Master Limited Partnerships: Conflicts of Interest

Master Thesis Financial Economics

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Abstract

This thesis challenges the discrepancy between the traditionally high-yielding and low-risk reputation of U.S. midstream Master Limited Partnerships (MLPs). The MLP asset class experienced a peculiar downturn in 2015, displaying losses of a magnitude similar to the Great Recession. The specificity of this sell-off implies presence of risks within the MLP's distinctive ownership, economic, and governance structure. It appears that each structural feature induces conflicts of interests between management and investors. By means of an empirical analysis, it is examined if these conflicts are able to explain differences in relative firm performance and whether this impact has changed due to the recent downturn. Three variables of interest are constructed: i) reliance on external sources of capital, ii) presence and usage of Incentive Distribution Rights, and iii) exposure towards "dropdown" transactions. Two different samples are used and two definitions of relative performance, dividend yield and total return, are maintained. The results indicate that increased dropdown activity leads to underperformance. The effect of reliance on capital markets and presence of IDRs on relative performance has become less positive after the downturn. Whilst conditional on the sample and/or dependent variable used, the evidence suggests conflicts of interest to present a source of risk.

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1. Introduction

According to Collins and Bey (1986), the C-Corporation[1] is the superior U.S. legal entity as investors enjoy limited liability in case of business failure and convenient transferability of ownership as shares can be issued and traded freely. This dominance has persisted over time, despite the burdensome disadvantage of double taxation on realized profits at both the corporate and personal level. Partnerships resolve the issue of double taxation as this legal entity is not subject to income tax under U.S. federal or state income tax laws. However, partnerships lack limited liability and liquidity (Sloan and Lay, 2010). As an attempt to increase the oil output after the 1970s oil crisis, the U.S. government decided to enable the creation of the Master Limited Partnership (MLP), a hybrid structure offering liquidity and limited liability (as with the C-Corporation), whilst avoiding corporate taxes. At the time, the rationale underlying the allowance of such structure was twofold. First, as this new structure provided both a tax-efficient and liquid investment opportunity, investor appetite increased and access to capital markets was enhanced (Benham et al., 2015). Second, the tax-efficient feature of MLPs resulted in a competitive advantage to similarly situated C-Corporations through a lower cost of capital (Ngo and Chen, 2018).

As a result, Apache Corporation (APC) created the first MLP in 1981. Combining the disparate interests of 33 oil and gas partnerships into a single investment vehicle enabled APC to operate them more efficiently, while simultaneously enabling investors to make a profit by trading interests instead of waiting for the sale of the partnership as a whole (Alerian, 2018). MLPs mushroomed in the oil and gas sector and it was not long before other industries followed. The appeal of the MLP legal structure was enshrined when the Tax Reform Act of 1986 effectively moved the top marginal tax rate for individuals, below the top marginal tax rate for corporations (Weaver and Mayew, 2012). In fear of tax revenue erosion, Congress created the Revenue Act of 1987, which places restrictions on which entities are eligible to operate as an MLP (Brett and Bruce, 2017). Pre-1986 MLPs that did not conform to the requisite list of qualifying income were granted a grandfather clause, allowing them to continue to use the MLP structure.

In order to qualify as an MLP, a company is required to generate most of their income from industries that play a vital role in the U.S. economy and have historically used partnerships to raise capital. More specifically, a tax "*pass-through*" structure is permitted if at least 90 percent of income is generated from qualifying activities. Otherwise the tax advantage lapses. Section 7704(d) of the U.S. Internal Revenue Code states the list of activities[2] that generate such "*qualifying income*".

[1] Most for-profit corporations are classified as C-Corporations. Owners of C-Corporations are taxed separately from the corporation itself, whom is also subject to corporate income taxation

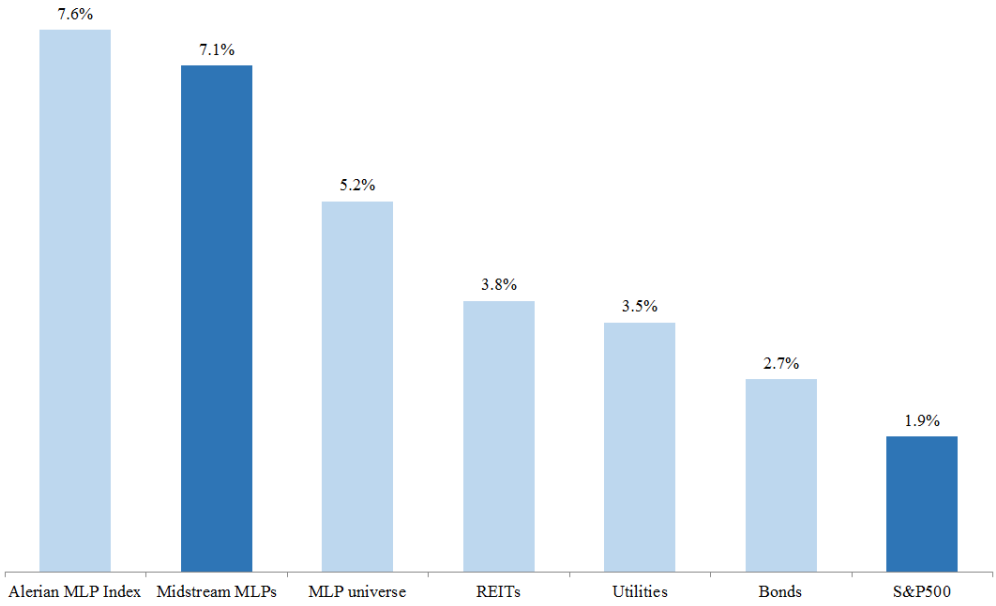
[2] Ethanol, biodiesel, and alternative fuel-transportation and storage were included as qualifying assets and activities in 2008. Since the introduction of the MLP Parity Act in 2013, renewable energy power generation and transportation are also qualifying activities

Kendall and Rogers (2017) summarize the current eligible list of activities as follows:

"Qualifying activities include oil and gas production in the "upstream" (exploration and extraction), "midstream" (transportation and pipelines), and "downstream" (refining, distribution, and marketing). Renting income and capital gains from real estate are likewise qualifying activities."

The MLP structure appears to be convenient for cash flow generative firms with limited investment opportunities (Ciccotello and Muscarella, 1997). In terms of growth, the U.S. oil and gas industry may be described as mature in general, with the annual production growing at an average rate of 2.6 percent over the last 20 years[3]. Jensen (1989) states that the C-Corporation is not the ideal legal structure in such an environment, as cash distributions are penalized with double taxation, thus favoring reinvestment. Contrarily, the MLP structure is suited to distribute all available cash as this structure does not face the same tax inefficiency the C-Corporation faces. Hence, they are particularly popular among income investors as MLPs make quarterly cash distributions and provide an attractive yield compared to alternative asset classes as illustrated by graph 1.

Graph 1: Historical average yield from December 29, 2007 until December 29, 2017[4]



Source: Alerian MLP Primer August 2018 and Bloomberg accessed January, 2019

Table 1 shows that MLPs are concentrated in the midstream segment. Midstream assets are a crucial link in the energy value chain[5], connecting upstream activities to end-users. They predominantly operate large pipeline infrastructures and are responsible for the transportation and storage of the larger share

3 Data retrieved from Statista (the statistics portal)

4 The Alerian MLP Index (AMZ) was launched in 2006 and is the leading benchmark of energy MLPs. As of December 31, 2018, approximately 70 percent of the AMZ Index is comprised by pipeline transportation MLPs

5 View appendix 1 for a graphical representation of the U.S. energy value chain

of U.S. hydrocarbons. The analogy of having a "*toll-road"* like business model is often used as midstream companies receive a fee for transporting or storing the customer's product, based on volume. As there is no change of ownership of the transported or stored product, exposure towards commodity prices poses less of a threat for midstream companies than for other links in the value chain. Moreover, short-term price volatility poses no immediate threat to the volume of hydrocarbons transported as sudden changes in output are accompanied with significant costs, which impedes producers from anticipating adequately to changing price levels (Goodgame, 2012). Ciccotello and Muscarella (2003) provide the following explanation as to why midstream assets are common in the MLP universe:

"Both tax and agency considerations suggest that MLPs should hold assets that produce steady cash. (...) In the energy industry, that translates to the use of MLPs for the "midstream" assets – namely distribution and storage. The corporate form is better suited for the volatile "tails" exploration and retail."

Midstream assets allow for relatively low maintenance CAPEX, steady growth, and high and visible cash flow potential due to their fee-based revenue model (EY, 2018). The asset intensive nature of the business causes high barriers to entry, which further supports a stable cash flow (Benham et al., 2015). Table 1 presents a historical overview of the development of the MLP asset class and the composition per operating activity.

Table 1: Overview of historical development of MLP activity per industry/sector

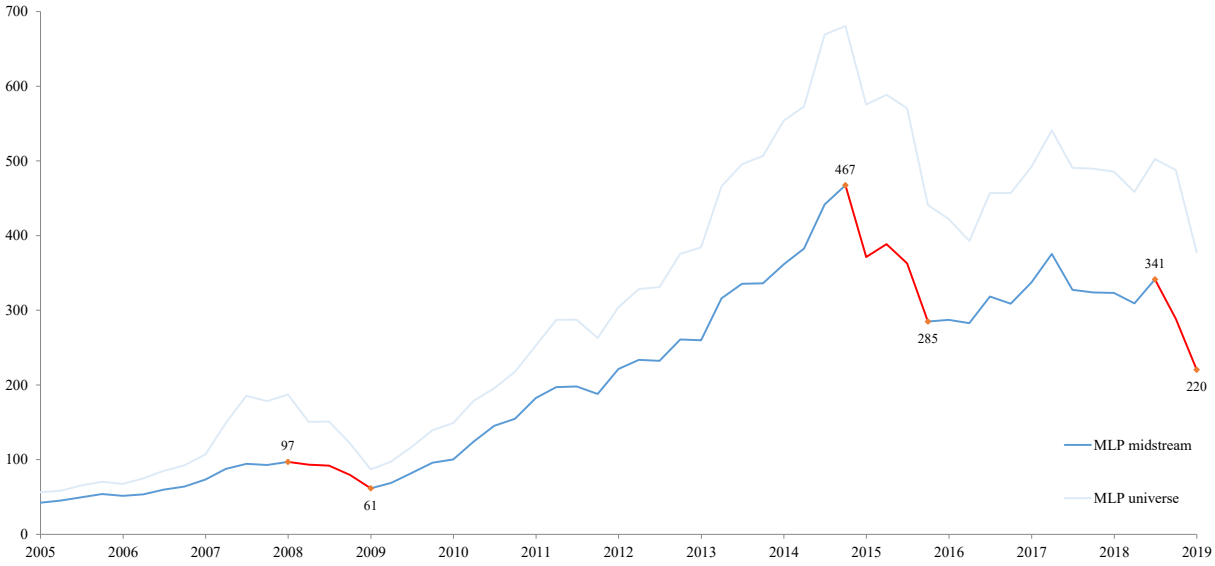
Only U.S. based MLPs are examined in this research. Non-U.S. based MLPs are still listed in the U.S., but have most of the owned assets in other countries. All ratios are expressed as a percentage of the number of U.S. based MLPs. Data is collected from Bloomberg, mlpdata.com, and naptp.org.

Year	No. of MLPs	U.S. based	Energy	Midstream	Financial	Real estate	Other	Energy % of total	Midstream % of total	Midstream % of energy
2000	25	24	15	10	5	3	1	63%	42%	67%
2001	29	28	19	13	5	3	1	68%	46%	68%
2002	35	34	24	17	5	3	2	71%	50%	71%
2003	37	36	26	18	5	3	2	72%	50%	69%
2004	41	40	29	21	5	3	3	73%	53%	72%
2005	49	48	35	25	7	4	2	73%	52%	71%
2006	62	61	46	30	8	4	3	75%	49%	65%
2007	76	75	56	36	12	4	3	75%	48%	64%
2008	80	78	59	37	12	4	3	76%	47%	63%
2009	80	78	59	37	12	4	3	76%	47%	63%
2010	88	86	65	40	14	4	3	76%	47%	62%
2011	104	101	76	47	16	4	5	75%	47%	62%
2012	121	118	88	54	18	4	8	75%	46%	61%
2013	138	134	103	65	19	4	8	77%	49%	63%
2014	144	138	110	71	18	4	6	80%	51%	65%
2015	142	136	109	69	18	4	5	80%	51%	63%
2016	136	130	104	66	18	4	4	80%	51%	63%
2017	126	121	95	60	17	4	5	79%	50%	63%
2018	109	105	81	53	16	4	4	77%	50%	65%

1.1. Topic description and motivation

The MLP has resurfaced as an asset class over the last 15 years, with a remarkable increase in market value of the MLP universe from 2005, as displayed by graph 2.

Graph 2: Market capitalization development ($bn)



Source: Bloomberg

In 2009, the shale revolution[6] emerged and created the need for large investments in new infrastructure, as the development of economically efficient unconventional drillings methods, such as hydraulic fracturing and horizontal drilling, gave access to new sources of crude oil, natural gas and natural gas liquids (Alerian, 2018). Prospects of a higher volume of hydrocarbons to be transported lifted expectations for energy infrastructure MLPs. According to a report issued by the Interstate Natural Gas Association of America (2014), total midstream infrastructure investments were expected to amount up to $640bn over the 2014-2035 period. As MLPs traditionally distribute approximately all available cash to investors, capital to fund this growth in infrastructure needed to be raised from external sources. Hence, access to affordable capital became a necessity (McCabe, 2014).

Apart from the general uptrend, visually inspecting graph 2 shows three noticeable downturns; the Great Recession in 2008, the period of September 2014 until September 2015, and from June 2018 onwards[7]. The 2015 downturn becomes more striking when comparing returns to the general U.S. market for which the S&P500 is used as a proxy.

[6] According to McCabe (2014), the "shale boom" is largely concentrated in Texas, North Dakota, Wyoming, and Pennsylvania

[7] This research covers the period between June 2005 and June 2018. Hence, the most recent downturn is not of direct interest. For the sake of completeness, appendix 9.4. discusses contemporary changes in U.S. tax legislation, which is driving this downturn

Table 2: Overview of annual returns

Year	Midstream MLP	MLP universe	Alerian MLP index	S&P500
2005	21%	20%	1%	3%
2006	42%	59%	19%	14%
2007	32%	75%	6%	4%
2008	(36%)	(54%)	(41%)	(38%)
2009	63%	71%	62%	23%
2010	82%	70%	27%	13%
2011	21%	20%	7%	(0%)
2012	17%	26%	(1%)	13%
2013	39%	44%	20%	30%
2014	3%	4%	(1%)	11%
2015	(23%)	(27%)	(37%)	(1%)
2016	17%	17%	9%	10%
2017	(4%)	(1%)	(13%)	19%
2018	(32%)	(22%)	(19%)	(6%)
Sep-2014 / Sep-2015	(39%)	(35%)	(43%)	(3%)

Table 2 indicates that the Sep-2014 / Sep-2015 downturn is limited to the MLP asset class as the S&P500 shows little volatility over this period. While there is limited academic research on the forces underlying this market crash, SL Advisors (2016) hints that the driving factor was not an issue of operating performance. They argue that the market crash was the result of increased dependency on capital markets to support the shale revolution due to the general lack of retained earnings. This is in line with Jensen's (1986, 1989) findings that the corporate form may be optimal for a firm that is in a growth phase and in need of external cash, versus the partnership structure that performs better in a low-growth environment. Goodgame (2012) adds that historically, MLP investors were well-informed high net worth individuals reluctant to sell their position as this compromised the tax-deferring capability[8] on outstanding units. However, the shale revolution required a larger audience to be addressed to raise more external (equity) capital. This broader investor base, primarily mutual fund and ETF buyers, withdrew their funds when the oil price collapsed as they were less informed on the toll-road business model of midstream MLPs. Also, these investors had no loss of tax deferability at stake as they did not own units directly. As capital markets froze, worries regarding MLPs' ability to finance growth CAPEX increased, which led to a sell-off.

Before the 2015 crash, MLPs were portrayed as "safe-harbor" investment vehicles offering high yields, often a multiple of what one would expect from other low-risk alternatives such as short-term bonds and bank account interest (Leman et al., 2014). However, this discrepancy in supposedly low risk profile and high yield does not correspond to basic finance theory. Existing literature for energy MLPs often mentions interest rate risk and commodity prices to be factors affecting performance. Yet these risks are not as relevant for the midstream segment and are unlikely to explain the peculiarity of the 2015 downturn as these risks are not MLP distinctive features. On the contrary, the ownership, economic,

[8] Please view appendix 9.3. for more information on this tax-deferring capability

and governance structure, are unique features to the MLP asset class and potentially are a source of idiosyncratic risk as they may give rise to conflicts of interest between management and investors. As rights and obligations between management and investors are concretized in the MLPs' partnership agreement (PA), versus a general lack of information on contracts among C-Corporations, the MLP structure presents the opportunity to empirically research the effect of these unique features on performance (Coase, 1992).

Existence of such conflicts is acknowledged by existing literature and even by MLPs in their disclosure to investors. Still, there has been limited research on the economic implications so far. For example, Ciccotello and Muscarella (2001) are interested in the relation between MLP performance[9] and its organizational structure. The authors test the impact of ten agency-cost related provisions present in MLPs' PA on performance by creating a dummy variable for each provision. While existence of conflicts of interest may be the direct result of such provisions in the PA, the sole acknowledgement of the presence of a provision may fail to capture its aftereffect and does not allow to link cross-sectional differences to firm performance. Other work that focusses on contracts between the owners of a company and its managers outside the MLP universe is that of Gompers and Lerner (1996), which examines provisions in venture capital agreements and Brickey (1999), whom is interested in restrictive agreements present in franchise agreements. More recent research on MLPs include the work by Kendall and Rogers (2017), who focus on the change in distributions, operating ratios, and returns compared to midstream corporate firms between 2005 and 2014. The authors find that during this period of relatively high growth, midstream partnerships and corporations show a negligible difference in their returns and profitability in contrast to significant differences found prior to 2005. Chen and Ngo (2018) research the performance of the MLP asset class compared to a buy-and-hold strategy of the S&P500 and find that MLPs provide lower risk and higher returns.

The ambition of this paper is to challenge the traditional low-risk reputation of the midstream MLP and quantify the impact of three firm attributes that are both MLP distinctive and plausible to involve conflicts of interest. These attributes consist of the infamous incentive alignment scheme called Incentive Distribution Rights (IDRs), asset "*dropdown*" transactions, and reliance on external sources of capital. The 2015 downturn is used to test if the data suggests presence of a structural break around the start of the downturn and whether the impact of any of the variables has changed due to the market crash.

[9] MLP performance is defined as the difference between the MLPs' EBITDA margin and median EBITDA margin for all listed C-Corporations that have a market value within 50% of the MLP's market value and share the same two-digit SIC code

Hence, the research question of this paper is:

Do midstream MLP-specific characteristics susceptible to conflicts of interest between management and investors negatively affect firm performance and has this impact changed due to the 2015 downturn?

By means of various panel data analyses, it is tested if any of the three variables have a significant impact on relative firm performance, defined by dividend yield and total return. The Chow test is used to inspect if the data suggests presence of a structural break. Aside from the fact that the MLP entity has received little academic attention in general, this paper contributes to existing literature by linking the suggested broad set of firm attributes that are prone to conflicts of interest in combination with the studying of the impact of the MLP market crash.

1.2. Scope of research

This section elaborates on the maintained MLP definition and applied restrictions on the sample of interest.

The abbreviation "*MLP*" in this paper refers to the prototypical "*publicly traded partnership*" MLP, or PTP MLP, unless stated otherwise. PTP MLPs are taxed as partnerships whereas taxable MLPs are used by entities that do not suffice to the qualifying income restriction and are exempt from adapting a pass-through structure. Taxable MLPs are concentrated in pure play offshore drilling, contracted power, and shipping MLPs. Hence, taxable MLPs are not relevant to this research.

All financial MLPs are excluded in this research, as their core business is not comparable to that of midstream energy infrastructure MLPs. Financial MLPs are defined as investment trusts, hedge funds, private equity parties, firms engaging in mortgage securities activities, financial advisory, and hedge funds. Second, real estate MLPs and the small group who are active in others businesses are excluded from the sample. Third, any up- and downstream assets as well as publicly traded midstream General Partners (GPs) are prohibited from the sample as their business model differs from midstream MLPs. Up- and downstream MLPs are less reliant on dropdown transactions as a source of growth compared to midstream assets and have higher exposure towards commodity prices. Listed GPs mostly act as holding companies, whom manage MLPs and collect IDRs.

Ciccotello (2011) argues that the passing of the American Jobs Creation Act in 2004 had a significant impact on MLP dynamics as this legislation opened the doors, while subject to various restrictions, for institutional investors to the MLP asset class. Before, open- and closed-end funds were unable to enjoy the pass-through advantage of the MLP as owning partnership units would trigger immediate taxation

as if it were a C-corporation. Hence, the American Jobs Creation Act cause a sudden broadening of the investor base[10] and introduced more skilled and better-informed investors, improving the overall understanding of the MLP as an asset class. Kendall and Roger (2017) add that from 2005, the midstream segment transformed to a more growth-oriented market versus more mature market dynamics before. To account for this pivotal point in time, observations before 2005 have been excluded from this research.

1.3. Structure

The remainder of this thesis is structured as following. Chapter 2 provides the theoretical framework, which starts with the discussion of features idiosyncratic to the MLP structure. The second part of the chapter focusses on the mechanisms underlying the MLP structure that give rise to conflicts of interest and ends with a brief overview of recent developments in the MLP landscape. Chapter 3 presents the hypotheses distilled from the theoretical framework. Chapter 4 describes the data collection, variable construction, and methodological approach to the quantitative analyses performed. Chapter 5 presents the main findings to the analyses and tests the robustness of the results. Chapter 6 concludes this paper by summarizing the findings and makes suggestions for further research.

[10] Institutional investors are known to purchase units both on the public marketplace and through private direct placements

2. Master Limited Partnerships explained

By definition, MLPs are public traded partnerships whose equity interests, which are called units, trade on established stock exchanges[11]. They are generally construed as tax efficient energy pipeline companies. However, there is more to this structure as will be explained in this chapter.

2.1. Ownership structure

The MLP ownership structure typically consists of one general partner (GP) and multiple limited partners (LPs). The GP holds 2% of the partnership units, is 100% owned by a sponsor, and is responsible for managing the operations of the company. Exemplified by figure 1, most sponsors will either be private equity firms, management, or publicly traded utility or energy companies (Alerian, 2018). Next to the 2% equity interest the GP holds incentive distribution rights (IDRs), which will be explained in greater detail in section 2.2. The MLP is fully-owned by the sponsor until the common units are sold to the public. Once sold, MLPs have numerous unitholders or LPs as corporations have numerous shareholders. The LPs provide capital and are eligible for cash distributions but have no say in how the company is managed.

After the initial public offering (IPO), there is a fourth type of interest that is generally encountered in the structure, subordinated units. These units are initially not publicly traded, held by the sponsor, and convert to an equal number of common units once the company complies with certain operational requirements or after a preset passage of time. Such requirements aim to test and ensure the ability to consistently generate sufficient cash flow to cover a minimum quarterly distribution (MQD) as disclosed by the company (Oelman el al., 2017). The corporate analogy for this structure is the selling of participating preferred shares to shareholders, while simultaneously retaining the common shares of the corporation. The subordinated units only receive cash distributions if the distributed amount exceeds the MQD threshold on the common units outstanding. As traditional MLPs IPO with an equal share of common and subordinated units[12], cash distributions need to decrease by more than half before the distributions to common unitholders are reduced (Fenn, 2014).

Moreover, MLPs generally have a two-tier structure. The first-tier is the MLP, the sole owner of second-tier assets, either one or more operating limited partnerships or operating limited liability companies (LLCs)[13] as illustrated by "*Operating Subsidiaries*" in figure 1. The subsidiaries own the operating assets and/or other operating subsidiaries of the MLP. MLPs whom directly own assets are rare (McCabe, 2014). According to Fenn (2014), legal and regulatory requirements driving the need for a two-tiered structure have evaporated over time. The two-tier structure is still in place due to practical

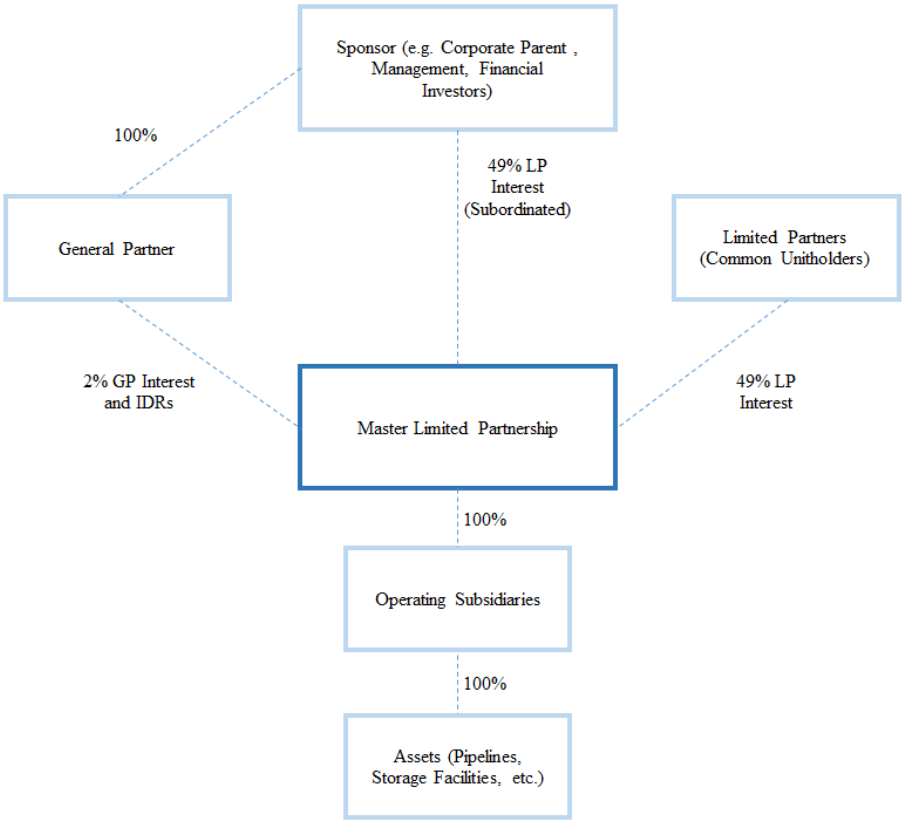
[11] Predominantly the New York Stock Exchange

[12] Both 49% of equity capital

[13] The main difference between operating limited partnerships and LLCs is that LLCs do not have a GP and provide common unitholders with broader voting rights. IDRs may still be existent

considerations, as it allows the MLP to take on a holding company entity and isolate assets and liabilities linked to various businesses activities below the operating subsidiary. Furthermore, debt can be raised at both the MLP and operating company level where debt at the MLP level is subordinated to outstanding debt at the operating level.

Figure 1: Visual representation of hypothetical traditional MLP structure



2.2. Economic structure

2.2.1. Distribution of available cash and minimum quarterly distributions

As the MLP evolves around cash flow and distributions, the distribution policy is a fundamental factor within the economic structure. This policy provides the framework regarding the allocation of cash distributions among the various partners and can be found in the PA. Common unitholders expect cash to be distributed on a quarterly basis (McCabe, 2014). Even more so, an MQD threshold is set in advance. Post IPO, having a robust equity growth story substantiating how the company is aiming to generate predictable cash flows to cover the MQD and further grow cash flows hereafter is essential to attract investors' attention. A common misconception is that, as with Real Estate Investment Trusts (REITs), MLPs are statutory and regulatory required to payout at least 90% of taxable income to investors. Instead, the partnership agreement contains clauses that obligate the MLP to distribute all "available cash" to unitholders. The amount of cash that is available at a specific point in time is determined at the discretion of the GP and is commonly defined as all cash generated during the quarter

minus working capital investments, maintenance CAPEX, reserves put in place to cover distribution for the next twelve months, cash needed to support the daily operations of the business, and liquidity required to comply with all debt covenants (Oelman et al., 2017). There are two mechanisms embedded in the distribution policy to align GP and LP interests: subordinated units as mentioned and IDRs as will be discussed below.

2.2.2. Incentive distribution rights

According to Peacock (2009), IDRs "*are a special class of limited partnership interests that entitle the holder to an increasing percentage of the cash distributions that the MLP pays out to its unitholders as certain thresholds are met*". Through its GP ownership, the sponsor is entitled to IDRs owned by the GP to encourage further cash distribution in excess of the MQD. IDRs increase the GP's initial right of 2 percent of cash distributed (equal to the GP's equity stake) as the distribution amount to common unitholders exceeds specified distribution levels or "*tiers*". This mechanism serves as an incentive to align interests between the sponsor and LPs, a performance fee, or a way of compensating the sponsor for taking on additional risk through its subordinated position in the capital structure (Goodgame, 2012). Figure 2 provides a hypothetical example of an IDR mechanism as can be found in the annual reports of traditional MLPs.

In this scenario, the IDR tiers range from the MQD of $0.20 per quarter to the highest tier, often referred to as reaching the "*high splits*" or "*50/50 splits*", at $0.30. This company declares a distribution of $0.40 per common unit, which is the actual amount the LPs receive. As outlined in figure 2, at $0.40 the MLP is in the high splits. For the first tier, the $0.23 per common unit only represents 98 percent of the total amount that is distributed to the LPs and GP together. The implied total amount distributed to the GP and LPs can be calculated by dividing the distributed amount by the percentage it represents of the total amount ($0.23/98%). Subsequently, one is able to calculate the GP distribution by multiplying this amount by the GP share of the tier (2%). As the LP distribution exceeds the high splits of the company, this process is repeated for each tier. To calculate the distribution that flows to the GP in the high splits tier, one divides the amount in excess of the threshold of the highest tier by the LP interest and multiplies this amount by the GP interest, resulting in:

$$GPinterest_{hsplits} = \frac{(\$0.40 - \$0.30) * 50\%}{50\%} = \$0.10 \qquad (1)$$

In this example, the cumulative cash flow allocation to the GP rises to 24%. This percentage may rise to a maximum of approximately 50% as the distribution per unit grows to infinity.

Figure 2: Hypothetical example of IDR structure

Share price and yield metrics	
Share price	$5
Declared distributions to LPs	$0.40
Yield	8.0%
Implied distributions to GP	$0.12
Yield	2.5%
Total distributions	$0.52
Implied total yield	10.5%

Distribution Targets	Total Quarterly Distribution Per Unit Target Amout		Unitholders	General Partner
Minimum Quarterly Distribution		$0.20	98%	2%
First Target Distribution	Above $0.20	up to $0.23	98%	2%
Second Target Distribution	Above $0.23	up to $0.25	85%	15%
Third Target Distribution	Above $0.25	up to $0.30	75%	25%
Thereafter	Above $0.30		50%	50%

	Distribution per unit			Cumulative distribution per unit		
Distribution Targets	LP	GP	Total	LP	GP	Total
Minimum Quarterly Distribution	$0.200	$0.004	$0.204	$0.200	$0.004	$0.204
First Target Distribution	$0.030	$0.001	$0.031	$0.230	$0.005	$0.235
Second Target Distribution	$0.020	$0.004	$0.024	$0.250	$0.008	$0.258
Third Target Distribution	$0.050	$0.017	$0.067	$0.300	$0.025	$0.325
Thereafter	$0.100	$0.100	$0.200	$0.400	$0.125	$0.525

	Cumulative cash flow allocation	
Distribution Targets	LP	GP
Minimum Quarterly Distribution	98%	2%
First Target Distribution	98%	2%
Second Target Distribution	97%	3%
Third Target Distribution	92%	8%
Thereafter	76%	24%

2.2.3. Tax environment

As stated in section 7704 of the Internal Revenue Code, an MLP is exempt from paying taxes at the company-level under the prerequisite that at least 90 percent of gross income comes from qualifying income sources. Hence, the unitholder is treated as if she directly earns its share of company cash flow. Tell (1986) advocates that this is the key driver for preferring the MLP over other legal entities as this enables a higher yield for the partners compared to the after-tax yield that an equivalently situated C-Corp can provide. In addition, as MLP taxable income generally only covers 20 percent of the distributed amount due to high depreciation charges, 80 percent of the distributions received by investors are tax deferred (Guenther, 1992). Cash distributed in excess of the amount of taxable income is not seen as dividend but as a return of basis[14] and is therefore not taxable. For tax-deferred accounts[15], tax-exempt entities[16], and institutional investors other rules apply. Also, there are nuances that must be considered to the abovementioned observations. Collins and Bey (1986) mention that if the personal income tax rate is substantially higher than the corporate tax rate, the after-tax cash flow might deteriorate compared to the C-Corporation. Also, the partnership tax structure brings various obstacles

[14] A return of basis returns the principal, or initial investment, to the investor. As a result, no gains or losses are included, which makes it an untaxable event

[15] Retirement plans that are allowed to earn tax-deferred income under the Internal Revenue Code such as 401(k)s and IRAs

[16] Mostly charities and non-profit organizations

and costs both for investors and the company itself[17] (Sloan and Lay, 2010). The tax reporting that comes with investing directly in MLPs is considered to be one of the larger disadvantages from an investor's point of view as this requires filing the ill-famed Schedule K-1 form[18] (Maresca et al., 2013; Johnson et al., 2008). Compared to the C-Corporation and limited liability company (LLC), whom require filing the substantially less complicated Form 1099-DIV, the K-1 Schedule may give rise to (higher) costs stemming from administrative support even if no trades are executed (Tortoise Advisors, 2018). The process becomes even more intricate if the MLP operates in multiple states as this could entail different tax filings for each state, further increasing the administrative burden. Foreign investors are faced with the same tax reporting hassle. Additionally, U.S. law[19] requires quarterly distributions received by non-U.S. investors be taxed at the highest effective tax rate for either corporations or individuals. Further information regarding tax-deferability and recent developments in U.S. tax legislation can be found in appendix 9.3. and 9.4.

2.2.4. Drivers of MLP performance and valuation methodology

Existing literature stresses that apart from distribution yield[20] and share price returns, distribution growth is a driver of MLP performance (Sloan and Lay, 2010; Kendall and Rogers, 2017; EY, 2018; Kwon, 2014). The most obvious way for an MLP to propel distribution growth is to grow its portfolio of cash-generating assets. As most generated cash is distributed, access to external sources of capital is necessary to finance such growth (see "*Funding gap*" in figure 3). Hence, dried up capital markets may force firms to cut back distribution growth, which in turn increases the required yield by investors as they demand to be compensated for the lower growth prospects (appendix 9.2.). Blum et al. (2013) provides empirical evidence for this inverse relationship between MLP yield and anticipated 3-year forward distribution compounded annual growth rate (CAGR). Plotting the 3-year distribution CAGR on MLP yield results in a negative correlation of 0.74.

Moreover, commodity prices are often said to impact MLP performance. When generalizing the MLP energy universe this may be true, but as explained in chapter 1, midstream infrastructure assets have little exposure to commodity prices due to their toll-road business model. Still, sustained increasing (decreasing) commodity prices may cause a decrease (increase) in the demand for the volume transported on the longer-term. Another factor having an effect on MLP growth historically is interest rates, as MLPs are especially popular among income investors. However, as the value proposition to

[17] Apache Petroleum Corporation sent its unitholders a proposal in 1988 where management opted for converting back to a C-Corporation as this would reduce administrative costs by a significant amount (2.6% of total revenue). Over time, costs have decreased with the development of technological solutions that keep track of all relevant data

[18] Visit www.irs.gov/pub/irs-pdf/f1065sk1.pdf to view a K-1 form

[19] Treasury Regulation Section 1.1446-4(b)(4) and (d)

[20] The corporate analogy is dividend yield. Both terms are used interchangeably in this paper

investors has changed from a pure fixation on yield to total return[21], due to an increased focus on growth, the correlation between MLP yield and the yield on treasuries has declined. Decreasing interest rates have further dampened this correlation and propelled investor interest.

There are two other cash flow related metrics that are commonly used to quantify performance; distributable cash flow (DCF) yield and the DCF coverage ratio. DCF is a non-GAAP liquidity measure used to quantify a firm's ability to realize a cash return on investment for the LPs (figure 3). DCF differs from available cash flow, as this does not consider the outflow of GP cash earned through IDRs. DCF yield is calculated by dividing the annualized DCF by the firm's market capitalization. Supplementary, DCF is used as an indicator whether the current level of quarterly cash distributions is sustainable and if there is room to further increase distributions. This is achieved by comparing generated DCF to the actual distribution to the LPs. If an MLP has a coverage ratio that exceeds 1.0x, the company's cash distributions are not reliant on external sources of capital. Most midstream MLPs have a coverage ratio between 1.0 and 1.1x[22] (Maresca et al., 2013). Other valuation methodologies used to value the MLPs are the enterprise value / adjusted EBITDA[23] (EV/ adj. EBITDA), Dividend Discount Model (DDM), and Net Asset Value (NAV) calculation (Wachovia, 2008; Blum et al., 2013).

Figure 3: Visual representation of hypothetical Distributable Cash Flow calculation for traditional MLP

Distributable Cash Flow Waterfall		
	Net income	100
+	Depreciation and amortization	25
+	Other non-cash items	5
-	Maintenance CAPEX	(25)
Available cash flow		105
-	Cash flow to General Partner	(21)
Distributable Cash Flow		84
-	Cash flow to Limited Partners	(80)
Cash flow after GP & LP interest		4
-	Growth CAPEX	(125)
"Funding gap"		(121)

DCF coverage ratio: $\frac{84}{80} = 1.05x$

Apart from realized distribution yield and share price returns, nearly all performance measures used in the MLP space do not follow any accounting and/or financial reporting rules and can be constructed at the discretion of management. This brings substantial complexity when comparing MLPs on a larger scale.

[21] Total return is defined as unit price appreciation plus current cash flow yield. An expected distribution growth component may also be added

[22] Implying a DCF pay-out ratio ranging from 90% - 100%

23 Enterprise value does not contain the GP interest in the company. However, as the GP has a claim on part of the generated EBITDA (as EBITDA is a proxy for the cash flow from operations to all investors), the unadjusted EV/EBITDA multiple would provide an unfair comparison. To account for this, the cash flow accruing to the GP is subtracted from EBITDA. Further adjustments can be made at the discretion of management

2.3. Governance

MLP governance differs substantially from corporate governance as having a board of directors is no prerequisite from a legal point of view. The GP has full authorization for making strategic and financial decisions and has fiduciary duties only towards its owner (the sponsor). Equally, the board of directors installed at the GP level do not represent the LPs (Moreen, 2013). LPs have little, if any, voting power. MLP governance evolves around the PA, the key governance mechanism (Ciccotello and Mucarella, 2001). The PA discloses duties and rights of investors and managers by specifying financial and operating guidelines and detailing managerial rights. More specifically, the PA stipulates the targeted cash distributions to the GP and LPs and allocates earned cash. While limited protective rights for the LPs may be in place, distributions are rarely guaranteed and the GP is allowed to modify distributions to their liking. Information on IDRs, as illustrated by figure 2, are a core part of the PA (EY, 2011).

Presence of more rigid arrangements explains, in part, the acceptance of the lack of a board of directors. According to Jensen and Meckling (1976), if the contractual design of a company successfully corresponds to its environment this may have a positive impact on performance. In this light, McConnel and Muscarella (1985) argue that the C-Corporation is incompatible with a mature, low-growth, and cash-rich environment as this may increase agency costs in the form of overinvestments. The problem of corporate overinvestments may be overcome by reselecting the board of directors, leveraged buyouts, takeovers, and spin-offs, amongst others (Jensen, 1989). Kensinger and Martin (1986) add that the MLP (governance) structure also provides a solution to the overinvestment problem in slow-growth industries. If the PA is capable of distributing cash to unitholders while also limiting CAPEX, the MLP structure should be preferred over its corporate alternative as this reduces agency costs.

Ciccotello and Muscarella (2000) present findings indicating that the provisions composition in the PA are dynamic over time, with an accentuation of IDRs and cash distribution provisions versus a decline in the GP's ability to engage in outside activities that may compete directly with the MLP. This trend has continued for many years as the focus on cash distributions intensified. Due to the fact that MLPs are publicly traded, it is mandatory to publicly disclose the PA. Purchasing common units on the market means one agrees upon the terms and conditions listed in the agreement.

2.4. Conflicts of interest

Brett and Bruce (2012) underline that various conflicts of interest arise between the GP and LPs from the economic, ownership, and governance structure. While measures are put in place to align GP and LP interests, such as the use of IDRs and the sponsor taking an LP ownership interest[24], these measures are flawed. It is the GP's fiduciary duty to act in the interest of its owner, the sponsor. This is a fundamental difference compared to the C-Corporation, where maximizing shareholder remuneration

[24] Sponsors generally obtains the subordinated position at book value, where LPs pay a premium for the issued units

is the primary objective. Sponsors are inclined to form an MLP under the Delaware Limited Partnership Act to maximize their contractual freedom and eliminate most fiduciary duties they have towards the common unitholder. The only covenant that can't be ignored is the "*implied contractual covenant of good faith and fair dealing*". Due to the fact that there are no other governance mechanisms in place to safeguard the best interest of the LPs, solely relying on a subjective standard of good faith to protect the LPs' interests is no comprehensive solution. Existence of conflicts of interest are acknowledged by MLPs and can be found under the "*Risk Factors*" section in the disclosed SEC filings. EQT Midstream Partners' 2017 10-K report exemplifies that MLPs are transparent on the existence of such conflicts[25]:

"EQT, through its control of EQGP, controls our general partner, which has sole responsibility for conducting our business and managing our operations. Potential conflicts of interest may arise among our general partner, its affiliates and us. Our general partner has limited its state law fiduciary duties to us and our unitholders, which may permit it to favor its own interests to the detriment of us and our unitholders."

For the C-Corporation, governance mechanisms are put in place to mitigate such conflicts of interest, in literature referred to as agency problems (Donaldson and Davis, 1991). As with corporate governance, MLP governance is subject to various legal frameworks, such as federal securities law and state law. Still, both governance structures are far from identical due to the contractual nature of MLP governance documents and different treatment under state law (Goodgame, 2012). Discrepancies in governance stem from the fact that with the corporation, shareholders elect the board of directors whom act as a fiduciary on behalf of shareholders and protect shareholders' and other stakeholders' interests. On the contrary, a limited partnership is governed by the GP's board of directors, whose directors are elected by the sponsor as the sole owner of the GP. LPs are thus excluded from partaking in electing directors and a have constrained ability to remove the GP (Leman et al., 2017). Furthermore, the responsibilities of the GP's board of directors are often contractually circumscribed and may be removed at the discretion of the sponsor. Michaely and Shaw (1995) argue that this drives LPs to have little control over management.

2.4.1. Incentive distribution rights

MLP enthusiasts consider IDRs to be a valid incentive compensation plan. As with other incentive compensation plans, such as stock options and restricted stock, there is no mechanism that allows for perfect alignment. The ulterior motive behind incentive schemes and the absolute level of compensation are continually questioned and remains a heated topic of debate. However, due to the fact that the GP is subject to less constraining governance resolutions compared to the C-Corporation, any system put in place to balance the interests of various stakeholders should be assessed with care.

[25] Other examples are p.35 of the 2017 10-K report of Magellan Midstream Partners L.P. and p.35 of the 2017 10-K report of Energy Transfer L.P.

As discussed in section 2.2., IDRs reward the GP with an increasing share of the MLP's available cash flow once predetermined levels of quarterly per-unit cash distribution are met. By paying the GP a larger share of available cash flow, as opposed to increasing the absolute distribution amount, the GP is able to benefit without affecting reported cash flow growth as would happen if an increasing percentage of sales or cash flow was granted. The cumulative cash allocation entices strictly opposing interests as an increasing share of available cash to flow to the GP lessens the LPs' distribution potential. A downside is that the GP may be "over-incentivized" to reach the high splits by raising distributions at all costs to maximize the amount of cash earned through IDRs (Leman et al., 2017). Riskier and less sustainable sources of growth, such as acquiring less appealing assets to grow the asset base, become increasingly attractive for the GP to support cash flows. Raising funds on the capital markets to cover distributions directly occurs sporadically as this may imply poor financial health[26].

The divergence in risk/reward profile presented by the IDR mechanism for the GP and LPs further stimulates excess risk taking of the GP. When at the lowest IDR tier, the GP receives 2% of distributed cash. Therefore, while the GP may lose its 2% stake if the MLP goes bankrupt, it may be entitled to 50% of incremental cash flow if the high splits are reached. Interests thus are only aligned in the upside case. Another caveat is that the pre-determined IDR tiers are ingeniously based on the distribution per LP unit. As a result, issuing (LP) units allows the GP to increase the absolute distribution per GP unit as there is no dilution, while LPs do experience a dilutive effect from the equity raise.

Figure 4: Impact of equity issuance on GP and LP distribution per unit

	Current	Incremental effect of issue	Pro-forma	Change (%)
Available cash flow	$500	$50	$550	
Distribution to LPs	$300		$330	
LP units	100	10	110	
LP distribution / unit	$3.00		$3.00	0%
Distribution to GP	$200		$220	
GP units	75		75	
GP distribution / unit	$2.67		$2.93	10%

Source: Martin Capital Management, LLC

This basic example shows that it is theoretically possible that the impact from issuing equity on distribution per unit, to for example fund an acquisition, can be experienced differently among the GP and LPs. The distribution per unit stays constant for the LPs, while the issuance is accretive to the GP's distribution per unit. As most MLP (retail) investors are interested in absolute cash distributions, such a scenario may not be noticed (Latham and Watkins, 2014).

[26] If external funds are required to cover cash distributions the DCF coverage ratio will deteriorate to a value below 1.0x

Ceteris paribus, the combination of the fiscal pass-through structure and initial low cash outflow through IDRs generally allows for a cost of capital benefit over the C-Corporation. However, an increase in cash outflow to the GP as the high splits are reached inflates the cost of GP equity capital[27]. While IDRs are supposedly mechanisms to stimulate growth as the sponsor is now financially incentivized to do so, they may ultimately hinder growth as a larger distribution per common unit implies a larger GP distribution, which in itself inflates the cost of capital to the firm. This impact is of importance as the initial lower cost of capital was and still is one of the foremost advantages of the MLP structure (Goodgame, 2012; Maresca et al. 2013; Moreen et al., 2013).

2.4.2. Dropdown transactions

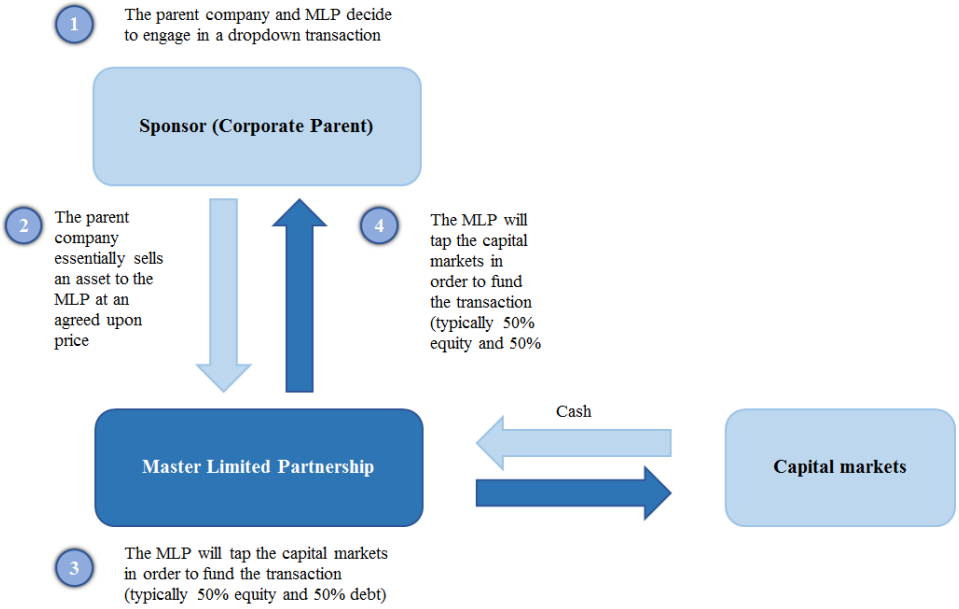
A "*dropdown*" transaction is the sale of an asset between the sponsor and the MLP. The primary objective of a dropdown is to monetize assets from the sponsor's point of view and grow the MLP's asset base to support future cash flow growth. Dropdowns are prevalent in the midstream sector, as the sponsor still uses the asset (i.e. a pipeline) to support its operating activities after the sale (McCabe, 2014). The extended use of the asset by the sponsor is recognized under a "*through-put*" agreement, offering a guaranteed use up to 20 years. The sponsor's use generates revenues and validates why paying a premium price from the MLP's point of view is justified. Subsequently, the sponsor shares in the incremental future MLP cash flows through the IDR mechanism.

According to Peacock (2009), an initial asset is often granted by the sponsor, after which common units are sold through an IPO. The pass-through structure of the MLP gives a competitive advantage over other structures as the avoidance of double taxation allows the MLP to pay a higher price for an acquisition due to the higher cash flows that result from the acquired asset (McCabe, 2014). Hence, assets owned by MLPs tend to trade at a premium valuation. This presents a conflict of interests between the sponsor and the MLP, as a higher purchase price unlocks greater value for the sponsor, while destroying value for the LPs. This conflict becomes even more severe when considering that the sponsor manages the MLP through its GP interest and thus acts as the buyer and seller, while having no fiduciary duty towards the LPs. Assuming the sponsor aims to maximize its gain on sale and that the book value of the asset on the sponsor's balance sheet understates the asset's fair value[28], the MLP pays a price in excess of the asset's book value. Therefore, MLPs that commonly use dropdown transactions as a source of growth are bound to have a substantial record of goodwill on their balance sheets.

[27] View appendix 9.2. for more information on IDRs and its impact on the cost of capital

[28] The result of large depreciation charges that are used as a tax-shield

Figure 5: Visual representation of a "dropdown" transaction



Source: Morgan Stanley Research

Moreover, the sponsor can use the monetizing of assets as a funding mechanism. When in need of external capital, selling an asset to the MLP may prevent the sponsor from having to raise debt and/or equity capital at its own level. As the cost of capital is generally lower for MLPs, this allows the sponsor to fund its own needs at a lower cost. Still, the firm's cost of capital is highly dependent on the current IDR tier[29]. Capital markets are accessed on the MLP level, either by increasing leverage or raising equity. Figure 6 provides an example to illustrate how a hypothetical all-debt financed dropdown transaction creates an increase in incremental cash flow for the LPs with no dilution. Please note that in addition to the realized gain on sale for the sponsor, there is leakage of incremental cash flow through the IDR mechanism. Concurrently, the MLP has imposed all the risk by taking on $150 of additional debt.

Figure 6: Hypothetical all-debt financed dropdown transaction

Sponsor	
Midstream asset building cost	$50
Midstream asset annual DCF	$15
Midstream asset annual return	30%
Disposition yield	10%
Midstream asset value	$150
Midstream asset sold to MLP	$150
Sponsor gain on sale	$100

MLP	
MLP raises debt to fund asset purchase	$150
Interest paid on debt	5%
Annual interest expense	($7.5)
Incremental cash flow (no dilution)	$7.5

Source: A Crisis in Ponzi-Land (The "Drop-Down"), adventuresincapitalism.com

[29] Section 2.2. and appendix 9.2.

In sum, a dropdown transaction not only presents an opportunity for the sponsor to monetize assets, but it may also act as a funding arm while allowing the GP to stay in control of the asset sold through its GP interest. Furthermore, the MLP acts as a steady source of income as expenses incurred for using the asset will be partly recouped through the IDRs. Access to (affordable) capital is essential for the MLP to finance dropdowns.

2.4.3. Access to capital markets

Distribution yield and coverage ratio are the main valuation metrics for investors to assess the (sustainability of the) level of cash distributions. Therefore, either cutting distributions or deteriorating the coverage ratio is likely to cause a sell-off by investors. As DCF is after the deduction of maintenance CAPEX[30], having limited retained earnings should pose no financial problems for running and maintaining the business in theory. However, declining profitability or ambitions to grow can pose substantial difficulties. Furthermore, due to the lack of retained earnings, MLPs are drawn towards external sources to fund growth with the potential risk of increasing leverage to unhealthy levels and/or diluting existing LPs. Kaiser (2014) states the amount of maintenance CAPEX as a percentage of depletion, depreciation, and amortization (DD&A) as disclosed by management of 31 midstream MLPs and draws the conclusion that maintenance capex is broadly understated. As maintenance CAPEX is a non-GAAP metric, its definition may vary widely among MLPs and it provides management the opportunity to boost DCF.

The large dependency on external sources for making capital investments is a legitimate risk. Even more so, the lack of retained earnings causes fundamental drivers of MLPs, such as the cost of capital and distribution growth, to be affected by the capital markets (Leman et al., 2017). This in itself is a potential source of conflicts of interest between the GP and LPs as the issuance of debt at the MLP level or issuing (common) LP units to support distribution growth will have a dissimilar impact on both. For example, a negative side-effect might be overleveraging the MLPs' balance sheet or diluting existing LPs to maximize IDR generated cash flows. As MLPs are generally priced exclusively on yield, as opposed to C-Corporations that are priced on a variety of metrics, a drop in yield typically leads to large unit price volatility (Leman et al., 2017). Consequently, a GP might increase leverage to unhealthy levels to support distribution growth when facing operational and/or economic turmoil.

2.5. Recent innovations and trends in the MLP landscape

The first significant change to the MLP structure occurred in 2004 when Copano Energy listed as an LLC as opposed to the traditional operating limited partnership structure (Goodgame, 2012). LLCs have a board of directors, no GP, and thus provide more voting power to the unitholders. An incentive scheme similar to IDRs may exist, but are called Management Incentive Interests (MIIs). Overall, the LLC

[30] Figure 3

model shows more similarities to the corporate form, while still enjoying a pass-through structure. Currently only a few MLPs are structured as an LLC.

Another variation to traditional MLPs are variable distribution MLPs also referred to as "*common only capitalization*" MLPs. Their ownership structure somewhat deviates from the hypothetical representation by figure 1. There are no IDRs and no subordinated units, leaving only common units in the capital structure. This structure makes fluctuating cash distributions that follow the fluctuations of generated DCF (Oelman et al., 2017). They are more focused on pursuing growth opportunities and have business operations that are less suitable for constantly producing steady cash flows. Hence, they have no preset MQD to unitholders. While the share of midstream MLPs as a percentage of total MLPs has remained roughly constant through time, the number of MLPs that are not energy related has increased. This has translated into a growing number of listed variable distribution MLPs listed as this structure may accommodate certain business requirements[31].

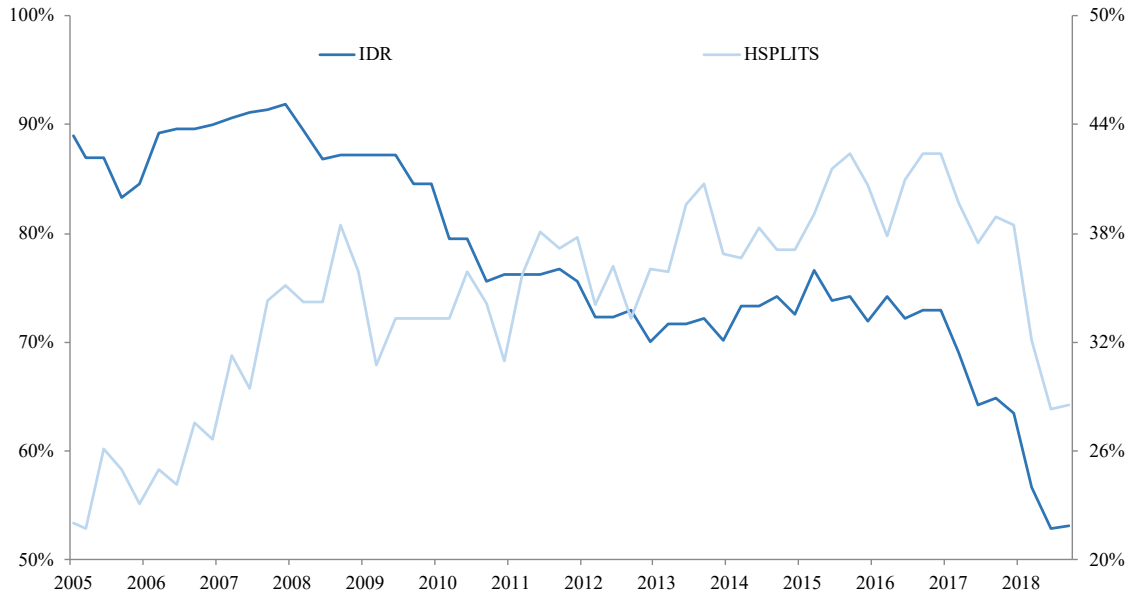
Third, investment companies such as KKR & Co and Ares Management Corp have decided to convert to a corporation in 2018 as an attempt to gain access to certain indices and broaden their investor base, potentially boosting their valuation. A similar trend is visible in the energy MLP space as they change their legal structure to become more accessible to institutional investors. Furthermore, deprived investor appetite, the recent U.S. tax reforms, and revised treatment cost-of-service rates[32] have actuated a *"simplification"* wave among energy MLPs. It seems as if investors have become more aware of risks that the MLP structure brings forth. Examples of recent simplifying transactions are the merger of NuStar with NuStar GP Holdings, the merger of EQT GP Holdings, EQT Midstream Partners, and Rice Midstream Partners LP, and the acquisition of Tallgrass Energy Partners by Tallgrass Energy GP[33]. These transactions aim to create a more sustainable business model by removing the GP, strengthening balance sheets, and reducing dependency on external capital markets. Removal of the GP allows firms to present a more comprehensive governance mechanism to common unitholders and reduce the cost of capital as IDRs are waived. In its 2018 10-K report, Spectra Energy Partners for example mentions that it has chosen to eliminate the GP IDRs as a way to *"enhance their long-term value proposition for unitholders and better position the company for future growth"*. Graph 3 shows a strong decline of IDR presence since 2005. The percentage of midstream MLPs having reached the high splits has diminished since 2017. This is either the result of distribution cuts or the modification of the IDR structure (remove high splits tier to lower cost of capital). An example of such a modification is the reduction of three to one tier by Niska Gas Storage Partners in 2013, which was enforced by shareholders Carlyle Group and Riverstone Holdings.

[31] Examples of such lines of activities are owned properties that receive mineral interests, nitrogen fertilizer factories, and up-/downstream activities that have a larger exposure towards commodity prices

[32] Please view appendix 9.4. for more information on the impact from the U.S. tax reforms and changes in cost-of –service rates

[33] Table 1 displays the downturn in no. of midstream MLPs from 71 in 2014 to 53 in 2018

Graph 3: Midstream MLP universe average IDR (left axis) and high splits (right axis) development



2.6. Concluding remarks

The MLP is a type of venture that differs substantially from the C-Corporation in terms of ownership, economic, and governance structure. Businesses that meet the qualifying income prerequisite, have matured, and are profitable may benefit from converting to an MLP structure as this lowers agency costs, avoids the disadvantage of double taxation on corporate profits, and allows tax-deferability on distributions to investors. Greater institutional participation along with the emergence of new unconventional drillings methods gave way to a transition to a more growth-oriented market from 2005 onwards. The increased focus on growth induced the exposure of conflicts of interest between the GP and LPs as this trend gave rise to the popularity in dropdown transactions, which increased dependency on capital markets. While IDRs are a flawed aligning mechanism per definition, its inflating effect on the cost of capital further entangled MLPs' capability to realize growth. The sector specific market crash in 2015 and recent simplification wave hints that the MLP structure indeed is accompanied with risks.

3. Hypotheses development

Based on the theoretical framework, five hypotheses are exhibited in this chapter. The findings on the presented hypotheses are used to substantiate an answer to the research question:

Research question: *Do midstream MLP-specific characteristics susceptible to conflicts of interest between management and investors negatively affect firm performance and has this impact changed due to the 2015 downturn?*

In this thesis, characteristics susceptible to conflicts of interests are defined by presence and usage of IDRs, exposure towards dropdown transactions, and reliance on external capital markets. Two additional control variables are added to control for firm size and profitability.

This research attempts to use the change in market dynamics from 2005, which exposed vulnerability and ultimately gave rise to the 2015 downturn, to research if the variables of interest can be linked to firm performance. Two definitions, dividend yield and total return, are used in this research to define firm performance, as either measure is imperfect as substantiated in section 4.2. Using two dependent variables provides a broader set of results and acts as a sanity check as this allows comparing regression outputs. An adverse consequence of this approach is that findings may vary conditional on the used dependent variable. Moreover, the quantitative analyses are performed using two deviating, although largely similar, samples[34]. As part of the empirical research focusses on the equality of regression coefficients before and after the crisis, this requires an acceptable number of observations to be present in both time slots for each of the included firms. Two direct implications are a reduced sample size, due to the reduced number of panels that comply with this requirement, and the emergence of survivorship bias. Therefore, a less restricted panel data model covering only the pre-downturn period, up until September 2014, is constructed first as this results in a broader and less biased sample composition. This sample is used in the first panel model and tests the first hypothesis:

H_1: *Presence and usage of IDRs, exposure towards dropdown transactions, and reliance on capital markets have a positive and significant impact on relative performance prior to the MLP market crash*

This hypothesis rests on the presumption that, in the wake of the changing market dynamics, investors were less or unaware of the potential risks that coincide with each of the three mechanisms. The absence of significant growth prior to 2005 demanded little capital market dependency. With a renewed focus on growth sparked by the shale revolution, access to external capital became a necessity to fund dropdown transactions. Sponsors with large pipeline assets suited to be sold to the MLP was perceived

[34] Appendix 9.8. lists the firms included for both samples

as an advantage as this was presented as a riskless source of growth. For IDRs, the hypothesized positive effect on relative firm performance assumes that it was not until the market crash occurred that the incentive scheme's inflationary effect on the cost of capital was first challenged on a larger scale. In this light, the fact that IDRs in itself are coherent to conflicting interests, may have also been an underexposed risk prior to the crash. The inclusion of proxies for firm size and profitability helps gaining an understanding to what extend these fundamental components contribute to relative firm performance. Due to the low-risk reputation of the MLP asset class before the market crash and the fact that the larger share of the investor base consists of less-informed retail investors, I expect both variables to have a marginal positive effect. Next, it is examined to what extend the 2015 downturn has affected the coefficients on the variables of interest estimated on a more restricted sample.

The 2015 crash illustrated that lack of retained earnings by MLPs can have a detrimental impact on cash available for distributions if capital markets dry up (Leman et al., 2017). Such risks are smaller for firms that have a higher degree of self-sufficiency. As a result, the second hypothesis is:

H_2: *Reliance on capital from external sources impacts relative performance more negative after the 2015 market crash compared to the impact before the crash*

For IDRs, I expect that MLPs who have IDRs in place and actively pursue the maximization of profits that may flow to the sponsor with this mechanism take on more risk. This risk may come in the form of understating maintenance CAPEX to boost the firm's DCF and reach a high(er) IDR tier and/or increasing leverage to unhealthy levels. As understated maintenance CAPEX was one of the main concerns that came to light during the crisis, it is assumed investors are less drawn towards MLPs with IDRs after the crash. Renewed investor focus since then has been on conserving a sustainable business model. Minimizing the cost of capital is a way to expedite this. Also, prolonging a flawed incentive scheme does not meet this focus. Given this development, the third hypothesis is:

H_3: *Presence and usage of IDRs impacts relative performance more negative after 2015 market crash relative to the impact before the crash*

As the GP's fiduciary duty is to maximize sponsor remuneration, dropdown transactions are an opportunity for sponsors to monetize assets at favorable prices, de-risk returns as financial leverage is increased only at the LP-level, increase future earnings through IDRs, and act as a funding arm. To investigate whether the 2015 downturn has raised awareness among investors with regard to these risks, the fourth hypothesis is:

H_4: *MLPs engaging in dropdown transactions impacts relative performance more negative after the 2015 market crash compared to the impact before the crash*

As the crisis restored investors' focus on sustainability, the final hypothesis tests if the effect of fundamental factors on relative firm performance has changed after the crisis. Larger and more profitable firms generally are financially more resilient. Therefore, the final hypothesis is:

H_5: *Firm size and profitability have a more positive impact on relative performance after the 2015 market crash compared to the impact before the crash*

The following chapter covers the data and methodology used to test the presented hypotheses.

Table 3: Overview of hypotheses

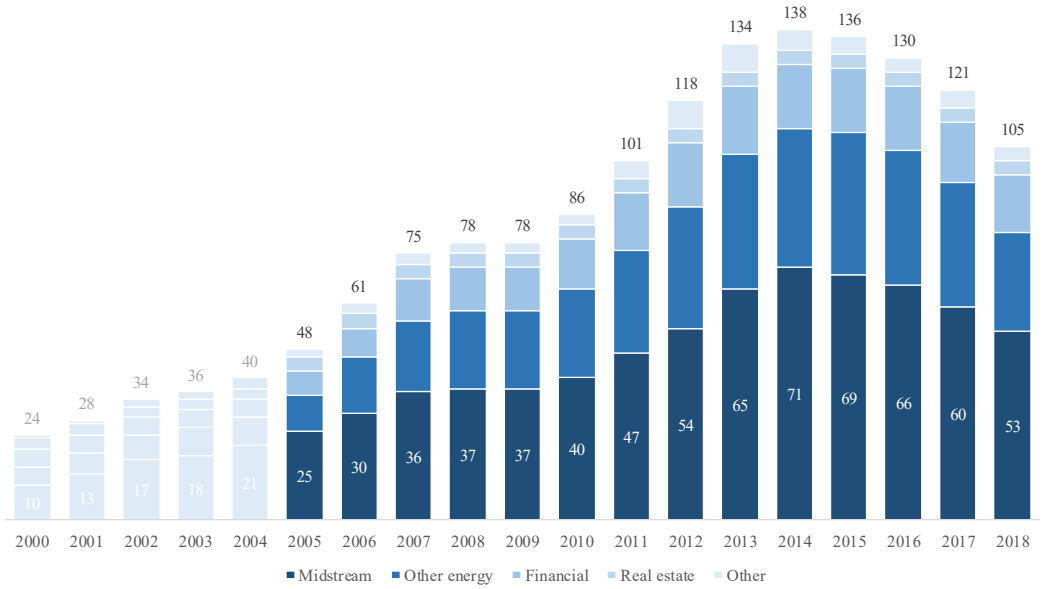
H_1	Presence and usage of IDRs, exposure towards dropdown transactions, and reliance on capital markets have a positive and significant impact on relative performance prior to the MLP market crash
H_2	Reliance on capital from external sources impacts relative performance more negative after the 2015 market crash compared to the impact before the crash
H_3	Presence and usage of IDRs impacts relative performance more negative after 2015 market crash relative to the impact before the crash
H_4	MLPs engaging in dropdown transactions impacts relative performance more negative after the 2015 market crash compared to the impact before the crash
H_5	Firm size and profitability have a more positive impact on relative performance after the 2015 market crash compared to the impact before the crash

4. Data and Methodology

4.1. Data

All data, except data concerning IDRs, is retrieved from Bloomberg. The equity screening tool[35] allows to filter on security type per time period. Subsequently, the provided ticker list has been verified through mlpdata.com and naptp.org to ensure no MLPs are missing. Missing MLPs are added to the database. Once the complete ticker list is constructed, additional per company information on the sector and industry group is extracted from Bloomberg. Companies active in the "*Oil Equipment, Services & Distribution*" and "*Industrial Transportation*" sector are preselected as midstream energy infrastructure MLPs. This preselection is then filtered by hand to exclude all listed GPs. The final dataset contains 82 unique midstream MLPs over the period of interest. Conditional on the set requirements per analysis, MLPs are dropped from the sample as explained in section 4.4. and 4.5.

Graph 4: Number of listed MLPs per year per sector



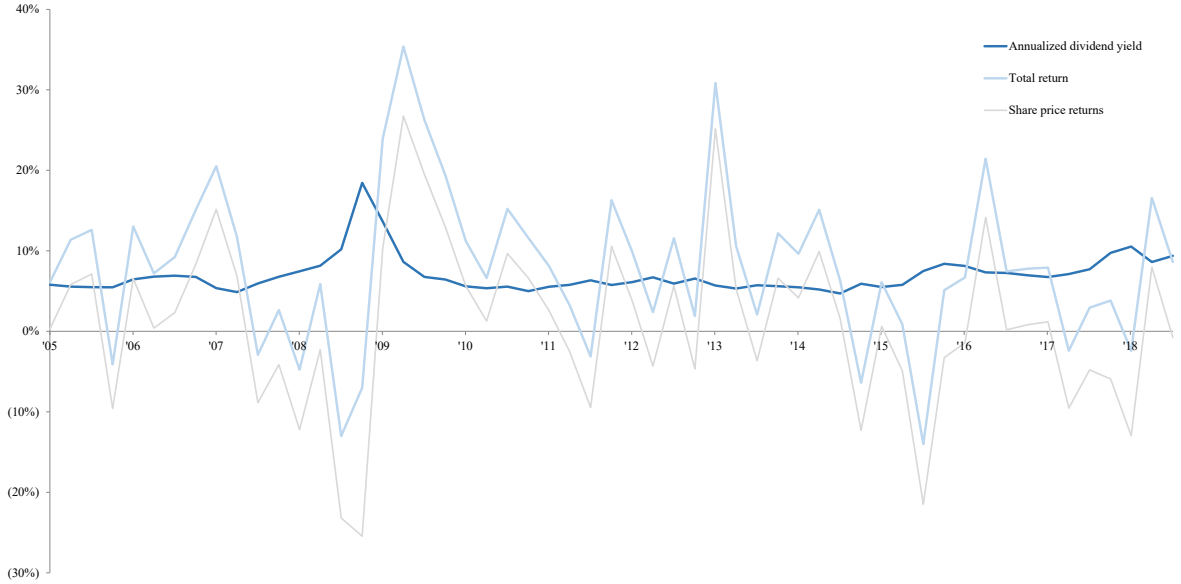
Data on IDR presence and tier reached for period *t* is handpicked from the annual reports of all included midstream MLPs. Multiple annual reports are checked to account for possible IDR modifications. To minimize the effects from outliers on results, which are encountered often, all data is winsorized at 5%. In order to suffice to an adequate number of observations, quarterly observations are used. To avoid confusion, sample statistics and results regarding the panel analysis performed as described in section 4.4. are referred to as the *"broad sample"* or *"broad panel analysis"*. Statistics and results referring to the methodology of section 4.5. are denoted as *"Chow sample"* or *"Chow panel analysis"* from henceforth.

35 Command - EQS - in Bloomberg terminal

4.2. Construction of dependent variables

Ciccotello and Muscarella (2001) argue that linking MLP performance to its organizational structure poses a considerable challenge as choosing a correct metric to embody firm performance is complex. As discussed in section 2.2., the most commonly used performance-related metrics disclosed by MLPs[36] pose several accounting complexities and varying definitions, which prohibits a fair comparison among firms. Using stock returns is an obvious metric as it circumvents the use of non-GAAP measures. According to the efficient market theory, a potential downfall of using stock returns is that firm characteristics are reflected in the share price. However, Chen and Ngo (2018) argue this is not the case for MLPs as the lack of corporate transparency stemming from the governance culture allows for significant information asymmetry.

Graph 5: Average winsorized performance metrics for midstream MLP universe[37]



Graph 5 displays the high volatility encountered in share price returns on a quarter-on-quarter basis[38]. This produces a potential mismatch with some explanatory variables, as changes in firm characteristics are generally longer-term of nature. Total return, calculated as the sum of the quarterly share price return and annualized dividends[39], experiences somewhat less volatility by the dampening impact of the latter component and is used as an explainable variable. As MLPs are yield-oriented investment vehicles, annualized dividend yield is also used to express relative firm performance. This is a less volatile alternative and thus circumvents the short-/long-term mismatch. However, merely focusing on yield can be misleading as it is possible for firms to deliver a steady yield on the short- to medium-term while

[36] Adjusted EBITDA , DCF, and DCF coverage ratio

[37] $Annualized\ dividend\ yield = \frac{(Quarterly\ LP\ cash\ distribution)*4}{Market\ capitalization\ on\ the\ last\ day\ of\ the\ quarter}$

[38] View appendix 9.5. graph c) and d) for an overview of quarterly share price returns and annualized dividend yield per firm

[39] This definition neglects the expected distribution growth component presented in section 2.2. as i) there is little data available on this component, ii) growth rate estimates are subject to different underlying assumptions

the underlying operating performance is deteriorating. Relative performance expressed by dividend yield is calculated as follows:

$$Relative\ performance = Annualized\ dividend\ yield_{i,t} - Annualized\ dividend\ yield_{BM,t} \qquad (2)$$

Relative performance based on total returns is calculated likewise. The average of the sample is used as a benchmark (BM) as the MLP midstream segment is rather specific. Corporate midstream firms are no appropriate benchmark as performance comparisons between MLPs and corporates changes significantly during periods of growth (Kendall and Rogers, 2017). Using existing MLP indices, such as the MLP Alerian Index, also provides no correct alternative as the composition of this index changes significantly over time and has non-midstream MLPs in its composite.

4.3. Construction of independent variables

Following Ciccotello and Muscarella (2001), a dummy variable is used to indicate presence of IDRs. Moreover, a dummy variable indicating if the high splits are reached is included. This is of value as presence of IDRs alone does not provide evidence that management pursues maximizing income from IDRs. Therefore, the high splits dummy is the default covariate included unless stated otherwise[40]. The IDR dummy is reintroduced in section 5.4. as a robustness check.

Exposure towards asset dropdowns is quantified by dividing the dollar amount of goodwill that is on the balance sheet in period *t* by the book value of total assets in period *t.* The construction of this ratio allows for a fair comparison between firms. This definition is validated in section 2.4.

Reliance on equity capital markets is constructed by dividing the number of net outstanding shares in period *t* by the number of shares in period t_{-1}. Likewise, tapping into debt capital markets is calculated by dividing the total amount of interest-bearing debt in period *t* by the total amount prior to period *t.* In addition to controlling for reliance on capital markets, both covariates implicitly control for the level of accessibility as firms with better, or cheaper, access are more likely to deflect to external sources.

Various operating performance metrics are put forth by existing literature, which may act as control variables to the presented model (Ciccotello and Muscarella, 1997 & 2001; Kendall and Rogers, 2017). Examples of such metrics are leverage[41], realized EBITDA margin as a proxy for profitability, and the log of total assets as a proxy for firm size. Given that exposure towards debt capital markets is already included in the model, leverage is omitted as an additional operating variable. To account for the fact that firms may have different asset structures[42], the natural logarithm of quarterly sales is used to define firm size. EBITDA margin is also included as an independent variable.

[40] A value of "1" signifies either presence of IDRs or achieving the high splits versus a "0" otherwise
[41] Most commonly calculated as total interest-bearing debt divided by total assets
[42] Resulting from dropdowns and/or sale-and-leaseback transactions

4.4. Broad panel analysis

This section presents the methodology used for the testing of the first hypothesis. Repeated measurements at multiple points in time on the same MLP are examined, also referred to as longitudinal or panel data (Kennedy, 2008). The panel regression thus captures both variation over time, or time-series dimensions, and over units, or cross-sectional dimensions (in this case MLPs) which may or may not be observable and thus accounts for individual heterogeneity (Hsiao et al., 1993). Brooks (2014) argues that the structuring of a dataset into a panel allows for more complex datasets to be analyzed and tested. Baltagi (2005) adds that panel data brings lower risk of collinearity between variables.

For this panel data, there are missing values as companies may have only become public and/or have been acquired. Therefore, the number of time periods T is not the same for all i ($T_i \neq T$ for some i), causing the panel dataset to be unbalanced. Stata is able to handle both unbalanced and balanced panel data. Hence, this is considered not to be an issue (Cameron and Trivedi, 2010). Little (1988) and Cheng (2013) provide more information on how to test whether the underlying reason for missing observations is random and how to handle this.

Finally, firms with less than 25 observations are excluded from the analysis, resulting in a sample of 35 panels. Raising this threshold leads to a vast decrease of the number of firms. Observations after September 2014 are omitted from this analysis as the downturn potentially (partly) offsets causality encountered before. As explained in section 1.2., observations prior to 2005 are excluded.

4.4.1. Diagnostic and panel data model selection tests

Presence of non-stationarity and heteroscedasticity are to be controlled for prior to any panel model specification test[43]. A times-series variable is stationary when it does not alternate over time or follows a trend and reverts to a set variance and mean. Hill et al. (2008) stresses that regression results from using non-stationary time-series may lead to the problem of spurious regressions where the results indicate a statistically significant relationship between variables, while in fact, they are unrelated to the non-stationary series. Stationary time-series variables are said to contain no "*unit root*" and require no further action. If present, the problem of non-stationarity can be resolved by including a lag of the variable containing the unit root. This panel analysis uses the Fisher Dickey-Fuller test to detect presence of non-stationary time series. This is an extension of the Augmented Dickey-Fuller test and is particularly focused on unbalanced and heterogeneous panels as it is robust to cross-sectional dependence and allows for gaps to be present in the dataset (Maddala and Shaowen, 1999). The null hypothesis is that all panels contain a unit root versus the alternative that not all panels contain a unit root. In other words, this test is complementary but not conclusive, as rejecting the null hypothesis does not rule out non-stationarity per se.

[43] To decide between a fixed effects (FE), random effects (RE), or pooled OLS model

In order to purge potential serial correlation and prevent the Fisher unit root test from being affected, lags of the tested variable may be included to the test[44]. Ng and Perron (1995) emphasize that including too many lags will lower the power of the test. According to Khim and Liew (2004), the Akaike Information Criterion (AIC) and Final Predition Error (FPE) are more appropriate for samples with observations below 60. As such, if a contradictory number of lags is suggested among the information criteria, more weight is attached to the AIC and FPE statistic. The Fisher test also allows to control for whether or not variable *x* contains a time trend. Table 4 provides an overview for the number of lags that have been included in the unit root test and whether or not each variable indicates presence of time trend behavior. If the null hypothesis is not rejected for a tested variable, a lag of the tested variable is added as a covariate immediately. If the null hypothesis is rejected, the Fisher test is not conclusive and a lag may still be added based on a visual diagnosis of each variable plotted over time[45].

Table 4: Fisher unit root test

For the covariates, a lagged version of goodwill, EBITDA margin, and the natural logarithm of sales is added to the model as these variables contain a unit root. Absence of a unit root for the percentage growth in NOSH and total interest-bearing debt stems from the fact that these variables are constructed as first-differences and thus display no time trend per definition. Also, the dummies contain no unit root as neither the mean, nor the variance are defined. Whether or not a lagged version of the relative dividend yield needs to be included as an independent variable depends on if there is serial correlation present in the model as shown in table 8.

Variables	Lags included for unit root test	Visual inspection for time trend	P-value	Unit root
Relative dividend yield	4	YES	0.2762	YES
Relative total return	0	NO	0.0000	NO
% growth in NOSH	0	NO	0.0000	NO
% growth in debt	1	NO	0.0000	NO
IDR (dummy)	n.a.	n.a.	n.a.	NO
High splits (dummy)	n.a.	n.a.	n.a.	NO
Goodwill	1	YES	0.0063	YES
EBITDA margin	0	YES	0.0000	YES
Ln(sales)	1	YES	0.0000	YES

Subsequently, it is determined if the residuals have an equal standard deviation across all values of x_i. The Modified Wald test for groupwise heteroscedasticity is used for the fixed effects (FE) approach, while for the random effects (RE) setup the Lagrange Multiplier (LM) test for groupwise heteroscedasticity is used. As the number of firms is finite, the inverse Chi-squared test statistic is applicable for both tests (Choi, 2001). Table 5 shows that presence of heteroscedasticity is present in all configurations. Hence, robust standard errors are included, which are also clustered per panel as not all observations are independent, robust to within-panel serial correlation, and robust to cross-sectional

[44] The appropriate number of lags is determined on the basis of four Information Criteria: 1) the Final Predictor Error 2) Akaike's Information Criterion 3) the Hannan and Quinn Information Criterion 4) Schwarz's Bayesian Information Criterion

[45] Graph a) and b) of appendix 9.5. illustrate two variables plotted over time per panel, exemplifying a time series which is stationary around a constant versus a variable where a clear trend is visible

heteroscedasticity (Arellano, 1987). If not corrected for, heteroscedastic standard errors may bias the estimators.

Table 5: Modified Wald and Lagrange Multiplier test for groupwise heteroscedasticity
Both tests indicate presence of heteroscedasticity. Hence, a robust version of the Hausman test is implemented next as clustered robust standard errors need to be included.

Test for groupwise heteroscedasticity	$\chi 2$	P-value	Heteroscedasticity
Relative dividend yield as dependent var:			
Modified Wald test for FE model	1870.74	0.0000	YES
Lagrange Multiplier (LM) test for RE model	1782.78	0.0000	YES
Relative total return as dependent var:			
Modified Wald test for FE model	338.89	0.0000	YES
Lagrange Multiplier (LM) test for RE model	1642.92	0.0000	YES

As the model now controls for non-stationarity and heteroscedasticity, the next step is to specify the correct panel model. Three types of panel models exist: the fixed effects (FE) model, the random effects (RE) model, and pooled or population-averaged OLS model (Bell and Jones, 2015). Consider the following formulation of a FE model:

$$Y_{it} = \alpha_{it} + \beta_1 x_{it} + \beta_2 x_{it} + \ldots + \beta_i x_{it} + \varepsilon_{it} \qquad (3)$$

Where a pooled OLS regression and RE model assume the slope coefficients and the intercept to be constant over time and the firms and error terms to capture the differences over firms and over time, the FE model assumes each firm to have its own intercept as displayed by the constant term α_{it}. Assuming not all cross-sectional (firm) differences are reflected by the independent variables included in the analysis, disturbances may be related to any of the regressors, have dissimilar variances, and could be related to each other (Greene, 2011). Hence, OLS assumptions on exogeneity, homoscedasticity, and non-autocorrelation may be violated. This becomes more obvious when rewriting the error term as follows:

$$\varepsilon_{it} = \omega_i + u_{it} \qquad (4)$$

As denoted by formula 4, the error term consists of two components. ω_i is a part of the error term that only takes cross-sectional differences into account, while u_{it} captures both cross-sectional and time-series changes. According to Wooldridge (2002), ω_i is a parameter that must only be estimated if it is a non-random variable, meaning that any unobserved effects captured by ω_i and the observed explanatory variables are correlated ($Cov\ (\omega_i, x_{it}) \neq 0$). In this case the FE model is appropriate as individual specific effects are time invariant and considered to be part of the intercept. If zero correlation is found, or $Cov\ (\omega_i, x_{it}) = 0$, the RE or pooled OLS model is more applicable as cross-sectional

differences stem from the specific errors and not the intercepts. In this case, ω_i is a component of the error term.

There are various tests for determining the correct panel model. The first step is to decide whether a RE or FE model is preferred by performing a robust Hausman test[46]. The null hypothesis states that there is no correlation between ω_i and x_{it} implying the RE model is appropriate, while the alternative hypothesis acknowledges existence of such correlation. If no correlation is found, then both RE and FE models are consistent but the RE model is preferred as the FE model is inefficient (Brooks, 2014). If a correlation is found, the RE model is inconsistent as variation across the dependent variables is non-random. The results indicate a FE model to be appropriate as the unobserved effects and independent variables of the model are correlated.

Table 6: Robust Hausman test for model specification (FE versus RE)

Fixed versus Random effects	Sargan-Hansen statistic	P-value	FE / RE preferred
Relative dividend yield as dependent var:			
Test of overidentifying restrictions	20.391	0.0156	FE
Relative total return as dependent var:			
Test of overidentifying restrictions	33.182	0.0001	FE

A Wald test is performed on included time dummies to determine if time fixed effects have a significant impact on relative performance and need to be added to the FE model. Table 7 shows that the null hypothesis is rejected. Hence, quarter fixed effects are included.

Table 7: Wald test on inclusion of (quarterly) time fixed effects

Test on inclusion of time fixed effects	F-statistic	P-value	Dummies for all quarters equal to zero
Relative dividend yield as dependent var:			
Wald test on time fixed effects	35.77	0.0000	NO
Relative total return as dependent var:			
Wald test on time fixed effects	191.17	0.0000	NO

The final question that remains to be answered is whether serial correlation is present in the model. If present, a lagged dependent variable is included in the model as an independent variable, transforming the previously static panel data model into a *"dynamic"* model. From a theoretical standpoint, including a lagged explainable variable as a covariate makes sense if the current value is influenced by past values. It introduces historical path dependency into the model as the lagged dependent variable includes all time paths of the covariates. If this is the case, excluding a lag leads to omitted variable bias. Dividend yield is heavily reliant on its past value, particularly for MLPs, due to the yield-oriented nature of the

[46] The default Hausman test assumes conditional homoscedasticity

structure. According to Leman et al. (2017), investors have a near complete disregard for any other (valuation) metrics apart from dividend yield. Hence, management actively tries to prevent dividend cuts as this is most likely to be punished harshly by investors. At the same time, as near 100 percent of available cash is typically distributed, large jumps in yield are unusual for MLPs. The same arguments may hold for relative total return due to its yield component.

From a statistical standpoint, the need to include a lag can be verified through testing for the presence of serial correlation in the model. This is done by means of Pesaran's test of cross-sectional independence. A potential downside from including a lagged dependent variable is that it may reduce the significance of the other independent variables and overall variance of the model (Nickell, 1981). However, I argue that the theoretical arguments in favor of a dynamic panel data model are decisive.

Table 8: Pesaran's test of cross-sectional independence

Pesaran's CD test is particularly focused on panel with a relatively large *N* and small *t,* which is the case in this model with $N = 35$ and $t = 39$ at most (average of 34 quarterly observations per firm). Under the null hypothesis it is assumed that u_{it} is identically distributed and independent across time-series and cross-sectional dimensions.

Serial correlation test	CD statistic	P-value	Cross-sectional independence
Relative dividend yield as dependent var:			
Pesaran's test of cross-sectional independence	-2.232	0.0256	NO
Relative total return as dependent var:			
Pesaran's test of cross-sectional independence	-3.303	0.0010	NO

As expected, Pesaran's CD test indicates presence of serial autocorrelation for both models. Hence, the models are transformed to a dynamic setup. This dynamic setup is also referred to as the Arellano-Bond dynamic panel-data estimation.

4.4.2. Panel data regressions

Taking into consideration all diagnostic and model specification tests leads to the following dynamic FE model:

$$Relative\ performance_{dvdy} = \qquad (5)$$

$$\beta_0 + \beta_1 Rdvdy_{i,t-1} + \beta_2 Gnosh_{i,t} + \beta_3 Gdebt_{i,t} + \beta_4 Highsplits_{i,t} + \beta_5 Goodwill_{i,t} + \beta_6 Goodwill_{i,t-1} + \beta_7 EBITDAmargin_{i,t} + \beta_8 EBITDAmargin_{i,t-1} + \beta_9 Ln(sales)_{i,t} + \beta_{10} Ln(sales)_{i,t-1} + i.Quarter + vce(cluster\ company_t)$$

$$Relative\ performance_{totreturn} = \qquad (6)$$

$$\beta_0 + \beta_1 Rtotreturn_{i,t-1} + \beta_2 Gnosh_{i,t} + \beta_3 Gdebt_{i,t} + \beta_4 Highsplits_{i,t} + \beta_5 Goodwill_{i,t} + \beta_6 Goodwill_{i,t-1} + \beta_7 EBITDAmargin_{i,t} + \beta_8 EBITDAmargin_{i,t-1} + \beta_9 Ln(sales)_{i,t} + \beta_{10} Ln(sales)_{i,t-1} + i.Quarter + vce(cluster\ company_t)$$

This setup acts as a base model and may be altered for the sake of various robustness checks performed in section 5.4.

4.5. Chow test for known structural breaks

To test if the impact of the variables of interest on relative performance has changed after the crisis, two panel data regressions are constructed by duplicating the steps provided in section 4.4. Comparing coefficients separately and jointly per model for non-overlapping samples by means of the "*Chow test*" enables to test if there is a change in behavior under the assumption that the breakpoint is known (Chow, 1960; Lee, 2008). The main difference with a t-test is that a t-test fails to consider the impact other regressors may have (McDowell, 2019). If a change in behavior is present, the data poses a structural break. As such, the Chow test is often used as a check for whether the pooling of data is justified as changing behavior may bring forth an offsetting effect. This concern drives the installed cutoff point at the start of the MLP downturn for the broad panel analysis described in section 4.4.

The 2015 downturn is assumed to have taken place between 30 September 2014 and 30 September 2015, as this 12-month period presents the largest relative underperformance for the midstream MLP segment compared to the S&P500[47]. To enable a comparison on firm level, observations of examined firms are required to be present both before and after the crisis. The maximum number of potentially available observations differs among the two time frames as the crash occurred recently[48]. An initial threshold of 25 firm observations before and 12 observations after the crash is enforced. The cutoff point is assumed to be equal to the start of the crash (30 September 2014). The rationale for this assumption is twofold. First, this approach yields a larger number of firm observations after the crash than a later date would provide. More specifically, this threshold yields an average of 35 / 16 quarterly observations before / after the crash over the 22 panels that are present in the sample[49]. Second, using non-parametric techniques that allow to test for unknown structural breaks in panel data brings significant complexities[50]. Before it is tested if the assumed cutoff is valid, meaning the estimated regression coefficients indeed are jointly unequal for the different samples, the panel models are established for both samples.

Two immediate issues are encountered with this approach. The combined requirement of firm observations to be present in both times frames leaves a small sample. This problem can't be solved and is one of the pitfalls of researching a recent event. Also, this approach is prone to survivorship bias

[47] As illustrated by table 2 of section 1.1.

[48] A maximum of 39 pre-crash observations between March 31, 2005 and September 30, 2014 versus 16 observation between 31 December, 2014 and 30 September, 2018. For this sample, all firms in the after-crash sample have 16 observations

[49] This differs substantially from the panel data sample presented in section 4.4., which has 35 panels with an average of 34 observations per panel over the pre-crisis period

[50] Older versions of Stata provide the ability to test for unknown structural breaks. However, these versions are outdated and are preferably not used. Preselecting a cut-off point omits such difficulties

as any firm that did meet the set threshold for the minimum number of observations before but not after the crash have been omitted from the analysis. Appendix 9.6. provides a visual representation of the repercussions the set requirements have on average sample characteristics.

4.5.1. Diagnostic and panel data model selection tests

Results of tests that have been exemplified extensively in the section 4.4. can be found in appendix 9.7. for the Chow sample without further annotation. Only the methodologic approach used for the Chow test is discussed in the next sub-section. The deviating sample structure does not affect any of the outcomes of the diagnostic and sample selection tests. This further substantiates the validity of the preset cutoff of 30 September 2014 for the broad panel analysis if a structural break is found.

4.5.2. Chow test

The default Chow test is not able to handle data structured in panels and can only be used for linear regressions. To circumvent this problem, I manually reconstruct the dynamic FE panel models by creating firm and time dummies, and demeaning all variables per panel. Traditional Chow tests also do not support the implementation of robust standard errors (Toyoda, 1974). As heteroscedasticity is present, clustered robust standard errors are required. Therefore, technically speaking Stata performs a Wald test. Still, the implications and interpretation are identical. Four regressions are run with dividend yield and total return as dependent variables, both before and after the crash. Only models with the same dependent variable are tested for the equality of regression coefficients. In section 5.3., all regressors are tested jointly to confirm if September 2014 poses a structural break and the panel analyses are discussed. Section 5.4. tests whether data can be pooled together per covariate as a robustness check.

5. Results

This chapter presents the empirical results of the analyses described in chapter 4. First, the results from the broad panel data analysis are discussed and the first hypothesis is tested. The second section examines the panel data regression output on the Chow sample and answers the second up to and including the fifth hypothesis. In the third section, checks are performed to address the robustness of the presented results. Appendix 9.10. provides a descriptive analysis of the constructed samples. Studying differences in composition is of importance as neglecting differences in characteristics between samples may cause an incorrect interpretation and comparison of the results.

5.1. Broad panel analysis

Table 9 reports the results of the estimates using the broad sample.

Table 9: Pre-crash broad panel analysis

This table depicts the effect each of the listed covariates have on either relative dividend yield or total returns. Data sources and definitions of variables are as described in the text. Coefficients of the constants have no trivial interpretation. Heteroscedasticity-consistent standard errors are used to calculate significance and are included in parenthesis.

	(1) Dividend yield	(2) Total return
Lagged dividend yield	0.561***	
	(0.044)	
Lagged total return		0.022
		(0.038)
QoQ growth units outstanding	-0.050***	-0.110*
	(0.008)	*(0.057)*
QoQ growth debt oustanding	0.006**	0.017
	(0.003)	*(0.020)*
High splits	0.006**	-0.002
	(0.003)	*(0.011)*
Goodwill	-0.042**	-0.259*
	(0.019)	*(0.135)*
Lagged goodwill	0.044	0.089
	(0.036)	*(0.135)*
EBITDA margin	0.009	-0.024
	(0.012)	*(0.045)*
Lagged EBITDA margin	0.018	0.048
	(0.015)	*(0.049)*
Ln(sales)	0.002	0.036**
	(0.002)	*(0.014)*
Lagged ln(sales)	0.000	-0.019
	(0.002)	*(0.012)*
Constant	-0.012	-0.134**
	(0.013)	*(0.051)*
Observations	1,176	1,176
Number of companies	35	35
R^2	0.444	0.043
Adj. R^2	0.421	0.004
Time FE	Yes	Yes

*Notes: *Significant at 10%, **significant at 5%, ***significant at 1%*

Robust standard errors in parentheses

At the top of each column, the designated dependent variable is specified. Hence, regression (1) illustrates the effect of the listed independent variables on dividend yield relative to the benchmark, while regression (2) uses relative total return as the explainable variable.

Clustered robust standard errors to counter presence of heteroscedasticity and time fixed effects are included for both regressions. Furthermore, table 9 displays a notable gap in R^2 and adjusted R^2 coexisting between the relative dividend yield and total return model[51]. The much higher goodness-of-fit for the first regressions appears to stem from the lagged dividend yield covariate. However, it is important to acknowledge that, customarily, panel models exhibit lower values for both statistical measures than for time series as panel models rely more on heterogeneity among cross-sections. Hence, interpretation of the R^2 is less obvious.

Visually inspecting the output for regression (1) shows that the relative dividend yield in period *t* is highly dependent on the realized dividend yield of the previous quarter. Once outperformance is realized, this is likely to be sustained. The theoretical explanation for this phenomenon is that MLPs have limited ability to drastically increase their yield as approximately all available cash is distributed already. Moreover, MLPs are anxious to cut distributions as this is generally punished harshly by the yield-oriented investor base. The notable economic and statistical significance of the coefficient hints that prior to the 2015 downturn, financial markets used previous yield levels as guidance with the risk of showing little interest in the quality and sustainability of the underlying business. This is not at all the case for the total return dependent and independent variables in the second estimation due to the high volatility of the share price component.

5.1.1. Testing of the first hypothesis

For growth in units outstanding, a significant negative impact on relative dividend yield is found, while its debt counterpart has a significant positive impact. Given that cash distributions are generally funded though operating activities, access to (affordable) capital is seen as a positive as it allows to fund growth and may act as a safety net by preventing a distribution cut in case cash generating activities do not suffice. The small positive and significant coefficient on quarterly growth in total-interest bearing debt is in line with this evaluation. This, however, is not the case for the coefficient measuring exposure to equity capital markets. Section 5.4. includes a robustness check that tests whether indeed different conclusions need to be drawn regarding raising debt and equity capital, or that the negative coefficient is the mere representation of the dilutive impact offering units in period *t* has on the dividend yield in period *t.* The latter appears to be true. Table d) of appendix 9.9. displays the constructed "*lagged QoQ growth in units outstanding*" covariate, which is constructed as an attempt to control for the initial dilutive effect. This yields a positive coefficient for the dividend yield model of 0.014 significant at the

[51] The default R^2 increases as more covariates are added, even if the added covariate is nonsensical. The adjusted R^2 corrects for this

10% level. Additionally, the larger negative coefficient of the quarterly growth in units outstanding for model (2) hints that this conjecture is probable, as a secondary equity offering has a larger dilutive effect on total returns due to the included share price component. In consequence, reliance on external capital markets has a marginal positive and significant impact on relative performance expressed as dividend yield after controlling for the initial dilutive impact of issuing equity. There appears to be no significant effect of either debt or lagged equity issuances on relative total returns.

As stated in section 4.3., the high splits dummy provides information on the intensity of management's pursuance of reaching the highest tier. The fraction of firms that is in the high splits is substantially lower than the fraction of firms that have IDRs in place, but are not in the highest tier[52]. Model (1) confirms that prior to the crash, which sparked financial markets to critically review the drawbacks of IDRs, reaching the high splits led to outperformance expressed as dividend yield. No significant impact is found for model (2). The increasing inflationary effect on the cost of capital as the high splits are reached may cause to dampen the significant impact found in model (1), as this potentially affects the firm's growth opportunities.

The coefficient for goodwill is significant and negative for both models, with a 1% increase in goodwill as a percentage of total assets negatively affecting relative performance for regression (1) and (2) by 0.042% and 0.259%, respectively. As discussed in section 2.4., it is inevitable for midstream MLPs to acquire an infrastructure asset at a premium to book value, as the structure's main justification for existence is its ability to boost an asset's valuation when placed in the tax-advantaged entity. Likewise, as a sponsor has no fiduciary duty to the LPs, maximizing the gain on sale of an asset is self-serving. This is the case for selling an owned infrastructure asset to either its own MLP, where the sponsor acts as both the seller and the buyer, or to another MLP. While I expected that MLPs that actively engage in acquiring other assets to support growth would outperform during the inspected period, the results suggest otherwise. Table 9 indicates that actively buying growth does not contribute to outperforming the benchmark for this sample.

The control variables for firm size and profitability appear to have no significant impact on relative performance expressed by dividend yield, versus a positive significant coefficient of 0.036 on firm size for the total return model. Intuitively, it seems odd that the EBITDA margin has no significant impact on relative performance, given the cash-oriented nature of MLPs. A probable interpretation is that this is evidence in favor of the argument that investors were fixated on yield during this period. Notwithstanding, considering that MLPs usually disclose an adjusted form of EBITDA, the current approach of using unadjusted EBITDA possibly undermines a correct causal relationship.

Concluding, the first hypothesis is rejected as exposure towards dropdown transactions has a negative and significant impact on relative firm performance prior to the MLP market crash. For model (1), both

[52] Appendix 9.6. table e) and f)

reaching the high splits and quarter-on-quarter growth of total interest-bearing debt outstanding have a positive and significant impact. Quarterly growth in units outstanding appears to have a negative impact at first sight, but the robustness test on this covariate indicates that equity offerings also have a small positive effect after adjusting for the initial dilutive impact. EBITDA margin does not affect relative performance, while firm size has a significant impact only on relative total return. Hence, relative total return is only affected by goodwill and firm size after controlling for the inceptive dilutive impact of issuing units[53].

5.2. Chow test for known structural breaks

This section aims to first identify whether the Chow dataset indicates presence of a structural break during September, 2014. Hereafter, the results of the panel analyses performed before and after the crash are discussed.

Table 10: Chow test for known structural breaks per model

Test for checking if the pooling of data is justified for two different regressions estimated on the same set of cross sections over different time periods. The null hypothesis is that the joint coefficients are the same, versus the alternative hypothesis that there is a significant difference in behavior per group.

	χ^2	P-value
Dividend yield:		
High splits	26.79	0.0008
IDR	24.35	0.0020
Total return:		
High splits	44.68	0.0000
IDR	56.52	0.0000

Table 10 provides convincing evidence that there is a change in behavior for each model and configuration, as the null hypothesis is strongly rejected in all instances. While this procedure confirms September 2014 to be a valid cutoff point, it doesn't alienate the possibility of other points in time providing a similar conclusion as this test is incapable of testing for structural breaks with unknown dates. However, as explained in section 4.5., assumptions underlying the known and now validated cutoff date rests on a quantitative argument (largest annual underperformance between Sep-14 and Sep-15 relative to the S&P500) and supports a larger number of observations to be present in the post-crisis sample than would be the case if a later date was selected. The current setup results in an average of ~16 post-crisis observations per firm as displayed by table 11. The average number of observations per panel is slightly higher pre-crash compared to the broad panel sample[54]. All firms included in the Chow sample are also in the broad panel sample. For a list of included firms per sample, please view appendix 9.8.

[53] Appendix 9.9. table d)

[54] For the broad panel sample, the average number of observations per panel is 1,176/35 = 33.6 versus 745/22 = 33.9 for the Chow sample

Table 11: Panel data analyses before and after the 2015 downturn

The used dependent variable is stated at the top of each regression. The same model is run with the IDR control variable instead of high splits as a robustness check in section 5.4. Data sources and definitions of variables are as described in the text. Coefficients of the constants can be neglected as these coefficients have no trivial interpretation. Heteroscedasticity-consistent standard errors are used to calculate significance and are included in parenthesis.

	(1)	(2)	(3)	(4)
	Before	After	Before	After
	Dividend yield	Dividend yield	Total return	Total return
Lagged dividend yield	0.541***	0.318**		
	(0.086)	*(0.143)*		
Lagged total return			0.022	-0.001
			(0.049)	*(0.086)*
QoQ growth units outstanding	-0.051***	0.003	-0.150*	0.003
	(0.011)	*(0.031)*	*(0.085)*	*(0.101)*
QoQ growth debt oustanding	0.001	-0.017**	0.016	0.024
	(0.003)	*(0.007)*	*(0.020)*	*(0.047)*
High splits	0.009*	0.008***	-0.013	-0.033**
	(0.004)	*(0.003)*	*(0.014)*	*(0.013)*
Goodwill	0.008	-0.113	-0.267	0.614
	(0.020)	*(0.092)*	*(0.234)*	*(0.541)*
Lagged goodwill	0.008	0.047	0.208	-1.032**
	(0.020)	*(0.099)*	*(0.191)*	*(0.431)*
EBITDA margin	0.019**	0.020	-0.014	0.069
	(0.008)	*(0.012)*	*(0.070)*	*(0.080)*
Lagged EBITDA margin	-0.018**	-0.026	0.126	-0.091
	(0.007)	*(0.026)*	*(0.077)*	*(0.084)*
Ln(sales)	-0.001	-0.010	0.007	0.034
	(0.003)	*(0.009)*	*(0.016)*	*(0.047)*
Lagged ln(sales)	0.002	-0.004	-0.008	-0.018
	(0.002)	*(0.003)*	*(0.016)*	*(0.030)*
Constant	0.007*	-0.004	0.034*	0.078***
	(0.004)	*(0.005)*	*(0.017)*	*(0.022)*
Observations	745	348	745	348
Number of companies	22	22	22	22
R^2	0.509	0.456	0.077	0.147
Adj. R^2	0.461	0.377	-0.013	0.023
Time FE	Yes	Yes	Yes	Yes

Notes: *Significant at 10%, **significant at 5%, ***significant at 1%

Robust standard errors in parentheses

For the regressions with relative dividend yield as the dependent variable, the coefficient on the lagged relative dividend yield has dropped substantially in magnitude and significance after the crash. It appears that maintaining a certain yield has become less self-explanatory, suggesting that firms are forced to critically review the level of sustainability of cash distributions. For lagged total returns little changes as the coefficients remain insignificant.

5.2.1. Testing of the second hypothesis

Pre-crash, the coefficient on quarterly growth in units outstanding for the Chow sample (-0.051) is approximately equivalent to the coefficient estimated on the broad panel dataset. The coefficient turns insignificant after the crash for both model (2) and (4). Table c) of appendix 9.6. outlines a general

decrease in size of the average quarterly issuance of units between 2005 and 2018. This decrease may have a dampening effect on the estimated coefficient as this lowers the dilutive effect. Nevertheless, the results suggest that reliance on equity capital markets no longer drags on relative performance. As discussed in the previous section, table d) of appendix 9.9. displays a constructed proxy for the impact quarterly growth in units has after adjusted for dilutive effects. The table shows that for the dividend yield model, the coefficient remains constant at 0.015, but becomes insignificant after the crash compared to 5% significance before. There is no effect on total return. For quarter-on-quarter growth in outstanding debt, the impact on relative dividend yield turns negative and significant. For the total returns model, the debt coefficient remains insignificant. Concluding, the adjusted quarterly unit growth covariate influences relative dividend yield as expected, while no change in effect is found for estimates on total returns. Firms in need of debt capital tend to underperform post-crisis in terms of yield. As deleveraging became a general tendency for the MLP sector after the crisis, it seems rationally plausible that firms whom still issue debt are probably in a less healthy state financially, which results in less cash available for distributions. Evidence is found in support of the second hypothesis that the effect of reliance on capital markets has become less positive on relative performance, expressed as dividend yield.

5.2.2. Testing of the third hypothesis

For the control variable on high splits, little difference is found before and after the crisis in terms of magnitude on dividend yield. The level of significance does increase from the 10% to the 1% level. For the total return model, the coefficient on high splits changes from insignificant to significant and negative. This trend suggests a decreasing appetite for IDRs among investors as total return is now negatively impacted. Consequently, the results imply that the hypothesized negative moderation presence of IDRs and reaching of the high splits after the crash can be verified based on the total return estimates. Hence, the results are in line with the third hypothesis.

5.2.3. Testing of the fourth hypothesis

The goodwill coefficients show large swings before and after the market crash. Moreover, the results suggest opposing movements, with a positive to negative effect on dividend yield before and after the crash and a vice versa change on total return. Nevertheless, as neither covariate is significant, no inferences can be made based on these outcomes. The lagged goodwill control variable also has no significant effect on relative dividend yield. For the total returns model, there is a clear transition from having no effect on total return to having an economically and statistically significant effect, with a coefficient of -1.032 (significant at 5%). As such, the results suggest that larger exposure towards goodwill on the balance sheet leads to underperformance after the crash. This change is in conformity

with the conclusion drawn in the theoretical framework and remarks made in the descriptive analysis[55], that MLPs tend to reduce dropdown activity after the downturn to meet investors' awakened demand for pursuance of a more sustainable business model. Realizing growth by acquiring overpriced assets from a sponsor, funded by external capital, has become unpopular among investors. Hence, evidence is found in support of the fourth hypothesis. A potential reason as to why this trend is captured only by the lagged covariate might be the short-/long-term mismatch between the dependent and independent variable.

5.2.4. Testing of the fifth hypothesis

Table 11 shows that the positive coefficient on EBITDA in the dividend yield model becomes insignificant after the crash. Furthermore, the negative lagged EBITDA margin covariate becomes insignificant after the crash. While it may seem illogical that the realized EBITDA margin of the previous period has a negative impact on this period's dividend yield, a possible explanation is that improved profitability boosts future valuation and thus lowers future dividend yield. There is no other significant impact on any of the profitability or firm size covariates, meaning that the fifth hypothesis is rejected as no coefficients have a more pronounced effect on relative performance after the 2015 downturn.

5.3. Robustness checks

This section performs a total of six robustness checks, consisting of three alterations to explore whether the novel evidence presented is robust to adjustments and three supplementary tests to check the validity of the models' setup. Appendix 9.7. presents the results from the fourth and fifth robustness check performed on the Chow sample.

For the first robustness check, only the covariates controlling for high splits, exposure towards dropdown activity, and reliance on external capital markets are included in the broad panel model. Furthermore, time fixed effects may or may not be included as displayed by table a) of appendix 9.9. Rearranging models' compositions allows to analyze to what extend the broad panel results are robust to alterations. Based on the similar coefficients of the robustness check and overall results of the estimations, there is no reason to question the plausibility of the conclusions drawn in section 5.2.

Second, the dummy for high splits used in all estimations so far is exchanged for the IDR dummy mentioned in section 4.3. This allows to test whether the strong reduction in IDRs in place has affected relative performance. Furthermore, this modification checks if changing one of the variables of interest alters any of the conclusions previously drawn. Table b) and c) of appendix 9.9. present the estimation results on the broad and Chow samples. For the pre-crisis broad sample, presence of IDRs has no significant effect on relative performance for both models. The suggested insignificancy may be the

[55] Appendix 9.10.

result of the IDR dummy in itself revealing little insight on to what extend the incentive scheme is actually being used. Another reason for the found insignificancy may be the high adoption rate of IDRs among firms in the broad panel sample. While the percentage of firms that have IDRs in place decreases over the 2005 – 2014 period, it stabilizes at an adoption rate of approximately 75%[56]. Subsequently, table c) illustrates that for the Chow sample the IDR dummy also has no significant effect on relative dividend yield. For the total returns model, there is a substantial change visible. The results provide evidence that post-crisis, presence of IDRs reduces the relative total return by 9.1%. Including the IDR dummy has a negligible impact on other coefficients.

Third, a lagged quarter-on-quarter growth in units outstanding covariate is added to each model. This modification aims to test whether or not the found negative coefficient on the unit growth covariate is an exclusive representation of its initial dilutive impact. The inclusion of the lagged variable is an attempt to filter out dilutive effects and examine if, for example, MLPs that issue equity are identified as financially less stable, which may affect relative performance. This check is relevant as raising equity is more of an integrated part of the MLP business model than for C-Corporations. As illustrated by table d) of appendix 9.9., the coefficients on the incremental lagged covariates have become either positive and significant or insignificant for the broad panel model. For the Chow sample, all previously negative and significant coefficients are now also positive or insignificant. Concluding, this robustness check indicates that, after adjusting for dilution, equity offerings have a slight positive contribution to relative dividend yield prior to the downturn. Such contribution is non-existent hereafter. There is no significant effect on relative total return.

Fourth, a Wald test is performed on the broad sample to test if the firm dummies jointly have an impact on the dependent variable that is greater than zero as this provides guidance on whether a FE or pooled OLS model is preferred. If the null hypothesis is rejected, this means poolability is rejected and the FE model is more suitable. The results of table 12 provide evidence in favor of the models' FE setup.

Table 12: Wald test output (FE versus Pooled OLS)

For the Wald test, the null hypothesis is that coefficients for all firm dummies are jointly equal to zero. As clustered standard errors are included, Stata is unable to test for a panel-wise effect by means of a F-test because it is too complex to compute. The results reject the null hypothesis, preferring a FE setup.

FE versus POLS	F-statistic	P-value	Dummies for all firms equal to zero
Relative dividend yield as dependent var:			
Wald test on firm fixed effects	477.99	0.0000	NO
Relative total return as dependent var:			
Wald test on firm fixed effects	253.32	0.0000	NO

[56] Graph f) of appendix 9.6.

Fifth, the Arellano-Bond test for serial correlation in the first-differenced errors is performed to verify that the implemented dynamic model indeed can be used. Furthermore, the test determines the right lag structure for the lagged explainable variable within the FE model (e.g. including Y_{t-1} or Y_{t-2}). It uses the second, third or other attainable lag of the y-variable as an instrument to test if the inclusion of the first lag brings endogeneity problems (Giovanni, 2005).

Table 13: Pesaran's test of cross-sectional independence

Arellano-Bond test	Order	Z-value	P-value	Autocorrelation
Relative dividend yield as dependent var:	1	-4.2898	0.0000	YES
	2	-0.09064	0.9278	NO
Relative total return as dependent var:	1	-5.1115	0.0000	YES
	2	-1.8879	0.0590	NO

Following Pinzon (2015), the results (autocorrelation of order 1, no autocorrelation of order 2) suggest that the Arellano-Bond assumptions are satisfied and that this structure can be used for both models. Including a single-period lagged dependent variable (Y_{t-1}) suffices. This supplementary diagnostic test provides evidence that indeed a dynamic FE panel model is most suitable.

The final robustness check tests whether there are structural breaks to be found on a per-covariate level when assuming the same cut-off point of September 2014. Table e) of appendix 9.9. present proof that this indeed is the case. For the relative dividend yield model, structural breaks are present for both the quarterly growth in debt covariate and the constant term. For the relative total returns model, there are structural breaks for both the lagged goodwill and lagged EBITDA margin covariate. These findings further support the findings of table 10 presented in section 5.2.

6. Conclusion & limitations

6.1. Conclusion

This thesis aims to challenge the discrepancy between the historically high-yielding and "safe-harbor" reputation of midstream energy infrastructure MLPs. During the 12-month period starting in September 2014, over a third of the total market value of the midstream MLP sector evaporated. While losses of similar magnitude were encountered during the Great Recession, its performance relative to the S&P500 (-36%) showed that the 2015 crash was limited to the MLP asset class. The specific nature of the downturn insinuates that the mechanisms underlying the sector turmoil are idiosyncratic to the MLP structure. Existing literature has identified three differentiating areas to the C-Corporation, namely i) the ownership structure, ii) the economic structure, and iii) the governance structure. After examining each attribute, the conclusion was drawn that there is one common denominator: each structural area, on a standalone basis or combined, enables conflicts of interest to be present between management (GP and sponsor) and the common unitholders. Three variables regarding reliance on capital markets (quarter-on-quarter growth of either units or total interest-bearing debt outstanding), presence and usage of IDRs (dummies), and exposure towards dropdown transactions (goodwill measured as a percentage of total assets), have been distilled from such idiosyncratic features. Proxies for profitability and firm size, defined by the EBITDA margin and natural logarithm of quarterly sales, have also been included as covariates. The constructed variables are linked to firm performance relative to the sector average expressed as either relative dividend yield or relative total return. If a significant negative effect is found, this implies conflicts of interest to be a valid source of risk.

The broad panel analysis solely consists of observations between June, 2005 and September, 2014. The hypothesized positive effect of the three covariates subject to conflicts of interest on relative firm performance is tested. Installing a threshold of at least 25 firm observations results in 35 panels with an average of approximately 34 observations per panel. For the regressions with relative dividend yield as the dependent variable, the results suggest that relative performance is heavily dependent on past relative performance. For the total returns model, no relationship is found between total return and past total returns resulting from the quarterly share price volatility. Furthermore, the first analysis rejects the assumption that dropdown transactions are portrayed as a sheer risk-free opportunity for MLPs as increasing dropdown exposure has a negative effect on relative performance. Access to capital markets, after adjusting for the initial dilutive impact of equity offerings, and reaching the high splits positively impact distribution yield as expected. These covariates have no significant effect on relative total return. An increase in firm size by 1% positively impacts relative total returns by 0.036%.

The second analysis uses stricter sample selection criteria, as firm observations are required both prior and post downturn. The resulting sample consisting of 22 firms, with an average of approximately 34 / 16 observations before / after the market crash. Performing a Chow test for known structural breaks

confirms that both the dividend yield and total return model behave differently after the downturn. The effect of the robust equity offerings covariate on relative dividend yield changes from slightly positive to insignificant, while the impact remains insignificant on total returns. The coefficient on debt capital turns negative in the dividend yield regressions. Hence, it seems that firms whom rely on debt after the crash are inclined to have less cash available for distributions. Other significant changes are the reversing impact from insignificant to significant and negative for the high splits and IDR dummy on total return. This implies that investor appetite has decreased for firms with IDRs and firms actively pursuing reaching the high splits. The coefficient on lagged goodwill in the total return model becomes significant, negative, and increases substantially in magnitude. As firms in the sample are still increasing in size, this suggests that investor preference for realizing organic growth opportunities has increased. There is no convincing evidence substantiating the hypothesized larger positive impact of profitability and firm size after the crash as there is only a change from positive and significant to insignificant of the coefficient on the EBITDA margin for the dividend yield model.

Concluding, the research question can be answered with a yes as conditional on the model, sample, and configuration used, significant negative effects on relative performance are encountered for all covariates of interest. Moreover, the results suggest a change in behavior due to the 2015 downturn. Hence, the evidence confirms that conflicts of interest are a legitimate source of risk.

6.2. Limitations and suggestions for further research

In this research, there are several limitations that call for additional mentioning. First, the implemented definition of firm performance is sub-optimal. This inadequacy stems from the fact that, due to the limited availability of data points, quarterly observations have been used as annual observations generate too small a sample size for performing quantitative analyses. Following from this, two definitions of firm performance are used as this i) provides a broader foundation of results for interpretation ii) allows to compare results and act as a sanity check. However, this solution is imperfect as dividend yield potentially fails to capture the underlying operating performance, while quarterly share price returns are prone to short-term investor sentiment. Additionally, linking firm characteristics that are longer-term of nature than quarterly share price returns is not ideal. Another limitation lies in the exclusion of anticipated distribution growth to the total return definition. As mentioned in section 2.2., existing literature provides empirical evidence for existence of an inverse relationship between MLP yield and 3-year forward estimated distribution growth. While one could argue that this is supposedly priced in to the stock price, this may not necessarily be the case. The rationale for omitting expected distribution growth from the empirical analyses is twofold. First, there is limited historical data available on distribution growth consensus that can be extracted immediately. Second, due to the limited time available for this research, handpicking data on growth as disclosed by management is non-viable. An additional problem with the latter approach is that, as is the case with all disclosed non-GAAP performance metrics, it is near impossible to trace all assumptions underlying the projected

growth rates. Hence, controlling for a fair comparison among firms with regard to such projections is challenging.

Second, while measures have been taken to increase sample sizes, sizes still are limited. Also, the composition of samples used for quantitative analyses are prone to selection and survivorship bias. As an attempt to minimize the influence from these biases, both a "*broad"* and *"Chow"* sample have been constructed. Appendix 9.8. emphasizes that this has only a limited impact as 63% of the broad sample consists of firms that are also present in the Chow sample, meaning that both samples are prone to presence of survivorship bias.

Third, the assumption on the validity of goodwill as a percentage of total assets as a suitable proxy for exposure towards dropdown activity may not be as strong. While several legitimate arguments have been made to support this rationale, GPs may be present in the sample whom are more concerned with the sustainability and financial health of the MLP it manages. This would allow dropdown activity without necessarily translating into goodwill on the balance sheet.

Fourth, I have not studied to what extend the commonly used non-GAAP performance metrics behave differently from the performance metrics used in this research. If substantial dissimilarities exist, this may lead to different conclusions in a comparable research using non-GAAP variables. The construction and credibility of disclosed non-GAAP metrics may be an interesting topic for further research. For example, Kaiser (2014) presents an overview of the disclosed maintenance CAPEX values of 31 MLPs, which indicates that most MLPs severely understate maintenance CAPEX to inflate DCF. Another interesting subject for further research is the change in investor mix and whether this has affected MLP performance in general and/or the correlation between commodity prices and midstream MLP performance.

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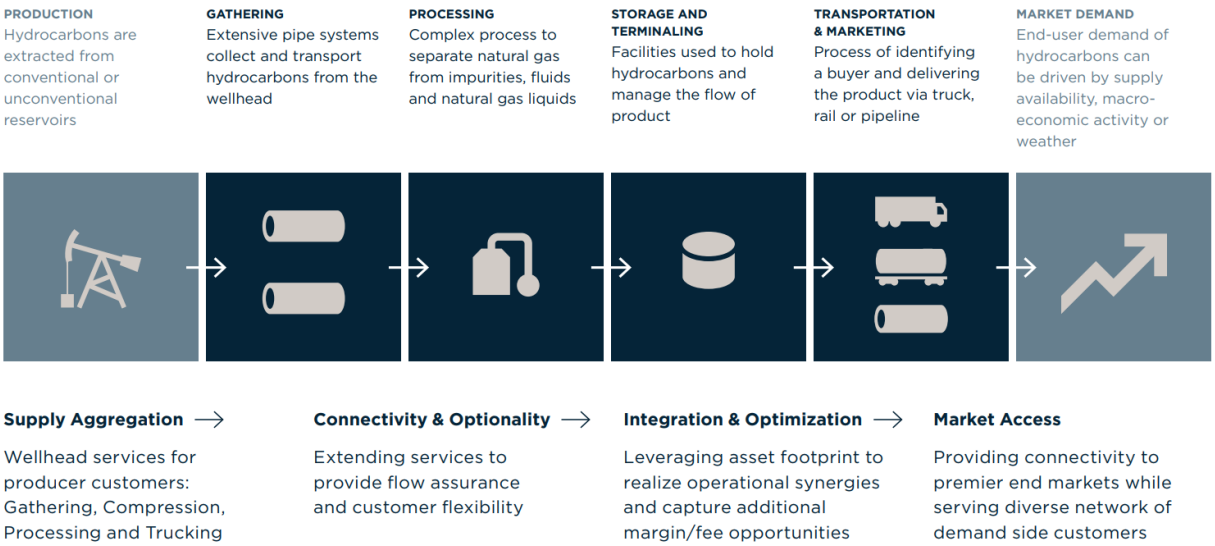
8. List of abbreviations

Abbreviation	Meaning
ADIT	Accumulated Deferred Income Taxes
AMZ	Alerian MLP Index
APC	Apache Corporation
BM	Benchmark
CAGR	Compounded Annual Growth Rate
CAPEX	Capital Expenditures
DCF	Distributable Cash Flow
DDM	Dividend Discount Model
EBTIDA	Earnings Before Interest Taxes Depreciation & Amortization
ETF	Exchange Traded Fund
EV	Enterprise Value
FE	Fixed Effects
FERC	Federal Energy Regulatory Commision
GAAP	Generally Accepted Accounting Principles
GP	General Partner
IDR	Incentive Distribution Rights
IPO	Initial Public Offering
IRA	Individual Retirement Account
ITA	Income Tax Allowance
LLC	Limited Liability Company
LM	Lagrange Multiplier
LP	Limited Partner
LTM	Last Twelve Months
MII	Management Incentive Interests
MLP	Master Limited Partnership
MQD	Minimum Quarterly Distribution
NAV	Net Asset Value
NOSH	Net Outstanding Shares
NTM	Next Twelve Months
OLS	Ordinary Least Squares
PA	Partnership Agreement
POLS	Pooled Ordinary Least Squares
PTP	Publicly Traded Partnership
QoQ	Quarter-on-Quarter
RDVDY	Relative Dividend Yield
RE	Randome Effects
REIT	Real Estate Investment Trust
RTOTALRETURN	Relative Total Return
UBTI	Unrelated Business Taxable Income

9. Appendix

9.1. Overview of the U.S. energy value chain



Source: Crestwood Midstream Partner LP's 2014 annual report

9.2. Cost of capital

Following Blum et al. (2013), the cost of capital for MLPs consists of the weighted average of three distinct capital sources; debt, LP equity, and GP equity. Hence, the hurdle rate for future investments should exceed this figure. While there are various ways to calculate the cost of equity for MLPs, the following method seems to be one of the more comprehensive alternatives as it considers costs stemming from the GP interest and acknowledges the value of the prospect of future distributions:

$$Cost\ of\ equity\ capital = \frac{Forward\ yield}{Allocation\ of\ cash\ flow\ to\ LPs\ (\%)} + Distribution\ growth \qquad (7)$$

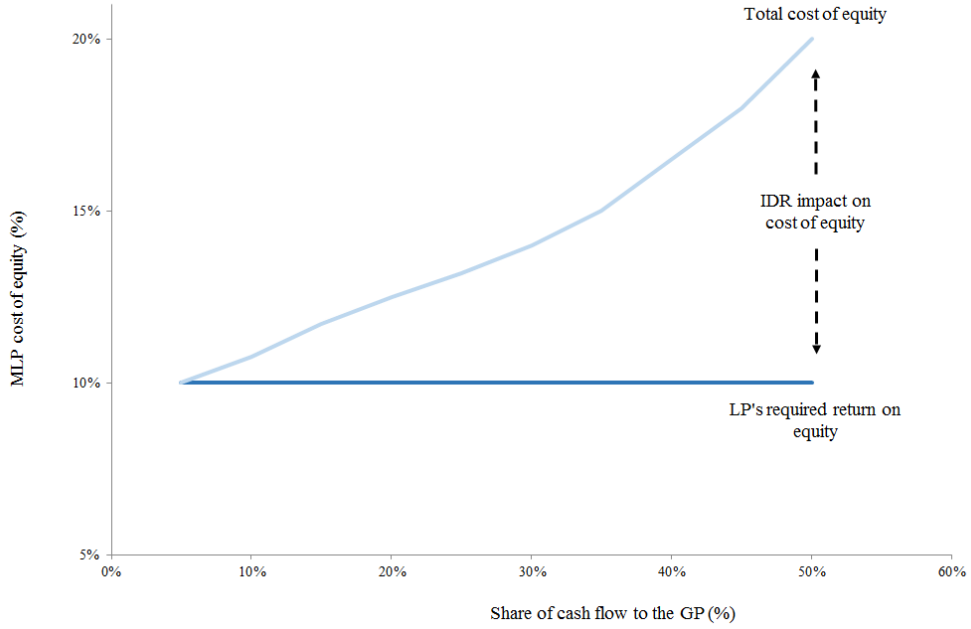
where

$$Forward\ yield = \frac{NTM\ distribution\ per\ unit}{Unit\ price} \qquad (8)$$

Formula 7 illustrates how the required return on equity by the common unitholders, is adjusted for a potential cash outflow to the GP by dividing the forward yield by the percentage of total cash flows that is attributed to the LPs. As a larger share of generated cash flows to the GP, the denominator decreases and the cost of total equity increases. The preference for using the next-twelve-months (NTM) yield instead of the realized trailing-twelve-months (TTM) is that this approach omits possible one-off events that may have occurred over the last twelve months. Furthermore, distribution growth is added as the NTM distributions per unit are implicitly adjusted for the expected value of growth opportunities that

are present in the unit price (e.g. Miller and Modigliani, 1961). As such, ignoring the distribution growth component will understate the cost of equity. Other methods to calculate the cost of equity, such as the Capital Asset Pricing Model (CAPM), may be used to calculate the LPs' cost of equity but are prone to understating the firm's total cost of equity as the CAPM model neglects costs related to IDRs.

Hypothetical visualization of IDR impact on MLP cost of equity capital



Source: Wells Fargo Securities, LLC

This graph exemplifies the discrepancy between the LPs isolated hurdle rate on their equity investment of 10% and the total cost of equity including the impact from the GP's IDRs. When at the second tier (figure 2), new investments will need to yield a return of at least 12% in order to cover the LP's 10% cost of equity. This gap rises to 10% when at the high splits, as a targeted return of 20% is required to sustain the LP's hurdle rate.

9.3. Tax deferability

MLPs use the discrepancy between the carrying amount and the fair value of assets on the balance sheet to minimize taxable income. As with most other businesses, MLPs depreciate their assets over time. For midstream assets, however, the market value of owned pipelines typically appreciates as most midstream MLPs have contracts that adjust for inflation (Fenn, 2014). Hence, revaluations of fixed assets after selling it to an MLP may lead to a significant increase of the tax-shield through the enlarged depreciation charges that follow. As distributions are regarded as a return of capital and taxable income is minimized, part or all of the distributions are generally tax-deferrable (Robert W. Baird & Co Incorporated, 2018). Cash distributed in excess of the amount of taxable income is not seen as dividend but as a return of basis and is therefore not taxable, as illustrated by the hypothetical example displayed

below. Tax-deferring capabilities depend on the cost basis of the units owned and causes the market to generally expect pre- and after-tax income to be approximately identical as the cash distributions generally far exceeds taxable income.

Tax implications from hypothetical purchase and selling with 5-year holding period on a per unit basis

	Unit purchase price	Year 1	Year 2	Year 3	Year 4	Unit sold ending year 5
Unit price	$20.00	$21.00	$22.00	$23.00	$24.00	$25.00
Annual distributions per unit	$1.00	$1.00	$1.00	$1.00	$1.00	$1.00
Distribution yield	5.0%	4.8%	4.5%	4.3%	4.2%	4.0%
% of distribution that is tax deferred (tax shield)	80%					
Ordinary (personal) income tax rate	35%					
Capital gains tax	15%					
Tax deferred portion of distribution		$0.80	$0.80	$0.80	$0.80	$0.80
Income allocated		$0.20	$0.20	$0.20	$0.20	$0.20
Tax paid at end of year on distributions received		$0.07	$0.07	$0.07	$0.07	$0.07
Cost basis of unit	$20.00	$19.20	$18.40	$17.60	$16.80	$16.00
Tax paid when unit is sold ending year 5:						
Capital gains tax paid on unit price increase	$0.75					
Ordinary income tax paid on return of capital	$1.40					
Tax paid on year 5 income allocated	$0.07					
Total taxes paid at the end of year 5	$2.22					

Source: Wells Fargo Securities, LLC

This example shows that the initial unit price or cost basis ($20) decreases with the distribution amount, while the net income per unit of $0.20 is added netting an annual decrease in the cost basis of $0.80. Taxes are paid on the taxable portion of the distribution at the personal income tax rate (35% assumed). Please note that the deferred portion of cash distributions are not limited to 80% as large depreciation charges may reduce taxable income to (below) zero. When the unit is sold at the end of year 5, additional capital gain taxes are paid on the current unit price relative to the initial purchase price and ordinary income taxes are paid on the difference in cost basis or return of capital. Net losses of a certain MLP can only be used by a unitholder to offset future income from the same MLP. On the contrary, if losses are carried forward, any remaining losses upon selling the entire stake in the MLP are allowed to be deducted from other sources of income. The return of capital must not be confused with the return on capital, which would amount to 25% in this example ([$25.00-$20.00]/$20.00).

For tax-deferred accounts[57], tax-exempt entities[58], and institutional investors other rules apply. As retirement plans itself defer taxes until the money is actually extracted, one may argue the tax-deferring capability of the MLP is not used to its full potential. Furthermore, if income received from a partnership

[57] Retirement plans that are allowed to earn tax-deferred income under the Internal Revenue Code such as 401(k)s and IRAs

[58] Mostly charities and non-profit organizations

interest exceeds $1,000 in one year in a single account, Unrelated Business Taxable Income (UBTI) is to be paid directly by the retirement plan as the MLP's business is not related to its own activities. The retirement plan is required to file a Form 990-T tax return and pay UBTI. As mentioned in section 1.2., the American Jobs Creation Act in 2004 granted institutional investors to enjoy the pass-through structure of the MLP if certain criteria are met. If a fund allocates less than 25% of the total amount invested to MLPs, regulation allows returns from the partnership interests to be passed on to investors without having to pay UBTI (referred to as a RIC-compliant fund). The 25% rule explains why investment funds generally either allocate less than 25% or approximately all money to MLPs. If a fund, for example, were to allocate 50% of invested money in MLPs, it would be forced to pay UBTI on income received while it could probably realize a higher yield if more funds were invested in MLPs compared to similar C-Corporations.

9.4. Recent changes in U.S. tax legislation

When commencing drafts of the recent U.S. tax reforms indicated a reduction in the corporate tax rate below the personal income tax rate, concerns were raised. However, the final version included an amendment that was put in place in order to safeguard the, whilst smaller, tax advantage of the MLP structure. The overview of updated tax rates below presents the lower MLP tax rate, which is no longer equal to the individual tax rate as the new tax legislation allows for a 20% deduction on taxes paid on distributions. This will have a minor impact when depreciation charges are large. Therefore, an additional cut of 20% is provided upon the total amount of taxes paid when an MLP unit is sold. The reduced individual and MLP tax rates are scheduled to expire after 2025. In its present condition, the reduced federal tax rate for the C-Corporation lasts into perpetuity. Hence, if future MLP effective tax rates are not extended they will be 2.8% higher than the C-Corporation effective tax rate after 2025.

Baker Botts (2017) mentions two other relevant changes resulting from the Act for MLPs and C-Corporations. A bonus depreciation provision has entered into force, allowing to immediately expense (depreciate) up to 100% of the acquired asset versus a capped maximum of 50% previously. In theory, this could enhance new investments project's financial appeal. However, this tax rule is expected to only have a limited impact (PwC, 2018). Additionally, where interest expenses could be fully deducted from a firm's operating profit before, the deductibility is now capped at 30%. If the interest expense exceeds the 30% threshold, the deduction is carried forward. The deduction is added back to the cost basis in case the company is sold. As such, this restriction will only impact firm value through the time value of money deterioration of the carried interest deductions. Finally, a rule has been put in place that revokes the "Partnership Technical Termination Rule". This repeal grants MLPs to continue operations after more than 50% of a partnership is sold without treating the MLP as a newly formed entity.

Concluding, while the Tax Reform Act has caused the MLP tax benefit to become smaller compared to the C-Corporation, the overall impact seems limited as the tax-deferred return of capital is still in effect.

Overview of various tax rates[59]

Tax rate	Corporate	Shareholder	Effective tax rate C-Corp	Individual tax rate	MLP	MLP benefit
Pre-2018	35.0%	20.0%	48.0%	39.6%	39.6%	8.4%
Tax Reform Act	21.0%	20.0%	36.8%	37.0%	29.6%	7.2%

Source: Baker Botts, "Tax Reform Act – Impact on Master Limited Partnerships", accessed February, 2019

Apart from the aforementioned tax reforms, there has been another noteworthy change in MLP tax regulations in 2018. In March, the Federal Energy Regulatory Commission (FERC) announced the revision of the "cost-of-service" rates for midstream MLPs as they failed to justify the structure of these rates after an appeal by the U.S. Court of Appeals (Horowitz et al., 2018). Before, MLPs' cost-of-service rates charged to customers consisted of two components, namely investors' required return on equity and an additional income tax allowance (ITA) under the assumption that an income tax liability would flow from the income generated with the used midstream assets. The U.S. Court of Appeals challenged this structure in 2016 when they accused the FERC's imputed tax expense allowance to enable the practice of recovering taxes twice as the return on equity component considers an after-tax return while the pass-through structure is in place already[60]. The new policy was somewhat revised in July, 2018, when the FERC added a complementary clause allowing the inclusion of taxes paid by a corporate parent of pipeline MLPs, if present, to the charged cost-of-service rates. At present, pipelines owned by MLPs are given the opportunity to choose between including investors' ITA in the cost-of-service rates at the lower corporate tax rate or to eliminate them. However, if a company chooses to retain the allowance, accumulated deferred income taxes (ADIT) on the balance sheet are also adjusted to reflect the lower tax rate. Deciding to eliminate investors' ITA results in an immediate elimination of all ADITs. ADITs are liabilities that are refunded to customers over time. The elimination of this liability thus prevents this from happening. Conversely, excluding ADITs is likely to have a dampening effect on the firm's return on equity as such elimination implies a relative increase in the amount of invested equity capital (Lack, 2018). While it is too soon to quantify the impact of the renewed legislation, the increased uncertainty has dragged on MLP performance over 2018 (Morris, 2018).

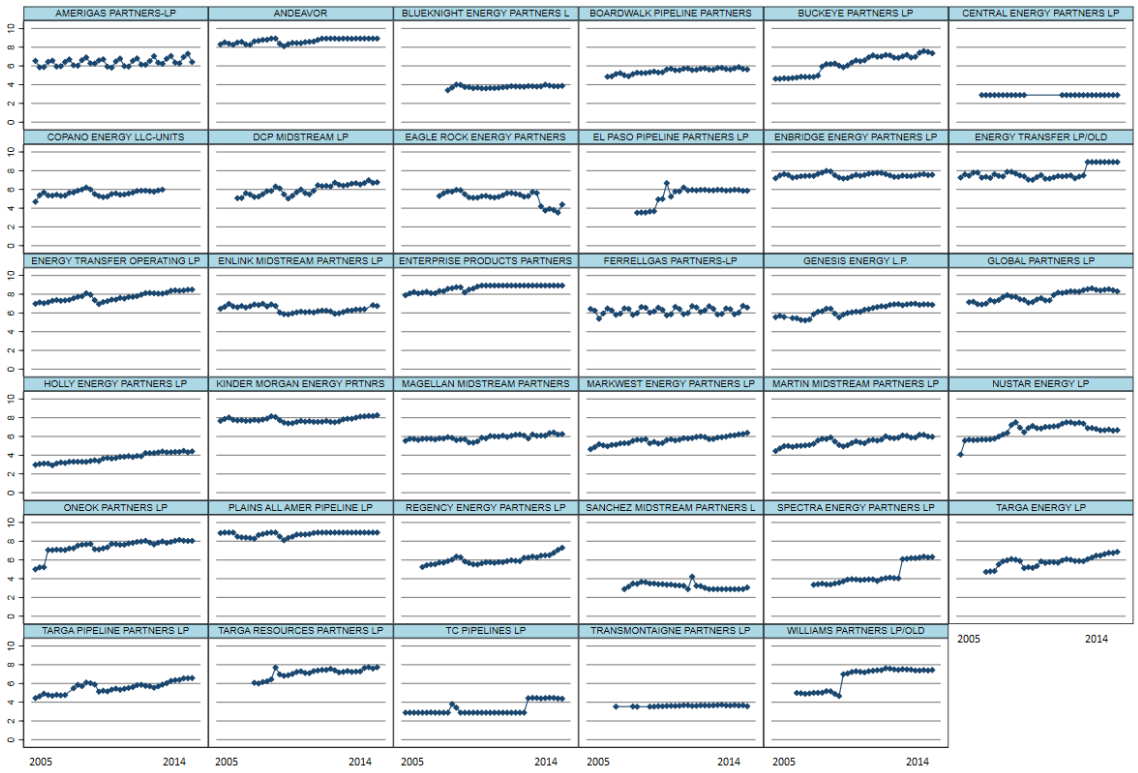
[59] Excluding the impact from Medicare taxes

[60] United Airlines, Inc. v. FERC, No. 11-1479 (D.C. Cir. 2016)

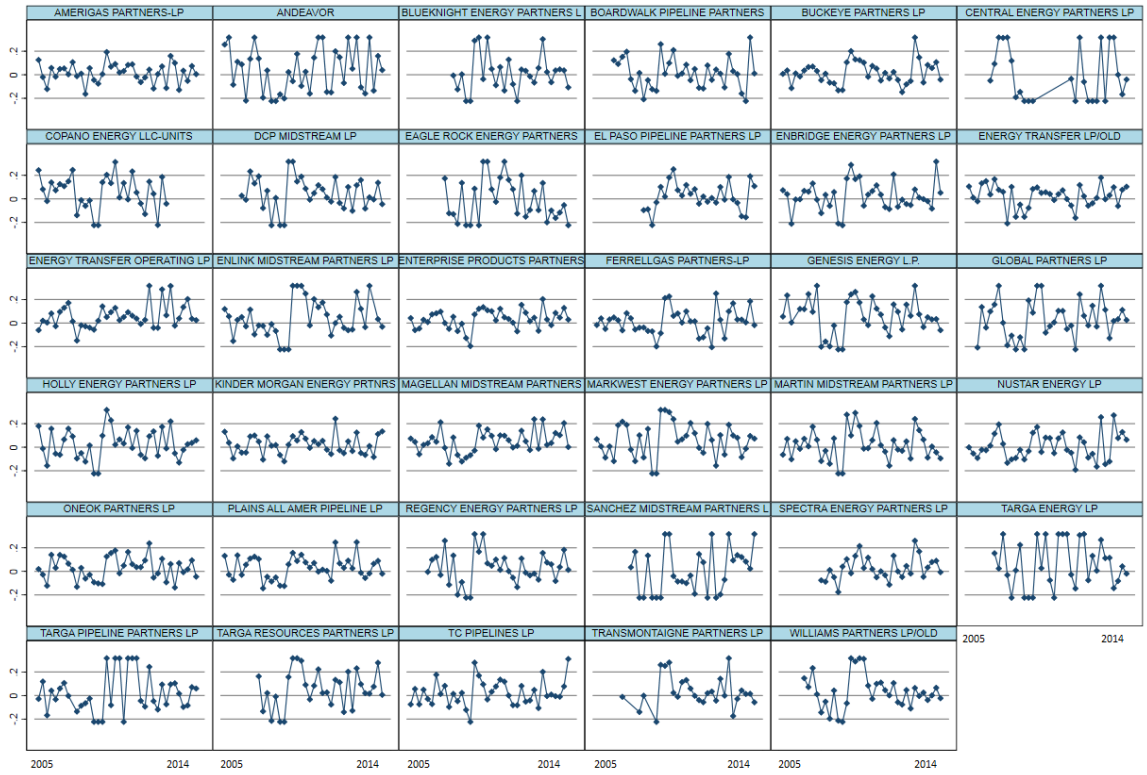
9.5. Per firm time plots based on the broad panel sample

a) Quarter-on-quarter growth in units outstanding – Stationary covariate

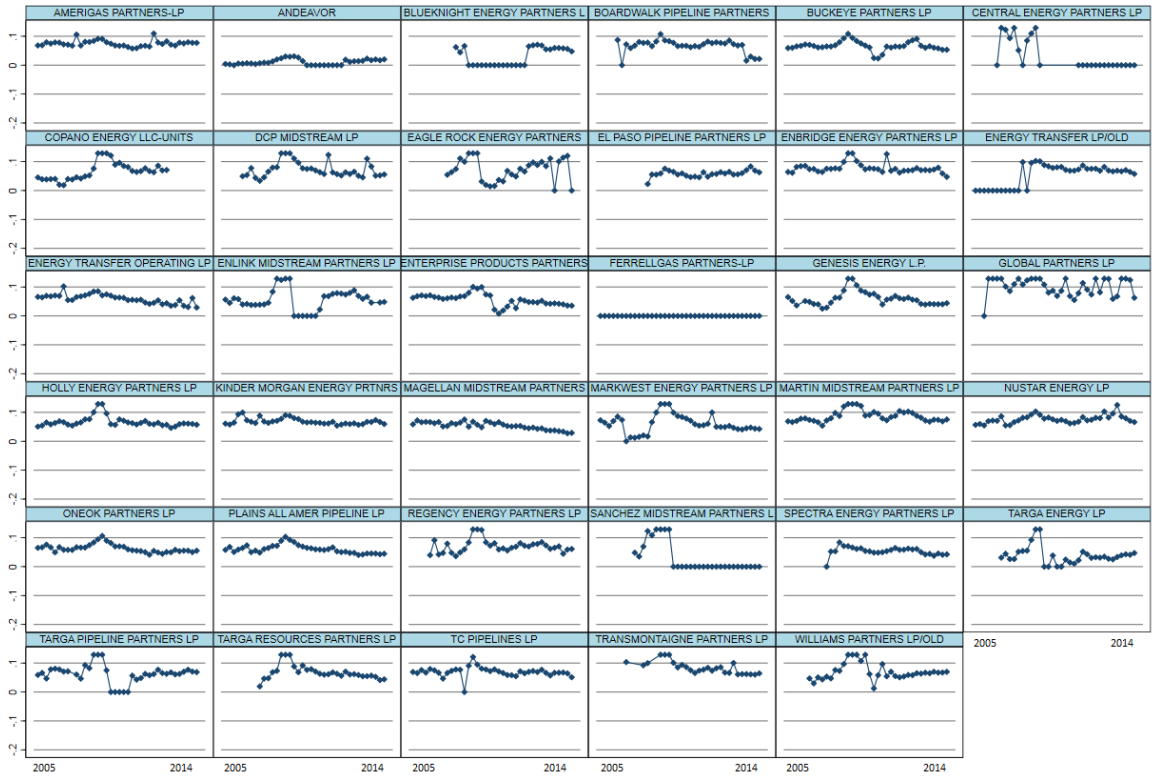
b) Ln(sales) – Non-stationary covariate



c) Quarter-on-quarter share price returns

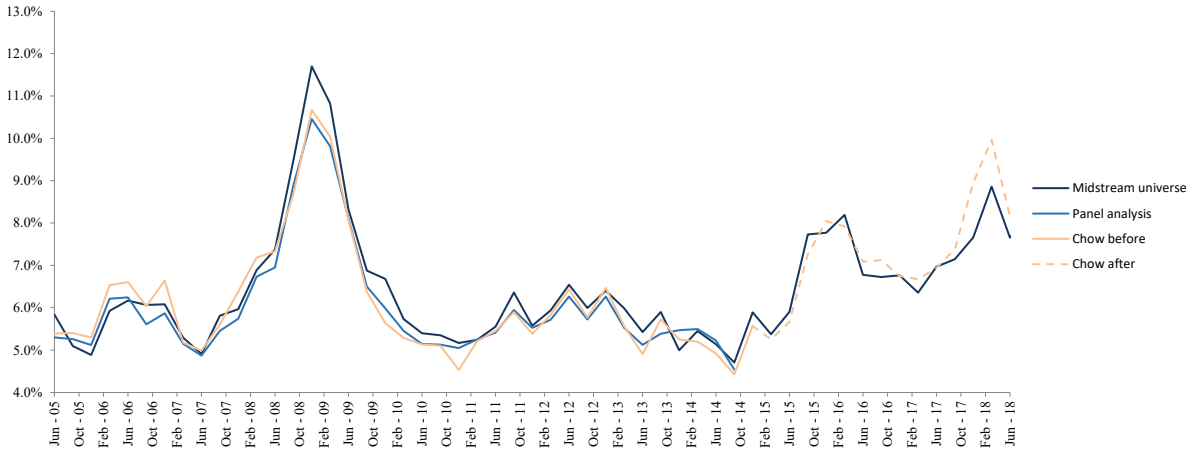


d) Annualized dividend yield

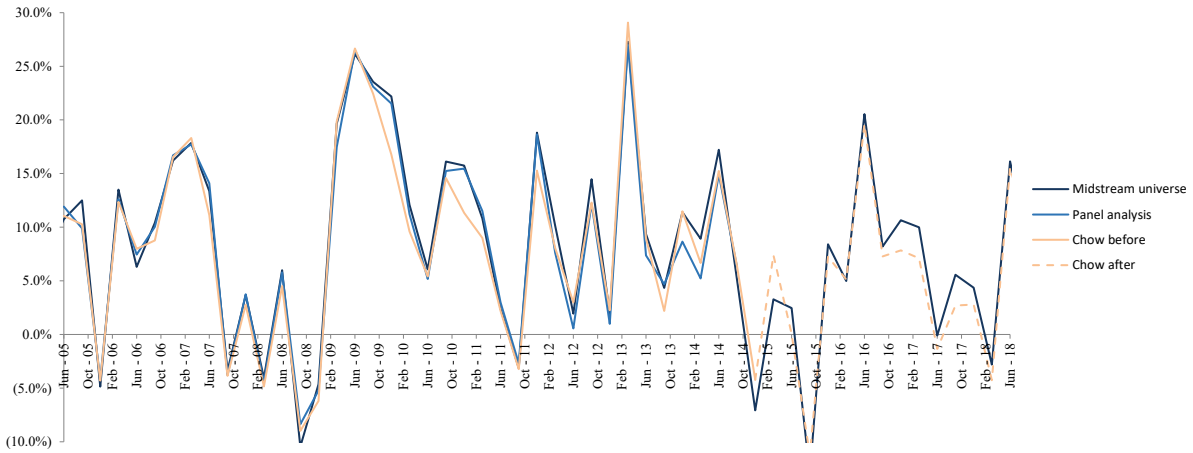


9.6. Benchmark overview per winsorized variable

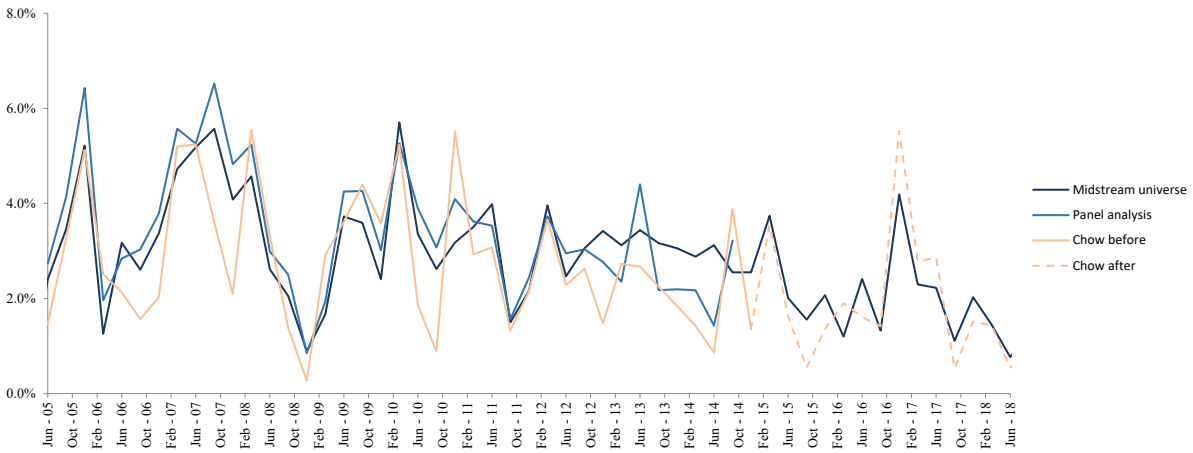
a) Annualized dividend yield



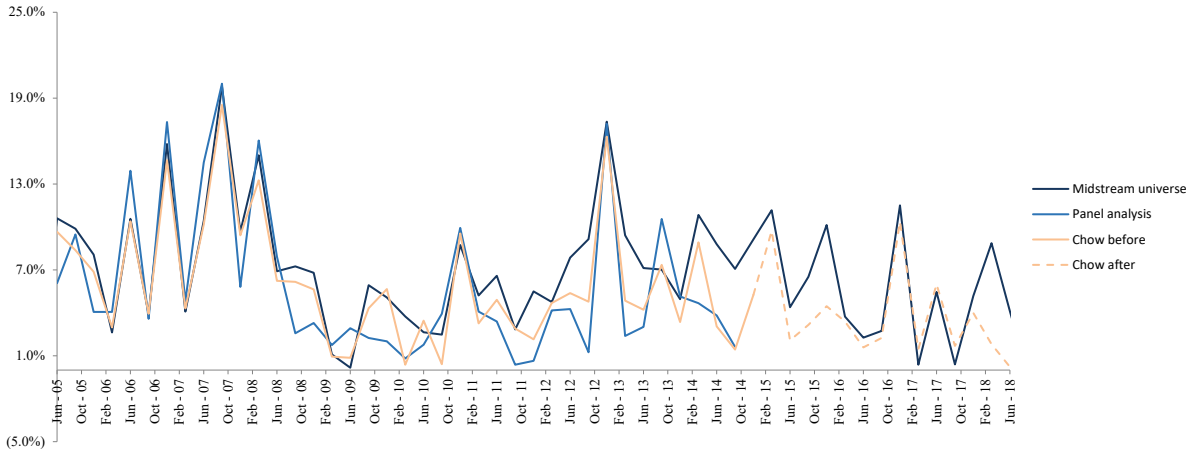
b) Total return (quarterly share price return plus annualized dividend yield)



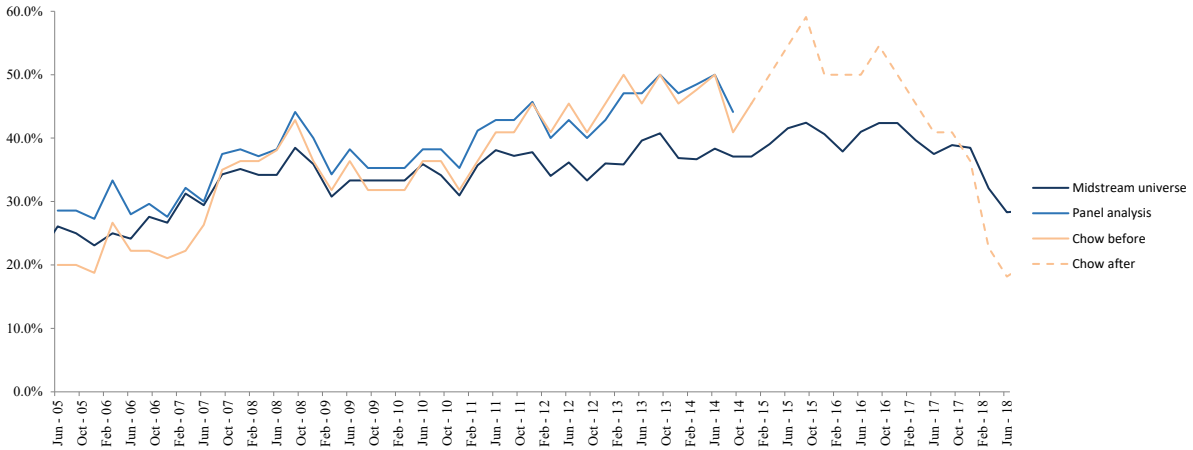
c) Quarter-on-quarter percentage growth in net outstanding units



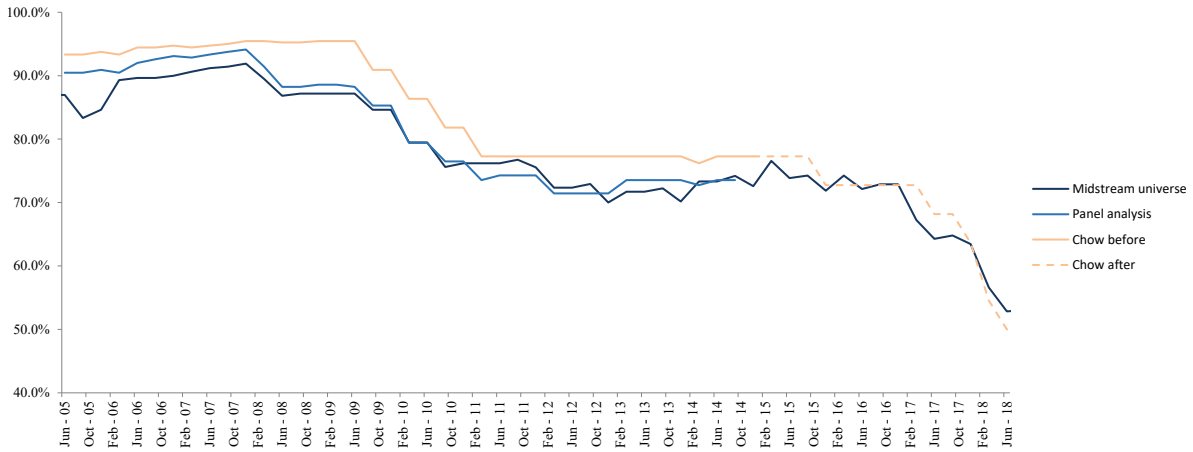
d) Quarter-on-quarter percentage growth in total outstanding interest-bearing debt



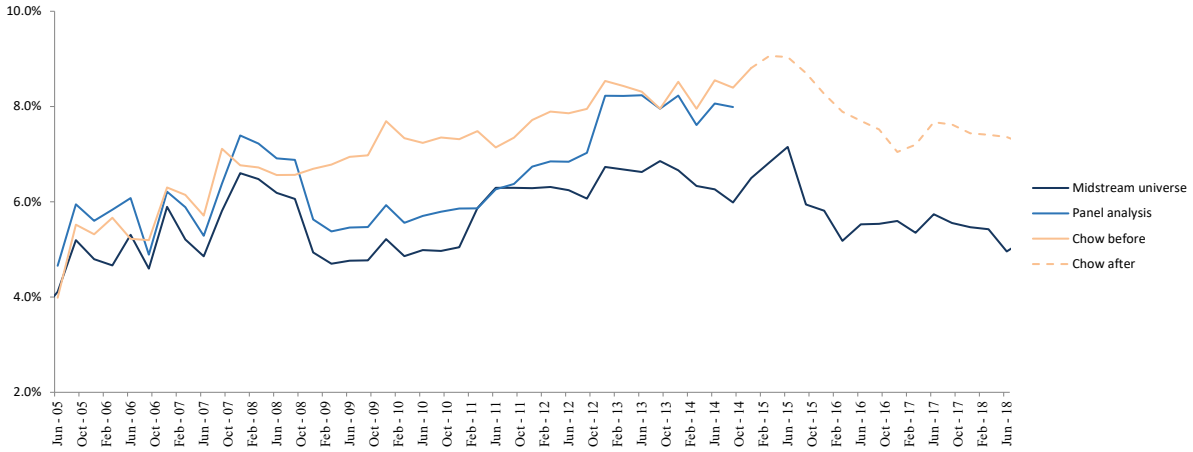
e) Percentage of firms that have reached the high splits



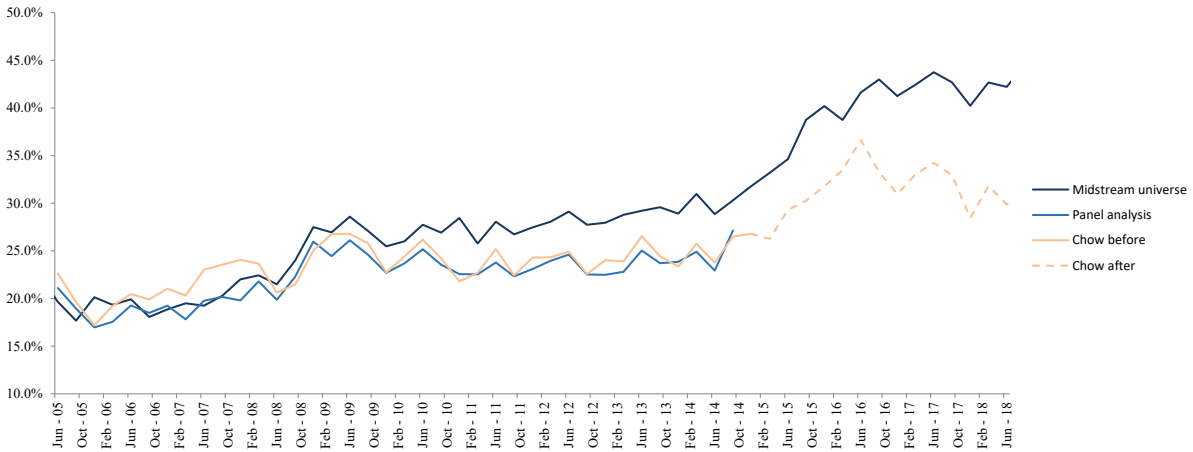
f) Percentage of firms that have IDRs in place



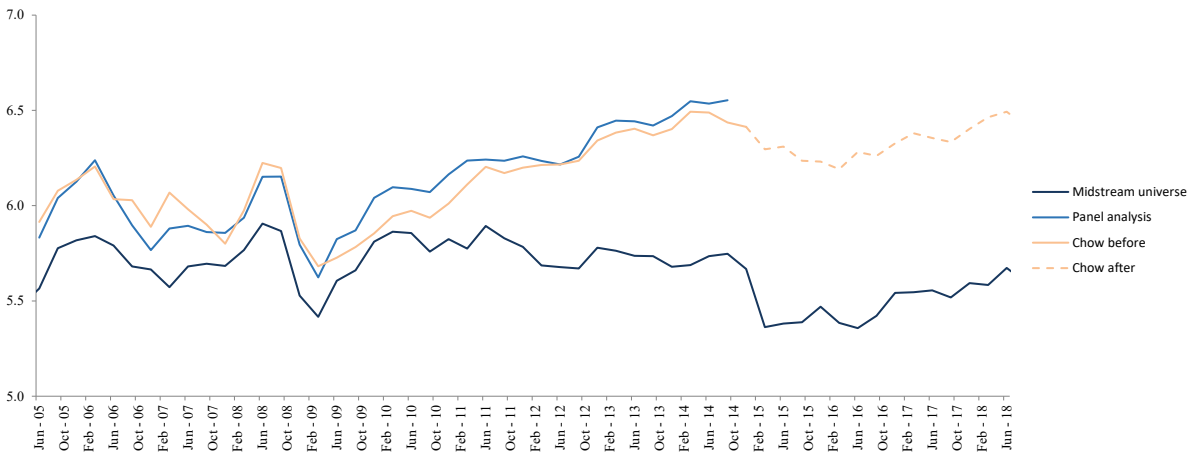
g) Goodwill expressed as a percentage of total assets



h) EBITDA margin



i) Natural logarithm of quarterly sales



9.7. Diagnostic and panel data model selection test output for the Chow panel analysis

a) Unit root test

	Before				*After*			
Variables	Lags included for unit root test	Visual inspection for time trend	P-value	Unit root	Lags included for unit root test	Visual inspection for time trend	P-value	Unit root
Relative dividend yield	4	YES	0.0000	YES	2	YES	0.0002	YES
Relative total return	0	NO	0.0000	NO	0	NO	0.0000	NO
% growth in NOSH	0	NO	0.0000	NO	0	NO	0.0000	NO
% growth in debt	0	NO	0.0000	NO	1	NO	0.0000	NO
IDR (dummy)	n.a.	n.a.	n.a.	NO	n.a.	n.a.	n.a.	NO
High splits (dummy)	n.a.	n.a.	n.a.	NO	n.a.	n.a.	n.a.	NO
Goodwill	1	YES	0.0002	YES	1	YES	0.0000	YES
EBITDA margin	4	YES	0.1478	YES	4	YES	0.9019	YES
Ln(sales)	4	YES	0.0134	YES	4	YES	0.0000	YES

b) Test for groupwise heteroscedasticity

	Before			*After*		
Test for groupwise heteroscedasticity	$\chi 2$	P-value	Heteroscedasticity	$\chi 2$	P-value	Heteroscedasticity
Relative dividend yield as dependent var:						
Modified Wald test for FE model	1107.10	0.0000	YES	1967.89	0.0000	YES
Lagrange Multiplier (LM) test for RE model	1305.91	0.0000	YES	2301.93	0.0000	YES
Relative total return as dependent var:						
Modified Wald test for FE model	281.95	0.0000	YES	157.87	0.0000	YES
Lagrange Multiplier (LM) test for RE model	1297.66	0.0000	YES	851.03	0.0000	YES

c) Robust Hausman test for FE/RE model selection

	Before			*After*		
Fixed versus Random effects	Sargan-Hansen statistic	P-value	FE / RE	Sargan-Hansen statistic	P-value	FE / RE
Relative dividend yield as dependent var:						
Test of overidentifying restrictions	57.287	0.0000	FE	54.336	0.0000	FE
Relative total return as dependent var:						
Test of overidentifying restrictions	46.607	0.0001	FE	41.269	0.0000	FE

d) Wald-test for FE/POLS model selection

	Before			*After*		
FE versus POLS	F-statistic	P-value	Dummies for all firms equal to zero	F-statistic	P-value	Dummies for all firms equal to zero
Relative dividend yield as dependent var:						
Wald test on firm fixed effects	998.38	0.0000	NO	2294.62	0.0000	NO
Relative total return as dependent var:						
Wald test on firm fixed effects	122.81	0.0000	NO	49.91	0.0000	NO

e) Wald-test for inclusion of time fixed effects

	Before			*After*		
Test on inclusion of time fixed effects	F-statistic	P-value	Dummies for all quarters equal to zero	F-statistic	P-value	Dummies for all quarters equal to zero
Relative dividend yield as dependent var:						
Wald test on time fixed effects	55.17	0.0000	NO	20.00	0.0000	NO
Relative total return as dependent var:						
Wald test on time fixed effects	9.51	0.0000	NO	11.71	0.0000	NO

f) Pesaran's CD test for serial autocorrelation

	Before			*After*		
Serial correlation test	CD statistic	P-value	Cross-sectional independence	CD statistic	P-value	Cross-sectional independence
Relative dividend yield as dependent var:						
Pesaran's test of cross-sectional independence	17.154	0.0000	NO	11.524	0.0000	NO
Relative total return as dependent var:						
Pesaran's test of cross-sectional independence	1.748	0.0081	NO	3.658	0.0003	NO

g) Arellano-Bond test on lag structure of independent variable

	Before				*After*		
Arellano-Bond test	Order	Z-value	P-value	Autocorrelation	Z-value	P-value	Autocorrelation
Relative dividend yield as dependent var:	1	-3.630	0.0003	YES	-2.6889	0.0072	YES
	2	-1.736	0.0682	NO	-1.3164	0.1880	NO
Relative total return as dependent var:	1	-3.979	0.0001	YES	-3.988	0.0001	YES
	2	-1.700	0.0892	NO	-1.4706	0.1414	NO

9.8. Firms included in samples used for quantitative analyses

Broad panel sample (N = 35)	Chow sample (N = 22)
Amerigas Partners LP	Amerigas Partners LP
Andeavor	Andeavor
Blueknight Energy Partners LP	Blueknight Energy Partners LP
Boardwalk Pipeline Partners	Boardwalk Pipeline Partners
Buckeye Partners LP	Buckeye Partners LP
Central Energy Partners	DCP Midstream LP
Copano Energy LLC	Enbridge Energy Partners LP
DCP Midstream LP	Energy Transfer Operating LP
Eagle Rock Energy Partners LP	Enlink Midstream Partners LP
El Paso Pipeline Partners	Enterprise Product Partners
Enbridge Energy Partners LP	Ferrellgas Partners LP
Energy Transfer LP	Genesis Energy LP
Energy Transfer Operating LP	Global Partners LP
Enlink Midstream Partners LP	Holly Energy Partnes LP
Enterprise Product Partners	Magellan Midstream Partners
Ferrellgas Partners LP	Martin Midstream Partners LP
Genesis Energy LP	Nustar Energy LP
Global Partners LP	Plains All American Pipeline LP
Holly Energy Partnes LP	Sanchez Midstream Partners LP
Kinder Morgan Energy Partners	Spectra Energy Partners LP
Magellan Midstream Partners	TC Pipelines LP
Markwest Energy Partners	Transmontaigne Partners LP
Martin Midstream Partners LP	
Nustar Energy LP	
Oneok Partners	
Plains All American Pipeline LP	
Regency Energy Partners	
Sanchez Midstream Partners LP	
Spectra Energy Partners LP	
Targa Energy	
Targa Pipeline Partners	
Targa Resources Partners	
TC Pipelines LP	
Transmontaigne Partners LP	
Williams Partners LP	

9.9. Robustness checks

a) Broad panel data analysis excluding profitability and firm size covariates and alternating between ex-/including time fixed effects

	(1) Dividend yield	(3) Dividend yield	(2) Total return	(4) Total return
Lagged dividend yield	0.556***	0.572***		
	(0.039)	*(0.042)*		
Lagged total return			0.022	0.025
			(0.036)	*(0.039)*
QoQ growth units outstanding	-0.039***	-0.050***	-0.098*	-0.102*
	(0.009)	*(0.008)*	*(0.056)*	*(0.059)*
QoQ growth debt oustanding	0.004	0.007**	0.026	0.024
	(0.003)	*(0.003)*	*(0.018)*	*(0.019)*
High splits	0.005**	0.006**	0.001	0.001
	(0.003)	*(0.003)*	*(0.009)*	*(0.010)*
Goodwill	-0.027**	-0.044*	-0.241*	-0.235*
	(0.013)	*(0.023)*	*(0.135)*	*(0.135)*
Lagged goodwill	0.025	0.049	0.094	0.085
	(0.029)	*(0.040)*	*(0.130)*	*(0.135)*
Constant	-0.003	0.007**	0.002	-0.033
	(0.002)	*(0.003)*	*(0.006)*	*(0.020)*
Observations	1,176	1,176	1,176	1,176
Number of companies	35	35	35	35
R^2	0.348	0.438	0.011	0.034
Adj. R^2	0.345	0.418	0.006	-0.002
Time FE	No	Yes	No	Yes

Notes: *Significant at 10%, **significant at 5%, ***significant at 1%
Robust standard errors in parentheses

b) Results of panel data analysis controlling for presence of IDRs instead of high splits

	(1) Dividend yield	(2) Total return
Lagged dividend yield	0.570***	
	(0.046)	
Lagged total return		0.022
		(0.038)
QoQ growth units outstanding	-0.051***	-0.111*
	(0.008)	*(0.057)*
QoQ growth debt oustanding	0.007**	0.017
	(0.003)	*(0.020)*
IDR	-0.003	-0.006
	(0.003)	*(0.010)*
Goodwill	-0.042**	-0.259*
	(0.019)	*(0.135)*
Lagged goodwill	0.044	0.088
	(0.036)	*(0.135)*
EBITDA margin	0.010	-0.025
	(0.012)	*(0.044)*
Lagged EBITDA margin	0.018	0.046
	(0.015)	*(0.049)*
Ln(sales)	0.002	0.036**
	(0.002)	*(0.014)*
Lagged ln(sales)	0.001	-0.019
	(0.002)	*(0.012)*
Constant	-0.012	-0.126**
	(0.013)	*(0.049)*
Observations	1,176	1,176
Number of companies	35	35
R^2	0.439	0.043
Adj. R^2	0.416	0.004
Time FE	Yes	Yes

*Notes: *Significant at 10%, **significant at 5%, ***significant at 1%*

Robust standard errors in parentheses

c) Results of Chow panel data analysis controlling for presence of IDRs instead of high splits

	(1)	(2)	(3)	(4)
	Before	After	Before	After
	Dividend yield	Dividend yield	Total return	Total return
Lagged dividend yield	0.556***	0.314**		
	(0.092)	*(0.138)*		
Lagged total return			0.022	-0.014
			(0.050)	*(0.082)*
QoQ growth units outstanding	-0.051***	0.003	-0.150*	-0.036
	(0.012)	*(0.030)*	*(0.085)*	*(0.095)*
QoQ growth debt oustanding	0.002	-0.016**	0.013	0.030
	(0.004)	*(0.007)*	*(0.022)*	*(0.045)*
IDR	-0.001	0.004	-0.009	-0.091***
	(0.003)	*(0.005)*	*(0.010)*	*(0.030)*
Goodwill	0.006	-0.107	-0.255	0.405
	(0.021)	*(0.099)*	*(0.239)*	*(0.468)*
Lagged goodwill	0.007	0.035	0.201	-0.887*
	(0.024)	*(0.100)*	*(0.189)*	*(0.459)*
EBITDA margin	0.025***	0.020	-0.022	0.061
	(0.009)	*(0.012)*	*(0.069)*	*(0.075)*
Lagged EBITDA margin	-0.011	-0.028	0.116	-0.068
	(0.007)	*(0.026)*	*(0.073)*	*(0.088)*
Ln(sales)	-0.000	-0.009	0.006	0.035
	(0.003)	*(0.010)*	*(0.016)*	*(0.048)*
Lagged ln(sales)	0.002	-0.002	-0.009	-0.030
	(0.002)	*(0.004)*	*(0.016)*	*(0.028)*
Constant	0.014***	-0.001	0.035*	0.149***
	(0.005)	*(0.006)*	*(0.018)*	*(0.040)*
Observations	745	348	745	348
Number of companies	22	22	22	22
R^2	0.493	0.450	0.075	0.167
Adj. R^2	0.444	0.370	-0.0152	0.0451
Time FE	Yes	Yes	Yes	Yes

Notes: *Significant at 10%, **significant at 5%, ***significant at 1%

Robust standard errors in parentheses

d) Robustness test on dilutive impact of equity offerings

Regression (1) and (2) are estimated on the broad panel sample. All other regressions are based on the Chow sample.

	(1)	(2)	(3)	(4)	(5)	(6)
	Before	Before	Before	After	Before	After
	Dividend yield	Total return	Dividend yield	Dividend yield	Total return	Total return
Lagged dividend yield	0.567***		0.548***	0.319**		
	(0.043)		*(0.086)*	*(0.145)*		
Lagged total return		0.021			0.019	-0.000
		(0.037)			*(0.047)*	*(0.086)*
QoQ growth units outstanding	-0.049***	-0.111*	-0.051***	0.004	-0.149*	0.004
	(0.008)	*(0.058)*	*(0.011)*	*(0.030)*	*(0.086)*	*(0.102)*
Lagged QoQ growth units outstanding	0.014*	-0.024	0.015**	0.015	-0.044	0.015
	(0.007)	*(0.038)*	*(0.007)*	*(0.019)*	*(0.046)*	*(0.098)*
QoQ growth debt oustanding	0.006**	0.017	0.000	-0.018**	0.016	0.024
	(0.003)	*(0.020)*	*(0.003)*	*(0.007)*	*(0.020)*	*(0.047)*
High splits	0.005**	-0.001	0.009*	0.008***	-0.013	-0.033**
	(0.003)	*(0.011)*	*(0.004)*	*(0.002)*	*(0.014)*	*(0.014)*
Goodwill	-0.046**	-0.250*	0.005	-0.119	-0.254	0.608
	(0.020)	*(0.137)*	*(0.020)*	*(0.092)*	*(0.240)*	*(0.545)*
Lagged goodwill	0.047	0.084	0.009	0.048	0.201	-1.032**
	(0.037)	*(0.136)*	*(0.019)*	*(0.099)*	*(0.197)*	*(0.434)*
EBITDA margin	0.009	-0.024	0.019**	0.020	-0.013	0.069
	(0.012)	*(0.045)*	*(0.008)*	*(0.012)*	*(0.070)*	*(0.080)*
Lagged EBITDA margin	0.017	0.048	-0.018**	-0.026	0.127	-0.091
	(0.015)	*(0.049)*	*(0.007)*	*(0.025)*	*(0.076)*	*(0.083)*
Ln(sales)	0.002	0.036**	-0.001	-0.010	0.007	0.034
	(0.002)	*(0.014)*	*(0.003)*	*(0.009)*	*(0.017)*	*(0.047)*
Lagged ln(sales)	0.000	-0.019	0.001	-0.004	-0.006	-0.018
	(0.002)	*(0.012)*	*(0.002)*	*(0.003)*	*(0.016)*	*(0.030)*
Constant	-0.012	-0.134**	0.007	-0.004	0.035*	0.079***
	(0.013)	*(0.051)*	*(0.004)*	*(0.005)*	*(0.017)*	*(0.022)*
Observations	1,176	1,176	745	348	745	348
Number of companies	35	35	22	22	22	22
R^2	0.446	0.043	0.510	0.457	0.077	0.147
Adj. R^2	0.422	0.003	0.462	0.376	-0.014	0.021
Time FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes: *Significant at 10%, **significant at 5%, ***significant at 1%

Robust standard errors in parentheses

e) Testing of the equality of regression coefficients for the Chow sample

	(1)	(2)		(3)	(4)	
	Before	After	$\beta_{before} = \beta_{after}$	Before	After	$\beta_{before} = \beta_{after}$
	Dividend yield	Dividend yield	*P-value*	Total return	Total return	*P-value*
Lagged dividend yield	0.541***	0.318**	0.2289			
	(0.086)	*(0.143)*				
Lagged total return				0.022	-0.001	0.7858
				(0.049)	*(0.086)*	
QoQ growth units outstanding	-0.051***	0.003	0.1121	-0.150*	0.003	0.1179
	(0.011)	*(0.031)*		*(0.085)*	*(0.101)*	
QoQ growth debt oustanding	0.001	-0.017**	0.0183	0.016	0.024	0.8601
	(0.003)	*(0.007)*		*(0.020)*	*(0.047)*	
High splits	0.009*	0.008***	0.7765	-0.013	-0.033**	0.2204
	(0.004)	*(0.003)*		*(0.014)*	*(0.013)*	
Goodwill	0.008	-0.113	0.1591	-0.267	0.614	0.1090
	(0.020)	*(0.092)*		*(0.234)*	*(0.541)*	
Lagged goodwill	0.008	0.047	0.6796	0.208	-1.032**	0.0038
	(0.020)	*(0.099)*		*(0.191)*	*(0.431)*	
EBITDA margin	0.019**	0.020	0.9487	-0.014	0.069	0.4308
	(0.008)	*(0.012)*		*(0.070)*	*(0.080)*	
Lagged EBITDA margin	-0.018**	-0.026	0.7253	0.126	-0.091	0.0000
	(0.007)	*(0.026)*		*(0.077)*	*(0.084)*	
Ln(sales)	-0.001	-0.010	0.3145	0.007	0.034	0.5344
	(0.003)	*(0.009)*		*(0.016)*	*(0.047)*	
Lagged ln(sales)	0.002	-0.004	0.1064	-0.008	-0.018	0.7098
	(0.002)	*(0.003)*		*(0.016)*	*(0.030)*	
Constant	0.007*	-0.004	0.0030	0.034*	0.078***	0.5877
	(0.004)	*(0.005)*		*(0.017)*	*(0.022)*	
Observations	745	348		745	348	
Number of companies	22	22		22	22	
R^2	0.509	0.456		0.077	0.147	
Adj. R^2	0.461	0.377		-0.013	0.023	
Time FE	Yes	Yes		Yes	Yes	

Notes: *Significant at 10%, **significant at 5%, ***significant at 1%

Robust standard errors in parentheses

9.10. Descriptive analysis

The next page provides an overview of the sample statistics[61]. Implementing all requirements and thresholds results in a severely more restricted sample for the Chow test sample as depicted by the lower number of observations and firms. Please view appendix 9.6. for time plots of the averages per variable per sample, as the static presentation of the summary statistics may be difficult to interpret on a standalone basis.

For the pre-crash samples, the average realized dividend yield is roughly similar based on the mean and median. Total return shows a higher volatility as indicated by the minimum and maximum value and is lower for the Chow sample. The quarter-on-quarter growth in both the number of units and total interest-bearing debt outstanding is also substantially lower compared to the other samples. A possible explanation for this is that, over the 2005-2014 period, firms in the Chow sample are less focused on growth and/or more self-supporting. Lower growth prospects directly translate into a lower appraisal of the growth opportunities for these MLPs, which could explain the underperformance based on total return as this also considers share price returns. It appears that firms in the Chow sample aspire a more sustainable business model. The survivorship bias present in the Chow sample can be used as an argument in favor of this line of thought. The percentage of firms that have reached the high splits is lower for the Chow sample, while the broad sample displays a lower average presence of IDRs. While it is not possible to come up with a solid conclusion based solely on these numbers, an ostensible explanation is that management of MLPs in the Chow sample are less selective regarding the implementation of IDRs in principle and less focused on reaching the high splits. The average and median of the EBITDA margin of both samples are largely in line with each other. Firm size based on the natural logarithm of sales is substantially higher for the broad/Chow sample compared to the midstream universe and there is a clear divergence visible over time as displayed by graph i) of appendix 9.6. One would expect the firm size of the Chow sample to be largest, as larger firms generally are more rigid financially. Goodwill as a percentage of total assets is larger in the Chow sample than for the other samples. Graph g) of appendix 9.6. indicates that the divergence in size portrayed by graph i) is driven by M&A activity as goodwill plotted over time shows the same parting between samples in the aftermath of the financial crisis of 2008. This observation provides further evidence that the firms in the Chow sample are more self-supporting, as they were able to consistently grow through acquisitions even when capital markets dried up.

[61] After winsorizing at 5%

Summary statistics by sample

Overview of three samples subject to the least restrictive requirements on the left (universe) to most restrictive on the right (Chow). Number of firms included in the samples before the market crash for the midstream universe, panel, and chow sample are 64, 35, and 22. After the market crash, the number of firms included in the midstream universe and Chow sample are 74 and 22, respectively. For the midstream universe sample, the only restriction in place is that for each quarterly observation data on all variables must be available. To test for equality of means and the proportion of percentages, t-tests and Chi-squared tests are used. Please note that the minimum and maximum values for the midstream universe sample are equal in both time frames due to the fact that the presented summary statistics presented are after the winsorization at 5 percent.

- Before September, 2014 -	Midstream universe (1)					Panel sample (2)					Chow sample (3)					Difference (1) - (3)	
	Mean	Median	Minimum	Maximum	N	Mean	Median	Minimum	Maximum	N	Mean	Median	Minimum	Maximum	N	T-stat Mean	P-value Proportions
Dividend yield	6.2%	6.3%	0.0%	15.0%	1,420	6.0%	6.4%	0.0%	12.9%	1,176	6.1%	6.5%	0.0%	15.2%	745	0.514	n.a.
Total return	9.7%	8.7%	-19.3%	38.4%	1,420	9.4%	8.4%	-14.9%	39.8%	1,176	8.7%	8.2%	-28.5%	45.3%	745	0.444	n.a.
QoQ growth units outstanding	3.2%	0.0%	-1.9%	25.2%	1,420	3.4%	0.1%	-1.0%	27.1%	1,176	2.8%	0.0%	-1.5%	26.7%	745	1.334	n.a.
QoQ growth debt oustanding	7.5%	1.9%	-18.5%	67.0%	1,420	6.0%	1.8%	-16.2%	54.8%	1,176	5.8%	1.3%	-14.3%	67.6%	745	1.374	n.a.
High splits	34.1%	0.0%	0.0%	100.0%	1,420	39.1%	0.0%	0.0%	100.0%	1,176	36.5%	0.0%	0.0%	100.0%	745	n.a.	0.733
IDR	79.8%	100.0%	0.0%	100.0%	1,420	81.6%	100.0%	0.0%	100.0%	1,176	86.0%	100.0%	0.0%	100.0%	745	n.a.	0.625
Goodwill	5.8%	2.4%	0.0%	24.4%	1,420	6.5%	3.7%	0.0%	27.7%	1,176	7.1%	4.2%	0.0%	24.6%	745	-6.230	n.a.
EBITDA margin	25.9%	15.9%	1.0%	75.6%	1,420	22.6%	14.2%	0.9%	68.7%	1,176	23.5%	11.5%	1.6%	72.7%	745	2.399	n.a.
Ln(sales)	5.73	5.79	2.80	8.74	1,420	6.13	6.10	2.89	8.93	1,176	6.10	6.20	2.95	8.77	745	-9.328	n.a.

- After September, 2014 -	Midstream universe (1)					Chow sample (3)					Difference (1) - (3)	
	Mean	Median	Minimum	Maximum	N	Mean	Median	Minimum	Maximum	N	T-stat Mean	P-value Proportions
Dividend yield	7.1%	7.0%	0.0%	15.0%	815	7.2%	7.3%	0.0%	15.2%	348	-0.591	n.a.
Total return	4.8%	4.6%	-19.3%	38.4%	815	4.5%	4.4%	-28.5%	40.7%	348	0.199	n.a.
QoQ growth units outstanding	2.0%	0.0%	-1.9%	25.2%	815	2.0%	0.0%	-1.5%	26.7%	348	0.438	n.a.
QoQ growth debt oustanding	5.5%	1.1%	-18.5%	67.0%	815	3.4%	1.0%	-14.3%	67.6%	348	1.458	n.a.
High splits	38.3%	0.0%	0.0%	100.0%	815	43.0%	0.0%	0.0%	100.0%	348	n.a.	0.422
IDR	68.3%	100.0%	0.0%	100.0%	815	69.4%	100.0%	0.0%	100.0%	348	n.a.	0.689
Goodwill	5.8%	2.9%	0.0%	24.4%	815	7.9%	5.2%	0.0%	24.6%	348	-9.362	n.a.
EBITDA margin	39.8%	43.2%	1.0%	75.6%	815	31.0%	22.8%	1.6%	72.7%	348	7.256	n.a.
Ln(sales)	5.49	5.36	2.80	8.74	815	6.34	6.41	2.95	8.77	348	-23.982	n.a.

After the crash, the dividend yield and total return of the midstream universe and Chow sample converge. As the number of existing MLPs dropped significantly[62] from 2014 to 2017, it is unsurprising that the characteristics of the samples have become more alike. Quarter-on-quarter growth in units and interest-bearing debt is lower for both samples and is especially pronounced for growth in debt capital. The average percentage of firms that have IDRs in place has decreased across the board. The drop in average existence of IDRs is larger for the Chow sample with a decrease of 16.7% versus an average decrease of 11.5% for the midstream universe. In contrast, the percentage of firms that is in the high splits has increased. This trend indicates that GPs whom have been unable to maximize cash earnings through IDRs are more inclined to abolish the incentive scheme completely and for example attempt to lower the cost of capital instead. Profitability has increased dramatically, implying that less profitable firms are no longer in business. Growth in average firm size slows down, but is still present over time for the Chow sample, while goodwill as a percentage of total assets decreases after its peak in March, 2015 (graph g) and i) of appendix 9.6.). A possible interpretation of these opposing developments is that firms are less eager to grow their asset base through acquisitions after the crisis. A similar, although less striking, trend is visible for the midstream universe.

Concluding, the sample of surviving firms has successfully increased in size at the expense of other MLPs prior to the MLP sector turmoil. The opposing trends in firm size and goodwill after the downturn implies that a larger share of growth is realized organically. While showing less growth in units and debt outstanding relative to other firms in the first place, surviving firms have responded more adequate to the crisis by further decreasing capital market dependency at a higher pace. Less profitable firms have gone out of business, boosting overall profitability for the midstream sector. Also, less firms have IDRs in place as the crisis introduced a renewed focus on a more sustainable way of running operations.

[62] Table 1