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Supply Matters for Asset Prices:

Evidence from IPOs in Emerging Markets

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Abstract:
We show that the introduction of a new asset affects the prices of previously existing assets in a market. Using data from 254 IPOs in emerging markets, we find that stocks in industries that covary highly with the industry of the IPO experience a larger decline in prices relative to other stocks during the month of the IPO. The effects are stronger when the IPO is issued in a market that is less integrated internationally, and when the IPO is big. The evidence supports the idea that the composition of asset supply affects the cross-section of stock prices.

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We study the effect of initial public offerings (IPOs) on the prices of other stocks listed in a market. We focus on emerging markets in order to explore quantitatively meaningful changes in asset supply. For each of 254 IPOs in 22 emerging markets, we measure excess returns on 17 industry portfolios in the market of issuance during the month of the IPO. We then regress the returns on the covariance between each industry and the industry of the IPO, as measured by returns on the 17 industries in historical U.S. data. We find a significant negative relation between returns and the covariance with the IPO industry. A strategy that takes a long position in the industry with the lowest covariance with the IPO industry and a short position in the industry with the highest covariance yields approximately 80 basis points over the month of issuance of the typical IPO. The effects are strong if the local market is poorly integrated with international markets, while they disappear if the market is well integrated. Furthermore, the cross-sectional gradient in response to the IPO is steeper when the new issue is big relative to the local market capitalization.

This paper provides direct evidence on the central role that market clearing and the supply side play in asset pricing, supporting recent theoretical and empirical interest on the issue. The basic intuition is the same as in Bansal, Fang, and Yaron (2005) and Cochrane, Longstaff, and Santa-Clara (2005), namely, that investors require higher expected returns for expanding sectors. As a sector grows with an IPO, its beta typically goes up, and therefore its price has to fall in order to promise higher expected returns. We add that this intuition is true also for sectors that have a high covariance with the expanding sector. In fact, the covariance with the growing sector governs the magnitude of the price change in the rest of the assets listed in the market.

It is not standard practice in asset pricing to talk about supply and demand because the implicit assumptions of perfectly elastic supply or demand dominate the literature. Supply is generally assumed to adjust to swings in demand, or in other words, supply is assumed to be perfectly elastic. Supply shocks are meaningless in such a world. The creation of a new asset is accompanied by the "destruction" of another asset (repurchases), so that in equilibrium prices stay determined by demand. In practice, this rebalancing is not automatic, giving rise to potential supply-side effects on asset prices. Cochrane, Longstaff, and Santa-Clara (2005) study these effects in a framework where there are shocks to broad sectors, for instance, stocks and bonds or the stock markets of two different countries. However, the typical IPO in the U.S. is too small to be comparable to these sizeable supply shocks, so we can hardly expect to observe effects akin to the ones described in that paper following an IPO. For such small shocks, demand still looks almost perfectly elastic, and, therefore, it eliminates any interesting effect on prices.

Our focus on emerging markets makes these insights applicable to the case of IPOs. These markets are small and not perfectly integrated with international markets, making IPOs relatively bigger shocks. To some extent, these markets live in autarky and, therefore, there is a market clearing condition for each of them.

The second advantage of studying emerging markets is that local demands for assets are expected to be more inelastic than in more developed markets, because the limits to arbitrage are more stringent (Shleifer (1986), Shleifer and Vishny (1997)). Standard factors that make the demand more inelastic are, for example, restrictions to short-sales and the lack of close substitutes (Wurgler and Zhuravskaya (2002)). Both of these attributes are probably more pervasive in emerging markets, characterized as they are by scarce liquidity and widespread insider ownership (La Porta et al. (2000)). The existence of greater limits to arbitrage amplifies the effects of supply shocks beyond the frictionless demand-side benchmark considered in Cochrane, Longstaff, and Santa-Clara (2005).

Throughout the paper, we remain agnostic about the determinants of the elasticity of demand. It is hard to disentangle simple segmentation from more sophisticated limits to arbitrage because the underlying causes of both are probably correlated. For instance, the same lack of liquidity keeps a market segmented and at the same time puts limits on the opportunities for arbitrage. Our main interest is in bringing attention to the effects of supply shocks. Irrespective of whether asset demand follows standard risk-return theories or behavioral theories—for lack of a better terminology—the changes in prices after an IPO suggest that there is a role for supply that has not been sufficiently studied.

Our focus on supply shocks is new to the literature. Previous studies have mostly documented the effect of demand changes on prices. Bekaert and Harvey (2000) and Henry (2000) show that stock prices increase on average when an emerging market opens up to foreign investors. Opening up the market provides a demand shock that induces a change in the value of local assets. This strategy is in essence the same strategy that Harris and Gurel (1986) and Shleifer (1986) use in the study of additions to the S&P 500—a particular segment of the larger U.S. market.

A close paper to ours is that of Hong, Kubik, and Stein (2004), who document that market-to-book ratios are negatively related to the ratio of total book equity to total personal income across U.S. states. We can interpret this ratio as a measure of a state's relative asset supply. Our approach differs in that, instead of focusing only on variation in the demand/supply balance derived from investors' geographical preferences (Coval and Moskowitz (1999)), we consider an experiment where supply *changes*. We also exploit within-market differences in returns and are thus better able to control for omitted variables.

Our focus on the effect of a new issue on the prices of other assets is related to the findings of Newman and Rierson (2004), who show that a very large issuance of Deutsche Telekom depressed the prices of other European telecommunications bonds. Our paper differs from theirs in three main respects: we study stocks instead of bonds; we document how the price effect declines as the cross-section of assets covaries less with the IPO; and we use cross-country variation from emerging markets.

The next sections present a preliminary motivation (Section 1) and a description of the methodology and the data (Section 2). The results follow in Section 3. We then conclude.

1. The Effect of a New Issue on the Prices of Other Assets: A Mean-Variance Approach

Assume that the CAPM holds and that each market is in autarky. Expected returns on asset *i* are described by the following equation:

$$E(r_i) - r_f = \beta_i [E(r_m) - r_f]. \quad (1)$$

Expected excess returns are equal to the beta of the asset times the local market risk premium. Under standard assumptions, Merton (1980) shows that the market risk premium can be written as

$$E(r_m) - r_f = \gamma \sigma_m^2. \quad (2)$$

The parameter γ is the coefficient of relative risk aversion of a representative investor, and σ_m^2 is the variance of the market return. Using the definition of market beta and substituting equation (2) into (1), we get

$$E(r_i) - r_f = \gamma\, Cov(r_i, r_m). \quad (3)$$

Now assume that a new asset (the IPO) is introduced in the market. The market initially has $i=1 \ldots n$ assets, so the IPO is asset $n+1$. We refer to the market with n assets as market 0, and to the market with $n+1$ assets as market 1. The weight of asset i in market 0 is denoted by $\omega_{i,0}$ (analogously for market 1). We assume that the number of shares is constant and, therefore, that any change in the market weight comes from a change in price. With the introduction of the IPO, the covariance in the right-hand side of equation (3) changes, therefore changing expected returns. Assuming, for simplicity, that the risk-free rate stays constant, we can express the change in expected returns as:

$$\Delta E(r_i) = \gamma\, \omega_{ipo} Cov(r_i, r_{ipo}) - \gamma \sum_{j=1}^{n} (\omega_{j,0} - \omega_{j,1}) Cov(r_i, r_j). \tag{4}$$

Equation (4) has two opposing terms. In order to simplify the interpretation, first consider the case of an asset that has zero covariance with the original *n* assets, but a non-zero covariance with the IPO. In market 0, the expected return on this asset is the risk-free rate—the asset has no systematic risk. The change in expected return on this asset corresponds only to the first term in equation (4). If the covariance with the IPO is positive, the asset receives a risk premium after the IPO; if the covariance is negative, the asset is a good hedge against the fluctuations of the IPO and it receives a risk discount. The magnitude of the effect is influenced by the weight of the IPO in the market, ω_{ipo} , and by the price of risk given by the investor's risk aversion.

The second term in equation (4) tends to offset the effect of the first term. The intuition is the following. From the first term we know that an asset that covaries positively with the IPO receives a higher expected return, a lower price, and consequently a lower weight in the market (ceteris paribus). Therefore, assets with positive IPO covariance see their market weight decline according to the first term. But the decrease in market weight leads mechanically to a lower covariance of these assets with the new market and a lower risk premium, dampening the previous increase in risk premium.

This second effect is likely to be of second order except for extreme cases. The extreme cases are similar to the examples in Cochrane, Longstaff, and Santa-Clara (2005), where an increase in the market share of an asset lowers its expected returns, for instance, when the share is close to one. Bansal, Fang, and Yaron (2005) also regard these cases as not empirically relevant.

We focus on the impact of $Cov(r_i, r_{ipo})$ throughout the paper, so, if anything, the second term in equation (4) biases our empirical strategy against finding a result. A simple example that shows the linear dependence of changes in expected returns with respect to the covariance is the case of the entire market,

$$\Delta E(r_m) = \gamma\, \omega_{ipo} [Cov(r_m, r_{ipo}) - \sigma_m^2]. \tag{5}$$

We consider variations in the impact of the covariance as the size of the IPO (ω_{ipo}) changes. We also study the impact of market segmentation, which can be understood as another way of varying the size of the IPO relative to the market. In a less segmented market the relevant market capitalization includes foreign assets, which amounts to saying that ω_{ipo} shrinks. In the extreme case of a fully integrated market (that is, where the world market is the reference for the CAPM as in Karolyi and Stulz (2003)), any IPO necessarily has a negligible size, and therefore the change in expected returns in equation (4) is zero.

In this analysis we assume that the IPO creates a new source of wealth in the economy. In a mean-variance graph (see Figure 1), the addition of the new asset modifies the efficient frontier and therefore the market for risky assets. In such case it is clear that the IPO has a potential effect on other asset prices. On the other hand, Willen (2005) finds that the introduction of an asset in zero net supply (that is, an asset that is not new wealth) leaves the prices of other risky assets unchanged. But even then, adding an asset that is not new wealth can affect other prices if we consider further frictions. For instance, an IPO leads to changes in prices in the case of a privately held company whose owners were formerly liquidity constrained.

2. Event Study around IPO Dates

A. Data Sources

Stock prices come from the Emerging Markets Database (EMDB). We use dollar prices as of the end of the month. We do not use daily data because many stocks are traded only sporadically in emerging markets, and we thus often observe zero daily returns. We form 17 value-weighted industry portfolios in each country, following the industrial classification of Fama and French.[1] We define the market return as the value-weighted return on the EMDB stocks in the country during the month.

The IPO data come from Thomson Financial's SDC Platinum. We start with all common equity primary IPOs. We then restrict the sample to the issues where the firm is listing in its home market. The sample excludes events initiated by firms already listed (firms issuing either a new class of stock or in other markets). IPOs are included only if the amount is larger than $20 million. This leaves out data of debatable quality and retains issues more likely to have a material impact on prices. In order to keep the identification of the events as clean as possible, we use IPOs that are issued in a month in which no other IPO larger than $20M is listed in the same country. From this data set we keep the issuance date, the dollar amount of the IPO, and the issuing firm's country and industry.

After matching the data sets, we end up with 254 IPOs in 22 different emerging markets, corresponding to the 1989-2002 sample period. Table AI in the appendix provides summary statistics.

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[1] The definition and returns associated with these portfolios in the U.S. can be found on Ken French's webpage (http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html). We match SDC's SIC and EMDB's GICS classification to the classification used by Fama and French. We also perform tests with Fama-French's 48-industry classification and obtain similar results. The panel looks more unbalanced in that case because of missing industries in some countries and periods.

B. Basic Regression and Identification

We conduct an event study around the date of the listing of new issues. Traditionally, event studies in the finance literature have focused on outcomes of the firm affected by or initiating the event. We instead concentrate on the evolution of the stock price of the other firms in the same national market. The regressions we estimate are of the following type:

$$R_i^{\,c} = \alpha + \beta \operatorname{cov}(R_i^{\,usa}, R_j^{\,usa}) + \varepsilon_i^{\,c}, \qquad (6)$$

where the dependent variable is the return on industry *i* in country *c* during the month of issuance of an IPO in country *c*. The vector α represents a set of IPO fixed effects. The main independent variable measures the covariance of returns between industry *i* and industry *j* to which the new issue belongs. A negative estimate for β is consistent with our hypothesis that high IPO-covariance stocks see their prices decline relative to other stocks as an IPO enters the market. This is a reduced-form regression, so there is no direct mapping between the estimate for β and parameters in equation (4) such as the risk aversion coefficient.

We compute the covariance of returns between each pair of industries with U.S. monthly excess returns on Fama-French's 17-industry portfolios from 1974 to 2003. Table AII in the appendix presents the 17x17 covariance matrix with the 153 different covariances. A country-specific covariance between industries was computed, although it is imperfect because of the dramatic changes in market structure and the lack of a long time series. Thus, it is not a good idea to then run a regression with these covariances because, on top of being noisy, they are endogenous. The need for an exogenous measure of covariance can be understood by noting that the model presented in the previous section is a partial equilibrium model. First moments, or expected returns, are derived from second moments of returns that are taken as given. In reality, second moments are equally endogenous. Therefore, equation (4) cannot be estimated directly as a regression without thinking further about the identification problem.

Our whole approach hinges on the idea that supply and demand matter for asset prices, and therefore that covariances respond to the local structure of the market. In other words, covariances have embedded in them the characteristics of the segment where they are traded. For example, stocks added to the S&P500 exhibit changes in their degree of comovement with other stocks inside and outside the index (Barberis, Shleifer, and Wurgler (2005)).

One example can illustrate the potential correlation between ε_i^c and the covariance computed with local data. Particularly in emerging markets, firms are usually organized in conglomerates because of the poor development of financial intermediaries. A high covariance between firms can in part reflect the existence of these internal capital markets (Lamont (1997)). In such case, an IPO can signal an alleviation of financial constraints for a whole set of firms within a conglomerate. In this example, the extent of internal capital markets is the omitted variable that is hidden in the error term and is correlated with the local covariance. Unfortunately, measuring these inter-firm links is virtually impossible, at least for a broad sample like the one we study.

Our identifying assumption is that the covariances in the U.S. capture the exogenous component of the covariances in each country. The U.S. market is a well-diversified, internationally-integrated market, with many arbitrageurs, and consequently a market where the covariances are potentially closer to fundamental measures of risk or behavioral degrees of substitutability between assets that do not rely on a particular market structure. Given that we exploit within-IPO, cross-industry variation in the data, we just need the ranking of the inter-industry covariances to be relatively stable across countries. For instance, Morck, Yeung, and Yu (2000) show that stocks in less-developed markets tend to be more correlated, leading mechanically to higher covariances (ceteris paribus). However, even if all covariances are higher in some markets, our variable is valid as long as the ranking of comovement across industries does not change dramatically.

We concentrate on the within-country variation in the effect of the covariance by including IPO fixed effects that absorb the market-wide price fluctuation or any change in the risk-free rate. Being able to control for unobserved characteristics constitutes a major advantage of our empirical design, because the results are robust to omitted variables that vary along any combination of the country, year, and IPO-industry dimensions. In particular, we shield ourselves from the potential biases due to market timing in new issues (Ritter (2003)) by focusing on the cross-section of price changes rather than the market price change. The need to control for country heterogeneity seems critical given the evidence on cross-country differences in valuations (La Porta et al. (2002)) and IPO underpricing (Ljungqvist (2004)), and the fact that these differences are not fully explained. We also take into account the fact that returns in the same country are potentially correlated across stocks and through time by allowing the residuals to be clustered within a country.

3. Empirical Results

A. Asset Prices Fall as the Covariance with the IPO Increases

Table I presents the results from the regression in (6) using returns on the month of the IPO. We measure abnormal returns in two ways in this table. First, we simply subtract the market return, which we call the market-adjusted return. Given the IPO fixed effects, it is equivalent to run regressions with market-adjusted returns or raw returns. Second, we compute the return in excess of a market-model return estimated with data from month *t-30* to month *t-7*, where *t* is the month of the IPO. We lose approximately 10 percent of the observations with the second method because it requires a longer time series for each industry.

The coefficient of the covariance with the IPO industry is negative and significant at the 5 percent level with both definitions of abnormal returns. The coefficient in the regression with market-adjusted returns implies that a one-standard-deviation increase in the covariance reduces prices by 40 basis points. In order to put this number into perspective, consider that HML (the book-to-market factor of Fama and French (1993)) gives an average premium of 40 basis points per month.

An alternative way of quantifying these magnitudes is to use as independent variable the ranking of each industry in terms of its covariance with the IPO industry. Using the ranking is a way of controlling for possible non-linearities in the effect of the covariance. The results in Table I indicate that moving one place closer to the IPO in the ranking lowers prices by 5.7 basis points (6.3 basis points when using market-model abnormal returns).

We find small changes in prices, which imply even smaller changes in expected returns. This can easily be seen from the Gordon growth model for the price-dividend ratio: P/D = 1/(r-g). Assume that the P/D ratio is 20. For given dividends, a change in prices of 40 basis points implies a change of only 2 basis points per month in expected returns. A back-of-the-envelope calibration of our model gives similar magnitudes. Take the first term in equation (4), which is our main focus, and consider the effect of a one-standard-deviation increase in the IPO covariance. Assume that the risk aversion coefficient is 100, consistent with the equity premium evidence, and that the IPO has the average size in the sample (0.25 percent of the country's market capitalization; see Table AI). Multiplying these terms gives the result that the change in expected returns is 1.5 basis points per month. We do not perform the tests with expected returns instead of prices because these tests would most likely lack power. The variance of returns is just too large relative to the size of the effect that we document.

Sometimes the changes in price are reported in terms of demand elasticities, particularly in the literature on index additions. If we assume that the IPO has the average size in the sample, a 0.40 percent change in prices implies an elasticity of -1.6. This number is within the range of previous estimates in the literature (see Wurgler and Zhuravskaya (2002) for a survey).

Figure 2 summarizes the basic result graphically. For each IPO we compute the market-adjusted return on each of the 17 industries in the country during the month of issuance. We then rank the industries from 1 to 17 according to the U.S. covariance with the IPO industry (with 1 being the industry with the lowest covariance). Finally, we average the returns across all IPOs for each ranking position. These returns are then plotted against the ranking, along with a regression line. This figure shows a strong negative relationship between returns and the covariance of different industries with the IPO industry. It is clear that the effect does not come from a few outliers, but is a robust feature of the data. In particular, the effect is not derived from the difference between the same industry of the IPO versus the impact on other industries. The same-industry data points (almost always corresponding to ranking position 17) can be discarded and a similar relationship holds.

The lower panel of Figure 2 shows the same average returns by ranking in the months before and after the IPO. The negative slope is no longer there. While during the month of the IPO the coefficient on the ranking is significantly negative (at the 2 percent level) and explains 30 percent of the variation in excess returns, it is insignificant and explains only 10 percent of the variation during the months before and after the issuance. Figure 2 suggests that the U.S. covariance is not just picking up some permanent difference in expected returns between industries.

In Figure 3, we show our basic result in yet another way. For each IPO we compute separately the market-adjusted return on industries above and below the median of the IPO covariance. We then plot the entire distribution of returns for both groups of industries. The difference in means of the two distributions is quite apparent in the month of the IPO. A Kolmogorov-Smirnov test easily rejects the null hypothesis of equality of distribution functions, with a p-value lower than 1 percent. Once again, the effect is not present in the months before and after the IPO (Figure 3B). For each of these months the test fails to reject the null (at p-values of 46 percent and 75 percent for the previous and subsequent month, respectively).

Table II confirms that the effect of the IPO covariance is exclusive to the month of the issue by showing the results of the same basic regression for the months before and after the IPO. In both cases the covariance is not significant and the coefficients are much smaller (in magnitude) than during the month of the IPO.

As an example of the basic effect, consider the price impact of the typical IPO in Transportation. Figure 4 plots market-adjusted returns against the covariance ranking as in Figure 2, but only for the IPOs in the transportation industry. As intuition suggests, the returns of transportation covary significantly more with the steel industry than with the food industry (the covariances are 0.29 percent and 0.19 percent, respectively). IPOs in transportation turn out to be associated with a negative change of more than 50 basis points in the price of the steel industry relative to the food industry. Put differently, when an IPO in the transportation industry occurs, a portfolio that shorts the local steel industry and buys the food industry generates a return of more than 50 basis points over the month of the IPO. These numbers closely match the ones in the benchmark regression.

An advantage of our methodology is that the event is not initiated by the firms for which we measure the change in the stock price. In fact, the industry returns in the dependent variable do not include the return on the issuing firm. In principle, the decision to issue equity can convey information about the future prospects of the firm (Myers and Majluf (1984)) and can also directly affect future cash flows if credit constraints are important. It can be argued that these effects are relevant not only for the issuing firm but also for other firms in the same industry or close competitors (Chevalier (1995), Phillips (1995)). The direct effect on cash flows or the information signaled about cash flows can affect the demand for assets and blur the effects of changes in expected returns that we point to in the model. We checked that the results are not driven by the competition within the same industry of the IPO by running regressions that exclude that industry, and we obtained the same results as before. In terms of the informational story, we think it is hard to argue that a single IPO conveys information not previously known to markets about the cash flows of all other industries in a country, and that the information is correlated with the covariance of returns measured in the U.S.

One caveat to our approach is that we measure price changes around the date of issuance of the new stock and not around the announcement date. If arbitrage is frictionless, the price effect should be observed when the issue is announced. At the date of announcement, arbitrageurs should sell-short stocks of industries with high IPO covariance and should go long in industries with low IPO covariance. Unfortunately, we do not have a practical way of identifying the announcement date because of the very nature of the process of public offerings. There is no certainty about the issuance when management announces plans to do it or files for it; rather, the probability of issuance grows slowly in time and reaches its peak only on the actual date of listing. In other words, there is substantial risk in the strategy suggested above, and this deters arbitrageurs from pursuing it (De Long et al. (1990)). Measuring returns around the month, and not the day, of the IPO likely mitigates this concern. In any case, if the effects are concentrated around the announcement date and not the issuance date, then it is more difficult for us to find empirically the results we document.[2]

B. Other Factors in the Cross-Section of Stock Returns

There is the possibility that the IPO covariance proxies for some of the factors that are usually considered in cross-sectional regressions of stock returns, such as the market-to-book ratio or size. In Table III we study the effect of including alternative factors. We first consider the

[2] Newman and Rierson (2004) document price effects both at announcement and issuance in their study on bonds.

factors used by Fama and French (1992), which are the log of market equity (ME), the log of the market-to-book ratio (P/B), the price-earnings ratio when earnings are positive (P/E(+)), and a dummy for those observations with negative earnings (E<0). These variables are measured 12 months prior to the IPO for each country-industry pair. Out of these four factors, the price-earnings ratio is the only one that enters significantly and with the expected negative sign. The market-to-book ratio has the right sign, but it is not significant. Size is not significant either, and it has the wrong sign when compared with what is found in the U.S. The IPO covariance survives all of these controls in terms of magnitude and significance; hence, a high covariance with an IPO is not simply an indication of small size or high market-to-book value (which is probably indicative of high growth opportunities).

Two other interesting factors are liquidity and momentum. Turnover is a proxy for liquidity risk, which may be a particularly discouraging factor for foreign investors considering investing in emerging markets (Bekaert and Harvey (2003), Lesmond (2005)). We define turnover as the average over the 12 months prior to the IPO of value traded divided by market capitalization of each industry in each country. However, the coefficient on turnover is not significant and it has the wrong sign (that is, negative).

Momentum, instead, is a robust predictor of returns. We measure momentum as a dummy variable that takes the value of one when the cumulative market-adjusted return over months *t-6* through *t-1* is positive; or in other words, when the industry under consideration is a winner in the 6 months prior to the IPO.[3] As seen in Table III, the momentum effect is very strong. Winners in the past 6 months earn, on average, an extra 1 percent during the IPO month. Even after including momentum, however, the coefficient on the IPO covariance remains significant at the 5 percent level, and its magnitude is only slightly reduced.

[3] We also tried the original definition of momentum in Jegadeesh and Titman (1993), which goes from month *t-12* to month *t-2*. It was less robust than the definition we use here, and it does not affect the coefficient on the IPO covariance.

IPOs tend to cluster around hot markets, that is, after a succession of positive returns. It has been suggested that managers exploit temporary windows of opportunity provided by market mispricing (Ritter (2003)). Under this hypothesis, we should observe IPOs clustered in industries with positive momentum. However, if this is the case, industries with a high covariance with the IPO will share the momentum and the high returns of the IPO industry. We show, instead, that high covariance industries have unusually low returns during the month of the IPO. In other words, a contagious IPO-industry momentum works against the negative effect of the high IPO-industry covariance. The results in Table III suggest that sharing the positive momentum of the IPO industry is not enough to overturn the negative effect of the market-clearing considerations.

C. IPO Size and Market Segmentation

In a deep market like the U.S., probably no IPO is big enough to have a significant effect on all other stocks. Emerging markets, instead, are much smaller in terms of total market capitalization and number of investors. The size of the average (median) IPO in our sample is \$98 (\$43) million, while the average (median) market capitalization is just \$91 (\$80) billion. Perhaps more important is the fact that, given the prevalence of government and insider control (La Porta et al. (2000)), market capitalization substantially overstates the value of stocks that are actually traded in these markets. Just to give a sense of the magnitude of the correction needed to account for this problem, the free-float market capitalization is only 14 percent of total capitalization in Chile. If we assume that this number is the same for all countries, then the average IPO represents just below 1 percent of the respective market free float.

As seen in equation (4), a bigger IPO amplifies the effect of the IPO covariance. The IPO fixed effects absorb any direct impact of size, but size can still interact with the covariance. In Table IV we split the sample in three, according to the dollar amount of the IPO relative to the total market capitalization. The coefficient on the IPO covariance increases (in magnitude) as we move from small to big IPOs. In fact, the covariance effect is significant in the third of the sample that corresponds to the relatively big IPOs, but not in the other two sub-samples.

A second source of variation in size comes from the segmentation of the market. Segmentation determines the extent of the demand for assets. For instance, investors from all over the world are potential participants in a perfectly-integrated market. We present two alternative measures of segmentation in Table V. These measures vary across countries and through time, as opposed to other institutional features that vary almost exclusively across countries. The decade under consideration is a period of substantial changes in the segmentation of emerging markets, so we prefer these time-varying measures (Bekaert and Harvey (1995)).

Our first measure corresponds to the ratio of the investable IFC index to the global IFC index (Bekaert (1995)). This ratio, which is available at the monthly frequency, shows the fraction of market capitalization in which foreigners can potentially invest. In the top panel of Table V we split the sample in three according to this ratio. The coefficient on the IPO covariance increases (in magnitude) as we move to more segmented markets. As seen in the first column, it is not significant in well-integrated emerging markets.

The middle panel of Table V presents results when the sample is split according to market turnover. Low liquidity can be a deterrent to foreign investors and an important cause of segmentation. As expected, the effect of the IPO covariance is strong in less liquid markets, but missing in the most liquid ones.

So far, we have focused on variation within emerging markets. In the bottom panel of Table V we compare emerging markets as a group with those markets that are more developed and well-integrated according to the IFC classification. To conduct this exercise, we gather stock-price data from Datastream to build the industry portfolios of 37 countries since 1990. We then match the returns to the SDC IPO data as before, and run the benchmark regression separately for emerging and developed countries. In the sample of emerging markets the results are comparable in magnitude and significance with the results of our benchmark sample. As expected, there is no effect of the IPO covariance in developed markets. We consider this as just a robustness exercise, because the number of stocks in Datastream is much smaller than in EMDB, and because we can form only equal-weighted portfolios since data on shares outstanding are not available.

D. Other Measures of Substitutability between Assets

The model presented in the introduction is a standard model of a risk-return tradeoff. The IPO changes the covariance of each asset with the market, which is the measure of risk, and therefore it commands a change in expected returns. Instead of focusing on traditional measures of risk, Barberis and Shleifer (2003) suggest that investors use easily observable characteristics such as size, the book-to-market ratio, or the industry, to classify assets. We can then speculate that, when a new asset appears, investors adjust their portfolios to reflect their desired exposure to the different styles within the market. Those assets that have a style similar to that of the IPO are substituted away more strongly than other assets. For example, an IPO can crowd out and lower the price of other stocks with similar book-to-market values. This effect can potentially wipe out or complement the effect of the IPO covariance previously identified.

To explore this issue, we classify assets according to the book-to-market ratio and size of each industry relative to the IPO industry in the month prior to the realization of the return. We say that an industry is close to the IPO if the absolute difference in the book-to-market ratio between the two is small, and proceed analogously for size. Teo and Woo (2004) also use categories based on size and book-to-market values in their tests of style investing.

In Table VI we show that the prices of industry portfolios that are close to the IPO industry in terms of book-to-market value and size fall relative to other industries. This effect is again limited to the month of the IPO. The effect of size is more robust, and in fact makes the book-to-market variable insignificant when both are included in the regression. The IPO covariance is still significant and its coefficient is of similar magnitude to the one in our benchmark regression.

In Table VII we see that the effects are concentrated in markets with medium and high levels of segmentation. In principle, the impact of this second class of substitutability measures is not necessarily expected to be stronger in more segmented markets. Style investing can affect international investors as well as local investors. However, our evidence suggests that style investing may be even worse in markets dominated by local investors.

One problem with testing style investing is that the definition of style is always debatable. For instance, following the methodology for the IPO covariance, we also try the measure of book-to-market closeness with historical book-to-market ratios for U.S. industries. However, this measure is never significant. We can argue that it is simply not a good measure of asset style, or that it is not relevant for the participants in the market. In any case, its inclusion does not affect the coefficient of the IPO covariance (results not reported).

E. Volume Traded

As a final step, we examine the volume traded during the month of the IPO and the months around it. Table VIII shows that the IPO covariance significantly predicts higher volume in the month of issuance, both when measured as dollar volume and when measured as number of shares traded, and does so even after controlling for the high autocorrelation by including lagged volume (Lo and Wang (2000)) . The relationship is, in general, insignificant for the previous and following months (with one exception, where the covariance comes in significantly at only the 10 percent level). The evidence on volume, taken together with the evidence on price changes, suggests that the industries that covary highly with the IPO experience more selling pressure than other industries as investors rebalance their portfolios. However, other possibilities cannot be ruled out completely without more detailed data on order flows.

4. Conclusions

This paper shows empirically that changes in asset supply have a significant impact on the prices of assets in a market. Therefore, the constraints imposed by market clearing should not be ignored, as also suggested by Cochrane, Longstaff, and Santa-Clara (2005). We measure the change in supply through IPOs and focus on imperfectly integrated emerging markets. The supply shock has a cross-sectional price impact that is inversely related to the covariance of returns between each industry and the IPO's industry. If one considers Fama and French's 17-industry classification, selling the closest industry and buying the most distant industry gives a spread of approximately 80 basis points in the month of the IPO.

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Table I

The Effect of an IPO on the Stock Returns of Other Industries during the Month of the IPO

This table shows the results from the following regression:

$$R_i^{c} = \alpha + \beta \operatorname{cov}(R_i^{usa}, R_j^{usa}) + \varepsilon_i^{c}.$$

In the left panel, the dependent variable is the return of industry *i* in country *c* in excess of the local market return during a month (market-adjusted returns). The local market is defined as the value-weighted sum of all stocks in that country and month reported in the EMDB database. In the right panel, the excess return is computed with a market model estimated between months *t-7* and *t-30*. Results are shown for month *t*, which is the month of the IPO. The independent variable is the covariance between industry *i* and industry *j*, which is the industry of the IPO. This covariance is estimated with monthly industrial returns from U.S. stocks between 1973 and 2004. The industry definitions correspond to the 17 groups of SIC codes defined on Ken French's website. The results are also shown using the rank of the covariance of each industry with a given IPO industry. The covariance rank ranges from 1 to 17. The coefficient on the covariance rank is multiplied by 1000, so it is interpreted as basis points lost (or gained) when moving one place in the ranking. The IPO fixed effects (α in the equation above) are not reported. Details on the selection of IPOs are provided in the text. Returns in the dependent variable are truncated at the 1% and 99% levels. Robust standard errors clustered by country are reported below the coefficients. Significance (two-sided): ***1%, **5%, *10%.

	Dependent Variable in IPO Month			
	Market-Adjusted Return		Market Model Abnormal Return	
Covariance with IPO industry	-6.746 **		-5.485 **	
	3.278		2.282	
Covariance Rank		-5.712 *		-6.338 **
		2.969		2.564
N Observations	3105	3105	2725	2725
N IPOs	254	254	243	243
R^2	0.124	0.124	0.236	0.236

Table II

The Effect of an IPO on the Stock Returns of Other Industries: The Previous and the Following Months

This table shows the results from the following regression:

$$R_i^c = \alpha + \beta \operatorname{cov}(R_i^{usa}, R_j^{usa}) + \varepsilon_i^c .$$

The dependent variable is the return of industry *i* in country *c* in excess of the local market return during a month (market-adjusted returns). The local market is defined as the value-weighted sum of all stocks in that country and month reported in the EMDB database. Results are shown for month *t*, which is the month of the IPO, and for months *t-1*and *t+1*. The independent variable is the covariance between industry *i* and industry *j*, which is the industry of the IPO. This covariance is estimated with monthly industrial returns from U.S. stocks between 1973 and 2004. The industry definitions correspond to the 17 groups of SIC codes defined on Ken French's website. The results are also shown using the rank of the covariance of each industry with a given IPO industry. The covariance rank ranges from 1 to 17. The coefficient on the covariance rank is multiplied by 1000, so it is interpreted as basis points lost (or gained) when moving one place in the ranking. The IPO fixed effects (α in the equation above) are not reported. Details on the selection of IPOs are provided in the text. Returns in the dependent variable are truncated at the 1% and 99% levels. Robust standard errors clustered by country are reported below the coefficients. Significance (two-sided): ***1%, **5%, *10%.

	Dependent Variable: Market-Adjusted Return					
	Month Relative to IPO					
	Previous Month		Month of IPO		Following Month	
Covariance with IPO industry	-2.382		-6.746 **		-2.408	
	3.833		3.278		3.509	
Covariance Rank		-3.310		-5.712 *		-4.228
		3.334		2.969		2.934
N Observations	3084	3084	3105	3105	3084	3084
N IPOs	253	253	254	254	254	254
R^2	0.136	0.136	0.124	0.124	0.125	0.126

Table III

The Effect of an IPO on the Stock Returns of Other Industries: Alternative Cross-Sectional Factors

This table shows the results from the following regression:

$$R_i^{\,c} = \alpha + \beta \operatorname{cov}(R_i^{\,usa}, R_j^{\,usa}) + X_i^{\,c} + \varepsilon_i^{\,c} .$$

The dependent variable is the return of industry *i* in country *c* in excess of the local market return during a month (market-adjusted returns). The local market is defined as the value-weighted sum of all stocks in that country and month reported in the EMDB database. Results are shown for month *t*, which is the month of the IPO. The set of independent variables includes the covariance between industry *i* and industry *j*, which is the industry of the IPO. This covariance is estimated with monthly industrial returns from U.S. stocks between 1973 and 2004. The industry definitions correspond to the 17 groups of SIC codes defined on Ken French's website. The other independent variables, represented by X_i^c in the equation above, include the log of the market equity (ME), the log of the price-to-book ratio (P/B), the price-earnings ratio if earnings are positive (P/E(+)), a dummy for negative earnings (E<0), the value of traded shares as a fraction of market capitalization averaged over the past 12 months (turnover), and a dummy for those industries that have positive accumulated market-adjusted returns in the 6 months prior to the IPO (momentum). The first 4 control variables mentioned are measured 12 months prior to the IPO. The IPO fixed effects (α in the equation above) are not reported. Details on the selection of IPOs are provided in the text. Returns in the dependent variable are truncated at the 1% and 99% levels. Robust standard errors clustered by country are reported below the coefficients. Significance (two-sided): ***1%, **5%, *10%.

	Dependent Variable: Market-Adjusted Return in IPO Month					
Covariance with IPO industry	-6.351 **	-6.422 *	-6.313 **	-5.838 *	-5.758 **	-5.730 **
	3.140	3.447	3.124	3.254	2.903	2.801
Log(ME)	0.001					0.002
	0.001					0.001
Log(P/B)		-0.003				-0.003
		0.002				0.003
P/E(+)			-0.0001 ***			-0.0001 ***
			0.00003			0.00003
E<0 Dummy			0.006			0.007
			0.006			0.005
Turnover				-0.026		-0.008
				0.021		0.021
Momentum					0.011 **	0.010 *
					0.005	0.006
N Observations	2970	2960	2970	2970	3039	2960
N IPOs	251	251	251	251	252	251
R^2	0.127	0.128	0.130	0.127	0.130	0.137

Table IV

The Effect of an IPO on the Stock Returns of Other Industries: Sub-Samples According to the Size of the IPO

This table shows the results from the following regression:

$$R_i^c = \alpha + \beta \operatorname{cov}(R_i^{usa}, R_j^{usa}) + \varepsilon_i^c .$$

The dependent variable is the return of industry *i* in country *c* in excess of the local market return during a month (market-adjusted returns). The local market is defined as the value-weighted sum of all stocks in that country and month reported in the EMDB database. Results are shown for month *t*, which is the month of the IPO. The independent variable is the covariance between industry *i* and industry *j*, which is the industry of the IPO. This covariance is estimated with monthly industrial returns from U.S. stocks between 1973 and 2004. The industry definitions correspond to the 17 groups of SIC codes defined on Ken French's website. The size of an IPO is the proceeds from the IPO divided by the total market capitalization of the country in the month of the IPO (excluding the IPO itself). The sample is split into three groups (small-medium-big) according to the 33rd and 66th percentile of the IPO size. The IPO fixed effects (α in the equation above) are not reported. Details on the selection of IPOs are provided in the text. Returns in the dependent variable are truncated at the 1% and 99% levels. Robust standard errors clustered by country are reported below the coefficients. Significance (two-sided): ***1%, **5%, *10%.

	Size of the IPO Relative to the Local Market		
	Small	Medium	Big
Covariance with IPO industry	-4.577	-5.039	-11.137 ***
	7.067	4.106	3.955
N Observations	1024	1025	1056
N IPOs	79	81	94
R^2	0.139	0.134	0.104

Table V

The Effect of an IPO on the Stock Returns of Other Industries: Sub-Samples According to Market Segmentation and Related Variables

This table shows the results from the following regression:

$$R_i^{\ c} = \alpha + \beta \operatorname{cov}(R_i^{\ usa}, R_j^{\ usa}) + \varepsilon_i^{\ c}.$$

The dependent variable is the return of industry *i* in country *c* in excess of the local market return during a month (market-adjusted returns). The local market is defined as the value-weighted sum of all stocks in that country and month reported in the EMDB database. Results are shown for month *t*, which is the month of the IPO. The independent variable is the covariance between industry *i* and industry *j*, which is the industry of the IPO. This covariance is estimated with monthly industrial returns from U.S. stocks between 1973 and 2004. The industry definitions correspond to the 17 groups of SIC codes defined on Ken French's website. Market segmentation corresponds to the IFC investable index divided by the IFC global index. Market turnover is provided by the EMDB, and it is the total value of traded shares over the total market capitalization in a month. The sample is split into three groups (low-medium-high) according to the 33^{rd} and 66^{th} percentile of each measure. In the lower panel, return data from Datastream for companies in 37 countries are aggregated into industry portfolios with equal weights, and then split into developed and emerging markets as defined by IFC. The IPO fixed effects (α in the equation above) are not reported. Details on the selection of IPOs are provided in the text. Returns in the dependent variable are truncated at the 1% and 99% levels. Robust standard errors clustered by country are reported below the coefficients. Significance (two-sided): ***1%, **5%, *10%.

	Market Segmentation					
	Low		Medium		High	
Covariance	-7.298		-8.033	**	-14.675	***
	6.752		3.864		2.784	
N Observations	903		801		819	
N IPOs	71		67		66	
R^2	0.096		0.083		0.160	
	Market Turnover					
	High		Medium		Low	
Covariance	0.262		-15.425	***	-9.840	**
	2.111		4.182		4.361	
N Observations	1029		999		1022	
N IPOs	85		80		86	
R^2	0.156		0.141		0.082	
	Emerging vs. Developed Markets					
	Developed Markets				Emerging Markets	
Covariance	1.383				-7.125	***
	1.325				2.355	
N Observations	3490				1729	
N IPOs	283				192	
R^2	0.069				0.116	

Table VI

The Effect of an IPO on the Stock Returns of Other Industries: B/M and Size Closeness to the IPO

This table shows the results from the following regression:

$$R_i^{\,c} = \alpha + \beta \operatorname{cov}(R_i^{\,usa}, R_j^{\,usa}) + \gamma\, B/M\ Closeness + \delta\, Size\, Closeness + \varepsilon_i^{\,c}\ .$$

The dependent variable is the return of industry *i* in country *c* in excess of the local market return during a month (market-adjusted returns). The local market is defined as the value-weighted sum of all stocks in that country and month reported in the EMDB database. Results are shown for month *t*, which is the month of the IPO, and for months *t-1*and *t+1*. The covariance between industry *i* and industry *j*, which is the industry of the IPO, is estimated with monthly industrial returns from U.S. stocks between 1973 and 2004. The industry definitions correspond to the 17 groups of SIC codes defined on Ken French's website. B/M (book-to-market) closeness is the negative of the log of the absolute difference between the B/M of industry *i* and industry *j* in the month before the realization of the return. Size closeness is defined analogously. The IPO fixed effects (α in the equation above) are not reported. Details on the selection of IPOs are provided in the text. Returns in the dependent variable are truncated at the 1% and 99% levels. Robust standard errors clustered by country are reported below the coefficients. Significance (two-sided): ***1%, **5%, *10%.

	Dependent Variable: Market-Adjusted Return								
	Month Relative to IPO								
	Previous Month			Month of IPO			Following Month		
Covariance with IPO industry	-3.067	-3.24	-3.223	-7.177 **	-7.38 **	-6.752 *	-2.138	-2.05	-2.238
	4.163	4.346	4.246	3.434	3.726	3.471	3.843	4.152	3.989
B/M Closeness to IPO Industry	-0.0003		-0.0004	-0.0035 *		-0.0034	0.0015		0.0014
	0.0021		0.0021	0.0021		0.0021	0.0016		0.0017
Size Closeness to IPO Industry		0.0009	0.0008		-0.0026 **	-0.0024 **		0.0008	0.0006
		0.0013	0.0013		0.0013	0.0012		0.0014	0.0015
N Observations	2656	2669	2656	2685	2688	2685	2675	2676	2675
N IPOs	235	235	235	235	235	235	236	236	236
R^2	0.160	0.159	0.160	0.137	0.136	0.138	0.142	0.141	0.142

Table VII

The Effect of an IPO on the Stock Returns of Other Industries: B/M and Size Closeness across Levels of Market Segmentation

This table shows the results from the following regression:

$$R_i^{\,c} = \alpha + \beta \operatorname{cov}(R_i^{\,usa}, R_j^{\,usa}) + \gamma\, B/M\ Closeness + \delta\, Size\, Closeness + \varepsilon_i^{\,c}\,.$$

The dependent variable is the return of industry *i* in country *c* in excess of the local market return during a month (market-adjusted returns). The local market is defined as the value-weighted sum of all stocks in that country and month reported in the EMDB database. Results are shown for month *t*, which is the month of the IPO. The covariance between industry *i* and industry *j*, which is the industry of the IPO, is estimated with monthly industrial returns from U.S. stocks between 1973 and 2004. The industry definitions correspond to the 17 groups of SIC codes defined on Ken French's website. B/M (book-to-market) closeness is the negative of the log of the absolute difference between the B/M of industry *i* and industry *j* in the month before the realization of the return. Size closeness is defined analogously. Market segmentation corresponds to the IFC investable index divided by the IFC global index. The sample is split in three groups (low-medium-high) according to the 33rd and 66th percentile of market segmentation. The IPO fixed effects (α in the equation above) are not reported. Details on the selection of IPOs are provided in the text. Returns in the dependent variable are truncated at the 1% and 99% levels. Robust standard errors clustered by country are reported below the coefficients. Significance (two-sided): ***1%, **5%, *10%.

	Market Segmentation		
	Low	Medium	High
Covariance with IPO industry	-7.369	-2.866	-16.731 ***
	9.471	5.489	3.789
B/M Closeness to IPO Industry	-0.0028	-0.0038	-0.0041 **
	0.0054	0.0025	0.0017
Size Closeness to IPO Industry	-0.0022	-0.0020 *	-0.0015
	0.0032	0.0012	0.0023
N Observations	807	676	715
N IPOs	67	60	62
R^2	0.107	0.093	0.183

Table VIII

The Effect of an IPO on the Volume Traded in Other Industries

This table shows the results from the following regression:

$$V_{i,t}^{\ c} = \alpha + \beta V_{i,t-1}^{\ c} + \gamma \operatorname{cov}(R_i^{usa}, R_j^{usa}) + \varepsilon_{i,t}^{\ c}.$$

The dependent variable is the volume traded in industry *i* in country *c* during a month. For each month we present regressions with two alternative measures of volume. First, volume is defined as the dollar amount traded over total market capitalization. Second, volume is defined as the number of shares traded over total shares outstanding. To get to industry volume we value-weight firm-level measures of volume. Results are shown for month *t*, which is the month of the IPO, and for months *t-1*and *t+1*. The main independent variable is the covariance between industry *i* and industry *j*, which is the industry of the IPO. This covariance is estimated with monthly industrial returns from U.S. stocks between 1973 and 2004. The industry definitions correspond to the 17 groups of SIC codes defined on Ken French's website. The IPO fixed effects (α in the equation above) are not reported. Details on the selection of IPOs are provided in the text. Robust standard errors clustered by country are reported below the coefficients. Significance (two-sided): ***1%, **5%, *10%.

	Dependent Variable: Volume Traded					
	Month Relative to IPO					
	Previous Month		Month of IPO		Following Month	
	Dollar V_t	Shares V_t	Dollar V_t	Shares V_t	Dollar V_t	Shares V_t
Volume Traded at t-1	0.780 ***	0.771 ***	0.817 ***	0.811 ***	0.837 ***	0.832 ***
	0.041	0.042	0.021	0.022	0.028	0.026
Covariance with IPO industry	41.27 *	37.72	36.83 ***	32.09 **	25.34	28.50
	24.03	23.67	13.15	15.04	22.82	22.65
N Observations	3179	3177	3184	3184	3189	3189
N IPOs	253	253	253	253	253	253
R^2	0.854	0.851	0.859	0.858	0.862	0.861

Table AI
Sample Characteristics

Country	# Obs.	# IPOs
Argentina	121	11
Brazil	63	4
Chile	54	5
China	132	9
Czech Republic	11	1
Greece	143	12
Hungary	14	2
Indonesia	189	16
India	191	13
Korea	334	22
Sri Lanka	11	1
Mexico	217	16
Malaysia	370	25
Pakistan	51	4
Philippines	96	13
Poland	68	8
Portugal	15	2
Thailand	394	36
Turkey	28	2
Taiwan	582	50
Venezuela	8	1
South Africa	13	1
Total	3,105	254

Year	# Obs.	# IPOs
1989	7	1
1990	45	4
1991	202	20
1992	149	15
1993	272	25
1994	537	44
1995	413	31
1996	258	18
1997	199	16
1998	170	13
1999	211	17
2000	233	19
2001	160	12
2002	249	19
Total	3,105	254

	IPO Industry	# Obs.	# IPOs
1	Food	222	18
2	Mining and Minerals	25	2
3	Oil and Petroleum Products	68	6
4	Textiles, Apparel & Footware	34	3
5	Consumer Durables	70	6
6	Chemicals	66	5
7	Drugs, Soap, Perfums, Tobacco	43	3
8	Construction and Construction Materials	243	21
9	Steel Works Etc	49	4
10	Fabricated Products	26	3
11	Machinery and Business Equipment	326	26
12	Automobiles	67	6
13	Transportation	132	11
14	Utilities	65	6
15	Retail Stores	63	6
16	Banks, Insurance Companies, and Other Financials	1,098	87
17	Everything Else	508	41
	Total	3,105	254

Variable	# Obs.	Mean	Std. Dev.	Min	Max	Pairwise Correlations					
Market-Adjusted Return	3105	-0.001328	0.068168	-0.21106	0.219904	1.00					
Market Model Abnormal Return	2725	-0.006588	0.080873	-0.247465	0.245623	0.73	1.00				
Covariance	3203	0.002272	0.000581	0.000872	0.004862	-0.02	0.01	1.00			
Covariance Rank	3203	9.399313	4.933356	1	17	-0.04	-0.03	0.57	1.00		
Size Relative to Local Market	3203	0.002532	0.006039	9.94E-05	0.052106	0.04	0.00	-0.11	-0.01	1.00	
Market Segmentation Index	2597	0.621059	0.319136	0	1	0.01	-0.06	-0.09	0.00	0.01	1.00

Table AII
Inter-Industry Covariances of Returns in the U.S.

The table shows the covariance matrix of excess returns for 17 U.S. industries classified according to the SIC codes on Ken French's website. The data are monthly from 1973 to 2004.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	0.0023																
2	0.0014	0.0047															
3	0.0011	0.0024	0.0030														
4	0.0020	0.0023	0.0015	0.0039													
5	0.0018	0.0022	0.0015	0.0027	0.0036												
6	0.0017	0.0025	0.0019	0.0026	0.0024	0.0031											
7	0.0019	0.0013	0.0012	0.0017	0.0020	0.0017	0.0026										
8	0.0020	0.0028	0.0018	0.0032	0.0030	0.0027	0.0019	0.0038									
9	0.0015	0.0035	0.0021	0.0028	0.0028	0.0029	0.0014	0.0032	0.0046								
10	0.0017	0.0026	0.0019	0.0026	0.0025	0.0024	0.0015	0.0028	0.0029	0.0032							
11	0.0015	0.0025	0.0018	0.0027	0.0033	0.0025	0.0019	0.0031	0.0033	0.0027	0.0049						
12	0.0015	0.0021	0.0013	0.0027	0.0027	0.0023	0.0014	0.0028	0.0028	0.0024	0.0027	0.0040					
13	0.0019	0.0025	0.0018	0.0028	0.0026	0.0025	0.0018	0.0030	0.0029	0.0027	0.0027	0.0025	0.0033				
14	0.0012	0.0011	0.0013	0.0011	0.0011	0.0011	0.0011	0.0013	0.0010	0.0012	0.0009	0.0011	0.0012	0.0018			
15	0.0021	0.0019	0.0012	0.0031	0.0027	0.0023	0.0019	0.0030	0.0023	0.0023	0.0026	0.0025	0.0026	0.0011	0.0034		
16	0.0019	0.0020	0.0016	0.0024	0.0023	0.0022	0.0018	0.0026	0.0022	0.0022	0.0022	0.0021	0.0024	0.0014	0.0023	0.0026	
17	0.0016	0.0021	0.0015	0.0024	0.0027	0.0022	0.0018	0.0027	0.0025	0.0022	0.0032	0.0022	0.0023	0.0010	0.0024	0.0021	0.0028

Figure 1: Introducing a New Asset to the Market in a Mean-Variance Framework

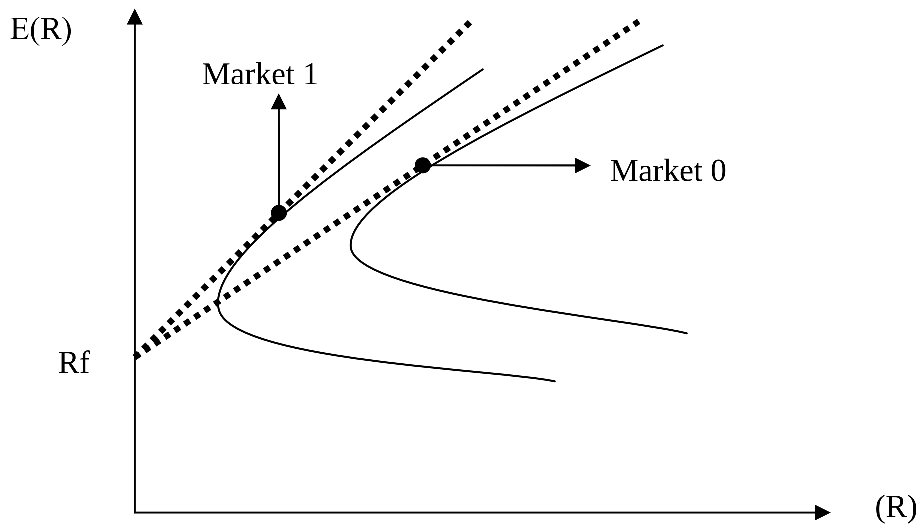


Figure 2: Industry Returns According to the Ranking of Covariance with the IPO

Figure 2A: Month of the IPO

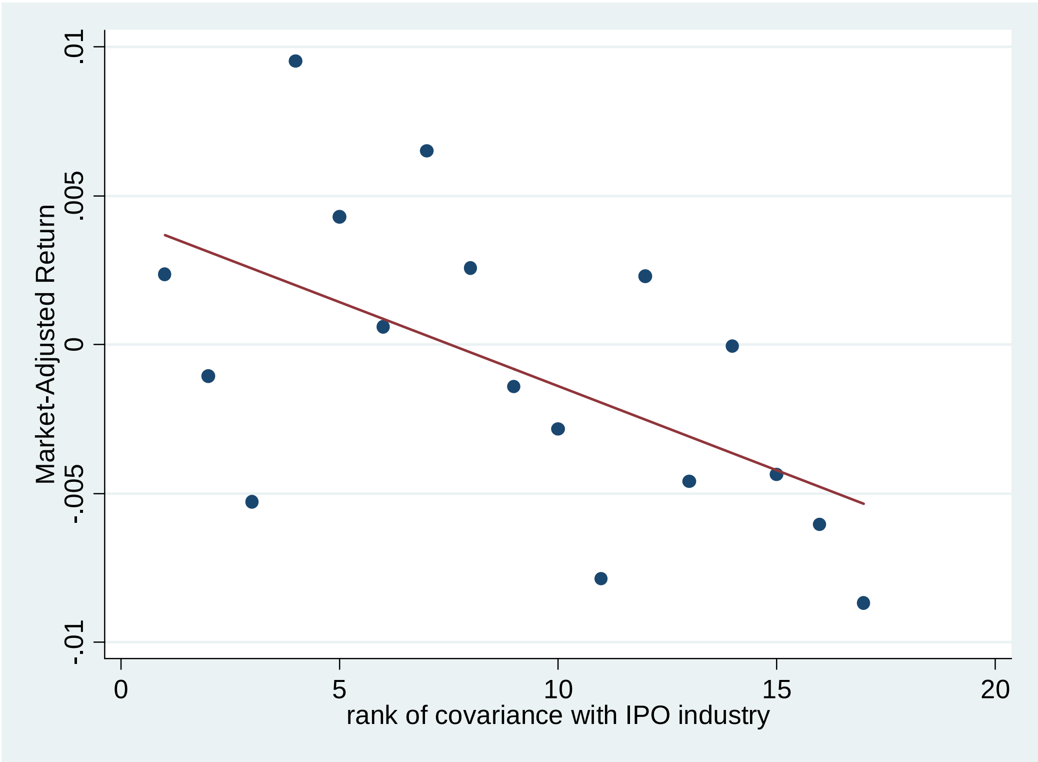
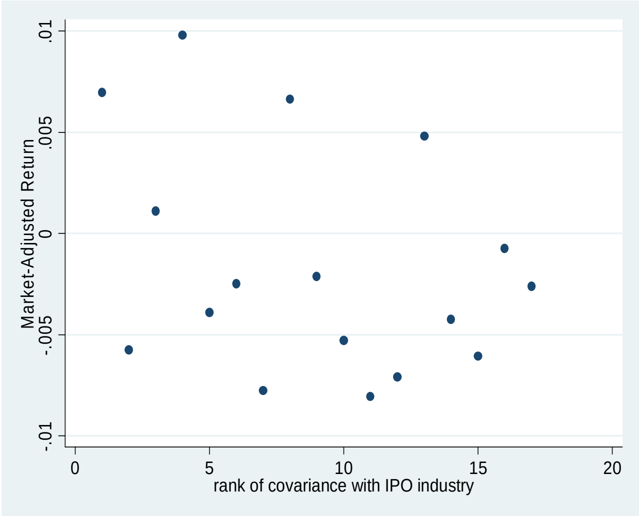


Figure 2B: Before and After the IPO

Month t-1



Month t+1

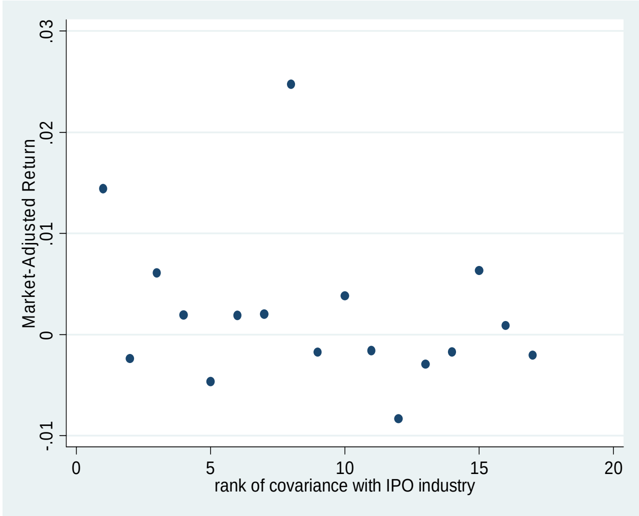


Figure 3: Distribution of Returns for Industries with High and Low IPO Covariance

Figure 3A: Month of the IPO

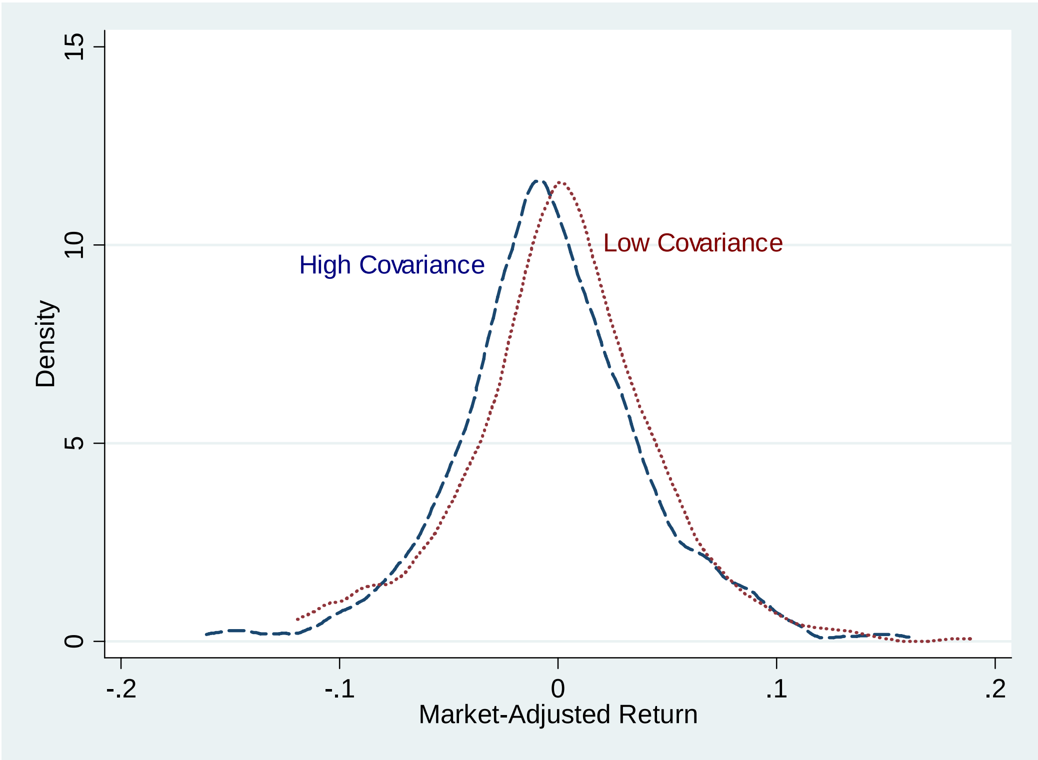
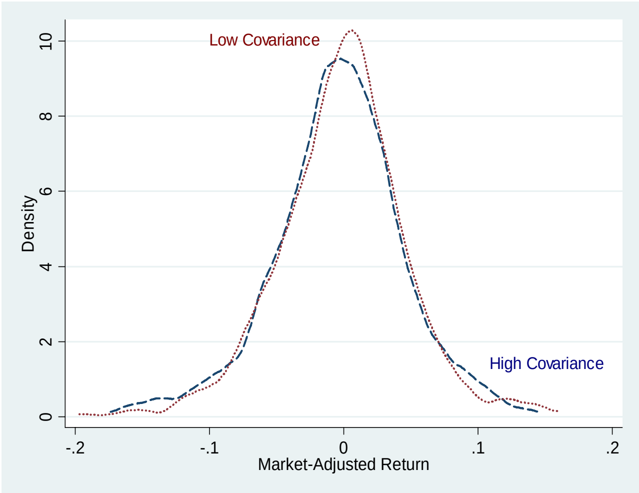


Figure 3B: Before and After the IPO

Month t-1



Month t+1

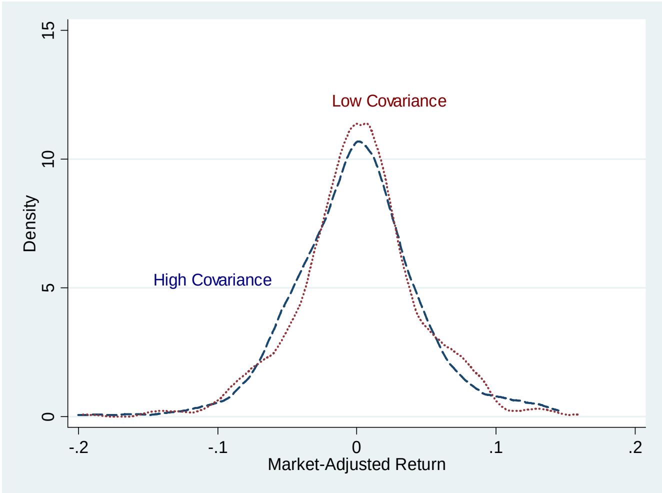


Figure 4: An IPO in the Transportation Sector