What explains the value premium? The case of adjustment costs, operating leverage and financial leverage

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A B S T R A C T

This paper empirically examines and compares the different theoretical predictions on how adjustment costs, operating and financial leverage influence the value premium. Consistent with Ozdagli (2012), financial leverage plays a dominant role, supported by adjustment costs (which represent the degree of investment irreversibility). Specifically, the observed value premium is driven by the financial leverage differences between value and growth firms, partially neutralized by investment irreversibility. The relation between the value premium and investment irreversibility is contrary to the intuition in Zhang (2005) and Cooper (2006). Operating leverage does not significantly influence the value premium.

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1. Introduction

The extant empirical literature documents a value premium, whereby trading strategies that enter long positions in value stocks and short positions in growth stocks generate positive returns on average (Fama and French, 1992, 1996; Garcia-Feijoo and Jorgensen, 2010; Novy-Marx, 2011). Drawing on Cochrane (1991), recent theoretical work links firms' stock returns to the return from their investment activities. Consequently, a number of related, yet competing, theoretical explanations for the value premium have been proposed. This paper aims to empirically examine and compare the different theoretical predictions on how adjustment costs, operating and financial leverage influence the value premium.

Several papers conjecture that the value premium reflects the adjustment costs firms face when investing and disinvesting. Zhang (2005) suggests that value firms earn higher returns as compensation for the higher risk attached to assets-in-place. Since assets-in-place are costly to scale down, value firms are less flexible in confronting macroeconomic shocks. By contrast, growth options are less costly to exercise, resulting in lower risk and

returns to growth stocks. As such, the value premium should increase with the asymmetry in investment and disinvestment adjustment costs. In a similar vein, Cooper (2006) proposes that the value premium is attributable to investment irreversibility, represented by adjustment costs which firms fail to fully recover on disinvestment. In the presence of irreversible capital investments, an adverse shock to productivity increases Book-to-Market ratio, since book value is relatively constant while market value declines. Accordingly, the value premium should be stronger amongst firms with higher investment irreversibility.

The value premium has also been theoretically linked to operating leverage. Noting that Book-to-Market ratio captures the operating leverage component of a firm's systematic risk, Carlson et al. (2004) attribute the value premium to the risk differential arising from differences in value and growth firms' operating leverage. Novy-Marx (2011) further partitions operating leverage into two components: (i) operational inflexibility (as characterized by Zhang (2005) and Cooper (2006)), and (ii) total operating costs. Relative to value firms, Novy-Marx (2011) models growth firms as more efficient producers whose higher profit margins act as a buffer to aggregate negative shocks. When total operating costs are high, investors are more willing to purchase the 'insurance' that growth firms provide, resulting in a stronger association between expected returns and Book-to-Market ratio. As such, Novy-Marx's (2011)

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model implies that the value premium is attributable to the total operating cost component of operating leverage, not operational inflexibility.

Other recent models suggest that adjustment costs and operating leverage play a secondary role to financial leverage in explaining the value premium. Contrary to Zhang (2005), Ozdagli (2012) argues that growth options are riskier than assets-in-place in the same way that a call option is riskier than its underlying asset. In the case of pure irreversibility, growth firms (which derive most of their value from growth options) are riskier than value firms. In the absence of leverage, this scenario leads to a *growth premium*. As firms' exposure to financial leverage increases, Ozdagli's (2012) model generates a value premium, consistent with Modigliani and Miller's (1958) view that financial leverage contributes to systematic risk. Hence, Ozdagli argues that the observed value premium is driven by financial leverage partially neutralized by investment irreversibility. Financial leverage also plays a role in Obreja's (2013) model, but only when fixed production costs are low (i.e. low operating leverage). When firms face high fixed production costs, the value premium is due to the operating leverage differences between value and growth firms.

Given the variety of theoretically-motivated linkages between the value premium and adjustment costs, operating leverage and financial leverage, there is a need for a comprehensive empirical study to examine the relative merits of these competing explanations. Despite their distinct implications for the value premium, the conjectures in Zhang (2005), Cooper (2006) and Carlson et al. (2004) are often treated homogeneously in the literature. Novy-Marx's (2011) view on the different roles of two operating leverage components has been tested only indirectly. While Ozdagli (2012) reports some evidence on financial leverage, its role in conjunction with investment irreversibility in his model remains unexplored. Finally, Obreja's (2013) conjecture on the impact of financial and operating leverage has not been empirically verified.

This study makes a number of important and timely contributions to this literature. First, we directly examine whether adjustment costs are related to the value premium. Using NYSE, AMEX, and NASDAQ listed firms during the period 1972–2011, we document that growth firms face lower adjustment costs than value firms in the sense that they tend to use shorter lived assets, more rented assets and less fixed assets. However, contrary to Cooper (2006), the results suggest that the value premium decreases with adjustment costs. If investment adjustment costs are sufficiently small relative to disinvestment adjustment costs, the adjustment cost asymmetry is driven by the magnitude of the latter. Under this assumption, our findings also contradict Zhang's (2005) prediction of a positive association between the value premium and the degree of asymmetry in adjustment costs. While Docherty et al. (2010) find cautious support for Zhang (2005) and Cooper (2006) using an indirect approach, our research design directly tests the theoretical predictions and finds that investment irreversibility is not positively related to the value premium.[1]

Consistent with Carlson et al.'s (2004) necessary condition that traditional operating leverage reflects systematic risk, we document that value firms have higher operating leverage. Yet, contrary to this intuition, we report a negative relation between traditional operating leverage and future returns. There is some modest evidence that the value premium increases with the total operating cost component of operating leverage, as foreshadowed by Novy-Marx (2011). However, in Fama and MacBeth (1973) cross-sectional regressions, the Book-to-Market coefficient

remains significant after controlling for both forms of operating leverage, suggesting that they do not explain the value premium. Investment irreversibility systematically affects the value premium, but in the opposite direction to theoretical predictions (Cooper, 2006; Zhang, 2005). The negative association between adjustment costs and the value premium is in line with Novy-Marx's (2011) view that operational inflexibility does not account for the value premium in the absence of leverage.

Our second contribution, therefore, is to differentiate the impact of investment irreversibility from operating leverage. Prior empirical studies either examine these characteristics in isolation or treat them homogeneously.[2] However, they are in fact clearly delineated in competing theories (i.e. Zhang, 2005 and Cooper, 2006 for the former and Carlson et al., 2004 and Novy-Marx, 2011 for the latter). Our empirical findings show that, while investment irreversibility is related to the value premium in a manner contrary to the featured theories, operating leverage does not significantly affect the value premium in any way. These findings highlight the importance of carefully matching the theoretical concept and empirical proxy.

Third, and most importantly, we present new evidence on the role that financial leverage plays, in conjunction with investment irreversibility and operating leverage, in explaining the value premium. Financial leverage exhibits several patterns consistent with Ozdagli's (2012) real option extension of Modigliani and Miller's (1958) paradigm. Financial leverage is positively related to future returns. Controlling for differences in financial leverage of value and growth firms weakens the value premium in portfolio analysis and renders the Book-to-Market coefficient insignificant in regression analysis. Ozdagli's (2012) predicted relationships between the coefficients on financial leverage and Book-to-Market are also supported, as is his view on the role of investment irreversibility. By contrast, there is no support for Obreja's (2013) theory that operating leverage and financial leverage jointly impact the value premium. Garcia-Feijoo and Jorgensen (2010) and Gulen et al. (2008) also study both financial and operating leverage, yet their methodologies treat them homogeneously. Our research design specifically investigates whether and how financial leverage co-exists with investment irreversibility and operating leverage in explaining the value premium as theoretically motivated by Ozdagli (2012) and Obreja (2013), respectively.

Overall, the findings of the paper suggest that the value premium is driven by financial leverage in conjunction with investment irreversibility. Consistent with Ozdagli (2012), the observed value premium is driven by the financial leverage differences between value and growth firms, partially neutralized by investment irreversibility. The empirical relation between investment irreversibility and the value premium is contrary to the intuition in Zhang (2005) and Cooper (2006). Operating leverage is insufficient to explain the value premium.

The remainder of the paper is structured as follows. Section 2 briefly reviews the relevant literature and formalizes the hypotheses tested in this paper. Data and the construction of key variables are described in Section 3. Section 4 examines the association between the value premium and investment irreversibility. Its relation with operating leverage and financial leverage is explored in Sections 5 and 6, respectively. Using a regression framework, Section 7 re-examines these relations and compares their relative

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[1] In a study of the Australian market, Docherty et al. (2010, Table 5) show that (a) their tangibility factor loading is comparable to the value factor loading, and (b) augmenting the Fama and French three factor model with their tangibility factor improves the return explanatory power.

[2] For example, while Garcia-Feijoo and Jorgensen (2010) focus solely on the traditional measure of operating leverage, they interpret their results as also supporting Zhang's (2005) and Cooper's (2006) models on investment irreversibility. Similarly, although Gulen et al. (2008) address both investment irreversibility and operating leverage, they treat these two characteristics equivalently and consolidate them into a single composite measure together with financial leverage.