as:

Synergy & Change of control

By controlling for synergy and change of control, the model will be able to explain how synergy affects the control premium and not just the acquisition premium. A dummy variable, SYNxCTRL will take the value of one for transactions that include change of control and synergy between buyer and target and zero otherwise.

Hypothesis: In the event of a synergy, the size of the control premium will increase, ceteris paribus.

Private Company & Change of control

By controlling for private company and change of control, the model will be able to explain how public ownership affects the control premium and not just the acquisition premium. As there may be some noise in the acquisition premium of private companies compared to public, since there is no effective market price for private companies, this variable has the potential to improve the model as it will give a stronger indication of the value of control in private companies compared to public. A dummy variable, PRIVxCTRL, will take a value of one for transactions that include change of control and private ownership, and zero otherwise.

Hypothesis: In transactions of privately-owned firms, control premium will be higher.

The model is re-estimated as three separate models: Pre-crisis, post-crisis and pooled data in appendix C and summarized in Table 11.

TABLE 11: Extended models summarized

Variable	Expected impact	Pre-Crisis est. & sign.	Post-Crisis est. & sign.	Pooled est. & sign.
Intercept	+	20.63810 <.0001	5.44539 0.00440	11.98458 <.0001
Change of control over target	+	13.62087 0.00010	10.55671 <.0001	13.70204 <.0001
Private Company dummy	+	4.84608 0.02900	16.53461 <.0001	10.36409 <.0001
Synergy	+	7.10301 0.00960	-2.37466 0.22420	1.82494 0.26500
Synergy & Change of control	+	0.52516 0.88600	6.58042 <.0001	6.66455 <.0001
Private Company & Change of control	-	-1.76163 0.59740	-2.46229 0.14770	-1.64819 0.27760
Medium Transaction	+	2.16928 0.27060	0.45588 0.72420	1.90526 0.03220
Large Transaction	+	-1.86181 0.42050	1.57068 0.18340	-1.09919 0.32990
Medium Board	-	-1.14180 0.56600	-0.43757 0.64720	-1.09335 0.21040
Large board	+/-	-1.50134 0.49020	-1.09278 0.27780	-1.57206 0.08850
Consumer Staples	+/-	-2.39793 0.44490	0.32037 0.83340	-0.56762 0.68680
Energy	-	-10.52610 0.00100	-3.09280 0.08850	-5.03668 0.00160
Financials	-	-6.28293 0.05690	-0.89748 0.56570	-2.49869 0.08570
Healthcare	+	-7.34819 0.01880	2.22560 0.17180	-0.73669 0.61780
Industrials	+/-	-0.11069 0.96340	1.47719 0.24930	1.04039 0.36890
Information	+	3.13087	2.19577	2.58591

Technology		0.24960	0.10150	0.03570
Materials	-	-0.40606 0.89080	0.43460 0.77490	0.14433 0.91690
Telecommunication Services	+	-2.07225 0.64530	3.17882 0.26600	1.44372 0.54810
Utilities	-	-2.56355 0.54840	-6.33682 0.00500	-5.23295 0.01030
Europe	-	-11.82255 <.0001	-2.28656 0.07680	-7.41301 <.0001
Asia Pacific	-	-10.76111 <.0001	0.20488 0.87120	-4.96116 <.0001
Africa & Middle east	-	-11.20612 0.00880	-1.46778 0.46790	-6.40749 0.00050
Latin America & Caribbean	-	-2.27909 0.71540	-3.08666 0.14620	-6.59684 0.00120
F-test		10.40	50.75	62.82
Pr > F		<.0001	<.0001	<.0001
R-Square		0.1046	0.1926	0.1718
Adj R-Square		0.0945	0.1888	0.1690
Obs		1,982	4,705	6,687

The three extended models all have significant F-tests, though it is worth noting that the F-test of the post-crisis model once more is much higher than that of the pre-crisis. Once again the pooled model has the highest F-test. Looking at the distribution of the fitted residuals of all three models from Appendix C, they are not perfectly normally distributed as they are skewed to the left, but as our data set is large and the data have been picked randomly, we can assume normal distribution in the residuals according to the central limit theorem.

The estimates for pure control premium in the extended model is about 1 percent point higher pre-crisis, 0.3 percent point lower post-crisis, and 1.72 percent point higher in the pooled model as compared to the initial model. Control is now on average explaining a larger part of the transaction premium than it was in the initial model. The extended model also estimates a drop of 3.06 percent point in control premium from 13.62% to 10.56%, equivalent to a fall of 22.47%.

The dummy for private ownership has fallen pre-crisis, risen post-crisis and fallen in the pooled version of the extended model. The variable for change of control in private companies is negative across all models, which is interesting in spite of the low significance of the estimates. It weakly suggests that the pure control premium is not as high in transactions of private companies as the overall acquisition premium. This could be explained by the noise included in the acquisition premium of private companies, as the value pre-transaction cannot be calculated as precisely for private as for public companies.

The synergy variable is higher pre-crisis, lower in the pooled data and negative in the post-crisis version of the extended model as compared to the initial. It is also interesting to note that parameters are only significant pre-crisis. It seems that synergy as a predictor of overall transaction premium is weaker after the inclusion of the new variables. The dummy variable for transactions with change of control and synergy between buyer and target represents synergy’s influence on the pure control premium. It is positive but insignificant in the pre-crisis model as well as positive and significant at the 1% level of the post-crisis and pooled model. This suggests that a synergy effect between buyer and target is significant and has a positive influence on the control premium which is in line with the hypothesis.

Extending the initial model has shown that synergy is indeed a strong explainer of the control premium and that private-ownership, though still being a strong explainer of the control premium, may have more relevance for the acquisition premium than the pure control premium as compared to what the initial model suggested.

3.8 Pooled Version of the Further Extended Model

Due to the findings of section 3.6 and 3.7, this section adds three more variables to create the further extended model on pooled data. The purpose of this further development is to estimate a model that also tests the significance of the differences between the two periods while being estimated with the power of a pooled model. By correcting for more variables with useful explanatory power, the model is expected to yield a higher estimate of the pure control premium. Three new variables are added:

Control post-crisis

By adding a change of control post-crisis variable, the model will explain how the control premium has changed after the financial crisis, while also testing for the significance of the difference of the pre- and post-crisis estimates. A dummy variable, CTRLxPOST, will take the value of one for transactions occurring post-crisis that include a change of control.

Hypothesis: The control premium will be lower post-crisis.

Synergy & Change of control post-crisis

By controlling for synergy and change of control post-crisis, the model will be able to explain how synergy affects the control premium and how this effect has changed after the financial crisis, while also testing for the significance of the difference of the pre- and post-crisis estimates and yielding a stronger estimate of the pure control premium. A dummy variable, SYNxCTRLxPOST, will take the value of one for post-crisis transactions that include change of control and synergy between buyer and target and zero otherwise.

Hypothesis: The influence of synergy on the control premium will be higher post-crisis.

Private Company & Change of control post-crisis

By controlling for private company and change of control, the model will be able to explain how public ownership affects the control premium and how this effect has changed after the financial crisis, while also testing for the significance of the difference of the pre- and post-crisis estimates and yielding a stronger estimate of the pure control premium. A dummy variable, PRIVxCTRLxPOST, will take the value of one for post-crisis transactions that include change of control and private ownership, and zero otherwise.

Hypothesis: The influence of private ownership on the control premium will be higher post-crisis.

The further extended model is estimated in appendix D and summarized in Table 12:

TABLE 12: Further extended model

Variable	Expected impact	Pooled Data estimation and significance
Intercept	+	11.68091 <.0001
Change of control over target	+	14.49986 <.0001
Change of control post-crisis	-	-1.27045 0.43140
Private Company dummy	+	10.52231 <.0001
Synergy	+	-0.53134 0.79340
Synergy and Change of control	+	3.48088 0.05920
Synergy and Change of control Post-crisis	+	6.78573 <.0001
Private Company and Change of control	+	-1.15471 0.55760
Private Company and Change of control Post-crisis	+	-1.33521 0.52600
Medium Transaction	+	1.89594 0.03320
Large Transaction	+	-1.04220 0.35550
Medium Board	-	-0.91759 0.29740
Large board	+/-	-1.41886 0.12710
Consumer Staples	+/-	-0.71825 0.61030
Energy	-	-5.18566 0.00120
Financials	-	-2.52503 0.08260
Healthcare	+	-0.70792

		0.63210
Industrials	+/-	1.00597 0.38500
Information Technology	+	2.59448 0.03560
Materials	-	0.12660 0.92710
Telecommunication Services	+	1.54180 0.52130
Utilities	-	-5.28407 0.00950
Europe	-	-7.20885 <.0001
Asia Pacific	-	-4.77687 <.0001
Africa & Middle east	-	-6.18562 0.00080
Latin America & Caribbean	-	-6.38450 0.00190
F-test		55.63
Pr > F		<.0001
R-Square		0.1727
Adj R-Square		0.1696
Obs		6,687

The further extended pooled model have a significant F-tests, Looking at the distribution of the fitted residuals from Appendix D, they are not perfectly normally distributed as they are skewed to the left, but as our data set is large and the data have been picked randomly, we can assume normal distribution in the residuals according to the central limit theorem.

The pure control premium is highly significant with an estimate of 14.50%. This is the highest and best estimate of the pure control premium as it has been adjusted for

more relevant variables than those of all the other models. The effect of the crisis on the pure control premium is insignificant but negative in line with the hypothesis.
Synergy as an explainer of overall acquisition premium is clearly insignificant with a small negative estimate. Synergy as an explainer of control premium is significant at the 10% level with a positive estimate and in the post-crisis estimate is significant at the 1% level with an impact of 6.79%.

Though private companies are traded at a higher acquisition premium than public companies, the model fails to yield significant evidence of its direct relation to the change of control.

3.9 Evaluation of the models

Overall the models have high explanatory power in that the most important parameters are significant. The results yielded by the model are in most cases congruent with what was expected based on theory and financial intuition.

CONCLUSION

This paper set out to investigate the control premium in change of control transactions. Previous research on the subject of control premiums showed that a control premium is made up of the costs of acquiring a majority stake of a company, the value of private benefits of control and as the potential for improvement of the acquired company. Based on this framework, previous studies find that variables affecting any of these three factors influence the control premium.

Related to the private benefits of control, previous research indicates that investor-protection is the most relevant factor in determining to what extent private benefits could be extracted by exploiting minority shareholders. While investor-protection laws differ by country and by public and private companies, countries with strong investor-protection laws limit the extent to which controlling shareholders can take advantage of minority shareholders. The stronger investor-protection laws, the lower the control premium.

As for the potential for improvement of the acquired company, the most relevant factors were found to be suboptimal firm strategy, inefficient management and boards, as well as the possibilities for obtaining synergies through the acquisition. The larger the potential for improvement of strategy, management and board structure, and the higher the extent of possible synergies, the larger the control premium.

This study examines a number of firm- and transaction-specific variables' explanatory power of the control premium, chosen on their theoretical relevance and their significance in previous research. By gathering a large amount of data randomly instead of carefully picking the transactions to be analyzed, this paper attempts to give a large-scale, explanation of how different variables influence the control premium. Another way in which this paper differs from previous research is in the analysis of the control premium in the years leading up to and in the years after the global financial crisis of 2007/08.

The study shows that the change of control in a transaction had a significant positive influence on the acquisition premium, providing strong empirical evidence for a control premium. It also found that private companies had a significantly higher acquisition premium than public companies, but failed to show this was directly due to the change of control. Horizontal synergies between buyer and target were found to be a highly significant positive influencer of the control premium. These three findings had the biggest and most consistent impact on the control premium, which is consistent with existing literature on control premiums. The paper also found that the control premium was significantly higher in the US-Canadian region than in any other geographical region. What is perhaps the most interesting discovery of this paper is the implication of the financial crisis on the control premium as the model found an overall significant drop in the size of the control premium of 22.47%, and that two statistically significant explanatory variables in particular have changed drastically during the crisis. First, the acquisition premium on private companies almost tripled post-crisis compared to pre-crisis levels. There is no single or simple explanation for this, but it is an interesting finding that calls for more in-depth research in the area. Second, the control premium drastically fell in the US-Canadian region post-crisis compared to pre-crisis levels. Where the US-Canadian acquisition premium was the highest in the world pre-crisis it was the lowest in the world in 2013 and 2014. As the global average control premium has decreased following the financial crisis, it would be reasonable to assume that the financial crisis has caused the drop in control premiums and as the financial crisis had a major impact on the US economy it makes intuitive sense that the US-Canadian region has experienced a significant drop in control premiums that far exceeds that of any other geographical region.

Overall the findings of this paper are in line with those of previous research. The paper has contributed by taking a large-scale approach to the subject while also adding the pre- and post-crisis perspective to the subject which resulted in several interesting outcomes.

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Database: www.capitaliq.com

APPENDIX A: SAS OUTPUTS FOR THE INITIAL MODEL

Initial pre-crisis model:

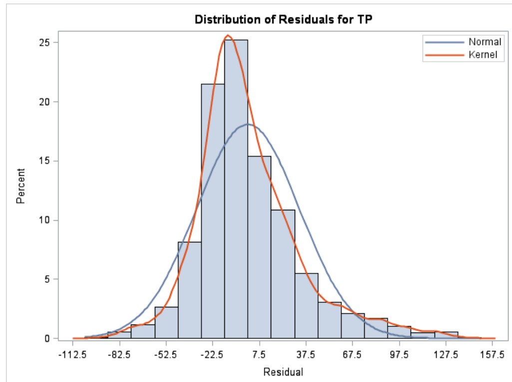
Number of Observations Read	3348
Number of Observations Used	1982
Number of Observations with Missing Values	1366

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	20	252861	12643	11.43	<.0001
Error	1961	2168486	1105.80626		
Corrected Total	1981	2421347			

Root MSE	33.25367	R-Square	0.1044
Dependent Mean	29.48409	Adj R-Sq	0.0953
Coeff Var	112.78514		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	21.24999	2.93166	7.25	<.0001
CTRL	1	12.40470	1.98402	6.25	<.0001
PRIV	1	5.15819	1.75539	2.94	0.0033
SYN	1	5.96230	1.59493	3.74	0.0002
MED_TRANS	1	2.17724	1.96514	1.11	0.2680
LARGE_TRANS	1	-1.90549	2.30822	-0.83	0.4092
MED_BRD	1	-1.15233	1.97461	-0.58	0.5596
LARGE_BRD	1	-1.55247	2.10252	-0.74	0.4604
CONS	1	-2.40366	3.13690	-0.77	0.4436
ENGY	1	-10.57027	3.18092	-3.32	0.0009
FIN	1	-6.26744	3.29483	-1.90	0.0573
HLC	1	-7.40944	3.12052	-2.37	0.0177
IND	1	-0.11749	2.41390	-0.05	0.9612
IT	1	3.07186	2.71493	1.13	0.2580
MAT	1	-0.40851	2.95523	-0.14	0.8901
TEL	1	-2.03001	4.49536	-0.45	0.6516
UTY	1	-2.56291	4.26892	-0.60	0.5483
EUR	1	-11.73904	1.85980	-6.31	<.0001
ASIA	1	-10.71677	2.58920	-4.14	<.0001
AFRME	1	-11.12079	4.27008	-2.60	0.0093
LAC	1	-2.13610	6.23377	-0.34	0.7319

Fitted residuals of initial model:



Code:

```
ODS GRAPHICS ON;
DATA _NULL_;
      dsid = OPEN("WORK.'MASTER THESIS 2000_2005 V2.001'n", "I");
      dstype = ATTRC(DSID, "TYPE");
      IF TRIM(dstype) = " " THEN
            DO;
            CALL SYMPUT("_EG_DSTYPE_", "");
            CALL SYMPUT("_DSTYPE_VARS_", "");
            END;
      ELSE
            DO;
            CALL SYMPUT("_EG_DSTYPE_", "(TYPE=""" || TRIM(dstype) ||
""")");
            IF VARNUM(dsid, "_NAME_") NE 0 AND VARNUM(dsid, "_TYPE_")
NE 0 THEN
                  CALL SYMPUT("_DSTYPE_VARS_", "_TYPE_ _NAME_");
            ELSE IF VARNUM(dsid, "_TYPE_") NE 0 THEN
                  CALL SYMPUT("_DSTYPE_VARS_", "_TYPE_");
            ELSE IF VARNUM(dsid, "_NAME_") NE 0 THEN
                  CALL SYMPUT("_DSTYPE_VARS_", "_NAME_");
            ELSE
                  CALL SYMPUT("_DSTYPE_VARS_", "");
            END;
      rc = CLOSE(dsid);
      STOP;
RUN;

/* -------------------------------------------------------------------
   Data set WORK.'MASTER THESIS 2000_2005 V2.001'n does not need to be
sorted.
```

```
   ------------------------------------------------------------------
*/
DATA WORK.SORTTempTableSorted &_EG_DSTYPE_ /
VIEW=WORK.SORTTempTableSorted;
      SET WORK.'MASTER THESIS 2000_2005 V2.001'n(KEEP=TP CTRL PRIV SYN
MED_TRANS LARGE_TRANS MED_BRD LARGE_BRD CONS ENGY FIN HLC IND IT MAT
TEL UTY EUR ASIA AFRME LAC &_DSTYPE_VARS_);
RUN;
TITLE;
TITLE1 "Linear Regression Results";
FOOTNOTE;
FOOTNOTE1 "Generated by the SAS System (&_SASSERVERNAME, &SYSSCPL) on
%TRIM(%QSYSFUNC(DATE(), NLDATE20.)) at %TRIM(%SYSFUNC(TIME(),
TIMEAMPM12.))";
PROC REG DATA=WORK.SORTTempTableSorted
            PLOTS(ONLY)=ALL
      ;
      Linear_Regression_Model: MODEL TP = CTRL PRIV SYN MED_TRANS
LARGE_TRANS MED_BRD LARGE_BRD CONS ENGY FIN HLC IND IT MAT TEL UTY EUR
ASIA AFRME LAC
            /           SELECTION=NONE
      ;
RUN;
QUIT;

/* ------------------------------------------------------------------
   End of task code.
   ------------------------------------------------------------------
*/
RUN; QUIT;
%_eg_conditional_dropds(WORK.SORTTempTableSorted,
            WORK.TMP1TempTableForPlots);
TITLE; FOOTNOTE;
ODS GRAPHICS OFF;
```

Initial post-crisis model:

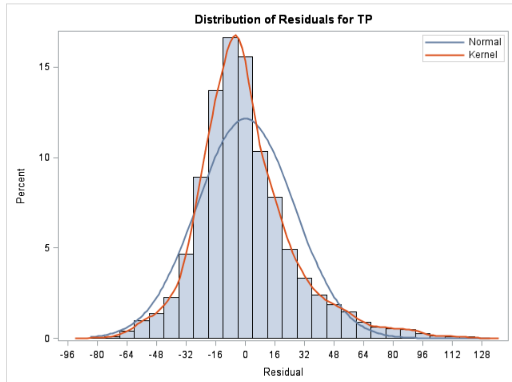
Number of Observations Read	6269
Number of Observations Used	4705
Number of Observations with Missing Values	1564

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	20	771046	38552	55.65	<.0001
Error	4684	3244688	692.71743		
Corrected Total	4704	4015735			

Root MSE	26.31953	R-Square	0.1920
Dependent Mean	18.46796	Adj R-Sq	0.1886
Coeff Var	142.51454		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	6.10528	1.61082	3.79	0.0002
CTRL	1	10.89405	1.05146	10.36	<.0001
SYN	1	5.41862	0.85662	6.33	<.0001
PRIV	1	15.11325	0.97184	15.55	<.0001
MED_TRANS	1	1.20128	0.97135	1.24	0.2163
LARGE_TRANS	1	-0.47259	1.28692	-0.37	0.7135
MED_BRD	1	-0.38897	0.95572	-0.41	0.6840
LARGE_BRD	1	-1.01963	1.00573	-1.01	0.3107
CONS	1	0.20086	1.52085	0.13	0.8949
ENGY	1	-3.22818	1.81369	-1.78	0.0752
FIN	1	-0.92495	1.56092	-0.59	0.5535
HLC	1	2.12416	1.62728	1.31	0.1918
IND	1	1.41885	1.28180	1.11	0.2684
IT	1	2.19784	1.34068	1.64	0.1012
MAT	1	0.32257	1.51737	0.21	0.8317
TEL	1	3.07347	2.85714	1.08	0.2821
UTY	1	-6.35737	2.25465	-2.82	0.0048
EUR	1	-2.43252	1.26748	-1.92	0.0550
ASIA	1	0.05864	1.24203	0.05	0.9623
AFRME	1	-1.68736	2.00487	-0.84	0.4000
LAC	1	-3.25433	2.11340	-1.54	0.1237

Fitted residuals of initial model:



Code:

```
ODS GRAPHICS ON;
DATA _NULL_;
      dsid = OPEN("WORK.'MASTER THESIS 2010_2015 V2.00'n", "I");
      dstype = ATTRC(DSID, "TYPE");
      IF TRIM(dstype) = " " THEN
            DO;
            CALL SYMPUT("_EG_DSTYPE_", "");
            CALL SYMPUT("_DSTYPE_VARS_", "");
            END;
      ELSE
            DO;
            CALL SYMPUT("_EG_DSTYPE_", "(TYPE=""" || TRIM(dstype) ||
""")");
            IF VARNUM(dsid, "_NAME_") NE 0 AND VARNUM(dsid, "_TYPE_")
NE 0 THEN
                  CALL SYMPUT("_DSTYPE_VARS_", "_TYPE_ _NAME_");
            ELSE IF VARNUM(dsid, "_TYPE_") NE 0 THEN
                  CALL SYMPUT("_DSTYPE_VARS_", "_TYPE_");
            ELSE IF VARNUM(dsid, "_NAME_") NE 0 THEN
                  CALL SYMPUT("_DSTYPE_VARS_", "_NAME_");
            ELSE
                  CALL SYMPUT("_DSTYPE_VARS_", "");
            END;
      rc = CLOSE(dsid);
      STOP;
RUN;

/* -------------------------------------------------------------------
   Data set WORK.'MASTER THESIS 2010_2015 V2.00'n does not need to be
sorted.
   -------------------------------------------------------------------
*/
DATA WORK.SORTTempTableSorted &_EG_DSTYPE_ /
VIEW=WORK.SORTTempTableSorted;
```

```
      SET WORK.'MASTER THESIS 2010_2015 V2.00'n(KEEP=TP CTRL SYN PRIV
MED_TRANS LARGE_TRANS MED_BRD LARGE_BRD CONS ENGY FIN HLC IND IT MAT
TEL UTY EUR ASIA AFRME LAC &_DSTYPE_VARS_);
RUN;
TITLE;
TITLE1 "Linear Regression Results";
FOOTNOTE;
FOOTNOTE1 "Generated by the SAS System (&_SASSERVERNAME, &SYSSCPL) on
%TRIM(%QSYSFUNC(DATE(), NLDATE20.)) at %TRIM(%SYSFUNC(TIME(),
TIMEAMPM12.))";
PROC REG DATA=WORK.SORTTempTableSorted
            PLOTS(ONLY)=ALL
      ;
      Linear_Regression_Model: MODEL TP = CTRL SYN PRIV MED_TRANS
LARGE_TRANS MED_BRD LARGE_BRD CONS ENGY FIN HLC IND IT MAT TEL UTY EUR
ASIA AFRME LAC
            /           SELECTION=NONE
      ;
RUN;
QUIT;

/* -------------------------------------------------------------------
   End of task code.
   -------------------------------------------------------------------
*/
RUN; QUIT;
%_eg_conditional_dropds(WORK.SORTTempTableSorted,
            WORK.TMP1TempTableForPlots);
TITLE; FOOTNOTE;
ODS GRAPHICS OFF;
```

Initial model for pooled data:

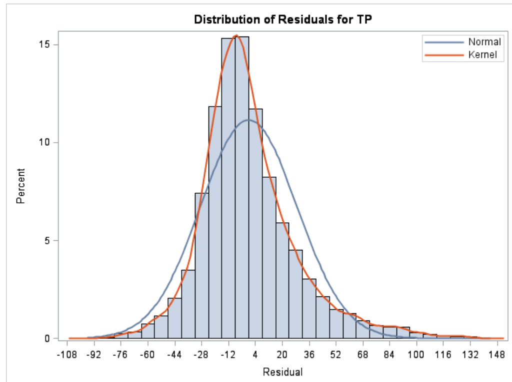
Number of Observations Read	9617
Number of Observations Used	6687
Number of Observations with Missing Values	2930

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	20	1132453	56623	68.95	<.0001
Error	6666	5473863	821.16159		
Corrected Total	6686	6606316			

Root MSE	28.65592	R-Square	0.1714
Dependent Mean	21.73309	Adj R-Sq	0.1689
Coeff Var	131.85383		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	12.32123	1.35961	9.06	<.0001
CTRL	1	11.98347	0.94207	12.72	<.0001
PRIV	1	11.51557	0.83728	13.75	<.0001
SYN	1	5.89209	0.76340	7.72	<.0001
MED_TRANS	1	1.90696	0.88926	2.14	0.0320
LARGE_TRANS	1	-1.21778	1.12573	-1.08	0.2794
MED_BRD	1	-1.13770	0.86937	-1.31	0.1907
LARGE_BRD	1	-1.61786	0.91667	-1.76	0.0776
CONS	1	-0.54335	1.40717	-0.39	0.6994
ENGY	1	-5.05983	1.58881	-3.18	0.0015
FIN	1	-2.42915	1.45332	-1.67	0.0947
HLC	1	-0.80846	1.47522	-0.55	0.5837
IND	1	1.04104	1.15753	0.90	0.3685
IT	1	2.55178	1.23063	2.07	0.0382
MAT	1	0.19701	1.38184	0.14	0.8866
TEL	1	1.46528	2.40326	0.61	0.5421
UTY	1	-5.20116	2.03860	-2.55	0.0108
EUR	1	-7.22239	1.01393	-7.12	<.0001
ASIA	1	-4.84335	1.03950	-4.66	<.0001
AFRME	1	-6.23474	1.82301	-3.42	0.0006
LAC	1	-6.50933	2.03181	-3.20	0.0014

Fitted residuals of initial model:



Code:

```
ODS GRAPHICS ON;
DATA _NULL_;
      dsid = OPEN("WORK.'MASTER THESIS POOLED DATA V2.00'n", "I");
      dstype = ATTRC(DSID, "TYPE");
      IF TRIM(dstype) = " " THEN
            DO;
            CALL SYMPUT("_EG_DSTYPE_", "");
            CALL SYMPUT("_DSTYPE_VARS_", "");
            END;
      ELSE
            DO;
            CALL SYMPUT("_EG_DSTYPE_", "(TYPE=""" || TRIM(dstype) ||
""")");
            IF VARNUM(dsid, "_NAME_") NE 0 AND VARNUM(dsid, "_TYPE_")
NE 0 THEN
                  CALL SYMPUT("_DSTYPE_VARS_", "_TYPE_ _NAME_");
            ELSE IF VARNUM(dsid, "_TYPE_") NE 0 THEN
                  CALL SYMPUT("_DSTYPE_VARS_", "_TYPE_");
            ELSE IF VARNUM(dsid, "_NAME_") NE 0 THEN
                  CALL SYMPUT("_DSTYPE_VARS_", "_NAME_");
            ELSE
                  CALL SYMPUT("_DSTYPE_VARS_", "");
            END;
      rc = CLOSE(dsid);
      STOP;
RUN;

/* -------------------------------------------------------------------
   Data set WORK.'MASTER THESIS POOLED DATA V2.00'n does not need to be
sorted.
   -------------------------------------------------------------------
*/
DATA WORK.SORTTempTableSorted &_EG_DSTYPE_ /
VIEW=WORK.SORTTempTableSorted;
```

```
      SET WORK.'MASTER THESIS POOLED DATA V2.00'n(KEEP=TP CTRL PRIV SYN
MED_TRANS LARGE_TRANS MED_BRD LARGE_BRD CONS ENGY FIN HLC IND IT MAT
TEL UTY EUR ASIA AFRME LAC &_DSTYPE_VARS_);
RUN;
TITLE;
TITLE1 "Linear Regression Results";
FOOTNOTE;
FOOTNOTE1 "Generated by the SAS System (&_SASSERVERNAME, &SYSSCPL) on
%TRIM(%QSYSFUNC(DATE(), NLDATE20.)) at %TRIM(%SYSFUNC(TIME(),
TIMEAMPM12.))";
PROC REG DATA=WORK.SORTTempTableSorted
            PLOTS(MAXPOINTS=10000)=ALL
      ;
      Linear_Regression_Model: MODEL TP = CTRL PRIV SYN MED_TRANS
LARGE_TRANS MED_BRD LARGE_BRD CONS ENGY FIN HLC IND IT MAT TEL UTY EUR
ASIA AFRME LAC
            /           SELECTION=NONE
      ;
RUN;
QUIT;

/* -------------------------------------------------------------------
   End of task code.
   -------------------------------------------------------------------
*/
RUN; QUIT;
%_eg_conditional_dropds(WORK.SORTTempTableSorted,
            WORK.TMP1TempTableForPlots);
TITLE; FOOTNOTE;
ODS GRAPHICS OFF;
```

APPENDIX B: SAS OUTPUTS FOR THE INITIAL MODEL BY YEAR

2000:

2000=1 2001=0 2002=0 2003=0 2004=0

Number of Observations Read	709
Number of Observations Used	414
Number of Observations with Missing Values	295

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	20	71127	3556.36678	2.61	0.0002
Error	393	535585	1362.81072		
Corrected Total	413	606712			

Root MSE	36.91627	R-Square	0.1172
Dependent Mean	43.82079	Adj R-Sq	0.0723
Coeff Var	84.24372		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	17.64843	7.83385	2.25	0.0248
CTRL	1	25.38746	5.75320	4.41	<.0001
PRIV	1	4.58114	4.49984	1.02	0.3093
SYN	1	7.36648	3.95404	1.86	0.0632
MED_TRANS	1	5.52122	5.66140	0.98	0.3300
LARGE_TRANS	1	-2.55480	6.14443	-0.42	0.6778
MED_BRD	1	-1.07516	5.04720	-0.21	0.8314
LARGE_BRD	1	1.68558	5.73194	0.29	0.7689
CONS	1	-9.48364	7.56146	-1.25	0.2105
ENGY	1	-13.52977	7.95262	-1.70	0.0897
FIN	1	-7.38633	8.30596	-0.89	0.3744
HLC	1	-15.74997	7.32934	-2.15	0.0323
IND	1	-1.44676	5.71126	-0.25	0.8002
IT	1	4.05322	6.29642	0.64	0.5201
MAT	1	3.59075	8.03487	0.45	0.6552
TEL	1	1.35266	14.82529	0.09	0.9273
UTY	1	-19.13753	11.84414	-1.62	0.1069
EUR	1	-9.34182	6.44923	-1.45	0.1483
ASIA	1	-12.91390	11.10894	-1.16	0.2457
AFRME	1	6.80042	21.81955	0.31	0.7555
LAC	1	10.49941	15.97808	0.66	0.5115

2001:

2000=0 2001=1 2002=0 2003=0 2004=0

Number of Observations Read	627
Number of Observations Used	383
Number of Observations with Missing Values	244

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	20	57060	2853.02414	2.24	0.0019
Error	362	461728	1275.49186		
Corrected Total	382	518789			

Root MSE	35.71403	R-Square	0.1100
Dependent Mean	36.06943	Adj R-Sq	0.0608
Coeff Var	99.01467		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	32.30102	7.14561	4.52	<.0001
CTRL	1	15.50434	5.06514	3.06	0.0024
PRIV	1	6.27512	4.21592	1.49	0.1375
SYN	1	3.02658	4.23277	0.72	0.4750
MED_TRANS	1	-4.93662	5.11627	-0.96	0.3352
LARGE_TRANS	1	-12.17970	5.92253	-2.06	0.0405
MED_BRD	1	-2.85937	5.10416	-0.56	0.5757
LARGE_BRD	1	-7.39087	5.51739	-1.34	0.1812
CONS	1	-1.95908	7.96654	-0.25	0.8059
ENGY	1	-10.55948	6.84708	-1.54	0.1239
FIN	1	-8.87531	7.74095	-1.15	0.2523
HLC	1	-5.90376	7.69049	-0.77	0.4432
IND	1	-3.47179	6.54545	-0.53	0.5962
IT	1	8.53971	7.23940	1.18	0.2389
MAT	1	-0.29033	7.64840	-0.04	0.9697
TEL	1	6.07840	12.43028	0.49	0.6251
UTY	1	7.89989	10.64620	0.74	0.4585
EUR	1	-10.89624	4.79262	-2.27	0.0236
ASIA	1	-13.77264	7.32798	-1.88	0.0610
AFRME	1	9.67577	12.99820	0.74	0.4571
LAC	1	20.63739	18.58338	1.11	0.2675

2002:

2000=0 2001=0 2002=1 2003=0 2004=0

Number of Observations Read	519
Number of Observations Used	299
Number of Observations with Missing Values	220

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	20	41844	2092.18777	2.15	0.0034
Error	278	270459	972.87343		
Corrected Total	298	312303			

Root MSE	31.19092	R-Square	0.1340
Dependent Mean	25.79408	Adj R-Sq	0.0717
Coeff Var	120.92278		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	11.84320	7.52110	1.57	0.1165
CTRL	1	14.64322	4.48469	3.27	0.0012
PRIV	1	11.49799	4.69590	2.45	0.0150
SYN	1	0.45363	3.88813	0.12	0.9072
MED_TRANS	1	2.23291	4.53466	0.49	0.6228
LARGE_TRANS	1	-7.11575	5.85261	-1.22	0.2251
MED_BRD	1	-6.85604	4.96983	-1.38	0.1688
LARGE_BRD	1	-2.67599	4.97284	-0.54	0.5909
CONS	1	-6.09947	7.65457	-0.80	0.4262
ENGY	1	-1.16348	8.36303	-0.14	0.8895
FIN	1	2.91248	9.35906	0.31	0.7559
HLC	1	1.59166	8.14717	0.20	0.8453
IND	1	1.81946	5.74322	0.32	0.7516
IT	1	4.90605	7.46847	0.66	0.5118
MAT	1	9.62595	6.68266	1.44	0.1509
TEL	1	2.76990	12.03418	0.23	0.8181
UTY	1	12.41739	9.47660	1.31	0.1912
EUR	1	-3.77912	4.66612	-0.81	0.4187
ASIA	1	-3.70457	6.67193	-0.56	0.5792
AFRME	1	-3.50245	8.89269	-0.39	0.6940
LAC	1	-36.41991	18.76307	-1.94	0.0533

2003:

2000=0 2001=0 2002=0 2003=1 2004=0

Number of Observations Read	688
Number of Observations Used	417
Number of Observations with Missing Values	271

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	20	57326	2866.28650	3.05	<.0001
Error	396	372557	940.79966		
Corrected Total	416	429882			

Root MSE	30.67246	R-Square	0.1334
Dependent Mean	22.37039	Adj R-Sq	0.0896
Coeff Var	137.11188		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	19.80641	5.62244	3.52	0.0005
CTRL	1	5.20274	3.79612	1.37	0.1713
PRIV	1	5.07432	3.62154	1.40	0.1620
SYN	1	1.36696	3.21060	0.43	0.6705
MED_TRANS	1	5.09936	3.79140	1.34	0.1794
LARGE_TRANS	1	5.02607	4.87545	1.03	0.3032
MED_BRD	1	9.58564	3.97711	2.41	0.0164
LARGE_BRD	1	-0.42105	4.16596	-0.10	0.9195
CONS	1	7.83092	6.57315	1.19	0.2342
ENGY	1	-18.48011	7.12230	-2.59	0.0098
FIN	1	-2.34504	6.47528	-0.36	0.7174
HLC	1	-10.27607	6.11134	-1.68	0.0935
IND	1	-3.44935	4.65673	-0.74	0.4593
IT	1	0.39304	5.65749	0.07	0.9446
MAT	1	-4.25231	6.15503	-0.69	0.4901
TEL	1	-17.07603	9.21589	-1.85	0.0646
UTY	1	-25.57996	8.13931	-3.14	0.0018
EUR	1	-10.37461	3.65741	-2.84	0.0048
ASIA	1	-6.39204	4.72831	-1.35	0.1772
AFRME	1	-13.98140	7.91466	-1.77	0.0781
LAC	1	6.12616	19.03499	0.32	0.7477

2004:

2000=0 2001=0 2002=0 2003=0 2004=1

Number of Observations Read	805
Number of Observations Used	469
Number of Observations with Missing Values	336

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	20	40214	2010.68305	2.61	0.0002
Error	448	345519	771.24768		
Corrected Total	468	385733			

Root MSE	27.77135	R-Square	0.1043
Dependent Mean	20.12831	Adj R-Sq	0.0643
Coeff Var	137.97160		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	8.80730	5.28010	1.67	0.0960
CTRL	1	6.21508	3.53334	1.76	0.0793
PRIV	1	5.61487	3.02925	1.85	0.0645
SYN	1	10.51138	2.76530	3.80	0.0002
MED_TRANS	1	0.59864	3.36768	0.18	0.8590
LARGE_TRANS	1	-1.21545	3.88701	-0.31	0.7547
MED_BRD	1	-1.07574	3.37592	-0.32	0.7501
LARGE_BRD	1	2.00454	3.64041	0.55	0.5822
CONS	1	-2.03242	5.35507	-0.38	0.7045
ENGY	1	-7.10222	6.16620	-1.15	0.2500
FIN	1	-10.78160	5.56763	-1.94	0.0534
HLC	1	4.13699	5.71163	0.72	0.4693
IND	1	2.62551	4.41582	0.59	0.5524
IT	1	4.99640	4.38278	1.14	0.2549
MAT	1	-4.06777	4.88445	-0.83	0.4054
TEL	1	1.31104	6.30945	0.21	0.8355
UTY	1	6.46144	7.90490	0.82	0.4141
EUR	1	-4.17748	3.32579	-1.26	0.2097
ASIA	1	-2.77132	4.06678	-0.68	0.4959
AFRME	1	-12.13985	6.57081	-1.85	0.0653
LAC	1	1.81755	8.34106	0.22	0.8276

Code:

```
ODS GRAPHICS ON;
DATA _NULL_;
	dsid = OPEN("WORK.'MASTER THESIS 2000_2005 V2.001'n", "I");
	dstype = ATTRC(DSID, "TYPE");
	IF TRIM(dstype) = " " THEN
		DO;
		CALL SYMPUT("_EG_DSTYPE_", "");
		CALL SYMPUT("_DSTYPE_VARS_", "");
```

```
            END;
      ELSE
            DO;
            CALL SYMPUT("_EG_DSTYPE_", "(TYPE=""" || TRIM(dstype) ||
""")");
            IF VARNUM(dsid, "_NAME_") NE 0 AND VARNUM(dsid, "_TYPE_")
NE 0 THEN
                  CALL SYMPUT("_DSTYPE_VARS_", "_TYPE_ _NAME_");
            ELSE IF VARNUM(dsid, "_TYPE_") NE 0 THEN
                  CALL SYMPUT("_DSTYPE_VARS_", "_TYPE_");
            ELSE IF VARNUM(dsid, "_NAME_") NE 0 THEN
                  CALL SYMPUT("_DSTYPE_VARS_", "_NAME_");
            ELSE
                  CALL SYMPUT("_DSTYPE_VARS_", "");
            END;
      rc = CLOSE(dsid);
      STOP;
RUN;

/* -------------------------------------------------------------------
   Sort data set WORK.'MASTER THESIS 2000_2005 V2.001'n
   -------------------------------------------------------------------
*/
PROC SORT
      DATA=WORK.'MASTER THESIS 2000_2005 V2.001'n(KEEP=TP CTRL PRIV SYN
MED_TRANS LARGE_TRANS MED_BRD LARGE_BRD CONS ENGY FIN HLC IND IT MAT
TEL UTY EUR ASIA AFRME LAC "2000"n "2001"n "2002"n "2003"n "2004"n
&_DSTYPE_VARS_)
      OUT=WORK.SORTTempTableSorted &_EG_DSTYPE_
      ;
      BY "2000"n "2001"n "2002"n "2003"n "2004"n;
RUN;
TITLE;
TITLE1 "Linear Regression Results";
FOOTNOTE;
FOOTNOTE1 "Generated by the SAS System (&_SASSERVERNAME, &SYSSCPL) on
%TRIM(%QSYSFUNC(DATE(), NLDATE20.)) at %TRIM(%SYSFUNC(TIME(),
TIMEAMPM12.))";
PROC REG DATA=WORK.SORTTempTableSorted
            PLOTS(ONLY)=ALL
      ;
      BY "2000"n "2001"n "2002"n "2003"n "2004"n;
      Linear_Regression_Model: MODEL TP = CTRL PRIV SYN MED_TRANS
LARGE_TRANS MED_BRD LARGE_BRD CONS ENGY FIN HLC IND IT MAT TEL UTY EUR
ASIA AFRME LAC
            /           SELECTION=NONE
      ;
RUN;
QUIT;

/* -------------------------------------------------------------------
   End of task code.
```

```
---------------------------------------------------------------------
*/
RUN; QUIT;
%_eg_conditional_dropds(WORK.SORTTempTableSorted,
                WORK.TMP1TempTableForPlots);
TITLE; FOOTNOTE;
```

2010:

2010=1 2011=0 2012=0 2013=0 2014=0

Number of Observations Read	1256
Number of Observations Used	925
Number of Observations with Missing Values	331

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	20	208848	10442	15.06	<.0001
Error	904	626754	693.31231		
Corrected Total	924	835602			

Root MSE	26.33082	R-Square	0.2499
Dependent Mean	21.35017	Adj R-Sq	0.2333
Coeff Var	123.32840		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	10.98456	3.71810	2.95	0.0032
CTRL	1	12.70644	2.30872	5.50	<.0001
SYN	1	5.33251	1.87564	2.84	0.0046
PRIV	1	14.74804	2.17113	6.79	<.0001
MED_TRANS	1	3.10242	2.22828	1.39	0.1642
LARGE_TRANS	1	-4.25138	2.82449	-1.51	0.1326
MED_BRD	1	0.18429	2.25481	0.08	0.9349
LARGE_BRD	1	-2.44933	2.29458	-1.07	0.2861
CONS	1	-1.62402	3.75572	-0.43	0.6655
ENGY	1	-2.32486	4.08199	-0.57	0.5691
FIN	1	-2.34310	3.63366	-0.64	0.5192
HLC	1	-1.50720	3.68431	-0.41	0.6826
IND	1	0.71675	3.03413	0.24	0.8133
IT	1	2.00207	3.17513	0.63	0.5285
MAT	1	-1.12622	3.55878	-0.32	0.7517
TEL	1	14.83695	6.17676	2.40	0.0165
UTY	1	-13.50004	4.86214	-2.78	0.0056
EUR	1	-5.94101	2.70150	-2.20	0.0281
ASIA	1	-4.74257	2.59590	-1.83	0.0680
AFRME	1	-5.69805	4.67563	-1.22	0.2233
LAC	1	-13.96399	5.11132	-2.73	0.0064

2011:

2010=0 2011=1 2012=0 2013=0 2014=0

Number of Observations Read	1311
Number of Observations Used	946
Number of Observations with Missing Values	365

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	20	160439	8021.96843	10.24	<.0001
Error	925	724462	783.20191		
Corrected Total	945	884901			

Root MSE	27.98574	R-Square	0.1813
Dependent Mean	22.55747	Adj R-Sq	0.1636
Coeff Var	124.06417		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	12.12405	3.86236	3.14	0.0017
CTRL	1	14.10207	2.42730	5.81	<.0001
SYN	1	4.10295	1.95946	2.09	0.0365
PRIV	1	14.27479	2.27805	6.27	<.0001
MED_TRANS	1	-4.66174	2.28282	-2.04	0.0414
LARGE_TRANS	1	-7.46008	3.03620	-2.46	0.0142
MED_BRD	1	1.85206	2.36399	0.78	0.4336
LARGE_BRD	1	1.42059	2.45720	0.58	0.5633
CONS	1	-1.42599	3.81117	-0.37	0.7084
ENGY	1	-5.35928	4.27244	-1.25	0.2100
FIN	1	-5.36838	3.83704	-1.40	0.1621
HLC	1	0.09701	4.06655	0.02	0.9810
IND	1	1.62948	3.01648	0.54	0.5892
IT	1	0.29148	3.07581	0.09	0.9245
MAT	1	-0.32871	3.73681	-0.09	0.9299
TEL	1	-4.08957	6.68664	-0.61	0.5410
UTY	1	-9.42800	5.17874	-1.82	0.0690
EUR	1	-5.55117	2.88647	-1.92	0.0548
ASIA	1	-0.92744	2.86485	-0.32	0.7462
AFRME	1	0.75243	5.16705	0.15	0.8843
LAC	1	-15.33755	5.42326	-2.83	0.0048

2012:

2010=0 2011=0 2012=1 2013=0 2014=0

Number of Observations Read	1238
Number of Observations Used	938
Number of Observations with Missing Values	300

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	20	148589	7429.42669	10.99	<.0001
Error	917	619733	675.82618		
Corrected Total	937	768321			

Root MSE	25.99666	R-Square	0.1934
Dependent Mean	21.71803	Adj R-Sq	0.1758
Coeff Var	119.70078		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	6.17123	3.42646	1.80	0.0720
CTRL	1	8.79251	2.33241	3.77	0.0002
SYN	1	4.22967	1.86125	2.27	0.0233
PRIV	1	14.17384	2.13120	6.65	<.0001
MED_TRANS	1	4.44808	2.11227	2.11	0.0355
LARGE_TRANS	1	3.41876	2.74849	1.24	0.2139
MED_BRD	1	0.34293	2.13070	0.16	0.8722
LARGE_BRD	1	-1.31535	2.29471	-0.57	0.5666
CONS	1	3.87332	3.37840	1.15	0.2519
ENGY	1	0.82259	4.01844	0.20	0.8378
FIN	1	-2.98544	3.64059	-0.82	0.4124
HLC	1	6.56386	3.55166	1.85	0.0649
IND	1	3.24944	2.89935	1.12	0.2627
IT	1	4.43029	2.88605	1.54	0.1251
MAT	1	6.14863	3.15838	1.95	0.0519
TEL	1	4.37202	6.75003	0.65	0.5173
UTY	1	-5.50409	5.23315	-1.05	0.2932
EUR	1	-1.72888	2.75443	-0.63	0.5304
ASIA	1	-0.64797	2.70506	-0.24	0.8107
AFRME	1	-5.48473	4.19644	-1.31	0.1915
LAC	1	1.94683	5.62605	0.35	0.7294

2013:

2010=0 2011=0 2012=0 2013=1 2014=0

Number of Observations Read	1239
Number of Observations Used	975
Number of Observations with Missing Values	264

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	20	162174	8108.71850	12.18	<.0001
Error	954	635248	665.87870		
Corrected Total	974	797423			

Root MSE	25.80463	R-Square	0.2034
Dependent Mean	15.29133	Adj R-Sq	0.1867
Coeff Var	168.75326		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	1.38008	3.56134	0.39	0.6985
CTRL	1	7.64319	2.35279	3.25	0.0012
SYN	1	8.51009	1.95131	4.36	<.0001
PRIV	1	16.67434	2.11238	7.89	<.0001
MED_TRANS	1	0.07094	2.09838	0.03	0.9730
LARGE_TRANS	1	1.46352	2.98352	0.49	0.6239
MED_BRD	1	-0.89300	2.04598	-0.44	0.6626
LARGE_BRD	1	-3.55800	2.14304	-1.66	0.0972
CONS	1	-1.59811	3.06941	-0.52	0.6027
ENGY	1	-0.46667	4.01539	-0.12	0.9075
FIN	1	2.33140	3.34341	0.70	0.4858
HLC	1	8.22682	3.53117	2.33	0.0200
IND	1	-0.22114	2.92465	-0.08	0.9397
IT	1	3.79525	2.92201	1.30	0.1943
MAT	1	-3.03465	3.33686	-0.91	0.3634
TEL	1	-1.77278	5.98633	-0.30	0.7672
UTY	1	-0.26120	5.09755	-0.05	0.9591
EUR	1	0.35827	2.89377	0.12	0.9015
ASIA	1	4.52624	2.82749	1.60	0.1098
AFRME	1	1.05563	4.41098	0.24	0.8109
LAC	1	1.62925	4.64205	0.35	0.7257

2014:

2010=0 2011=0 2012=0 2013=0 2014=1

Number of Observations Read	1225
Number of Observations Used	921
Number of Observations with Missing Values	304

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	20	101806	5090.30440	8.50	<.0001
Error	900	538752	598.61309		
Corrected Total	920	640558			

Root MSE	24.46657	R-Square	0.1589
Dependent Mean	11.42551	Adj R-Sq	0.1402
Coeff Var	214.13985		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	0.66748	3.78600	0.18	0.8601
CTRL	1	9.34806	2.38939	3.91	<.0001
SYN	1	5.05841	1.98098	2.55	0.0108
PRIV	1	10.84522	2.46628	4.40	<.0001
MED_TRANS	1	2.27182	2.22676	1.02	0.3079
LARGE_TRANS	1	7.94972	2.94585	2.70	0.0071
MED_BRD	1	-1.40033	2.00501	-0.70	0.4851
LARGE_BRD	1	1.55491	2.16686	0.72	0.4732
CONS	1	0.59512	3.15964	0.19	0.8506
ENGY	1	-6.22351	3.95659	-1.57	0.1161
FIN	1	0.33106	3.09313	0.11	0.9148
HLC	1	-6.26340	3.42143	-1.83	0.0675
IND	1	0.72824	2.56945	0.28	0.7769
IT	1	-0.64585	2.99017	-0.22	0.8290
MAT	1	-0.84025	3.23486	-0.26	0.7951
TEL	1	7.14322	6.61801	1.08	0.2807
UTY	1	-3.60672	4.86475	-0.74	0.4586
EUR	1	2.29966	3.15479	0.73	0.4662
ASIA	1	2.50428	3.14549	0.80	0.4262
AFRME	1	2.83497	4.34678	0.65	0.5144
LAC	1	7.93911	4.17393	1.90	0.0575

Code:

```
ODS GRAPHICS ON;
DATA _NULL_;
      dsid = OPEN("WORK.'MASTER THESIS 2010_2015 V2.00'n", "I");
      dstype = ATTRC(DSID, "TYPE");
      IF TRIM(dstype) = " " THEN
            DO;
            CALL SYMPUT("_EG_DSTYPE_", "");
            CALL SYMPUT("_DSTYPE_VARS_", "");
```

```
            END;
      ELSE
            DO;
            CALL SYMPUT("_EG_DSTYPE_", "(TYPE=""" || TRIM(dstype) ||
""")");
            IF VARNUM(dsid, "_NAME_") NE 0 AND VARNUM(dsid, "_TYPE_")
NE 0 THEN
                  CALL SYMPUT("_DSTYPE_VARS_", "_TYPE_ _NAME_");
            ELSE IF VARNUM(dsid, "_TYPE_") NE 0 THEN
                  CALL SYMPUT("_DSTYPE_VARS_", "_TYPE_");
            ELSE IF VARNUM(dsid, "_NAME_") NE 0 THEN
                  CALL SYMPUT("_DSTYPE_VARS_", "_NAME_");
            ELSE
                  CALL SYMPUT("_DSTYPE_VARS_", "");
            END;
      rc = CLOSE(dsid);
      STOP;
RUN;

/* -------------------------------------------------------------------
   Sort data set WORK.'MASTER THESIS 2010_2015 V2.00'n
   -------------------------------------------------------------------
*/
PROC SORT
      DATA=WORK.'MASTER THESIS 2010_2015 V2.00'n(KEEP=TP CTRL SYN PRIV
MED_TRANS LARGE_TRANS MED_BRD LARGE_BRD CONS ENGY FIN HLC IND IT MAT
TEL UTY EUR ASIA AFRME LAC "2010"n "2011"n "2012"n "2013"n "2014"n
&_DSTYPE_VARS_)
      OUT=WORK.SORTTempTableSorted &_EG_DSTYPE_
      ;
      BY "2010"n "2011"n "2012"n "2013"n "2014"n;
RUN;
TITLE;
TITLE1 "Linear Regression Results";
FOOTNOTE;
FOOTNOTE1 "Generated by the SAS System (&_SASSERVERNAME, &SYSSCPL) on
%TRIM(%QSYSFUNC(DATE(), NLDATE20.)) at %TRIM(%SYSFUNC(TIME(),
TIMEAMPM12.))";
PROC REG DATA=WORK.SORTTempTableSorted
            PLOTS(ONLY)=ALL
      ;
      BY "2010"n "2011"n "2012"n "2013"n "2014"n;
      Linear_Regression_Model: MODEL TP = CTRL SYN PRIV MED_TRANS
LARGE_TRANS MED_BRD LARGE_BRD CONS ENGY FIN HLC IND IT MAT TEL UTY EUR
ASIA AFRME LAC
            /           SELECTION=NONE
      ;
RUN;
QUIT;

/* -------------------------------------------------------------------
   End of task code.
```

```
   ------------------------------------------------------------------
*/
RUN; QUIT;
%_eg_conditional_dropds(WORK.SORTTempTableSorted,
            WORK.TMP1TempTableForPlots);
TITLE; FOOTNOTE;
ODS GRAPHICS OFF;
```

APPENDIX C: SAS OUTPUTS FOR THE EXTENDED MODEL

Extended pre-crisis model:

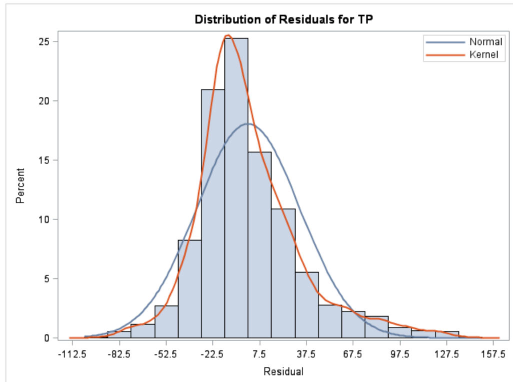
Number of Observations Read	3348
Number of Observations Used	1982
Number of Observations with Missing Values	1366

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	22	253212	11510	10.40	<.0001
Error	1959	2168135	1106.75602		
Corrected Total	1981	2421347			

Root MSE	33.26794	R-Square	0.1046
Dependent Mean	29.48409	Adj R-Sq	0.0945
Coeff Var	112.83356		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	20.63810	3.42352	6.03	<.0001
CTRL	1	13.62087	3.56474	3.82	0.0001
PRIV	1	4.84608	2.21845	2.18	0.0290
SYN	1	7.10301	2.74023	2.59	0.0096
CTRLxPRIV	1	0.52516	3.66100	0.14	0.8860
CTRLxSYN	1	-1.76163	3.33529	-0.53	0.5974
MED_TRANS	1	2.16928	1.96855	1.10	0.2706
LARGE_TRANS	1	-1.86181	2.31052	-0.81	0.4205
MED_BRD	1	-1.14180	1.98903	-0.57	0.5660
LARGE_BRD	1	-1.50134	2.17565	-0.69	0.4902
CONS	1	-2.39793	3.13826	-0.76	0.4449
ENGY	1	-10.52610	3.19633	-3.29	0.0010
FIN	1	-6.28293	3.29756	-1.91	0.0569
HLC	1	-7.34819	3.12462	-2.35	0.0188
IND	1	-0.11069	2.41523	-0.05	0.9634
IT	1	3.13087	2.71833	1.15	0.2496
MAT	1	-0.40606	2.95719	-0.14	0.8908
TEL	1	-2.07225	4.50094	-0.46	0.6453
UTY	1	-2.56355	4.27076	-0.60	0.5484
EUR	1	-11.82255	1.86794	-6.33	<.0001
ASIA	1	-10.76111	2.60351	-4.13	<.0001
AFRME	1	-11.20612	4.27574	-2.62	0.0088
LAC	1	-2.27909	6.24902	-0.36	0.7154

Fitted residuals of extended model:



Code:

```
ODS GRAPHICS ON;
DATA _NULL_;
      dsid = OPEN("WORK.'MASTER THESIS 2000_2005 V2.001'n", "I");
      dstype = ATTRC(DSID, "TYPE");
      IF TRIM(dstype) = " " THEN
            DO;
            CALL SYMPUT("_EG_DSTYPE_", "");
            CALL SYMPUT("_DSTYPE_VARS_", "");
            END;
      ELSE
            DO;
            CALL SYMPUT("_EG_DSTYPE_", "(TYPE=""" || TRIM(dstype) ||
""")");
            IF VARNUM(dsid, "_NAME_") NE 0 AND VARNUM(dsid, "_TYPE_")
NE 0 THEN
                  CALL SYMPUT("_DSTYPE_VARS_", "_TYPE_ _NAME_");
            ELSE IF VARNUM(dsid, "_TYPE_") NE 0 THEN
                  CALL SYMPUT("_DSTYPE_VARS_", "_TYPE_");
            ELSE IF VARNUM(dsid, "_NAME_") NE 0 THEN
                  CALL SYMPUT("_DSTYPE_VARS_", "_NAME_");
            ELSE
                  CALL SYMPUT("_DSTYPE_VARS_", "");
            END;
      rc = CLOSE(dsid);
      STOP;
RUN;

/* -------------------------------------------------------------------
   Data set WORK.'MASTER THESIS 2000_2005 V2.001'n does not need to be
sorted.
   -------------------------------------------------------------------
*/
```

```
DATA WORK.SORTTempTableSorted &_EG_DSTYPE_ /
VIEW=WORK.SORTTempTableSorted;
      SET WORK.'MASTER THESIS 2000_2005 V2.001'n(KEEP=TP CTRL PRIV SYN
CTRLxPRIV CTRLxSYN MED_TRANS LARGE_TRANS MED_BRD LARGE_BRD CONS ENGY
FIN HLC IND IT MAT TEL UTY EUR ASIA AFRME LAC &_DSTYPE_VARS_);
RUN;
TITLE;
TITLE1 "Linear Regression Results";
FOOTNOTE;
FOOTNOTE1 "Generated by the SAS System (&_SASSERVERNAME, &SYSSCPL) on
%TRIM(%QSYSFUNC(DATE(), NLDATE20.)) at %TRIM(%SYSFUNC(TIME(),
TIMEAMPM12.))";
PROC REG DATA=WORK.SORTTempTableSorted
            PLOTS(ONLY)=ALL
      ;
      Linear_Regression_Model: MODEL TP = CTRL PRIV SYN CTRLxPRIV
CTRLxSYN MED_TRANS LARGE_TRANS MED_BRD LARGE_BRD CONS ENGY FIN HLC IND
IT MAT TEL UTY EUR ASIA AFRME LAC
            /           SELECTION=NONE
      ;
RUN;
QUIT;

/* -------------------------------------------------------------------
   End of task code.
   -------------------------------------------------------------------
*/
RUN; QUIT;
%_eg_conditional_dropds(WORK.SORTTempTableSorted,
            WORK.TMP1TempTableForPlots);
TITLE; FOOTNOTE;
ODS GRAPHICS OFF;
```

Extended post-crisis model:

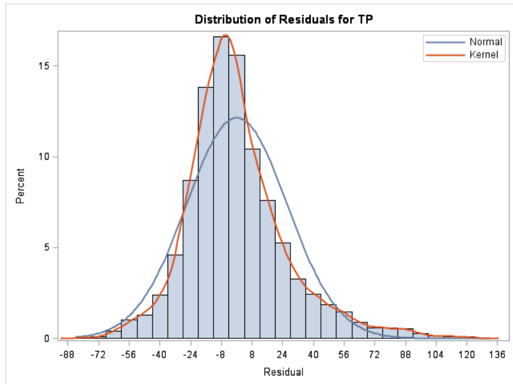
Number of Observations Read	6269
Number of Observations Used	4705
Number of Observations with Missing Values	1564

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	22	773268	35149	50.75	<.0001
Error	4682	3242467	692.53879		
Corrected Total	4704	4015735			

Root MSE	26.31613	R-Square	0.1926
Dependent Mean	18.46796	Adj R-Sq	0.1888
Coeff Var	142.49617		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	5.44539	1.90881	2.85	0.0044
CTRL	1	10.55671	1.56969	6.73	<.0001
PRIV	1	16.53461	1.59006	10.40	<.0001
CTRLxPRIV	1	-2.37466	1.95348	-1.22	0.2242
SYN	1	6.58042	1.15595	5.69	<.0001
CTRLxSYN	1	-2.46229	1.70057	-1.45	0.1477
SMALL_TRANS	1	0.45588	1.29186	0.35	0.7242
MED_TRANS	1	1.57068	1.18041	1.33	0.1834
MED_BRD	1	-0.43757	0.95607	-0.46	0.6472
LARGE_BRD	1	-1.09278	1.00673	-1.09	0.2778
CONS	1	0.32037	1.52300	0.21	0.8334
ENGY	1	-3.09280	1.81525	-1.70	0.0885
FIN	1	-0.89748	1.56225	-0.57	0.5657
HLC	1	2.22560	1.62845	1.37	0.1718
IND	1	1.47719	1.28205	1.15	0.2493
IT	1	2.19577	1.34059	1.64	0.1015
MAT	1	0.43460	1.51944	0.29	0.7749
TEL	1	3.17882	2.85751	1.11	0.2660
UTY	1	-6.33682	2.25458	-2.81	0.0050
EUR	1	-2.28656	1.29207	-1.77	0.0768
ASIA	1	0.20488	1.26379	0.16	0.8712
AFRME	1	-1.46778	2.02177	-0.73	0.4679
LAC	1	-3.08666	2.12370	-1.45	0.1462

Fitted residuals of extended model:



Code:

```
ODS GRAPHICS ON;

DATA _NULL_;
      dsid = OPEN("WORK.'MASTER THESIS 2010_2015 V2.00'n", "I");
      dstype = ATTRC(DSID, "TYPE");
      IF TRIM(dstype) = " " THEN
            DO;
            CALL SYMPUT("_EG_DSTYPE_", "");
            CALL SYMPUT("_DSTYPE_VARS_", "");
            END;
      ELSE
            DO;
            CALL SYMPUT("_EG_DSTYPE_", "(TYPE=""" || TRIM(dstype) ||
""")");
            IF VARNUM(dsid, "_NAME_") NE 0 AND VARNUM(dsid, "_TYPE_")
NE 0 THEN
                  CALL SYMPUT("_DSTYPE_VARS_", "_TYPE_ _NAME_");
            ELSE IF VARNUM(dsid, "_TYPE_") NE 0 THEN
                  CALL SYMPUT("_DSTYPE_VARS_", "_TYPE_");
            ELSE IF VARNUM(dsid, "_NAME_") NE 0 THEN
                  CALL SYMPUT("_DSTYPE_VARS_", "_NAME_");
            ELSE
                  CALL SYMPUT("_DSTYPE_VARS_", "");
            END;
      rc = CLOSE(dsid);
      STOP;
RUN;

/* -------------------------------------------------------------------
   Data set WORK.'MASTER THESIS 2010_2015 V2.00'n does not need to be
sorted.
   -------------------------------------------------------------------
*/
```

```
DATA WORK.SORTTempTableSorted &_EG_DSTYPE_ /
VIEW=WORK.SORTTempTableSorted;
      SET WORK.'MASTER THESIS 2010_2015 V2.00'n(KEEP=TP CTRL PRIV
CTRLxPRIV SYN CTRLxSYN SMALL_TRANS MED_TRANS MED_BRD LARGE_BRD CONS
ENGY FIN HLC IND IT MAT TEL UTY EUR ASIA AFRME LAC &_DSTYPE_VARS_);
RUN;
TITLE;
TITLE1 "Linear Regression Results";
FOOTNOTE;
FOOTNOTE1 "Generated by the SAS System (&_SASSERVERNAME, &SYSSCPL) on
%TRIM(%QSYSFUNC(DATE(), NLDATE20.)) at %TRIM(%SYSFUNC(TIME(),
TIMEAMPM12.))";
PROC REG DATA=WORK.SORTTempTableSorted
            PLOTS(ONLY)=ALL
      ;
      Linear_Regression_Model: MODEL TP = CTRL PRIV CTRLxPRIV SYN
CTRLxSYN SMALL_TRANS MED_TRANS MED_BRD LARGE_BRD CONS ENGY FIN HLC IND
IT MAT TEL UTY EUR ASIA AFRME LAC
            /           SELECTION=NONE
      ;
RUN;
QUIT;

/* -------------------------------------------------------------------
   End of task code.
   -------------------------------------------------------------------
*/
RUN; QUIT;
%_eg_conditional_dropds(WORK.SORTTempTableSorted,
            WORK.TMP1TempTableForPlots);
TITLE; FOOTNOTE;
ODS GRAPHICS OFF;
```

Extended model for pooled data:

Number of Observations Read	9617
Number of Observations Used	6687
Number of Observations with Missing Values	2930

Analysis of Variance

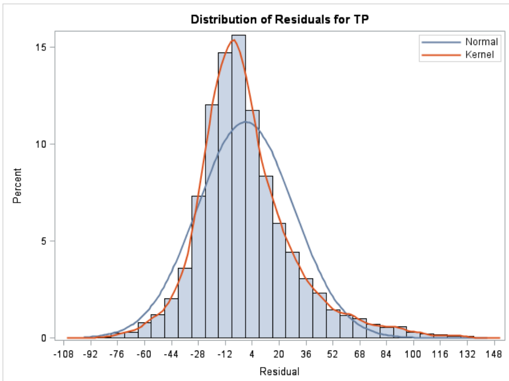
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	22	1134689	51577	62.82	<.0001
Error	6664	5471627	821.07250		
Corrected Total	6686	6606316			

Root MSE	28.65436	R-Square	0.1718
Dependent Mean	21.73309	Adj R-Sq	0.1690
Coeff Var	131.84668		

Parameter Estimates

Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	11.98458	1.37604	8.71	<.0001
CTRL	1	13.70204	1.42189	9.64	<.0001
PRIV	1	10.36409	1.24325	8.34	<.0001
CTRLxPRIV	1	1.82494	1.63723	1.11	0.2650
SYN	1	6.66455	1.10427	6.04	<.0001
CTRLxSYN	1	-1.64819	1.51807	-1.09	0.2776
MED_TRANS	1	1.90526	0.88958	2.14	0.0322
LARGE_TRANS	1	-1.09919	1.12804	-0.97	0.3299
MED_BRD	1	-1.09335	0.87279	-1.25	0.2104
LARGE_BRD	1	-1.57206	0.92289	-1.70	0.0885
CONS	1	-0.56762	1.40790	-0.40	0.6868
ENGY	1	-5.03668	1.59360	-3.16	0.0016
FIN	1	-2.49869	1.45387	-1.72	0.0857
HLC	1	-0.73669	1.47653	-0.50	0.6178
IND	1	1.04039	1.15772	0.90	0.3689
IT	1	2.58591	1.23080	2.10	0.0357
MAT	1	0.14433	1.38266	0.10	0.9169
TEL	1	1.44372	2.40366	0.60	0.5481
UTY	1	-5.23295	2.03862	-2.57	0.0103
EUR	1	-7.41301	1.02049	-7.26	<.0001
ASIA	1	-4.96116	1.04217	-4.76	<.0001
AFRME	1	-6.40749	1.82597	-3.51	0.0005
LAC	1	-6.59684	2.03254	-3.25	0.0012

Fitted residuals of extended model:



Code:

```
ODS GRAPHICS ON;
DATA _NULL_;
	dsid = OPEN("WORK.'MASTER THESIS POOLED DATA V2.00'n", "I");
	dstype = ATTRC(DSID, "TYPE");
	IF TRIM(dstype) = " " THEN
		DO;
		CALL SYMPUT("_EG_DSTYPE_", "");
		CALL SYMPUT("_DSTYPE_VARS_", "");
		END;
	ELSE
		DO;
		CALL SYMPUT("_EG_DSTYPE_", "(TYPE=""" || TRIM(dstype) ||
""")");
		IF VARNUM(dsid, "_NAME_") NE 0 AND VARNUM(dsid, "_TYPE_")
NE 0 THEN
			CALL SYMPUT("_DSTYPE_VARS_", "_TYPE_ _NAME_");
		ELSE IF VARNUM(dsid, "_TYPE_") NE 0 THEN
			CALL SYMPUT("_DSTYPE_VARS_", "_TYPE_");
		ELSE IF VARNUM(dsid, "_NAME_") NE 0 THEN
			CALL SYMPUT("_DSTYPE_VARS_", "_NAME_");
		ELSE
			CALL SYMPUT("_DSTYPE_VARS_", "");
		END;
	rc = CLOSE(dsid);
	STOP;
RUN;

/* -------------------------------------------------------------------
   Data set WORK.'MASTER THESIS POOLED DATA V2.00'n does not need to be
sorted.
```

```
   ---------------------------------------------------------------------
*/
DATA WORK.SORTTempTableSorted &_EG_DSTYPE_ /
VIEW=WORK.SORTTempTableSorted;
      SET WORK.'MASTER THESIS POOLED DATA V2.00'n(KEEP=TP CTRL PRIV
CTRLxPRIV SYN CTRLxSYN MED_TRANS LARGE_TRANS MED_BRD LARGE_BRD CONS
ENGY FIN HLC IND IT MAT TEL UTY EUR ASIA AFRME LAC &_DSTYPE_VARS_);
RUN;
TITLE;
TITLE1 "Linear Regression Results";
FOOTNOTE;
FOOTNOTE1 "Generated by the SAS System (&_SASSERVERNAME, &SYSSCPL) on
%TRIM(%QSYSFUNC(DATE(), NLDATE20.)) at %TRIM(%SYSFUNC(TIME(),
TIMEAMPM12.))";
PROC REG DATA=WORK.SORTTempTableSorted
            PLOTS(MAXPOINTS=10000  )=ALL
      ;
      Linear_Regression_Model: MODEL TP = CTRL PRIV CTRLxPRIV SYN
CTRLxSYN MED_TRANS LARGE_TRANS MED_BRD LARGE_BRD CONS ENGY FIN HLC IND
IT MAT TEL UTY EUR ASIA AFRME LAC
            /           SELECTION=NONE
      ;
RUN;
QUIT;

/* ---------------------------------------------------------------------
   End of task code.
   ---------------------------------------------------------------------
*/
RUN; QUIT;
%_eg_conditional_dropds(WORK.SORTTempTableSorted,
            WORK.TMP1TempTableForPlots);
TITLE; FOOTNOTE;
ODS GRAPHICS OFF;
```

APPENDIX D: SAS OUTPUTS FOR THE FURTHER EXTENDED MODEL

The further extended model for pooled data:

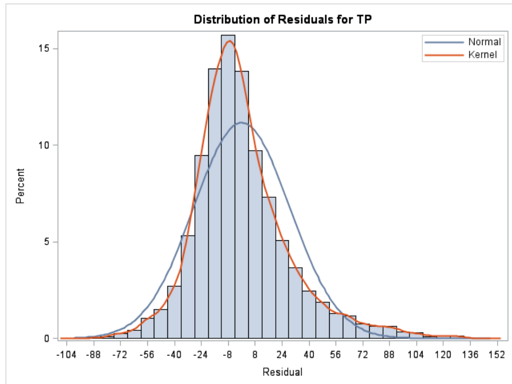
Number of Observations Read	9617
Number of Observations Used	6687
Number of Observations with Missing Values	2930

Analysis of Variance					
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	25	1141084	45643	55.63	<.0001
Error	6661	5465233	820.48232		
Corrected Total	6686	6606316			

Root MSE	28.64406	R-Square	0.1727
Dependent Mean	21.73309	Adj R-Sq	0.1696
Coeff Var	131.79929		

Parameter Estimates					
Variable	DF	Parameter Estimate	Standard Error	t Value	Pr > |t|
Intercept	1	11.68091	1.42136	8.22	<.0001
CTRL	1	14.49986	1.82371	7.95	<.0001
CTRLxPOST	1	-1.27045	1.61449	-0.79	0.4314
PRIV	1	10.52231	1.25219	8.40	<.0001
CTRLxPRIV	1	-0.53134	2.02891	-0.26	0.7934
CTRLxPRIVxPOST	1	3.48088	1.84465	1.89	0.0592
SYN	1	6.78573	1.10605	6.14	<.0001
CTRLxSYN	1	-1.15471	1.96917	-0.59	0.5576
CTRLxSYNxPOST	1	-1.33521	2.10544	-0.63	0.5260
MED_TRANS	1	1.89594	0.88998	2.13	0.0332
LARGE_TRANS	1	-1.04220	1.12795	-0.92	0.3555
MED_BRD	1	-0.91759	0.88051	-1.04	0.2974
LARGE_BRD	1	-1.41886	0.92989	-1.53	0.1271
CONS	1	-0.71825	1.40922	-0.51	0.6103
ENGY	1	-5.18566	1.59672	-3.25	0.0012
FIN	1	-2.52503	1.45465	-1.74	0.0826
HLC	1	-0.70792	1.47867	-0.48	0.6321
IND	1	1.00597	1.15788	0.87	0.3850
IT	1	2.59448	1.23445	2.10	0.0356
MAT	1	0.12660	1.38310	0.09	0.9271
TEL	1	1.54180	2.40403	0.64	0.5213
UTY	1	-5.28407	2.03807	-2.59	0.0095
EUR	1	-7.20885	1.03686	-6.95	<.0001
ASIA	1	-4.77687	1.08505	-4.40	<.0001
AFRME	1	-6.18562	1.84262	-3.36	0.0008
LAC	1	-6.38450	2.05220	-3.11	0.0019

Fitted residuals of extended model:



Code:

```
ODS GRAPHICS ON;
DATA _NULL_;
      dsid = OPEN("WORK.'MASTER THESIS POOLED DATA V2.00'n", "I");
      dstype = ATTRC(DSID, "TYPE");
      IF TRIM(dstype) = " " THEN
            DO;
            CALL SYMPUT("_EG_DSTYPE_", "");
            CALL SYMPUT("_DSTYPE_VARS_", "");
            END;
      ELSE
            DO;
            CALL SYMPUT("_EG_DSTYPE_", "(TYPE=""" || TRIM(dstype) ||
""")");
            IF VARNUM(dsid, "_NAME_") NE 0 AND VARNUM(dsid, "_TYPE_")
NE 0 THEN
                  CALL SYMPUT("_DSTYPE_VARS_", "_TYPE_ _NAME_");
            ELSE IF VARNUM(dsid, "_TYPE_") NE 0 THEN
                  CALL SYMPUT("_DSTYPE_VARS_", "_TYPE_");
            ELSE IF VARNUM(dsid, "_NAME_") NE 0 THEN
                  CALL SYMPUT("_DSTYPE_VARS_", "_NAME_");
            ELSE
                  CALL SYMPUT("_DSTYPE_VARS_", "");
            END;
      rc = CLOSE(dsid);
      STOP;
RUN;

/* -------------------------------------------------------------------
   Data set WORK.'MASTER THESIS POOLED DATA V2.00'n does not need to be
sorted.
   -------------------------------------------------------------------
*/
DATA WORK.SORTTempTableSorted &_EG_DSTYPE_ /
VIEW=WORK.SORTTempTableSorted;
```

```
      SET WORK.'MASTER THESIS POOLED DATA V2.00'n(KEEP=TP CTRL
CTRLxPOST PRIV CTRLxPRIV CTRLxPRIVxPOST SYN CTRLxSYN CTRLxSYNxPOST
MED_TRANS LARGE_TRANS MED_BRD LARGE_BRD CONS ENGY FIN HLC IND IT MAT
TEL UTY EUR ASIA AFRME LAC &_DSTYPE_VARS_);
RUN;
TITLE;
TITLE1 "Linear Regression Results";
FOOTNOTE;
FOOTNOTE1 "Generated by the SAS System (&_SASSERVERNAME, &SYSSCPL) on
%TRIM(%QSYSFUNC(DATE(), NLDATE20.)) at %TRIM(%SYSFUNC(TIME(),
TIMEAMPM12.))";
PROC REG DATA=WORK.SORTTempTableSorted
            PLOTS(MAXPOINTS=10000)=ALL
      ;
      Linear_Regression_Model: MODEL TP = CTRL CTRLxPOST PRIV CTRLxPRIV
CTRLxPRIVxPOST SYN CTRLxSYN CTRLxSYNxPOST MED_TRANS LARGE_TRANS MED_BRD
LARGE_BRD CONS ENGY FIN HLC IND IT MAT TEL UTY EUR ASIA AFRME LAC
            /           SELECTION=NONE
      ;
RUN;
QUIT;

/* -------------------------------------------------------------------
   End of task code.
   -------------------------------------------------------------------
*/
RUN; QUIT;
%_eg_conditional_dropds(WORK.SORTTempTableSorted,
            WORK.TMP1TempTableForPlots);
TITLE; FOOTNOTE;
ODS GRAPHICS OFF;
```