Understanding the Value and Size premia: What Can We Learn from Stock Migrations?

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Abstract

The realized size and value premia reflect earnings-induced price surprises that do not fit the rational pricing story. In addition, they seem to have little to do with systematic risks. This is because the majority of value or small firms with persistently high systematic risks are not rewarded with a premium. The premium happens, as a price adjustment, only to the subset of migrating firms when they receive earnings shocks, and only during the migration periods. In addition, the systematic risks of the migrating firms completely change after the migration. Finally, the size premium has not disappeared: excluding growth firms, the size premium is as robust as ever.

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1 Introduction

The value premium is the return spread between stocks with high ratios of book equity or earnings to market equity (value stocks) and stocks with low ratios (growth stocks); the size premium is the return spread between small stocks and big stocks. The profitability of the value and size premia has long been proposed and widely documented (e.g., Graham and Dodd, 1934; Dreman, 1977; Fama and French, 1992; Lakonishok, Shleifer, and Vishny, 1994). In a sequence of seminal studies, Fama and French (1992, 1993, 1995) propose a three-factor model, including the market factor, the HML factor (high book-to-market minus low book-to-market, i.e., the value premium), and the SMB factor (small minus big, i.e., the size premium), that seems to explain the cross-section of stock returns. Since then, the three-factor model has become the benchmark model for estimating expected returns, and has had profound impact on financial economics and industry practice.

Given their importance, it is natural to ask what the value and size premia mean. Unfortunately, little agreement has been reached in this regard and they represent two major asset pricing puzzles. Some economists propose a behavioral story to explain the value premium (e.g., DeBondt and Thaler, 1987; Lakonishok, Shleifer, and Vishny, 1994; Haugen, 1995). According to this story, naive investors overextrapolate the past poor (good) earnings performance of value (growth) firms into prices. They are subsequently surprised by the improved (deteriorated) performance of value (growth) firms and make price adjustments. Thus, the value premium is caused by price adjustments due to earnings surprises. Consistent with this story, Lakonishok, Shleifer, and Vishny (1994) show that the earnings performance of value (growth) firms improves (deteriorates) after portfolio formation.

Some others prefer a rational pricing story. As Fama and French (1992, 1993, 1995) forcefully argue, value (small) firms have dynamics of returns and earnings distinctively different from growth (value) firms. Put differently, if one regresses stock returns on the HML and SMB factors, value (small) firms will have higher HML (SMB) betas than growth (big) firms. If the HML and SMB factors proxy for undiversifiable systematic risks, then the *realized* value and size premia proxy for *expected* risk premia as rational compensations for bearing such risks. Fama and French (1995) further argue that, even though the earnings performance of value (growth) firms improves (deteriorates) after portfolio formation, this could be rationally expected by investors.

Lakonishok, Shleifer, and Vishny (1994) motivate their study by observing that "Whether value strategies have produced higher returns because they are contrarian to naive strategies or because they are fundamentally riskier remains an open question." Fifteen years later, the question remains as open as ever. Fama and French (2004) admit that "the conflict between the behavioral irrational pricing story and the rational risk story ... leaves us at a timeworn impasse." Simply put, the cause of the value premium remains a puzzle.

The situation with the size premium is arguably worse. The size premium has disappeared: it is 0.18% per month during 1951-2006, statistically indistinguishable from zero (t-statistic 1.56). This disappearance is due to the lackluster performance of the size premium (0.11%) during 1981-2006. In an important survey, Schwert (2003) summarizes the literature and makes the following conclusion: "Thus, it seems that the small-firm anomaly has disappeared since the initial publication of the papers that discovered it. Alternatively, the differential risk premium for small-capitalization stocks has been much smaller since 1982 than it was during the period 1926-1982."

If the size factor is a proxy for systematic risk, where does the size premium go? If the size premium has been arbitraged away or has gone done toward zero, what does this say about the systematic risks of small firms? If the size premium has disappeared, why do people continue to use the size factor to estimate expected returns? The current literature is largely silent on these issues. As can be seen, the size premium, disappearing or not, remains a major asset pricing puzzle.

In this paper we show that studying stock migration goes a long way in understanding the value and size premia. We are motivated by Fama and French (2007) who show that almost all of the value and size premia are driven by stock migration: by value (small) stocks that are "upgraded" to growth (big) stocks, or the other way around. However, they provide no explanation on why stocks migrate. Nor do they explore the implications of stock migration on the value premium puzzle and the missing size premium puzzle. Therefore, they do not address the main issues of interest in this paper.

We find three pieces of new evidence that clearly favor the behavioral story but challenge the rational pricing story.

First, the stock migration is driven by earnings shocks. In particular, relative to non-migrating firms, stocks that are upgraded (downgraded) experience positive (negative) earnings shocks. In a powerful test, we show that the three-day earnings announcement returns are strongly positive for upgraded stocks, and negative for downgraded stocks; in the meantime, analysts revise their forecasts on future earnings, from one-year, two-year, to long horizons in the same manner consistent with earnings announcement returns. The logic is compelling: earnings shocks propel investors to revise the outlooks on future cash flows and adjust prices, causing the value and size premia.

Therefore, consistent with the prediction by the behavioral story, the value and size premia are in nature price adjustments in response to earnings shocks.

In a rational pricing world, the expected value premium is compensation for systematic risk given *expected* future cash flows. It is possible to observe that stock prices respond to earnings shocks, as rightfully argued by Fama and French (1995). However, such responses cannot be the main driver of *expected* value premium. This is because, on average, the impact of such responses on returns should be zero. The novel evidence here is to show, jointly, that (i) the value premium is driven by stock migrations, and (ii) the migrations are responses to earnings shocks. Once the *realized* value premium is tied to earnings shocks, it becomes difficult to explain it as the *expected* value premium, which is necessary in a rational pricing story.

We are not the first study on post-earnings announcement returns for value and growth firms. La Porta, Lakonishok, Shleifer, and Vishny (1997) show that up to 30% of the value spread is driven by the post-earnings return spread between high and growth stocks. Doukas, Kim, and Pantzalis (2002), however, find that value firms, despite higher announcement returns, have higher forecast errors, which are defined as the difference between forecasted earnings and actual earnings. The higher forecast errors for value firms suggest that investors are more optimistic about these firms, contrary to the behavioral story.

We confirm the finding by Doukas, Kim, and Pantzalis (2002) that value firms have higher forecast errors. However, crucially, we show that this is only true for the non-migrating stocks, which we know contribute little to the value premium. Among the migrating stocks that matter for the value premium, value firms that are upgraded have much lower forecasts errors and growth firms that are downgraded have higher forecast errors. Another way to illustrate this point is to regress announcement returns on forecast errors. Doukas, Kim, and Pantzalis (2002) suggest a positive coefficient, while the behavioral story predicts a negative coefficient. We find that such a univariate regression yields a negative coefficient with a t-statistic of 5.91 and R-squared of 0.50. We further show that the upgraded value stocks also experience positive analyst revisions on future cash flows at all horizons, suggesting that investors were indeed too pessimistic about these stocks. Therefore, by distinguishing between stocks that matter and those that do not matter for the value premium, our finding reconciles both studies and provides an intuitive interpretation.

Second, Fama and French (1995) find that the ratio of earnings to last year's market price is stable for both value and growth firms from five years before to five years after portfolio formation. They argue that, if investors overextrapolate past earnings, then this ratio, due to surprise, should not be stable for the whole period and should be higher for value stocks after portfolio formation. The evidence is thus taken as against the behavioral story. We note that the evidence is also consistent with a behavioral story in which the investors not only extrapolate past earnings but are myopic so that they adjust prices year by year following each year's earnings shocks. To distinguish these interpretations, it is better not to study the ratio of earnings to last year's market price, but the ratio of earnings to the market price in the portfolio formation year. When doing so, we find that the ratio is unstable from the pre-sorting to the post-sorting periods, and shows a diverging pattern between value and growth stocks: the spread of the ratio between high and low BE/ME stocks is positive and this spread increases monotonically with time after portfolio formation. This result is intuitive: it says that, given the price multiples at the portfolio formation time, value firms are better investments (in terms of profitability), and ever more so as time evolves. The results thus clearly favor the behavioral story.

Third, we show a somewhat surprising implication of stock migration, namely that the realized value and size premia have little to do with systematic risks as measured by HML and SMB betas. The reason is straightforward. The majority of the firms – more than 80% of total market capitalization and more than 68% of all firms – are not rewarded with a positive value or size premium. A positive premium only happens to the subset of firms that are being upgraded, and only during the migration period, not after. Crucially, the systematic risks of these firms completely change after the migration. In contrast, the typical value (small) firms with persistently high HML (SMB) betas are not rewarded with a premium. The evidence strongly suggests that the premium is due to price adjustments in response to surprises rather than as an expected premium.

We finally show that studying stock migration also sheds new insights on the missing size premium puzzle. It is a puzzle in a rational pricing story because the current interpretations would suggest either (i) systematic risk does not matter (because the risk premium can be arbitraged away) or (ii) the SMB beta is not a measure of systematic risk. We show that the "disappearance" of the size premium is solely due to the disappointing return performance of small growth firms that also experience large negative earnings shocks since the 1980s. If one decomposes the SMB factor into two components, with and without growth firms separately, then the value premium without growth firms is as robust as ever.

This is a surprising result and thus worthy of details. The total size premium is 0.24% (t-statistic 2.20) per month during 1926-2006, 0.30% (t-statistic 2.23) during 1926-1980, and 0.11% during 1981-2006. In comparison, the size premium without growth firms is 0.31% (t-statistic 3.03) during 1926-2006, 0.31% (t-statistic 2.47) during 1926-1980, and 0.30% during 1981-2006; the size premium with growth firms is 0.28% during 1926-1980 and -0.27% during 1981-2006. Therefore, if one excludes the growth firms, the size premium is as robust as ever. This finding should put to rest the argument that the size premium has been arbitraged away. The -0.27% of the size premium for growth firms is the sole cause of the "disappearance" of the size premium, and this disappointing performance has more to do with negative earnings shocks than to do with arbitrage.

Moreover, in all of the above-mentioned periods, the SMB factor is more than 90% correlated with its components with or without growth firms. This suggests that the systematic risk related to size is as systematic as ever. In other words, the size premium "comes and goes" even though the systematic risk does not change. Therefore, the size premium has not been arbitraged away, has not declined at all since the publication of Banz (1981) if one does not consider the small growth stocks, and the disappointing performance of small growth stocks is not driven by the change of systematic risks.

In summary, using stock migrations, we have shown that the realized size and value premia reflect earnings-induced price adjustments that do not seem to fit the rational pricing story well, that they seem to have little to do with systematic risks, and that, excluding growth firms, the size premium is as robust as ever.

The rest of the paper proceeds as follows. In Section 2 we briefly discuss the literature, which sets up the stage for the value premium puzzle and the missing size premium puzzle. Section 3 reports the relation between stock migration and the value and size premia. Section 4 explores what drives the stock migration. Section 5 studies the missing size premium puzzle. Section 6 provides some further robustness checks. Section 7 provides concluding remarks including some implications on the current literature.

2 Literature background

The three-factor Fama-French model is as big a milestone as an enigma. It originates from the finding by many studies that the capital asset pricing model (CAPM) fails to explain the cross-section of stock returns related to market equity (ME) and book equity to market equity ratio (BE/ME) (e.g., Banz 1981; Fama and French 1992; and Lakonishok, Shleifer, and Vishny 1994). Taking this into consideration, Fama and French (1993) show that a three-factor model that includes the market factor, the size factor, and the value factor explains the cross-section of stock return well. Since then, the three-factor model has practically become the benchmark model for asset valuation. For empirical research, it is a workhorse to estimate expected returns (i) for event studies and capital budgeting and (ii) for practitioners to evaluate abnormal performance. For theoretical research, it has become a standard challenge for new models to fit the value and size premia (e.g., Berk, Green, and Naik, 1999; Gomes, Kogan, and Zhang, 2003; Zhang, 2005).

The value premium puzzle Despite the importance, the interpretation of the value premium remains controversial. The behavioral story (e.g., DeBondt and Thaler 1987; Lakonishok, Shleifer, and Vishny 1994) goes that naive investors extrapolate past earnings into current prices. In particular, BE/ME is high (low) for value (growth) stocks because investors believe that their poor (good) past performance is likely to continue. As a result, positive (negative) earnings shocks for value (growth) stocks after portfolio formation surprise the market and prices are adjusted in response to earnings shocks, causing the value premium. The key ingredients of the behavioral story are earnings surprises and price adjustments.

As shown in Figure 1, for the five years before portfolio sorting, the return on equity (ROE), defined as earnings divided by book equity in the past year, keeps rising (declining) for growth (value) firms. However, after sorting, the ROE declines (rises) for growth (value) firms in the following five years. This pattern is consistent with the behavioral story.

The rational pricing story (e.g., Fama and French, 1993, 1995) emphasizes the fact that the returns and earnings of value stocks tend to move together in a fashion different from growth stocks. As a result, value stocks have significantly higher HML betas than growth stocks. If the HML factor represents certain systematic risk that is not captured by the market factor, then the value premium could be a rationally expected risk premium compensating for the higher loading of value stocks on the systematic risk. Therefore, the key ingredients of the rational pricing story are systematic risk and expected returns (given expected future cash flows) rather than earnings surprises and price adjustments.

Fama and French (1995) also provide an interpretation on the convergence of earnings in Figure 1. They argue that value (growth) stocks experienced some negative (positive) earnings shocks sometime before portfolio formation. The profit-maximizing response of the value (growth) firms is to reduce (increase) their production until the return on equity increases (drops) to the equilibrium level. Such a behavior can cause the convergence of earnings after portfolio sorting.

Fama and French (2005) further argue that, if the behavioral story holds, the ratio of earnings to last year's market equity should be unstable and higher for value stocks after portfolio formation.

The point is that, if investors overextrapolate past earnings, they should be surprised by the improving (deteriorating) performance of value (growth) firms given the initial investment after portfolio formation. Fama and French (1995) find that this ratio is very stable for both value and growth stocks, which seems to suggest that the market rationally expects the trends in earnings.

Therefore, both behavioral and rational interpretations have been used to explain the value premium and the earnings trend. The cause of the value premium remains a puzzle.

The missing size premium puzzle Compared to the value premium, there has been less debate on the cause of the size premium. This is partly because the size premium has disappeared. The size premium is 0.18% per month and statistically indistinguishable from zero (t-statistic 1.56) during 1951-2006. Summarizing the literature, Schwert (2004) provides two interpretations on the disappearance of the size premium: it might have been arbitraged away since the publication of the size effect by Banz (1981); alternatively, the size premium as an expected risk premium has gone down dramatically for some unknown reason.

The missing size premium, in fact, imposes as big a challenge to the literature as the value premium. If the size factor is a proxy for systematic risk, where does the size premium go? It can be easily shown that small firms continue to have significantly higher SMB betas than big firms since the 1980s, suggesting that small firms carry as much systematic risks as ever. Therefore, if the size premium has been arbitraged away, what does this say about the systematic risks of small firms? In addition, if the expected size risk premium has disappeared, why do people continue to use the size factor to estimate expected returns? The current literature is largely silent on these issues. Nevertheless, given the importance of the size factor, sorting out these issues seems important.

3 Stock migration patterns and returns

In an intriguing paper, Fama and French (2007) show that most of the size and value premia are due to stock migration: value (small) stocks migrating to growth (big) stocks; value stocks migrating to growth stocks, and vice versa. We follow their approach and ask two questions. First, what drives the stock migration (and thus value and size premia)? Second, what can we learn from the stock migration regarding the value premium puzzle and the missing size premium puzzle?

Fama and French (2007) provide no evidence regarding the first question and concede that the evidence on stock migration does not separate the rational pricing story from the behavioral story.

We take a different view. If the value and size premia only apply to a subset of firms, then studying the difference between the firms that matter for the premia and the ones that do not is likely to yield fresh insight on the puzzles.

3.1 Factor construction

We use the universe of stocks from NYSE/AMEX/NASDAQ. The return data are from the Center for Research in Security Prices (CRSP) and the accounting data are from the COMPUSTAT annual tape. The combined data cover the sample period from July 1951 to December 2006.

We follow the literature to construct six size and BE/ME portfolios. In June of each year, we sort firms into big (B) and small (S) categories using the median size of market capitalization of NYSE firms. We also sort firms into three book-to-market categories, low (L), neutral (N), and high (H), using the 30% and 70% cutoff points of NYSE firms at the end of last year. The book-to-market is defined as the ratio of book equity to market capitalization; the book equity is Compustat's total assets (data item 6) minus liabilities (item 181) plus deferred taxes and investment tax credit (item 35) and minus the value of preferred stock, in the order of availability, liquidating value (item 10), redemption (item 56), or carrying value (item 130).

The ranking is conducted once a year in June and stocks belong to the sorted categories from July of this year to June of next year. The intersection of size and book-to-market categories yields six portfolios, SL, SN, SH, BL, BN, BH. The SMB (size) factor is defined using the returns of the six portfolios: $(SL+SN+SH)/3-(BL+BN+BH)/3$; the HML (value) factor is defined using the returns of four portfolios: $(SH+BH)/2-(SL+BL)/2$.

From July of this year to June of next year, stocks in each of the six size and BE/ME portfolios may either stay in their original rank or migrate to the other five ranks. This creates a migration matrix of 36 cells. The interesting question, which we pursue below, is which migration cells contribute to the value and size premia and for what reasons.

3.2 Migration weights

Table 1 reports the stock migration matrix. Panel A reports the market cap migration. For example, 65.03% of market capitalization that starts with the small growth category will remain so after one year; 21.55% will be downgraded to small neutral firms, and 10.93% upgraded to big growth firms. In comparison, 70.72% of small value firms will remain so after one year; 19.61% are upgraded to small neutral firms, 3.40% upgraded to big neutral firms, and 4.34% upgraded to big value firms.

We can calculate from this panel the percentage of market cap that does not migrate. During the period 1951-2006 the percentages of market cap for the six portfolios before migration are (not in the table): 2.69% (SL), 2.82% (SN), 1.80% (SH), 54.71% (BL), 28.98% (BN), 9.00% (BH). If we multiply the percentages of market cap without migration by these weights and sum them up, we reach a number of 81.59%. That is, more than 80% of the market cap do not migrate within one year.

There is a higher percentage of market cap among small firms to migrate to big firms than the other way around. For example, 11.67% of the market cap of small growth firms migrate to big firms; only 0.95% of the market cap of big growth firms migrate down to small firms. The reason is that those firms that are closest to the size boundary (NYSE 50% cutoff point) are more likely to migrate. It follows then that those firms migrating upward are relatively bigger among small firms and take a larger weight in market cap; and those firms migrating downward are relatively smaller among big firms and take a smaller weight.

The above pattern leads to two interesting implications. First, small firms migrating upward are not the typical small firms – they are much bigger. In other words, if one regard size as a proxy for risk, then these migrating firms are much less risky. Similarly, big firms migrating downward are not the typical big firms – they are much smaller and thus more risky. Second, when calculating weighted-average returns for the size and value premia, those migrating upward will receive higher weights, and those migrating downward will receive lower weights in their respective categories.

It is easier to migrate between style than between size categories. For example, 23.30% of small growth firms will be downgraded to small neutral or small value firms, and only 11.67% upgraded to the big firm categories. Similarly, 26.28% of big value firms will be upgraded to big neutral or big growth firms, and only 2.05% downgraded to the small firm categories.

Panel B reports the migration matrix in terms of the percentage of portfolio firms. The percentages of number of firms that migrate to other categories are similar to those in Panel A, except for two noticeable differences. First, the percentage of the number of small firms migrating upward is similar to the percentage of the number of big firms migrating downward. Second, the percentage of the number of big growth firms without migration (78.59%) is much smaller than the percentage of the market cap of big growth firms without migration. Both exceptions are related to the fact that those migrating firms are different from those non-migrating firms: those migrating upward are bigger among small firms and those migrating downward are smaller among big firms.

Finally, If we multiply the percentages of the number of firms without migration by their weights as percentages of the total number of firms, we reach a number of 68.94%. That is, more than two third of the firms do not migrate within one year.

3.3 Migration returns

Panel A of Table 2 reports the value-weighted average returns of each migration cell. Small growth firms have a monthly return of 0.80% if they remain small growth firms after one year; in comparison, small value firms earn a monthly return of 0.88% if they remain small value firms. Big growth firms have a monthly return of 1.08% if they do not migrate; big value firms earn a monthly return 1.05% without migration. This translates into a tiny value premium of (annualized) 0.30% during 1951-2006. The corresponding annualized number in Fama and French (2007) is -0.25% during 1963-2005. Therefore, without migration the value premium is essentially zero in the postwar period. Put differently, for most of the firms there is no value premium.

We find an average return of 2.23% per month when small value firms are upgraded to small neutral firms, 3.74% for upgrade to small growth firms, 4.47% for upgrade to big neutral firms, 3.86% for upgrade to big value firms, and 9.31% for upgrade to big growth. When considering these numbers, it is important to keep the migration weights (Panel A of Table 1) in mind since they tell the relative importance of the cells. In particular, the 9.31% from small value to big growth appears impressive but adds little to the value premium since it only accounts for 0.49% of the market cap. The average return is -0.58% for small growth firms being downgraded to small neutral firms, -2.63% for downgraded to small value firms, and 4.40% for upgraded to big growth firms. The other cells are not important since they carry little weight.

Overall, it is clear how the small value premium is earned: it is through small value firms being upgraded through both the style and size dimensions, and through small growth firms being downgraded through the style dimension. In addition, some small growth firms offset part of the premium by migrating to big growth firms. We find similar patterns for the big value premium.

Move on to the size premium. Without migration, the size premium is -0.28% ($= 1.08\% - 0.80\%$) among growth firms, -0.07% among neutral firms ($= 1.02\% - 0.95\%$), and -0.17% among value firms ($= 1.05\% - 0.88\%$). Therefore, there is no size premium without migration. In fact, small firms are punished for staying small. The size premium, if any, must come from the migration cells. These results are consistent with Fama and French (2007).

Panel B reports the return of each cell weighted by the total market cap of the initial rank. For example, the weighted average return of small growth firms is 0.99% per month, 0.54% of which comes from non-migrating small growth firms, -0.14% from downgrade to small neutral, -0.06% from downgrade to small value, and 0.61% from upgrade to big growth firms. Small value firms earn an average return of 1.53%, 0.58% of which comes from non-migrating small value firms, 0.46% from upgrade to small neutral, 0.17% from upgrade to big neutral, and 0.17% from upgrade to big value. The average return of large growth firms is 0.95%, all of which comes from non-migrating large growth firms; the migration firms play a minor role. The average return of large value firms is 1.30%, 0.72% of which comes from non-migrating big value firms, and 0.57% from upgrade to big neutral firms; the other cells matter little.

In the end, the value premium is 0.45% and the size premium is 0.18% for 1951-2006. The corresponding numbers from Kenneth French's website are 0.42% and 0.18% respectively.[1] Therefore, we have replicated the value and size premia. Importantly, there is no value or size premium for more than 80% of the market capitalization and more than 68% of the firms. The value and size premia are completely driven by the rest of the firms through migration.

4 What drives stock migration?

4.1 Earnings changes

We first examine whether the stock migrations are driven by earnings changes. As in Fama and French (1995), we use the change of return on equity (ROE), defined as the income before extraordinary items (item 18) divided by the book equity in the past year, as a proxy for the shock to expected net cash flows. Table 3 reports the results; Panel A reports the change of ROE for each migration cell and Panel B reports the same numbers with market cap weights considered.

The general pattern is that when firms are upgraded (downgraded) along either the style or size dimension, there are corresponding positive (negative) shocks to cash flows. For example, the three cells that matter most for small growth firms are small growth without migration, small growth downgraded to small neutral, and small growth upgraded to big growth; the corresponding changes of ROE in Panel A are -3.60%, -6.00%, and 0.33% respectively. In comparison, small value firms without migration has a ROE change of -0.70%; that is, the earnings performance of these firms

[1]To enter into the migration matrix, a stock should be available at the portfolio formation time and one year after. This excludes stocks that disappear for reasons such as merger, acquisition, or delisting within one year. Such exclusion affects little of the value and size premia. For example, the average monthly returns from Kenneth French are 0.95% (small growth), 1.34% (small neutral), 1.51% (small value), 0.95% (big growth), 1.07% (big neutral), and 1.25% (big value) for 1951-2006. These numbers are very close to those in Table 2. We can replicate essentially the whole value and size premia without considering the small faction of stocks that are excluded.

does not improve. However, when small value firms are upgraded to small neutral, large neutral, or large value firms, the three cells that contribute most to the value premium, the corresponding changes of ROE are 1.91%, 4.22%, and 2.11% respectively.

Panel B reports the change of ROE weighted by the initial market cap. In the last column, the weighted average change of ROE for small growth firms is -3.80%, and the weighted average change of ROE for small value firms is 0.32%; the weighted average change of ROE for big growth firms is -1.39%, and the weighted average change of ROE for big value firms is 0.48%. We thus have observed the familiar convergence of ROE between value firms and growth firms as shown in Figure 1.

Therefore, the evidence on the stock migrations and on the relation between stock migration and earnings change suggests that the value and size premia are caused by price adjustments in response to earnings changes.

What does this mean? The interpretation depends on the nature of the earnings changes. If they come mainly as surprises to investors, then the value and size premia are caused by investors' revisions of expectations on future cash flows. As such, they are not informative about the expected returns. That is, the existence of value (size) premium does not necessarily imply that the value (small) stocks have higher expected returns than growth (big) stocks. Therefore, if the earnings changes represent surprises, then they fit a behavioral story rather than a rational pricing story.

Alternatively, Fama and French (1995) argue that investors rationally expect that the earnings of value (growth) firms improve (deteriorate) after portfolio formation, but they do not know which value (growth) firms will improve (deteriorate). As such, it is possible to observe price adjustments after the new information on earnings transpires.

It appears that the evidence on stock migration and on earnings changes fits both the behavioral and rational interpretations. Fortunately, it does not. As the following example shows, if the earnings changes are rationally expected, then the value premium cannot be caused by stock migrations.

Imagine that value stocks and growth stocks have the same systematic risks and thus the same discount rate R. The growth stocks have expected cash flow of X in the following year. Also imagine that a portion π of value stocks have expected cash flow of X in the next year, and a portion $1-\pi$ of value stocks have expected cash flow Y, where $Y > X$. Investors cannot distinguish which portion of value stocks have expected cash flow of X and which portion have expected cash flow of Y. If the investors are rational, they should treat the expected cash flow of value stocks as $\pi \times X + (1 - \pi) \times Y$ and price them this way. After one year, when the information transpires, the portion $1 - \pi$ of value stocks will experience positive earnings shocks and their prices will be adjusted upward; the portion π of value stocks will experience negative earnings shocks and their prices will be adjusted downward. Combined, however, the positive price adjustments on average offset the negative adjustments and the value stocks will earn R for the whole asset class. One should not observe the value premium simply because some stocks are upgraded.

The point is that, in a rational pricing world, the expected value premium is compensation for systematic risk given *expected* future cash flows. It is possible to observe that stock prices respond to earnings shocks, as rightfully argued by Fama and French (1995). However, such responses cannot be the main driver of *expected* value premium. This is because the impact of responses on returns, on average, must be zero if the future cash flows are rationally expected. Since we have found that the value and size premia are driven by stock price adjustments in response to earnings shocks – they essentially do not exist for stocks that do not migrate – they do not fit the rational pricing story.

The different earnings performances of value and growth firms, as shown in Figure 1, have been well known since Lakonishok, Shleifer, and Vishny (1994) and Fama and French (1995). The novel evidence here is to show, jointly, that (i) the value premium is driven by stock migrations, and (ii) the migrations are related to earnings shocks. Once the realized value premium is tied to earnings shocks, it becomes difficult to explain it as the expected value premium, which is necessary in a rational pricing story.[2]

4.2 Earnings announcement returns

Here we provide further evidence strengthening the link between the realized value and size premia and earnings surprises. A powerful way to do so is to study post-earnings announcement returns. It is powerful in the sense that such announcement returns are deemed to be unexpected. We merge the sample with the I/B/E/S data set, which contains earnings announcements dates and analyst forecasts on earnings. We then calculate the three-day announcement returns, from the day before the announcement to the day after, during the four quarters after portfolio formation.

[2]It is also interesting to note that not all ROE changes are unexpected. For example, small value stocks without migration have relatively less negative ROE changes than small growth stocks without migration; similarly, big value stocks without migration have relatively less negative ROE changes than big growth stocks without migration. Since the value premium is essentially zero for stocks without migration, this suggests that the market properly expects the earnings pattern for the stocks without migration.

Panel A of Table 4 reports the average three-day returns of the 36 migration portfolios. It is clear that large announcement returns are related to stock migrations. For example, for the small growth firms staying small growth, their three-day announcement return is 0.10%; if the small growth firms are downgraded to small neutral firms or small value firms, their announcement returns are -0.50% and -1.32% respectively; if small growth firms are upgraded to big growth firms, the announcement return is 2.35%. Compared to Table 2, the three-day announcement returns are frequently more than 50% of the total return for the migrating stocks.[3]

It is also revealing to observe that, if small value firms remain small value, their announcement return is 0.05%, comparable to 0.10% for small growth firms without migration. Similarly, for big growth firms without migration, the three-day return is 0.49%, comparable to the 0.53% for big value firms without migration. Therefore, there is little return difference between value and growth firms without migration. This is consistent with our finding from Table 3 that the market seems to properly expect the earnings patterns for the stocks without migration.

Panel B reports the cumulative abnormal returns adjusted for the CAPM returns, in which cases the betas are estimated using daily return data from day -145 to -20 before the event date. The patterns in Panel B are very similar to those in Panel A.

Current debate We are not the first study to examine post-earnings announcement returns. La Porta, Lakonishok, Shleifer, and Vishny (1997) show that up to 30% of the value spread is driven by post-earnings announcement returns. This evidence suggests that the value spread is in nature price adjustments in response to earnings shocks. It is consistent with the view that investors overextrapolate past earnings performance; they are subsequently surprised by the positive (negative) earnings of value stocks and adjust prices upward (downward).

Doukas, Kim, and Pantzalis (2002) show, however, that value stocks display higher forecast errors (i.e., the difference between forecasts and actual earnings) than growth stocks, suggesting that investors are actually more optimistic about value stocks than about growth stocks. Their evidence thus casts doubt on the behavioral story. They argue that the results in La Porta, Lakonishok, Shleifer, and Vishny (1997) could be driven by the possibility that the market responses to earnings news for value and growth stocks in an asymmetric way.

Examining stock migration gives us an opportunity to separate the interpretations of these two

[3]Throughout the paper, we do not report the results for the portfolios if there is no data. For example, there is no announcement return data for big value firms that are downgraded to small growth firms. This happens to Tables 4, 5, 6, and 7.

studies. Panel C reports the forecast errors of the migration groups, in which cases forecast error is defined as the ratio of the difference between the latest quarterly earnings forecast and the actual earnings to the absolute value of the mean quarterly earnings forecast. If small growth firms stay small growth, the forecast error is 6.77%; in comparison, if small value firms stay small value, the forecast error is 27.24%. Similarly, if big growth firms stay big growth, the forecast error is -1.25%; if big value firms stay big value, the forecast error is 10.58%. We thus have confirmed the finding in Doukas, Kim, and Pantzalis (2002) that typical value firms have larger forecast errors than growth firms.

However, even though non-migrating value stocks have larger forecast errors than non-migrating growth stocks, they do not contribute to the value premium. On the other hand, if small growth firms are downgraded to small neutral firms or small value firms, the forecast errors are 19.45% and 53.98% respectively, suggesting that the actual earnings are much lower than the forecasts. In contrast, if small value firms are upgraded to small neutral firms, big neutral firms, or big value firms, the forecast errors are 9.70% (compared to 27.24% without migration), -11.29%, and -3.63% respectively. Therefore, for the migration groups that contribute to the value premium, value stocks tend to have overall lower forecast errors than growth firms, which likely drives the value premium.

The same story applies to the size premium. Small growth firms without migrations have higher forecast errors (6.77%) than big growth firms without migration (-1.25%); small value firms without migration have higher forecast errors (27.24%) than big value firms (10.58%). However, these firms do not contribute positively to the size premium. The size premium is mainly driven by small firms being upgraded along either the size or style dimension, in which cases the forecast errors are negative and are smaller than the forecast errors of big firms without migration.

The main argument of Doukas, Kim, and Pantzalis (2002) is that value stocks, despite higher announcement returns, have higher forecast errors. This argument predicts a positive relation between announcement returns and forecast errors. The behavioral story, on the other hand, predicts a negative relation – the higher announcement returns are responses to lower forecast errors (i.e., higher earnings surprises). A simple way to distinguish the two interpretations is to regress the abnormal returns on the forecast errors. If the hypothesis in Doukas, Kim, and Pantzalis (2002) is correct, we should observe a positive slope coefficient; otherwise the coefficient should be negative. Panel D of Table 4 conducts such an exercise. We observe a slope coefficient of -0.04 with a t-statistic of -5.91 and adjusted R-squared of 0.50. Therefore, the evidence is compelling: the value spread in announcement returns is driven by the migration groups, in which case the value stocks have lower forecast errors than growth firms.

It is easy to see why we get results different from Doukas, Kim, and Pantzalis (2002). When grouped together, value (small) stocks have higher forecast errors than growth (big) firms. However, this is driven by the bulk of the firms without migration, which contributes little to the value (size) premium and are associated with small announcement returns. Among the migration groups, value (small) stocks tend to have lower forecast errors and higher announcement returns. Studying stock migration helps us break the false positive relation between returns and forecast errors for value (small) firms. We still do not know why non-migrating value (small) stocks have higher forecast errors than growth (big) stocks. But the answer to that question, whatever it is, is secondary to the value (size) premium. This insight can only be gained through studying stock migrations. We have reconciled the results by both studies and gain new insight on the subject.

4.3 Analyst forecast revisions

Another way to understand whether the earnings changes are surprises is to study analyst forecast revisions. If the earnings shocks are unexpected, and if they lead to significant price adjustments, they must also propel investors to revise their expectations on future cash flows. We provide such evidence in Table 5. Panel A reports the difference between the new 1-year ahead forecasts and the last 1-year ahead forecasts, scaled by the lagged price. If small growth firms remain small growth, there is a small positive revision of 0.65%; in comparison, if small value firms remain small value, there is a small positive revision of 0.27%. However, if small growth firms are downgraded to small neutral or small value firms, there are negative revisions of -1.16% and -4.28% respectively; if small value firms are upgraded to small neutral, small growth, big growth, or big neutral firms, there are positive revisions of 2.75%, 8.08%, 8.74%, and 4.62% respectively. We find similar patterns for big growth and big value firms.

Panels B and C report the revisions of two-year and long-term analyst forecasts respectively. The patterns are again similar to those in Panel A. For example, in Panel C, it is well known that analysts tend to overestimate the long-term growth rates. Therefore, the revisions tend to be negative when there are no large earnings shocks. The revision for non-migrating small growth (value) firms is -1.50% (-0.73%). If small growth firms are downgraded to small neutral or small value firms, the revisions are -2.31% and -4.71% respectively. If small value firms are upgraded to small neutral, small growth, big growth, or big neutral firms, the revisions are 0.55%, 2.01%, 2.64%, and 0.58% respectively. We find similar patterns for big growth and big value firms.

In sum, analyst revisions on future cash flows show consistent patterns. Relative to the non-migrating stocks, those that are upgraded display positive revisions on future cash flows, from one-year, two-year, to long horizons; those that are downgraded experience negative revisions. The logic is compelling: those firms experiencing large positive (negative) earnings shocks propel analysts to positively (negatively) revision expectations on future cash flows on all horizons. If the investors think as the analysts do, they will adjust prices. The different price adjustments lead to the value and size premia.

Doukas, Kim, and Pantzalis (2002) show that value stocks display larger downward revisions of earnings forecasts than growth firms for the next quarter when the announcement time approaches. This result is not surprising. If value stocks, as a group, have higher forecast errors than growth stocks, their forecasts on the next quarter's earnings must be revised downward as the earnings announcement date approaches. For earnings shocks to affect prices, what is more revealing is how the market revise the expectation on future cash flows with longer horizons. In this regard, our evidence in Table 5 indicates that the value premium is indeed price adjustments in response to revisions of expectations on future cash flows.

4.4 Do investors rationally predict future cash flows?

Fama and French (1995) agree that the earnings patterns in Figure 1 and the return patterns for value and growth stocks are consistent with the behavioral story. They argue, however, that the behavioral story bears an additional prediction: if the investors of value stocks are indeed too pessimistic (optimistic) about the value (growth) stocks, the ratio of earnings income to last year's market price, EI_{t+i}/ME_{t+i-1} (t is the portfolio formation year), must be unstable from the five years before portfolio formation to the five years after. Instead, they find that the ratio is quite stable throughout the period. They thus argue that this evidence suggests that the prices are set in such a way that future earnings are rationally predicted, contrary to the behavioral story.

We note that the pattern for EI_{t+i}/ME_{t+i-1} is also consistent with a behavioral story in which investors not only extrapolate past earnings but also are myopic in the sense that they adjust prices to earnings shocks year by year, resulting in a stable EI_{t+i}/ME_{t+i-1}. To distinguish these interpretations, it is better to examine EI_{t+i}/ME_t, where t is the portfolio formation year. The reason is that the ranking is done in year t, and thus any test on misvaluation should be based on the price in year t as well. If one uses EI_{t+i}/ME_{t+i-1}, the fact that the prices of value stocks grow faster than growth stocks will disguise the additional earnings value stocks gain relative to the investment in year t.

We report the pattern of EI_{t+i}/ME_t from portfolio formation year t to t+5 in Table 6, in which case for year t we use EI_t/ME_{t-1}. In the last column, the weighted average ratio for small growth stocks is 7.48% in year t; it dips to 6.49% in year $t+1$ and then goes up in the next four years. In comparison, the ratio for small value firms is 8.99% in year t; it goes up to 9.99% in year $t+1$ and increases steadily. The spread of the ratios between small value and small growth stocks is 1.51% in year t, 3.50% in year $t+1$, 5.42% in year $t+2$, 6.92% in year $t+3$, 8.72% in year $t+4$, and 11.03% in year $t+5$. We find very similar patterns for big value and big growth stocks.

The other columns in Table 6 reports EI_{t+i}/ME_t for each migration group. Not surprisingly, stocks experiencing upward (downward) migration have higher (lower) EI_{t+i}/ME_t and thus contribute to the EI_{t+i}/ME_t spread between value and growth stocks.

Therefore, new insight emerges once one uses ME_t as the reference point. The evidence here indicates that, based on the purchase price in year t, the earnings shocks in value stocks are more positive than in growth stocks and become increasingly more so in the subsequent years.

Figure 2 plots the ratios from year $t-5$ to $t+5$. From $t-5$ to t we use ME_{t-6} as the denominator and from $t+1$ to $t+5$ we use ME_t as the denominator. The point is to compare the ratio for the five years before and the five years after portfolio formation. Controlling for size, growth stocks have higher ratios for at least two years before portfolio formation, but value stocks have higher ratios than growth stocks after portfolio formation, and increasingly more so as time evolves. The graph drives home the point that the ratio is unstable and is increasingly higher for value stocks after portfolio formation. Both Table 6 and Figure 2 are consistent with the behavioral view that value stocks are relatively underpriced in year t.

4.5 The migration of systematic risk

What does migration do to the systematic risks of the migrating stocks? To answer this question, we conduct the following regression for the 36 portfolios after migration,

$$r_{i,t} = \alpha_i + b_i \times MKT_t + h_i \times HML_t + s_i \times SMB_t + \varepsilon_{i,t}, \tag{1}$$

where $r_{i,t}$ is the excess monthly return of portfolio i, MKT_t is the market factor, HML_t is the value factor, and SMB_t is the size factor. Data for MKT_t, HML_t, and SMB_t are obtained from Kenneth French's website. The three slope coefficients, b_i, h_i, and s_i are the corresponding market, HML, and SMB betas. Fama and French (1993, 1995, 1996) argue that value (small) stocks are riskier because they have higher HML (SMB) betas. These betas are thus measures of systematic risks.

Table 7 reports the portfolio returns and betas after stock migration. For each portfolio, we report on the first row the return or beta, and the second row in parenthesis the p-value testing the hypothesis that the mean is the same as that of the corresponding non-migration portfolio. Panel A are the average returns. For small growth firms without migration, the average monthly return is 1.07%; for small growth firms downgraded to small neutral or small value firms, the after-migration returns are 1.30% and 1.18% respectively. These numbers are not only larger than the average returns without migration, but are contrary to the negative returns during the migration period (see Table 2). Similarly, for small value firms without migration, the average return is 1.53%; for small value firms upgraded to small growth firms or big growth firms, the after-migration returns are only 0.60% and 0.84% respectively. There are a few exceptions, but the general pattern is that the migration-period returns, which are the sources of value and size premia, tend to be transient and are opposite, in magnitude, to the after-migration returns. This finding reinforces our earlier argument that the value and size premia are price adjustments responding to surprises; they do not seem to reflect stable expected returns.

Panel B reports the HML betas. The striking feature is that the systematic risk after migration, as measured by HML betas, is completely different between the migrating and non-migrating firms. For example, for small growth firms without migration, the HML beta is -0.16; for small growth firms downgraded to small neutral or small value firms, the HML betas are 0.36 and 0.37 respectively. Similarly, for small value firms without migration, the HML beta is 0.62; if small value firms are upgraded to small neutral or small growth firms, the HML betas are 0.22 and -0.12 respectively. Therefore, if one takes HML betas as a measure of systematic risk, then stock migrations lead to fundamental changes of systematic risk. Panel C reports the SMB betas, and the patterns are very similar to those in Panel B.

Panel D reports the market betas, and the patterns are interesting. For example, for small growth firms without migration, the market beta is 1.06; if they are upgraded to big growth or big neutral firms, the market betas are 1.16 and 1.31 respectively. Similarly, for small value firms without migration, the market beta is 0.93; if they are upgraded to other styles or size, the market betas are higher. The finding that upgrades usually lead to higher market betas is puzzling, but is consistent with the previous finding that growth or big firms tend to have higher market betas (e.g., Fama and French, 1992, 1993, 1996).

What does it mean, when the stock migrations lead to fundamental changes of systematic risks, as measured by the HML and SMB betas, and when the after-migration returns tend to be opposite, in magnitude, to the migration-period returns? The natural interpretation is that the value and size premia are transient and do not represent expected premia for stable, systematic risks. In particular, value stocks have higher returns than growth stocks not because they have higher HML betas – the bulk of the stocks with high HML betas are not rewarded with a premium –, but because a portion of them are upgraded. The upgrade firms earn higher returns not because they have high HML betas, but because the nature of these firms has changed during the migration period. Once the migration is done, the high returns during the migration period do not continue. Simply put, the value premium represents price adjustment in response to surprises.

It seems difficult to fit such evidence into a rational pricing story, which would argue that the realized value premium represents expected risk premium as compensation for certain systematic risk. To the contrary, the evidence says that the value premium happens not when the risk is high, but when the risk changes. It follows that, if the realized value premium represents surprises (for whatever reason), it is unlikely to be part of the expected risk premium.

We do not meant to say that value (small) stocks are not riskier than growth (big) stocks. Rather, we mean to argue that, even if value (small) stocks are riskier than growth (big) stocks, risk per se is not the direct cause of value (size) premium.

The traditional approach in the rational asset pricing literature is to argue that value stocks are systematically riskier. Once this done, it seems natural to conclude that the value premium is the reward for such risk. The implicit assumption is that the realized value premium is a good proxy for the expected value premium. Our evidence from stock migrations and their link to earnings shocks suggests that this assumption seems questionable, and thus sheds fresh light on the interpretation of the value and size premia.

4.6 Regressional analysis

In this section we conduct regressional analysis to address two questions: first, what explains the value and size premia? Second, what predicts stock migrations?

What explains the value and size premia? Since the value and size premia are driven by stock migrations, this question is equivalent to asking what drives the returns of the migrating stocks. Our evidence on earnings announcement suggests that the returns of the migrating stocks are responses to earnings shocks. To formally test this hypothesis, in Panel A of Table 8, we first regress the returns of the migrating portfolios on the contemporaneous change of ROE. While there are 36 migrating portfolios, in the regressional analysis we only use 34 portfolios, excluding the group of small growth firms migrating to big value firms and the group of big value firms migrating to small growth firms. The reason is that these two groups count for 0.02% of the total market cap and 0.03% of the total number of firms. They are essentially outliers and do not contribute to the value and size premia.

Regressing portfolio returns on the ROE change yields a large coefficient of 0.384 with a t-statistic of 7.33 and an adjusted R-squared of 0.615. The evidence thus strongly supports the hypothesis that the value and size premia are responses to earnings shocks. We also regress the returns on the lagged market betas, the lagged HML betas, and the lagged SMB betas. The lagged market or HML betas do not explain the migrating returns. The lagged SMB betas predicts positively the migrating returns in the univariate regression, but this predictive power disappears when we include the contemporaneous ROE change.

In Panel B of Table 8 we regress the portfolio returns on the lagged portfolio book-to-market or log size. The lagged book-to-market predicts positively portfolio returns in the univariate regression. This is intuitive because value stocks are more likely to be upgraded than growth stocks and thus generating higher migration returns. But this predictive power disappears when the contemporaneous ROE change is included. This is also intuitive because it says that value stocks lead to higher migrating returns due to their tendency to experience more positive earnings shocks. Once the earnings shocks are included then, the explanatory power of the lagged book-to-market should disappear.

In all, the clear feature in Table 8 is that the contemporaneous ROE change strongly explains the returns of the migrating portfolios. As we have argued earlier, if the *realized* value and size premia are caused by price adjustments in response to earnings changes, they cannot be part of the *expected* value and size premia and thus do not fit the rational pricing story. The evidence in Table 8 is important in this regard because it confirms the link between the value and size premia and earnings changes.

What predicts stock migration? We use the full panel of firm-level data to conduct a multinomial logit analysis to investigate the six migrating types. In particular, we use no migration as the base case, and assume the migration process can be described as

$$P_{ik} = \frac{e^{X_{i,t-1} \times \gamma_k}}{1 + \sum_{k=2,3,4,5,6} e^{X_{i,t-1} \times \gamma_k}} \tag{2}$$

where P_{ik} represents the probability of the ith firm-year migrating into kth migration category ($k = 2, 3, 4, 5, 6$). X_{t-1} is the set of lagged explanatory variables, including the market-to-book ratio, log size, and ROE. The regressions are conducted on each of the initial six types of firms separately and the results are reported in Table 9. For each migration type there are three coefficients in sequence, for the lagged book-to-market, log size, and ROE respectively, followed by the t-statistics in parenthesis.

There are two clear patterns in Table 9. First, stocks that are upgraded (downgraded) along the style dimension have significantly lower (higher) book-to-market than the stocks without migration. For example, relative to the small growth firms without migration, small growth firms downgraded to small neutral or small value firms have positive book-to-market coefficients at 2.68 and 1.52, both statistically significant. Similarly, relative to the small value firms without migration, small value firms upgraded to small neutral for small growth firms have the book-to-market coefficients at -0.74 and -0.58, both statistically significant.

Second, stocks that are upgraded ((downgraded) along the size dimension have significantly bigger (smaller) sizes than the stocks without migration. For example, relative to the small growth firms without migration, small growth firms upgraded to large growth or large neutral firms have positive size coefficients at 1.08 and 1.63, both statistically significant. Similarly, relative to the large value firms without migration, large value firms downgraded to small value or small neutral firms have the size coefficients at -0.84 and -0.79, both statistically significant.

The coefficients for the lagged ROE are significant sometimes and insignificant at some other times, and these coefficients do not seem to possess a clear pattern.

The evidence in Table 9 is intuitive. Among the value stocks, those with lower book-to-market ratios are easier to be upgraded along the style dimension because they are closer to firms with lower book-to-market ratios and thus requires less earnings shocks to migrate. Similarly, among the small stocks, those with bigger sizes are more likely to become bigger firms given the same earnings shocks.

The fact that the firms with lower book-to-market among the value stocks are easier to be upgraded along the style dimension does not mean that they will generate higher migration returns. It takes bigger earnings shocks for the high book-to-market firms among the value stocks to become growth stocks, but this will also generate higher migrating returns; it takes smaller earnings shocks for the low book-to-market firms among the value stocks to become growth stocks, but this will also generate lower migrating returns.

5 The missing size premium puzzle

It is well documented that the size premium has "disappeared". During 1951-2006 the size premium is 0.18% per month, statistically indistinguishable from zero (t-statistic 1.56). This "disappearance" is caused by the small size premium of 0.11% during 1981-2006. Summarizing the literature, Schwert (2003) concludes that the size premium has either been arbitraged away or, as a risk premium, has gone down considerably.

The missing size premium presents a puzzle to the rational pricing story. During 1951-2006, even though the size premium is insignificant, small firms have large positive loadings on the SMB factor and big firms tend to have negative loadings. This can be seen in Tables 7 and 8 by comparing the SMB betas for small firms without migration to the SMB betas for big firms without migration. It can be easily shown that the same pattern holds during 1981-2006. If, as Fama and French (1995) argue, the SMB betas represent systematic risks, then small stocks are as risky as ever. If that is the case, where does the size premium go? If the size premium has been arbitraged away, do SMB betas still represent systematic risk? If there is essentially no size premium, then why do studies continue to use the size factor in the Fama-French three-factor model? The current literature is largely silent on these issues presumably because the disappearance of the size premium makes the issue less interesting. The contrast between the SMB betas and the lack of premium, however, is in fact as big a puzzle as the value premium.

Panel A of Table 9 reports the weighted returns of the migration matrix for 1981-2006. From the last column, the growth size premium is -0.25% (=0.76%-1.10%), the neutral size premium is 0.22% (=1.32%-1.10%), and the value size premium is 0.31% (=1.52%-1.21%). In comparison, during 1951-2006, the growth size premium is 0.04%, the neutral size premium is 0.26%, and the value size premium is 0.23%. It is immediately clear that the disappearance of the size premium is solely due to the poor performance of small growth firms.

To verify this conjecture, we use the six size and book-to-market portfolios from Kenneth French's website and construct two size factors: the growth size factor, defined as the return of $(SL - BL)$, and the no-growth size factor, defined as $(SN + SH - BN - BH)/2$. The no-growth size premium is 0.31% (t-statistic 3.03) per month during 1926-2006, 0.27% (t-statistic 2.53) during

1951-2006, and is 0.30% (t-statistic 1.77) during 1981-2006.[4] In comparison, the total size premium is 0.24% (t-statistic 2.20) during 1926-2006, 0.23% during 1951-1980, and 0.30% (t-statistic 2.23) during 1926-1980. Therefore, the no-growth size premium has been remarkably stable, between 0.27% and 0.31% in the past 80 years and is very close to the full size premium before 1981. The size premium is as alive as ever if we do not consider the growth firms.

How about the growth size premium? It is 0.28% during 1926-1980, 0.23% during 1951-1980, and -0.27% during 1981-2006 (we have -0.25% using our own data). What this says is that the growth size premium is close to the no-growth size premium and the full size premium excluding 1981-2006. The negative growth size premium during 1981-2006 is the sole reason for the "disappearance" of the size premium. Excluding the growth firms, the size premium is as robust as ever.

The disappearance of the growth size premium has nothing to do with the change of systematic risks. This point can be appreciated in two ways. First, it is easy to show that small value firms have significantly higher SMB betas than small value firms during 1981-2006. Second, as shown in Figure 3, the SMB factor, the growth size factor, and the no-growth size factor track each other very well in any of the period during 1926-2006. In particular, during 1926-2006 the SMB factor is 96% correlated with the no-growth size factor and 92% with the growth size factor; during both 1951-2006 and 1981-2006 the SMB factor is 97% correlated with the no-growth size factor and 94% with the growth size factor. After 1980, the growth size factor still follows the other factors very well, but has a slightly more downward movement. As a result, the growth size factor becomes negative.

What has caused the growth size premium to be negative during 1981-2006? The simple answer from Table 10 is that the small growth firms have too low returns. Small growth firms without migration contribute 0.33% to the small size premium; the corresponding number for 1951-2006 is 0.54%. In addition, small growth firms are downgraded more (than during 1951-2006) to small neutral firms and small value firms.

From our earlier analysis, the reader might guess that earnings shocks might have something to do with the disappointing performance of the small growth stocks. We find some evidence in this regard. As shown in Panel B, the weighted change of ROE is -5.00% for small growth firms; the responding number during 1951-2006 is -3.80%; the difference of -1.20% is the largest among all six size and BE/ME portfolios. Therefore, a plausible interpretation is that the small growth firms

[4] The t-statistic of 1.77 during 1981-2006 is due to the short sample size. In fact, the corresponding no-growth size premium is 0.24 (t-statistic 1.81) during 1951-1980. Combining the two periods will yield a significant premium. The point is that the no-growth size premium has not decreased at all since 1981.

experience the most negative earnings shocks, which, coupled with the fact that they are favorably valued, leads to low returns and a negative growth size premium.

Table 11 shows that, during 1981-2006, the value and size premiums are again driven by stock migrations due to earnings shocks. In particular, we regress the average excess returns of the migration cells on the change of ROE, the lagged HML betas, and the lagged SMB betas, separately or jointly. When we regress return on the change of ROE alone, the coefficient is 0.319, with a t-statistic of 6.76 and adjusted R-squared of 58%. The HML beta has either a negative or insignificant coefficient; the coefficient on the SMB beta is not stable.

In sum, excluding growth firms, the size premium is as robust as ever. The growth size premium is negative during 1981-2006 due to the lackluster performance of small growth firms, which has nothing to do with changes in systematic risk.

6 Further robustness checks

The focus of the paper has been on the six size and value portfolios, which form the basis of the value and size factors. It is interesting to ask whether the patterns we find also apply to more refined sorting. To this end we sort stocks into ten book-to-market portfolios. Since they can migrate into ten portfolios in the next year, the combination forms a matrix consisting of 100 migration portfolios.

Panel A of Table 12 reports the average returns of the migration matrix. The lowest (highest) book-to-market firms earn an average returns of 0.87% (1.52%). This leads to a value premium of 0.65% per month. A careful look suggests that this positive premium is only rewarded to the migrating firms. In particular, among the non-migrating firms, the lowest book-to-market firms have an average return of 1.15% and the highest book-to-market firms have an average return of 1.05% – there is no positive value premium. The value premium exists because low (high) book-to-market firms tend to downgrade (upgrade), dragging the average returns down (up). The realized value premium is thus not a premium per se for all value firms, but is due to price adjustments of the migrating firms.

Panel B reports the post-migration HML betas of the 100 portfolios. The systematic risk after migration, as measured by such betas, is fundamentally different between the migrating and non-migrating firms. The upgraded value firms are changed toward growth firms, and the downgraded growth firms are changed toward value firms. It seems difficult to argue why an *expected* value premium should be awarded to the subset of value firms that will become less risky. Again, a natural interpretation is that the realized value premium is not a proxy for the expected value premium; rather, it is caused by price adjustments in response to surprises.

7 Concluding remarks

We show that studying stock migrations can go a long way to understand the realized value and size premia, which have become building blocks in empirical asset pricing and in industry practice. We find that the value and size premia are caused by price adjustment in response to earnings shocks. This finding is consistent with a behavioral story in which investors overextrapolate past earnings performance but do not properly consider predictable trends in earnings. Surprised by the subsequent improvement (deterioration) in earnings performance of value (growth) stocks, they revise their expectations on future cash flows and adjust prices, leading to the value premium.

If the realized value and size premia represent price adjustment responding to cash flow shocks, they are uninformative about the expected value and size premia. That is, the existence of such premia tells little about whether value (small) stocks have higher or lower expected returns than growth (big) stocks. In a rational pricing framework, for the value and size premia to represent expected risk premia, they must be driven by systematic risks rather than price adjustment in response to cash flow shocks.

Therefore, a major objection to the behavioral story is to argue that the earnings changes could be rationally expected. We find extensive evidence suggesting that this is not the case. In particular, we find that there is no value or size premium during the earnings-announcement period for non-migrating firms. In contrast, there are large post-announcement returns for the migrating firms, who are the drivers of the value and size premia. Crucially, analysts revise their forecasts on future cash flows, from short to long horizons, for the migrating firms in the directions of the earnings shocks. The evidence thus seems compelling: earnings shocks propel investors to revise their expectations on future cash flows and adjust stock prices accordingly, leading to the value and size premia. Therefore, the value and size premia are in nature price adjustments in response to surprises, and thus are not good proxies for expected returns, as would be necessary in a rational pricing story.

A standard rational pricing story would argue that the realized value (size) premium reflects the expected risk premium as a compensation to investors for taking the systematic risks of value (small) firms. We find evidence questioning this argument. First, for the majority of the non-migrating stocks – more than 80% of market capitalization and more than 68% of all firms – there is no value or size premium. That is, most of the value (small) stocks that have high loadings on the value (size) factors are not rewarded with a premium. Second, those that are rewarded with a premium usually see their systematic risks completely changed after the migrations. Importantly, the premium is only rewarded during the migration period, but not afterwards. All the evidence suggests that the value and size premia are price adjustments (rather than expected premia) because the perceived nature of the migrating firms has changed. It seems difficult to fit such evidence into a rational pricing story.

We do not mean to say that value (small) stocks are not systematically riskier than growth (big) firms. It is clear, as Fama and French (1992, 1005) forcefully argue, that value (small) firms have fundamental and return dynamics systematically different from growth (big) firms. What we ask is whether the value (size) premium is compensation for taking such systematic risks. Our evidence suggests that this is not the case.

It is widely held that the size premium has disappeared during 1981-2006 either because it has been arbitraged away or because the risk premium has practically declined toward zero. These interpretations are at odds with the fact that small firms continue to have dynamics different from big firms and small firms have higher SMB betas than big firms. They would lead to the conclusion that (i) either systematic risk does not matter or (ii) the SMB beta is not a measure of systematic risk.

We find that the "disappearance" of the size premium is completely driven by small growth firms during 1981-2006. Excluding the growth stocks, then the size premium is as robust as ever.

It has become a standard challenge for rational pricing models to fit the magnitude of value (size) premium. The assumption is that the realized value (size) premium is an unbiased estimate of the expected risk premium. We show it is not. The challenge for asset pricing models is to fit the following set of facts: (i) the majority of the stocks are not rewarded with value or size premium; (ii) when the value or size premium are rewarded to some stocks, they are through price adjustment as response to earnings shocks, and (iii) the portion of value (size) stocks that are rewarded with the value (size) premium usually have their systematic risks, as captured by the book-to-market or size, completely changed after the price adjustments.

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Table 1 : Stock migration matrix

We form six value-weighted portfolios at the end of each June from 1951 to 2006 as the intersection of two size groups, small and big, and three book-to-market ratio groups, low, neutral, and high. The size groups are separated by the median market cap of NYSE stocks at the end of June. The book-to-market groups are separated by the 30% and 70% of NYSE book-to-market cutoff points at the end of last year. Panel A reports the average percentage of market cap in each of the six categories from the sorting year to the year after, with the vertical dimension representing the sorting year and the horizontal dimension representing the year after the sorting year. For example, 65.03% of small growth market cap remains in the small growth category from this June to next June; 21.55% of small growth market cap migrates to the small neutral category. Panel B reports the same migration matrix, but as a percentage of the number of firms.

Panel A: Migration as a percentage of market cap

	Small Growth	Small Neutral	Small Value	Large Growth	Large Neutral	Large Value
Small Growth	65.03	21.55	1.75	10.93	0.72	0.02
Small Neutral	10.22	63.12	16.62	2.83	6.67	0.55
Small Value	1.44	19.61	70.72	0.49	3.40	4.34
Large Growth	0.66	0.25	0.04	89.10	9.78	0.18
Large Neutral	0.17	0.96	0.33	13.99	74.49	10.05
Large Value	0.00	0.28	1.77	0.91	25.37	71.66

Panel B: Migration as a percentage of firms

	Small Growth	Small Neutral	Small Value	Large Growth	Large Neutral	Large Value
Small Growth	68.99	23.14	4.27	3.34	0.25	0.01
Small Neutral	15.28	58.09	23.79	0.89	1.80	0.16
Small Value	3.32	19.63	75.60	0.12	0.58	0.75
Large Growth	5.52	2.32	0.32	78.59	12.94	0.31
Large Neutral	0.48	4.17	1.75	12.98	69.39	11.23
Large Value	0.02	1.10	4.95	0.89	23.80	69.24

Table 2 : Average monthly returns for the migration groups in the year after portfolio formation

We form six value-weighted portfolios at the end of each June from 1951 to 2006 as the intersection of two size groups, small and big, and three book-to-market ratio groups, low, neutral, and high. The size groups are separated by the median market cap of NYSE stocks at the end of June. The book-to-market groups are separated by the 30% and 70% of NYSE book-to-market cutoff points at the end of last year. Panel A reports the average monthly return of stocks of the 36 migration groups, with the vertical dimension representing groups in the sorting year and the horizontal dimension representing groups during the year after the sorting year. For example, for small growth stocks that remain in the small growth category in the following year, their average return is 0.80% per month in the following year; for small growth stocks that migrate to the small neutral category, their average return is -0.58%. Panel B reports the return of each migration cell weighted by the initial market cap of each migration group. For example, the average value-weighted return of small growth firms is 0.99% per month, 0.54% of which comes from small growth firms staying small growth, -0.14% from migration to small neutral, -0.06% from migration to small value, 0.61% from migration to big growth, 0.03% from migration to big neutral, and 0.00% from migration to big value.

Panel A: Average returns

	Small Growth	Small Neutral	Small Value	Large Growth	Large Neutral	Large Value
Small Growth	0.80	-0.58	-2.63	4.40	3.11	8.55
Small Neutral	2.59	0.95	-0.25	5.33	3.52	3.29
Small Value	3.74	2.23	0.88	9.31	4.47	3.86
Large Growth	-2.64	-2.47	-4.73	1.08	-0.02	-0.45
Large Neutral	-1.78	-1.35	-2.36	2.10	1.02	0.13
Large Value	-0.56	-0.84	-1.65	2.73	2.06	1.05

Panel B: Contribution of each migration cell to portfolio returns

	Small Growth	Small Neutral	Small Value	Large Growth	Large Neutral	Large Value	Weighted Return
Small Growth	0.54	-0.14	-0.06	0.61	0.03	0.00	0.99
Small Neutral	0.29	0.60	-0.06	0.21	0.26	0.02	1.31
Small Value	0.07	0.46	0.58	0.08	0.17	0.17	1.53
Large Growth	-0.02	-0.01	0.00	1.00	-0.02	0.00	0.95
Large Neutral	0.00	-0.01	-0.01	0.32	0.75	0.00	1.05
Large Value	0.00	0.00	-0.02	0.03	0.57	0.72	1.30

Table 3 : Average earnings changes for the migration groups in the year after portfolio formation

We form six value-weighted portfolios at the end of each June from 1951 to 2006 as the intersection of two size groups, small and big, and three book-to-market ratio groups, low, neutral, and high. The size groups are separated by the median market cap of NYSE stocks at the end of June. The book-to-market groups are separated by the 30% and 70% of NYSE book-to-market cutoff points at the end of last year. Panel A reports the average change of earnings (ROE) during the migration year for the 36 migration groups, with the vertical dimension representing groups in the sorting year and the horizontal dimension representing groups during the year after the sorting year. For example, for small growth stocks that remain in the small growth category in the following year, their average ROE change is -3.60% in the following year; for small growth stocks that migrate to the small neutral category, their average return is -6.00%. Panel B reports the ROE changes weighted by the initial market cap of each migration group. For example, the average value-weighted ROE change of small growth firms is -3.80%, -2.36% of which comes from small growth firms staying small growth, -1.23% from migration to small neutral, -0.24% from migration to small value, 0.07% from migration to big growth, -0.01% from migration to big neutral, and -0.02% from migration to big value.

Panel A: Average earnings changes

	Small Growth	Small Neutral	Small Value	Large Growth	Large Neutral	Large Value
Small Growth	-3.60	-6.00	-14.78	0.33	-0.19	-14.36
Small Neutral	3.75	-0.99	-3.10	4.08	1.96	1.02
Small Value	10.48	1.91	-0.70	11.86	4.22	2.11
Large Growth	-8.39	-7.08	-3.35	-1.14	-3.81	-3.75
Large Neutral	-8.24	-3.57	-6.37	2.90	-0.36	-2.43
Large Value	22.02	1.57	-4.44	11.49	2.20	-0.28

Panel B: Contribution of each migration cell to portfolio earnings changes

	Small Growth	Small Neutral	Small Value	Large Growth	Large Neutral	Large Value	Weighted $\triangle$ROE
Small Growth	-2.36	-1.23	-0.24	0.07	-0.01	-0.02	-3.80
Small Neutral	0.30	-0.63	-0.53	0.11	0.12	0.00	-0.63
Small Value	0.13	0.37	-0.46	0.01	0.16	0.10	0.32
Large Growth	-0.07	-0.02	0.00	-1.00	-0.32	0.02	-1.39
Large Neutral	0.00	-0.03	-0.03	0.37	-0.27	-0.28	-0.23
Large Value	0.00	0.00	-0.07	0.24	0.47	-0.17	0.48

Table 4 : Earnings announcement returns and forecast errors

Starting from each of the six initial size-BE/ME categories, stocks can migrate to six categories after one year. This creates a migration matrix of 36 portfolios. Panel A reports the value-weighted average cumulative three-day returns of the 36 migration portfolios. Panel B reports the value-weighted average cumulative three-day abnormal returns of the 36 migration portfolios, in which case beta is estimated using returns during days [-145, -20] before the event date. Panel C reports forecast error of the 36 migration portfolios, in which case forecast error is defined as the ratio of the difference between the latest quarterly earnings forecast and the actual earnings to the absolute value of the mean quarterly earnings forecast. The sample period is from 1985 to 2006. The vertical dimension represents groups in the sorting year and the horizontal dimension represents groups during the year after the sorting year. In Panel D we regress the abnormal returns on the forecast errors.

Panel A: Cumulative raw returns [-1, 1] (in percentages

	Small Growth	Small Neutral	Small Value	Large Growth	Large Neutral	Large Value
Small Growth	0.10	-0.50	-1.32	2.35	1.84	2.75
Small Neutral	0.82	0.41	-0.57	2.47	1.68	1.47
Small Value	1.35	0.75	0.05	2.52	1.95	1.15
Large Growth	-1.08	-1.28	-4.42	0.49	-0.29	-0.64
Large Neutral	-0.45	-1.38	-1.06	1.48	0.36	0.09
Large Value		-1.44	-0.53	1.21	0.98	0.53

Panel B: Cumulative abnormal returns

	Small Growth	Small Neutral	Small Value	Large Growth	Large Neutral	Large Value
Small Growth	-0.28	-0.50	-0.88	1.60	1.63	2.65
Small Neutral	0.09	0.14	-0.55	1.58	1.05	1.82
Small Value	0.29	0.20	-0.15	0.82	1.03	0.78
Large Growth	-1.07	-1.27	-3.47	0.21	-0.23	0.06
Large Neutral	-0.50	-1.20	-0.77	0.95	0.23	0.05
Large Value		-1.55	-0.60	0.65	0.59	0.31

Panel C: Forecast errors

	Small Growth	Small Neutral	Small Value	Large Growth	Large Neutral	Large Value
Small Growth	6.77	19.45	53.98	-6.75	-10.30	-5.92
Small Neutral	0.09	8.95	41.26	-11.95	-5.84	-9.55
Small Value	5.08	9.70	27.24	-33.23	-11.29	-3.63
Large Growth	9.34	22.03	34.98	-1.25	3.40	-7.10
Large Neutral	31.67	23.86	29.63	1.41	0.57	18.21
Large Value		67.22	31.38	25.69	-3.10	10.58

Panel D: Regression of abnormal returns on forecast errors

	Intercept	Forecast Error	Adjusted R-squared
Coefficient	0.526	-0.040	0.500
T-statistic	(3.42)	(-5.91)	

Table 5 : Analyst forecast revisions

Starting from each of the six initial size-BE/ME categories, stocks can migrate to six categories after one year. This creates a migration matrix of 36 portfolios. Panel A reports the value-weighted average changes in 1-year ahead annual earnings forecast (scaled by lagged price) from the previous year, Panel B reports the value-weighted average changes in 2-year ahead annual earnings forecast (scaled by lagged price) from the previous year, and Panel C reports the value-weighted average changes in long-term earnings forecast for each of the 36 migration groups. The sample period is from 1985 to 2006. The vertical dimension represents groups in the sorting year and the horizontal dimension represents groups during the year after the sorting year.

Panel A: One-year forecast revisions

	Small Growth	Small Neutral	Small Value	Large Growth	Large Neutral	Large Value
Small Growth	0.65	-1.16	-4.28	2.12	0.84	-10.14
Small Neutral	2.77	0.53	-2.30	4.42	2.47	0.91
Small Value	8.08	2.75	0.27	8.74	4.62	2.39
Large Growth	-0.77	-2.72	-7.95	0.71	-0.72	-6.38
Large Neutral	-1.64	-1.11	-4.06	1.81	0.47	-1.55
Large Value		-0.62	-2.64	3.06	2.20	0.34

Panel B: Two-year forecast revisions

	Small Growth	Small Neutral	Small Value	Large Growth	Large Neutral	Large Value
Small Growth	0.63	-0.86	-3.30	2.47	1.07	-3.34
Small Neutral	2.67	0.48	-2.00	4.21	2.61	0.50
Small Value	4.58	2.44	0.12	7.11	4.28	2.68
Large Growth	-0.95	-2.37	-7.32	0.81	-0.78	-5.02
Large Neutral	-1.13	-1.06	-3.41	1.89	2.58	-1.35
Large Value		-1.02	-2.61	2.93	2.38	0.45

Panel C: Long-run forecast revisions

	Small Growth	Small Neutral	Small Value	Large Growth	Large Neutral	Large Value
Small Growth	-1.50	-2.31	-4.71	-0.08	-1.29	-0.44
Small Neutral	-0.06	-0.63	-1.30	0.97	-0.15	1.23
Small Value	2.01	0.55	-0.73	2.64	0.58	-0.51
Large Growth	-2.91	-2.84	-7.17	-0.58	-1.31	-2.76
Large Neutral	-1.80	-0.70	-2.35	0.03	-0.33	-0.94
Large Value		-0.57	-1.26	1.17	0.24	-0.34

Table 6 : Economic fundamentals in the five years after portfolio formation

Starting from each of the six initial size-BE/ME categories, stocks can migrate to six categories after one year. This creates a migration matrix of 36 portfolios. For each of the 36 portfolios, and for each portfolio formation year t, we calculate the ratio of EI/ME0, in which case EI is earnings and ME0 is the market equity at portfolio formation year. We then report the average EI/ME0 for all portfolio formation years. The vertical dimension represents groups in the sorting year and the horizontal dimension represents groups during the year after the sorting year. For example, for small growth stocks that migrate to small value firms in year t+1, their weighted average EI/ME0 is 5.01% in the portfolio formation year. This number drops to -2.49% in the first year after portfolio formation and 1.19% in the second year.

	Small Growth	Small Neutral	Small Value	Large Growth	Large Neutral	Large Value	Weighted EI/ME0
Small Growth							
t	7.03	8.07	5.01	9.51	7.85	13.64	7.48
t+1	6.16	6.30	-2.49	9.64	12.09	54.92	6.49
t+2	6.95	7.06	1.19	11.38	11.90	-3.03	7.44
t+3	7.78	9.32	4.07	12.42	16.46	1.54	8.66
t+4	9.04	9.98	6.41	13.86	12.37	-7.56	9.76
t+5	10.11	10.98	8.67	8.39	16.44	-73.94	10.17
Small Neutral							
t	10.16	10.54	7.92	12.32	12.50	10.46	10.22
t+1	10.69	9.86	6.30	13.04	14.35	13.11	9.66
t+2	10.80	11.14	8.52	15.75	16.33	15.50	11.13
t+3	11.96	12.45	10.84	17.82	18.27	22.28	12.69
t+4	14.02	14.13	12.83	17.17	20.49	26.55	14.45
t+5	16.21	15.86	14.69	22.55	22.94	28.46	16.42
Small Value							
t	-1.81	11.16	8.42	2.99	12.64	11.05	8.99
t+1	8.64	12.34	8.39	26.67	17.71	17.60	9.99
t+2	10.97	13.90	11.60	36.46	19.35	21.80	12.86
t+3	14.98	16.09	14.65	60.38	21.51	20.75	15.58
t+4	16.95	19.32	17.84	47.76	24.32	19.73	18.48
t+5	20.02	21.88	20.68	51.42	29.41	22.85	21.20
Large Growth							
t	6.21	7.36	-0.45	6.89	8.12	3.34	7.00
t+1	4.00	4.16	-2.23	6.46	7.43	4.13	6.50
t+2	4.42	4.95	0.91	7.00	8.14	5.61	7.06
t+3	4.96	7.06	0.00	7.59	8.90	11.90	7.65
t+4	5.54	7.82	0.60	8.24	10.06	10.14	8.33
t+5	6.37	8.38	7.85	8.99	10.28	16.37	9.05
Large Neutral							
t	6.68	8.57	6.29	9.47	10.20	9.61	10.03
t+1	0.83	5.88	1.93	9.58	9.77	8.57	9.55
t+2	3.52	7.40	5.41	10.71	10.68	9.81	10.49
t+3	5.79	8.84	8.22	11.51	11.69	11.48	11.56
t+4	6.15	10.13	9.31	11.71	12.91	12.99	12.55
t+5	5.90	11.47	12.07	12.65	13.88	13.79	13.40
Large Value							
t	0.24	3.08	6.39	12.78	11.56	10.57	10.83
t+1		3.88	-0.69	10.38	12.14	10.39	10.83
t+2		6.07	6.35	12.71	12.47	12.13	12.19
t+3		9.05	10.48	10.56	13.84	13.16	13.33
t+4		10.14	12.32	17.78	14.69	14.47	14.41
t+5		11.86	15.85	20.76	17.27	15.53	15.81

Table 7 : Returns and systematic risks after migration

For the 36 portfolios, we calculate the post-migration returns and the HML, SMB, and market betas. For Panels B-D, for each portfolio, the first row reports the number and the second row reports in parenthesis the *p*-value testing the hypothesis that the number is the same as the corresponding number for the non-migration portfolio. The vertical dimension displays the groups in the initial sorting year and the horizontal dimension displays the groups after migration.

	Small Growth	Small Neutral	Small Value	Large Growth	Large Neutral	Large Value
Panel A: Average returns						
Small Growth	1.07	1.30	1.18	1.25	2.15	-0.53
Small Neutral	1.13	1.39	1.53	1.30	1.40	1.85
Small Value	0.60	1.45	1.53	0.84	1.38	1.74
Large Growth	0.71	0.97	2.56	0.95	0.88	1.96
Large Neutral	0.41	1.30	1.62	0.91	1.11	1.18
Large Value		1.06	1.60	1.16	1.11	1.30
Panel B: HML betas						
Small Growth	-0.16	0.36	0.37	-0.61	0.10	-0.10
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Small Neutral	-0.22	0.35	0.64	-0.58	0.11	0.85
	(0.00)		(0.00)	(0.00)	(0.00)	(0.00)
Small Value	-0.12	0.22	0.62	-0.91	0.17	0.57
	(0.00)	(0.00)		(0.00)	(0.00)	(0.00)
Large Growth	-0.09	0.18	1.26	-0.31	0.34	0.01
	(0.00)	(0.00)	(0.00)		(0.00)	(0.00)
Large Neutral	0.79	0.60	1.06	-0.12	0.29	0.76
	(0.00)	(0.00)	(0.00)	(0.00)		(0.00)
Large Value		0.85	1.03	-0.09	0.29	0.77
		(0.73)	(0.00)	(0.00)	(0.00)	
Panel C: SMB betas						
Small Growth	0.93	1.08	1.61	0.63	0.41	0.54
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Small Neutral	1.11	0.78	0.94	0.55	0.44	0.78
	(0.00)		(0.00)	(0.00)	(0.00)	(0.09)
Small Value	1.41	0.81	0.84	0.94	0.41	0.61
	(0.00)	(0.00)		(0.11)	(0.00)	(0.00)
Large Growth	1.09	0.96	1.02	-0.20	-0.03	0.21
	(0.00)	(0.00)	(0.00)		(0.00)	(0.00)
Large Neutral	0.79	0.64	1.00	-0.00	-0.14	0.12
	(0.00)	(0.00)	(0.00)	(0.00)		(0.00)
Large Value		0.59	0.92	0.50	0.10	0.04
		(0.20)	(0.00)	(0.00)	(0.00)	
Panel D: Market betas						
Small Growth	1.06	1.06	1.00	1.16	1.31	2.08
		(0.59)	(0.00)	(0.00)	(0.00)	(0.00)
Small Neutral	1.02	0.93	0.98	1.16	1.10	1.32
	(0.00)		(0.00)	(0.00)	(0.00)	(0.00)
Small Value	1.03	1.04	0.93	1.10	1.28	1.18
	(0.00)	(0.00)		(0.00)	(0.00)	(0.00)
Large Growth	1.15	1.25	1.97	1.01	1.05	1.34
	(0.00)	(0.00)	(0.00)		(0.00)	(0.00)
Large Neutral	1.63	1.13	1.34	1.07	0.98	1.10
	(0.00)	(0.00)	(0.00)	(0.00)		(0.00)
Large Value		1.07	1.29	1.24	1.06	1.04
		(0.20)	(0.00)	(0.00)	(0.00)	

Table 8 : What explains migration returns?

In Panel A, we use the migration portfolios to regress the average excess returns on the average ROE changes and on the average lagged betas, separately or jointly. In Panel B, we regress the average excess returns on the average ROE changes and lagged firm characteristics. We report the slope coefficients, t-statistics, and R-squared. The sample period is 1951-2006.

Panel A: Current ROE changes versus lagged betas

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Change in ROE	0.384					0.366
t-value	7.33					(5.75)
Lag MKT Beta		-0.024			0.016	-0.028
t-value		(-0.51)			(0.33)	(-0.81)
Lag HML Beta			0.016		0.015	0.012
t-value			(1.33)		(1.32)	(1.60)
Lag SMB Beta				0.041	0.043	0.003
t-value				(3.04)	(2.91)	(0.25)
Intercept	0.010	0.035	-0.002	0.001	-0.027	0.032
t-value	(3.45)	(0.65)	(-0.25)	(0.14)	(-0.51)	(0.84)
Adj-R^2	0.615	-0.023	0.023	0.200	0.206	0.616

Panel B: Current ROE changes versus lagged characteristics

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Change in ROE						0.450
t-value						(7.27)
Lag Book-to-Market		0.024		0.023	0.019	0.013
t-value		(2.36)		(2.18)	(0.95)	(1.01)
Lag Log Size			-0.004	-0.002	-0.002	-0.005
t-value			(-0.97)	(-0.60)	(-0.51)	(-2.32)
Lag ROE	-0.172				-0.034	0.200
t-value	(-2.18)				(-0.21)	(1.97)
Intercept	0.028	-0.013	0.029	0.000	0.006	0.008
t-value	(2.74)	(-1.32)	(1.31)	(0.01)	(0.16)	(0.35)
Adj-R^2	0.102	0.121	-0.002	0.1032	0.075	0.661

Table 9 : What predicts stock migration?

We use firm-level data to run multivariate logit regressions. The regressions are run for each of the six groups of firms that belong to the initial six size-BE/ME portfolios. The non-migrating firms are treated as the base category. We report the coefficients for the lagged book-to-market on the first row, the lagged log size on the second row, and the lagged ROE on the third row. Followed in parenthesis are the robust t-statistics also controlling for clustering. The sample period is 1951-2006.

	Small Growth	Small Neutral	Small Value	Large Growth	Large Neutral	Large Value
Small Growth		2.68 (32.06)	1.52 (10.70)	2.58 (10.31)	6.53 (14.09)	0.92 (0.26)
		0.08 (7.38)	-0.14 (-6.66)	1.08 (35.36)	1.63 (11.95)	1.10 (2.63)
		0.01 (0.94)	0.00 (0.87)	0.03 (3.52)	0.04 (4.01)	-0.00 (-0.26)
Small Neutral	–1.23 (-15.10)		0.32 (7.87)	0.11 (0.37)	2.51 (20.87)	3.63 (9.94)
	-0.22 (-15.17)		-0.21 (-20.01)	0.91 (17.34)	1.35 (24.28)	1.54 (8.02)
	-0.38 (-1.37)		-0.01 (-0.38)	-0.35 (-1.37)	0.04 (3.69)	0.04 (2.28)
Small Value	-0.58 (-9.90)	-0.74 (-27.09)		-0.11 (-0.40)	-0.15 (-1.63)	0.43 (8.51)
	-0.15 (-6.53)	0.03 (2.27)		1.15 (8.99)	1.19 (20.36)	1.29 (22.29)
	-1.63 (-4.09)	-0.60 (-3.17)		-1.23 (-4.02)	0.05 (2.09)	0.00 (1.10)
Large Growth	-5.17 (-13.85)	0.25 (0.68)	-1.03 (-1.05)		3.99 (26.68)	1.31 (1.85)
	-0.74 (-24.16)	-0.53 (-14.03)	-0.34 (-4.09)		0.12 (5.00)	0.27 (3.07)
	-0.30 (-2.22)	0.02 (4.11)	-0.48 (-2.77)		-0.02 (-0.13)	0.01 (1.21)
Large Neutral	-5.35 (-4.34)	-1.63 (-7.06)	-0.46 (-1.98)	-2.29 (-14.02)		1.54 (18.87)
	-0.55 (-7.22)	-0.66 (-18.12)	-0.44 (-9.44)	-0.12 (-5.14)		0.18 (6.96)
	-2.68 (-4.33)	-1.95 (-3.51)	-1.69 (-2.30)	-0.84 (-2.71)		-1.83 (-6.08)
Large Value	-4.70 (-1.42)	-1.25 (-3.39)	-0.32 (-2.80)	-1.07 (-2.46)	-1.14 (-9.93)	
	-0.79 (-4.62)	-0.84 (-8.12)	-0.74 (-11.83)	-0.06 (-0.47)	-0.18 (-5.35)	
	-3.06 (-2.33)	-3.24 (-2.59)	-1.31 (-1.16)	-2.16 (-1.09)	-0.59 (-1.42)	

Table 10 : Average monthly returns and change of ROE for the migration groups in the year after portfolio formation: 1981-2006

We form six value-weighted portfolios at the end of each June from 1980 to 2006 as the intersection of two size groups, small and big, and three book-to-market ratio groups, low, neutral, and high. The size groups are separated by the median market cap of NYSE stocks at the end of June. The book-to-market groups are separated by the 30% and 70% of NYSE book-to-market cutoff points at the end of last year. Panel A reports the return of each migration cell scaled by the initial market cap weight. For example, the average value-weighted return of small growth firms is 0.76% per month, 0.33% of which comes from small growth firms staying small growth, -0.21% from migration to small neutral, -0.10% from migration to small value, 0.71% from migration to big growth, 0.03% from migration to big neutral, and 0.00% from migration to big value. Panel B reports the change of ROE of each migration cell scaled by the initial market cap weight.

Panel A: Contribution of each migration cell to portfolio returns

	Small Growth	Small Neutral	Small Value	Large Growth	Large Neutral	Large Value	Weighted Return
Small Growth	0.33	-0.21	-0.10	0.71	0.03	0.00	0.76
Small Neutral	0.35	0.57	-0.12	0.25	0.25	0.02	1.32
Small Value	0.11	0.52	0.48	0.09	0.17	0.15	1.52
Large Growth	-0.03	-0.01	0.00	1.08	-0.02	-0.01	1.01
Large Neutral	0.00	-0.02	-0.01	0.32	0.80	0.02	1.10
Large Value	0.00	-0.01	-0.02	0.04	0.44	0.76	1.21

Panel B: Contribution of each migration cell to portfolio returns

	Small Growth	Small Neutral	Small Value	Large Growth	Large Neutral	Large Value	Weighted $\triangle$ROE
Small Growth	-2.88	-1.69	-0.14	-0.01	-0.02	0.00	-5.00
Small Neutral	0.33	-0.90	-0.87	0.19	0.11	0.00	-1.14
Small Value	0.18	0.53	-1.06	0.00	0.21	0.03	-0.11
Large Growth	-0.12	-0.03	0.00	-1.49	-0.51	0.04	-2.11
Large Neutral	-0.01	-0.05	-0.05	0.60	-0.45	-0.51	-0.47
Large Value	0.00	0.01	-0.09	0.47	0.77	-0.52	0.64

Table 11 : Regressional analysis: 1981-2006

In Panel A, we use the migration portfolios to regress the average excess returns on the average ROE changes and on the average lagged betas, separately or jointly. In Panel B, we regress the average excess returns on the average ROE changes and lagged firm characteristics. We report the slope coefficients, t-statistics, and R-squared. The sample period is 1981-2006.

Panel A: 36 portfolios						
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Change in ROE	0.319					0.308
t-value	6.76					5.52
Mkt Beta		-0.013			0.030	-0.029
t-value		-0.25			0.57	-0.76
HML Beta			0.015		0.013	0.014
t-value			1.22		1.12	1.68
SMB Beta				0.040	0.044	0.004
t-value				2.76	2.75	0.26
Intercept	0.010	0.021	-0.003	-0.007	-0.043	0.032
t-value	2.94	0.37		-0.80	-0.75	0.74
Adj-R^2	0.575	-0.029	0.0.15	0.115	0.169	0.581

Panel B: Current ROE changes versus lagged characteristics						
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Change in ROE						0.357
t-value						6.46
Book-to-Market		0.025		0.024	0.019	0.005
t-value		2.09		1.98	1.03	0.42
Log Size			-0.003	-0.002	-0.001	-0.006
t-value			-0.77	-0.54	-0.29	-2.12
Lag ROE	-0.141				-0.045	0.107
t-value	-1.90				-0.36	1.26
Intercept	0.021	-0.013	0.027	0.002	0.005	0.039
t-value	2.34	-1.22	1.00	0.06	0.16	1.86
Adj-R^2	0.074	0.093	-0.013	0.070	0.046	0.595

Table 12 : Migration matrix of ten book-to-market portfolios

For each year, we sort firms into ten book-to-market portfolios. Starting from each of the ten initial BE/ME categories, stocks can migrate to ten categories after one year. This creates a migration matrix of 100 portfolios. We then report the average returns and post-migration HML betas for 1951-2006 for each of the 100 migration portfolios. The vertical dimension represents groups in the sorting year and the horizontal dimension represents groups during the year after the sorting year.

	Low	2	3	4	5	6	7	8	9	High	All
Panel A: Average returns											
Low	1.15	-0.12	-1.16	-1.58	-2.46	-2.99	-2.48	-2.31	-3.72	-2.48	0.87
2	2.12	1.23	0.38	-0.32	-1.00	-1.50	-2.01	-1.11	-2.29	-3.31	1.04
3	3.72	2.01	1.10	0.45	-0.10	-0.65	-0.92	-1.82	-2.32	-2.55	0.99
4	3.93	2.85	1.85	0.94	0.54	0.01	-0.50	-0.65	-1.50	-3.14	0.95
5	3.72	3.38	2.46	1.75	1.15	0.71	0.20	-0.18	-1.09	-2.02	1.17
6	5.23	3.53	2.74	2.29	1.76	1.13	0.71	0.01	-0.63	-2.24	1.11
7	4.19	3.82	3.66	2.53	2.41	1.68	1.10	0.46	-0.05	-0.86	1.13
8	3.51	5.06	3.32	3.28	2.35	2.46	1.72	1.25	0.48	-0.87	1.29
9	4.28	5.05	5.16	3.50	3.19	2.38	2.64	1.68	1.08	0.28	1.39
High	2.07	4.69	5.57	3.02	4.27	3.70	2.60	2.81	1.98	1.05	1.52
Panel B: Post-migration HML betas											
Low	-0.46	0.06	0.20	0.34	0.52	0.60	-0.04	0.13	0.82	0.85	-0.45
2	-0.39	-0.01	0.35	0.44	0.36	0.34	0.77	0.39	0.48	0.50	-0.06
3	-0.42	-0.04	0.10	0.38	0.51	0.61	0.65	0.63	0.83	0.79	0.09
4	-0.24	-0.32	0.12	0.23	0.44	0.58	0.46	0.94	0.66	1.02	0.26
5	-0.19	-0.02	-0.04	0.22	0.30	0.50	0.79	0.66	1.00	0.96	0.28
6	-0.40	-0.13	-0.09	0.21	0.35	0.46	0.57	0.83	0.88	0.96	0.41
7	-0.10	-0.28	-0.19	0.30	0.27	0.38	0.55	0.73	0.88	0.74	0.59
8	-0.40	-0.32	0.19	0.03	0.40	0.46	0.63	0.72	0.83	1.05	0.76
9	-0.58	-0.16	0.24	0.16	-0.05	0.46	0.45	0.73	0.78	0.94	0.79
High	0.38	-0.16	0.30	0.23	0.23	0.23	0.59	0.61	0.65	0.89	0.95

Figure 1 : The 11-year evolution of earnings on book equity for size-BE/ME portfolios

For each portfolio formation year $t = 1951 - 2006$, the ratio of earnings to lagged book equity is calculated for $t + i$, $i = -5, \ldots, 5$. The ratio for $t + i$ is then averaged across portfolio formation years.

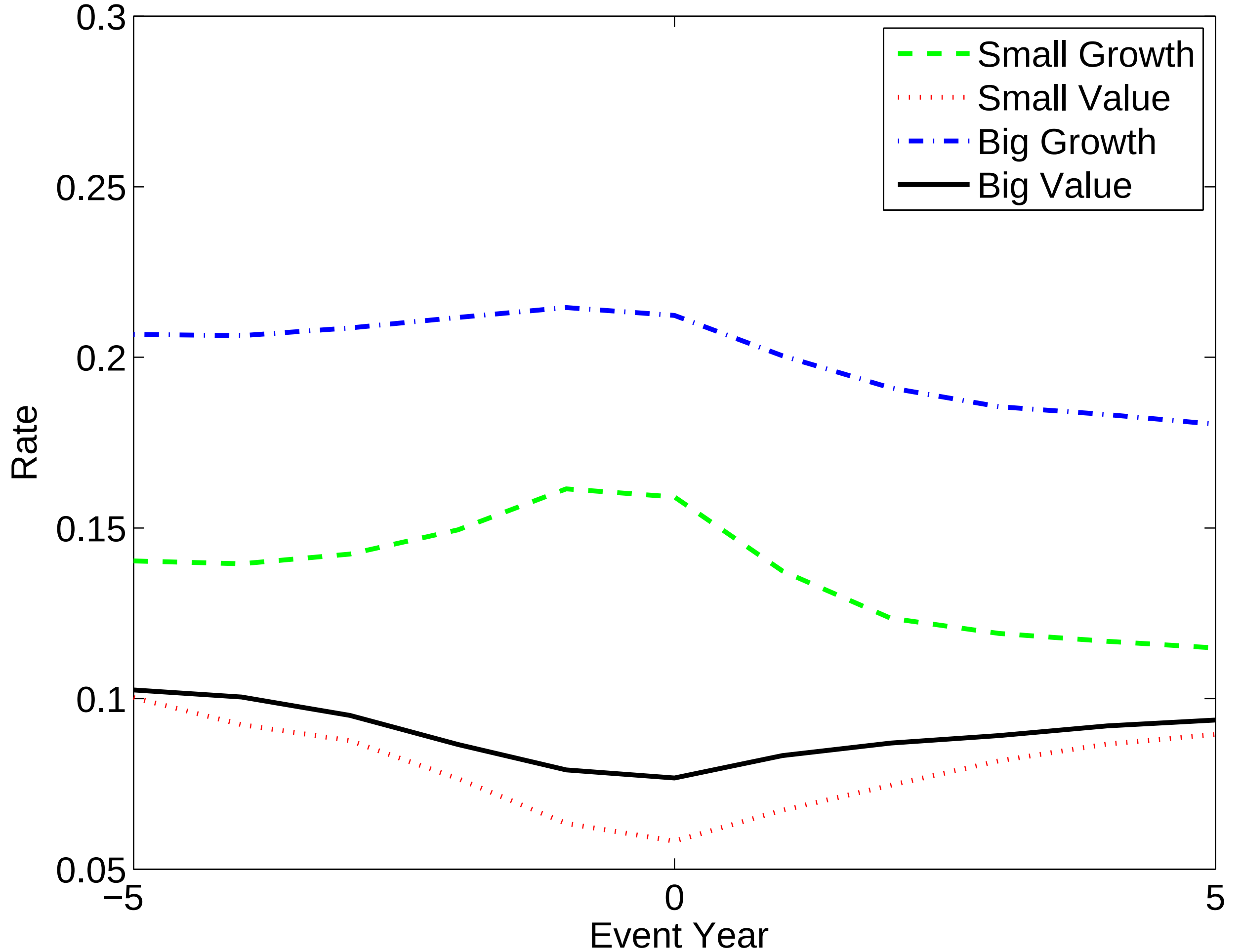

Figure 2 : The 11-year evolution of the ratio of earnings to the market equity in the portfolio formation year for size-BE/ME portfolios

For each portfolio formation year $t = 1950 - 2006$, the ratio of earnings in year $t + i$ to the book equity in year $t - 6$ is calculated for $t + i$, $i = -5, \ldots, 0$. The ratio of earnings in year $t + i$ to the book equity in year t is calculated for $t + i$, $i = 1, \ldots, 5$. The ratios are then averaged across portfolio formation years.

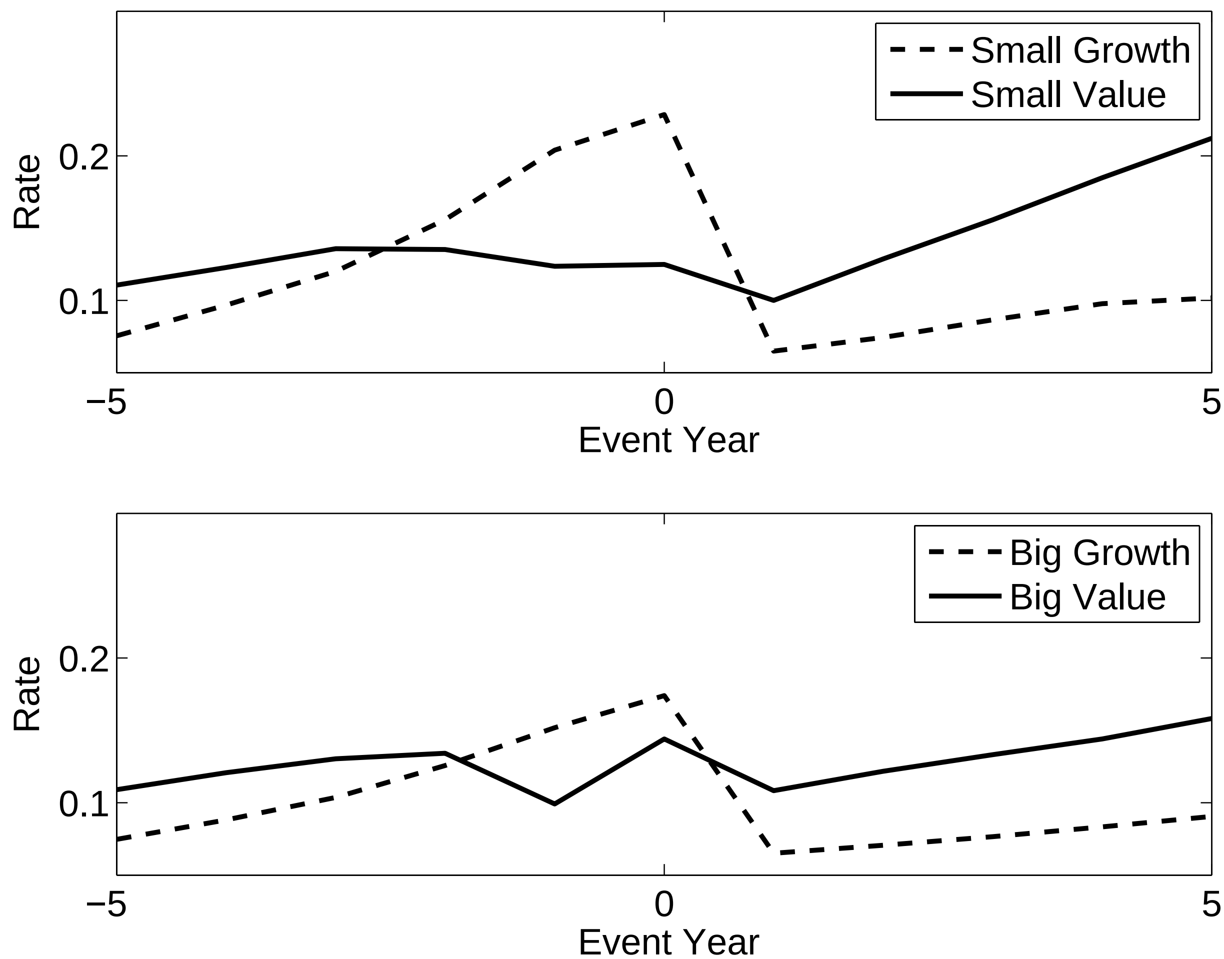

Figure 3 : The size factor and its components

For 1926-2006, we use the six annual Fama-French size-BE/ME portfolios, SL, SN, SH, BL, BN, BH, to construct the size factors. The data is downloaded from Kenneth French's website. The full size factor is the return of (SL+SN+SH-BL-BN-BH)/3; the size factor with growth stocks is the return of SL-BL; and the size factor without growth stocks is the return of (SN+SH-BN-BH)/2. We then plot the size factor and its two components.