



**Center for Analytical Finance  
University of California, Santa Cruz**

**Working Paper No. 29**

**Underpricing, Institutional Investors and the JOBS Act**

**Wentao Su**

*Bank of America, [wentao.su@bankofamerica.com](mailto:wentao.su@bankofamerica.com)*

May 2016

**Abstract**

Underpricing in IPOs, which is the first day stock price return, is a significant cost to the issuers of raising capital. The money left on the table also attracts attention from different financial players such as institutional investors and big underwriters for its profits and commissions. This paper reviews two hypotheses for IPO underpricing, the general information asymmetry theory that ‘underpricing’ is a consequence of investors needing to be compensated for uncertainty about the quality of the firm, and the more practical underwriter-institutional investor collusion that may explain the increase in underpricing in recent years. By studying underpricing in the context of the JOBS Act, a natural policy experiment that significantly reduces IPO disclosure requirement and yet increases the communication between institutional investors and issuers, I find that the JOBS Act increases the overall IPO underpricing 18 months after it was passed in 2012 compared to the same period before, in line with the traditional adverse selection phenomenon. However, empirical analysis shows underpricing also increases correspondingly with the rise in proportional shares of institutional investors in post-Act period, which supports the collusion hypothesis. The overall conclusion shows strong side effect of JOBS Act in terms of increasing underpricing to issuers and as a result more lucrative underwriting business.

Keywords: JOBS Act, IPO underpricing, institutional investors, propensity score, regression discontinuity

JEL Codes: G28

**About CAFIN**

The Center for Analytical Finance (CAFIN) includes a global network of researchers whose aim is to produce cutting edge research with practical applications in the area of finance and financial markets. CAFIN focuses primarily on three critical areas:

- Market Design
- Systemic Risk
- Financial Access

Seed funding for CAFIN has been provided by Dean Sheldon Kamieniecki of the Division of Social Sciences at the University of California, Santa Cruz.

## 1. Introduction

Underpricing, defined as the pricing of an initial public offering (IPO) below the close price of the first trading day, is the worldwide financial phenomenon. It is receiving great attention in the academic world (Rock (1986), Benveniste and Spindt (1989), Loughran and Ritter (2004), Rodrigues (2014), Booth and Chua (1996)) not only because an excessive low offer price is a net loss to issuers who receive less public capital for future corporate purposes, but also because severe underpricing distorts financial markets by encouraging IPO stakeholders to chase their own interests while ignoring public interest in the long run (Loughran and Ritter (2004)). Information asymmetry plays a very important role in this and causes conflicts of interest in financial market.

Since 2000, US financial markets have experienced great volatility in terms of stock market changes and economic growth. Figure 1<sup>1</sup> shows that the number of US IPOs<sup>2</sup> rises sharply to about 150 per year in 2004 and then declines back to only 21 in 2008 and increases again to 157 in 2013 as the economy gradually recovers. Underpricing of IPOs shows an unstable pattern; calculated as the percentage change of the first day closing price compared to the offer price, it stays around 10% to 15% in the early 2000s and then declines to the bottom 6.4% and gradually rises to the highest 21.1% in the most recent decade. The trend of increase in underpricing continues into 2014, with very large underpricing of several big IPOs.<sup>3</sup> Figure 2 shows the ratio of money left on the table to the total proceeds of IPO. Money left on the table is the total amount of capital that issuers lose as a result of IPO underpricing. From 2000, this ratio gradually rises and peaks at 24.8% before the great financial recession, then drops quickly afterwards and rises sharply to new high in 2013. For a private firm looking for public financing, it is a significant loss to the issuer, as more than 20% of total proceeds it should receive from the public flows to the underwriters and big investors' pockets. Therefore, it is of great significance to study the cause of this loss, be it deliberate or not, and provide facts and evidence to the SEC regulators for effectively regulating the financial market. Besides directly measuring the

---

<sup>1</sup> All figures and tables are at the end of the paper.

<sup>2</sup> The Ritter sample is IPOs with an offer price of at least \$5.00, excluding ADRs, unit offers, closed-end funds, REITs, partnerships, small best efforts offers, banks and S&Ls, and stocks not listed on CRSP (CRSP includes Amex, NYSE, and NASDAQ stocks).

<sup>3</sup> Alibaba, the largest IPO in the history, achieved a 38% gain in the first day of IPO trading.

underpricing, this paper also studies the role of institutional allocation on IPO market and its subsequent market strategy and provides a different viewpoint on the underpricing issue.

This paper tries to explain this rising trend of underpricing in the context of the JOBS Act from two perspectives; the cost of information and underwriter-institutional investors collusion. The first hypothesis is focused on information asymmetry. Investors are eager to know the business details of the IPO issuing firm beyond what is available from publicly disclosed information which is usually selective and incomplete. Issuers also avidly want to know the investors' information, particularly how long the investors will hold their shares, but this information is difficult, if not impossible, to obtain. (It's possible to negotiate the holding term with big institutional investors but not with retail investors.) Neither party knows the other perfectly well and investors require some compensation for information cost, which issuers are willing to offer in order to attract more enthusiastic investors. Therefore, high information asymmetry between issuers and investors leads to higher underpricing and the JOBS Act exaggerates this cost. The second hypothesis explores hidden relationship between underwriter and institutional investors. Institutional investors are big investors such as pension funds, mutual funds, ETFs and so on. They have great purchasing power and are usually well connected with listed companies and underwriters, and so they play a very important role in the book-building process. Thanks to this special relationship between those institutional investors and issuers, information asymmetry is not as severe as between retail investors and issuers. It is possible, therefore, that higher institutional allocation in an IPO offering would calm the market and lead to less underpricing. On the other hand, this 'cronyism' between issuers and institutional investors provides a good opportunity to share the underpricing profits with long-term investors by assigning more offerings to them. Institutional investors may choose to book more offerings to support the stock price in exchange for lower offer price, which causes even higher underpricing. I arrive at the conclusion that the increase in information uncertainty since implementation of the JOBS Act has been partially explains the rising underpricing. However, this cannot explain why institutional investors who have information advantages over retail investors also contribute to higher underpricing. I conclude collusion between underwriters and institutional investors may be another reason for higher underpricing.

I use empirical tests to validate these two hypotheses. The JOBS Act significantly increases underpricing mainly during the first period from offer price to first day open price, indicating that higher cost of information affects valuation of the IPO firm. Underpricing is also positively correlated with institutional allocation, in contrast to Benveniste and Spindt (1989). In addition, original institutional allocation has no bearing on future stock performance. Based on this result, it seems that some institutional investors only focus on very short-term investment and quickly claim most of the money left on the table without being fully committed to the issuers. Underwriters, in their own interest of implicit trade commission and long-term relationship with institutional investors, are willing to underprice the offer price intentionally. Institutional investors take advantage of this willingness on the part of the underwriters and possibly flip their shares in the first few days. More data is needed to prove this collusion, but the paper shows that asymmetric information is not the only cause of IPO underpricing.

The rest of the paper is organized as follows. Section 2 states the background of JOBS Act, lists its main provisions and discusses the direct consequences of some provisions on the capital market and potential negative effect caused by information asymmetry. Section 3 reviews literature on underpricing, JOBS Act, institutional investors and their connections as well as this paper's contributions to the literature. Section 4 underlines major hypotheses and sample data. The three basic regression specifications used to support the two hypotheses as well as complete details of the Bloomberg dataset I use are also described here. Section 5 presents empirical results for the information asymmetry hypothesis as well as several robustness tests to conclude that the JOBS Act increased IPO underpricing of those issuers who use EGC status to report less publicly. Section 6 further analyzes the potential underwriter-institutional investor collusion hypothesis. Preliminary evidence shows there is positive correlation between underwriters and institutional investors. Section 7 concludes and discusses further work.

## 2. JOBS Act Background

US Congress passed the Jumpstart Our Business Startups (JOBS) Act with bipartisan support and it became law on April 5, 2012 with the stated goal being "to increase American job creation and

economic growth by improving access to the public capital markets for emerging growth companies (EGCs)" by reversing the trend of declining IPOs in United States in the last two decade (see figure 3). Among the seven titles<sup>4</sup>, Title 1 of the JOBS Act, Reopening American Capital Markets to Emerging Growth Companies, defines emerging growth companies as those with less than \$1 billion total annual gross revenues in their most recent fiscal year and also states certain conditions that may cause such companies lose its EGC status.<sup>5</sup> Section 102-108 of the Title 1 lists a menu of provisions for the EGCs to elect. Issuers qualified as EGC can choose all or any of these provisions when formally registering with SEC. The main provisions are:

- Reduced financial disclosure: EGCs need not present more than 2 years of audited financial statements in order for the registration statement to be effective.
- Delayed new accounting standards: EGCs may not be required to comply with any new or revised financial accounting standards and may continue to use previous accounting standards for a period.
- Reduced disclosure of executive compensation: EGCs are exempt from shareholders advisory votes on executive compensation required by the Dodd-Frank act of 2010. In addition, EGCs may omit a written discussion of executive compensation from its prospectus and disclose the compensation of only 3 executives or senior managers instead of the previous 5 executives.
- Exemption from internal control audit: The EGCs are exempt from an internal control audit as stipulated by the Sarbanes-Oxley Act (2002).
- Exemption from Public Company Accounting Oversight Board (PCAOB) rules Confidential SEC review: Any EGCs prior to its IPO date may confidentially submit to the Commission a draft registration statement, for confidential nonpublic review no later than 21 days before the date of a road show.

---

<sup>4</sup> The other titles cover private firm, e.g. the requirements to register its common stock with the SEC and become a publicly reporting company are generally triggered when a company's assets reach \$10 million and it has 500 unaccredited shareholders or 2000 total shareholders (Title 5). A new exemption would allow use of the Internet funding portals (Title 3) and general solicitation (Title 2) to sell securities to accredited investors. In addition, securities offerings exempted under Regulation A are relaxed from \$5 million to \$50 million without registering as a public company (Title 6). Title 1 was taken into effect immediately and Title 2 was effective on September 2013 while other titles are still under discussions.

<sup>5</sup> Section 101 states that a company will remain an EGC until the earlier of the last day of any fiscal year in which company earns \$1 billion revenue or more; the last day of the fiscal year following the fifth anniversary of IPO date; the date on which such issuer has, during the previous 3-year period, issued more than \$1 billion in non-convertible debt; or the date on which such issuer is deemed to be a 'large accelerated filer' with at least \$700 million in public equity float.

- Testing-the-waters: The EGC can engage in written, electronic or oral communications with institutional investors, either before or after filing the first registration statement with the help of underwriter.

The first five provisions focus on the reduction of cost burden for the IPO procedures. Sarbanes-Oxley Act and Dodd-Frank Act greatly increase the disclosure requirement and cost issuers millions of dollars to hire independent auditing firms to meet the SEC requirement (Gao, Ritter, and Zhu (2013)). While these Acts protect the individual investors from potential fraud by issuers, it becomes prohibitively expensive for small issuers to handle the cost, which can account for as much as 10% of total proceeds. Exemption and reduction from certain previous disclosure requirements would help reduce the burden and stimulate capital formation in market capital. The remaining two provisions improve the ability to communicate between issuers, investors and the SEC through underwriters. For example, confidential review allows a company to exchange the basic information on issuing matter with SEC beforehand so that issuer can better prepare the files before being exposed to the public, and also protects the firm's confidentiality from its competitors, especially in the pharmaceutical industry. Testing-the-waters clause closely connects institutional investors to issuers who have more opportunities to understand market sentiment and change its financing strategy. Institutional investors have a valuable chance to delve into the issuer's information and offer a more accurate estimation of issuer's value and then submit a reasonable bidding of the offer price. This provision grants more privileges to institutional investors as most informal meetings are organized in the presence of underwriters and strategic investors. While those provisions received much support from Capitol Hill and investment bankers (Jensen, Marshall, and Jahera (2015)), opponents of JOBS Act are also strong. Luis Auilar, the Commissioner of the Securities and Exchange Commission, pointed out that the JOBS Act reduces transparency and rests on the faulty premise that less regulatory provisions will lead to better capital formation (Martin (2012)). It still remains to be seen whether JOBS Act can accelerate capital formation and create "jobs".

Overall, JOBS Act Title 1 reduces the costs of IPO process directly through the exemptions of financial disclosure and auditing requirement, and indirectly through better dialogue between issuers and other IPO players that saves issuers both time and energy. It provides a natural policy

experiment in which EGCs conducting IPOs could take advantage of the provisions for reduced disclosure or other provisions immediately after the Act became effective on April 12, 2012, a key date that I will use repeatedly in my analysis. The paper gauges the effects of the cost reduction provisions on IPO financing characteristics and whether the Act increased underpricing and accelerated capital formation.

### 3. Literature Review

The literature on IPOs and causes of underpricing is quite abundant. A stream of literature discusses the role of information asymmetry on IPO underpricing. Rock (1986) presents a model to explain IPO underpricing given that a group of investors exist with access to information that is superior than what the firm and other investors possess. In this model, if new shares are priced at the expected value, informed investors crowd out the others when good issues are offered and withdraw from the market when bad issues are offered. As a result, firms offering bad issues must price the shares at a discount so as to entice uninformed investors to take the offering. Benveniste and Spindt (1989) find that underpricing is a natural consequence of the premarket auction in which IPO offer prices must be set low to provide profit to compensate investors for revealing positive information. Effective communication between institutional investors and underwriters is important in the price discovery process and underwriters can use the leverage of expected future profits to reduce underpricing. Chiang, Qian, and Sherman (2009) examine Taiwanese IPO auctions and find that they are underpriced and that returns of institutional investors display partial adjustment. Rocholl (2009) examines institutional and retail demand for different kinds of stocks in terms of demand elasticity for bookbuilding, which is the ratio of the percentage change in demand and the percentage change in price between the lower and the upper end of the bookbuilding range. Rocholl finds that underpricing is due to institutional investors' superior ability to detect underpriced stocks rather than underwriter's preferential treatment. Booth and Chua (1996) develop an explanation in which the issuer's demand for ownership dispersion creates an incentive to underprice and underpricing is a positive function of broad ownership dispersion and oversubscription in the presence of costly information. Their empirical results are consistent with initial underpricing reflecting the level of ownership dispersion. These

papers in general believe underpricing exists because of traditional asymmetric information between different financial players, such as investors, issuers and underwriters.

Another stream of research describes underpricing as an intentional financial distortion benefitting stockholders and underwriters. Loughran and Ritter (2004) examine three hypotheses: the changing risk composition hypothesis, the realignment of incentives hypothesis and the changing issuer objective function hypothesis. The changing risk composition hypothesis assumes that riskier IPOs will be underpriced by more than less-risky IPOs so as to induce investors to participate in the IPO market. The realignment of incentive hypothesis argues that the managers of issuing firms acquiesced in leaving money on the table during the 1999-2000 bubble period thanks to reduced CEO ownership and other interests which makes decision makers less motivated to bargain for a higher offer price. The changing issuer objective function hypothesis argues that issuers became more willing to accept underpricing because of an increased emphasis on analyst coverage and co-opting of decision makers through side payments. They conclude that with more familiar relationship between underwriter, issuer and institutional investors, underpricing is increasing due to an increased emphasis on research coverage and more allocations of hot IPOs to personal brokerage accounts of issuing firm executives. Aggarwal, Krigman, and Womack (2002b) find that higher ownership by managers is positively correlated with first-day underpricing, which attracts analyst coverage and shifts out the demand curve for a new issue. This allows managers to sell shares at the lockup expiration at prices higher than they would otherwise obtain. They conclude managers strategically underprice IPOs to maximize personal wealth from selling shares at lockup expiration at a relatively higher price due to underpricing market promotion. Krigman, Shaw, and Womack (1999) examine underwriters' pricing errors and the information content of first-day trading activity in IPOs and conclude flipping is predictable for different first day return and underpricing errors are intentional to attract well known and informed institutions who flip IPOs that perform the worst in the future more often. Aggarwal, Prabhala, and Puri (2002a) also document a positive relationship between institutional allocation and day one IPO returns as underwriters always give institutions more shares in IPOs with strong premarket demand, consistent with book-building theories. However, using IV instrumental variables, they also find institutional allocation contains private information about first-day IPO returns not

reflected in pre-market demand and other public information, which suggests other factors might explain the excessive allocation. Cornelli and Goldreich (2001) have a unique dataset containing bidding books for 39 international equity issues. They find that investment bankers award more shares to bidders who provide information in their bids. Regular investors receive favorable allocation, especially when the issue is heavily oversubscribed. In addition, the underwriters also favor revised bids and domestic investors at their discretion. A survey of the views of institutional investors (Jenkinson and Jones (2009)) finds that brokerage relationship with the bookrunner is the most important factor influencing allocations and raises doubt about the extent of information production or revelation. Some literature expands the scope from IPO to SEO. Chemmanur, He, and Hu (2009) find that institutions are able to identify and obtain more allocations with better long-run stock returns of SEOs, and that institutions possess private information on issuers with an information production instead of a manipulative trading role. However, none of these papers directly answer the question of how institutional investors affect the underpricing in different post-IPO period and how its allocation evolves for post-IPO period. I discuss both of the issues in this paper.

In the fast-growing JOBS Act literature, economists evaluate the Act in terms of underpricing and efficiency. Gupta and Israelsen (2014) suggest there is an increased degree of asymmetry of information among investors in JOBS Act firms when IPO underpricing increases and post IPO liquidity decreases. They document not only the effect of the JOBS Act on IPO underpricing and post-IPO liquidity but also the extent to which EGCs take advantage of scaled disclosure requirements and other provisions of the JOBS Act in the IPO process. They conclude that the easing of disclosure requirements in the JOBS Act negatively impacts the IPO firms by increasing costs induced by asymmetric information, thereby leading to higher underpricing. The authors also examine the set of disclosed risk factors from IPO prospectus by using novel textual analysis technique. Barth, Landsman, and Taylor (2014) find both underpricing and volatility are significantly greater for IPO firms with EGC status than comparable firms without EGC status, concluding that JOBS Act's eased disclosure requirements increased information uncertainty in IPO firms. Similarly, Chaplinsky, Hanley, and Moon (2014) find underpricing is significantly higher for

EGCs than others and do not find any evidence for reduction in the direct costs of issuance, accounting, legal, or underwriting fees. In addition, they find no increase in IPO volume after the Act, concluding the Act has initially not been effective in achieving its main objectives and there are significant consequences in extending scaled disclosure to larger issuers. Dharmapala and Khanna (2014) analyze market reaction for EGCs that conducted IPOs after JOBS Act was enacted. By calculating abnormal returns based on a benchmark return preceding the Act cut-off date, they suggest that the value to investors of the relaxed disclosure requirements under JOBS Act is outweighed by the associated compliance costs and imply a positive abnormal return of between 3% and 4%. Ritter (2012) argues critically that "the law of unintended consequences will never be repealed" and the net effect of the JOBS Act might be young high technology companies receiving less capital flow. The author believes it is the increased difficulty of small companies to earn profits that impedes the smaller companies going public rather than heavy-handed IPO procedure. Therefore, the JOBS Act does little to improve the profitability of firms and will not result in noticeably higher economic growth or job creation.

Overall, most literature focus on the determinants of IPO underpricing in terms of information asymmetry and special interests of big shareholders and underwriters. Few papers study this issue in the context of the natural policy experiment that my I use. While Gupta and Israelsen (2014), Barth, Landsman, and Taylor (2014), Chaplinsky, Hanley, and Moon (2014) conclude that the JOBS Act increases underpricing due to the exemption of certain disclosure requirements using regression and propensity score technique, they do not elaborate on the mechanism behind it or identify how the Act changes the structure of issuer-underwriter-investors relationship. This paper combines two streams of literature and tests two hypotheses of information asymmetry and under-writer collusion together for the first time. It studies whether adjustment of financial disclosure and communication makes ownership effect more important in determining underpricing. By measuring changes in underpricing and its fundamental causes, I present a comprehensive picture on the effectiveness of JOBS Act and identify areas of future research, specifically on protecting retail investors from unfair competition due to information inferiority and underwriter preference. Another contribution to the literature is the

completely new dataset that I collect from Bloomberg covering US IPOs from 2009 to 2014 as well as detailed information about the JOBS Act provisions that issuers elect to adopt. An important feature of this dataset is that it separates the standard defined underpricing period to two parts, the period from offer price to first day open price and the period from open price to close price on the first day. We can analyze underpricing issue more clearly through price changes in two separate periods after the JOBS Act in enacted. By comprehensive research based on this new dataset, this paper supplements the literature on causes of underpricing and the effectiveness of security regulation on capital formation.

## 4. Empirical analysis - model and dataset

### 4.1 Econometric model

Following previous literature (Gupta and Israelsen (2014), Barth, Landsman, and Taylor (2014), Chaplinsky, Hanley, and Moon (2014), etc.), I model underpricing as being determined by several market variables including issuers' information and general financial markets. I expect cross-sectional differences in underpricing to be related to the degree of information asymmetry between investors and issuers and the potential amount of profit distribution for stakeholders. As defined in the introduction, underpricing is measured as the initial offer-day return.<sup>6</sup> The mathematic representation is as follows:

$$\text{Underpricing} = (\text{market close price on offer day} - \text{offer price}) / \text{offer price}$$

Offer price, another important variable in IPO, is determined by negotiations between the underwriter, the representative of IPO issuer, and institutional investors, who are usually important clients of the underwriter such as banks, top pension funds, mutual funds, hedge funds, high net worth individuals and long standing clients.<sup>7</sup> Institutional investors make major subscription of IPO offers, as they are more experienced, accredited and have deeper pockets to handle risk. In addition, they reduce information asymmetry by disclosing their own valuation of the firm. JOBS Act, by changing the regulatory disclosure standards, inevitably changed the pattern of investor financial behavior and underpricing. I describe the explanatory variables with the main hypotheses.

---

<sup>6</sup> Some authors also use initial one-week return as one of the underpricing measure. I use it as robust test.

<sup>7</sup> <http://www.forbes.com/sites/quora/2013/11/08/how-does-ipo-pricing-work/>

(1) 'Information cost hypothesis': Less disclosure requirement by JOBS Act increases the cost of obtaining information and underpricing

Gupta and Israelsen (2014) argue that the easing of disclosure requirement in the JOBS Act increases the indirect cost of going public. This may lead to significant information asymmetry among investors about the future prospects of the firm offering IPO. It is true that when the issuing firm discloses less financial information, for example audit statements for two years instead of three, investors find it more difficult to judge the quality of business and its future prospect. Lower accounting standards such as no internal control auditing and delaying new accounting standards also make investors worry about the true quality of the firm. One exception is the enhanced communication between SEC regulator, issuer and institutional investors as a result of testing-the-water and confidential submission provisions. However, these meetings and discussions during the IPO offering are not necessarily public and have no spillover effect on individual investors.

Overall, the JOBS Act can aggravate the adverse selection problem and investors may demand more compensation to bear uncertainty and risk. Thus, the coefficient on the dummy variable for EGC status should be positive and significant. Variables representing firm characteristics are included such as IPO offer size (proceeds), total assets or total revenues of the firm in the year before the IPO. Dummy for top underwriter and pricing dummy are introduced in the test of collusion hypothesis. Other controls include indicators for foreign IPOs, IPO days which is the number of days from the announcement of IPO to offer days, being one of the big 4 accounting firms and firms' profitability such as profit margin and return on asset. The regression model is the following:

$$\text{Underpricing}_i = \alpha + \beta_1 * \text{Procceds}_i + \beta_2 * \text{EGC dummy}_i + \beta_3 * \text{Total asset}_i + \beta_4 * \text{D\_Underwriter}_i + \beta_5 * \text{D\_Above priced range}_i + \text{other controls}_i + \varepsilon_i$$

(2) 'Underwriter-Institutional Investor collusion hypothesis': Underwriters intentionally underprice IPOs and give more favors to institutional investors in exchange for trading commissions and future booking.

This is an emerging explanation for IPO underpricing in recent years (Loughran and Ritter (2004)). In bookbuilding process, underwriters decide who gets shares if there is excess demand. They

can use this discretion to favor long-time clients such as institutional investors or even executives of issuing firms so as to stabilize IPO share allocation process. More importantly, underwriters play a crucial role in advising the issuer on pricing the issue when the issuer registers with the SEC on S1 form, when the formal IPO prospectus is published, and when the final offer price is announced. This pricing power encourages underwriters to recommend a lower offer price in order to receive commission generated from money left on the table on top of general gross spread, which is usually fixed around 7% in US. Another reason to underwriter is they can maintain long-term relationship with regular investors and have relatively smooth IPO market sales in the future. Institutional investors, on their part, can harvest large sum of profits simply by subscribing to the IPO offer. After the first day trading or the end of lock-up period, they can sell the stock and reap the benefits. The issuing firm suffers most in this profit distribution process, which loses a large amount of money on account low offer price (see figure 2). The firm could have raised more capital if the underwriters price retail investors with real demand on the stock and done due diligence in finding true equilibrium price.

The dummy variable for underwriter, when equal to one, indicates top 5 underwriters in the IPO industry published by Renaissance Capital in 2014. Aggarwal, Krigman, and Womack (2002b) show that higher quality underwriters lead to more analyst and research coverage, which are positively correlated with stock returns. However, Booth and Chua (1996) shows investment banker prestige reduces underpricing. Key variable is the percentage of outstanding shares held by institutional investors immediately after the IPO. The higher this ownership, the more likely investors can find true value of the firm and thus reduce underpricing based on information asymmetry. On the other hand, strong institutional investors tend to collude with underwriter and may strategize to lower the offer price. A similar variable, percentage of floating shares held by institutional investors at the time of IPO, excludes closely-held shares as well as restricted shares and measures the extent to which institutional investors control liquidity of the stock market. However, data for floating allocation is missing for many issuers. Effect in the post-JOBS Act period is measure using an interaction term between institutional allocation and EGC. The dummy for

pricing above indicates whether the offer price finally made is above the original pricing range. IPOs priced at the upper end of the filing range tend to have strong pre-market demand (Aggarwal, Prabhala, and Puri (2002a)), and higher demand can push up the first day stock price. Other variables are introduced in the first regression.

$$\text{Underpricing}_i = \alpha + \beta_1 * \text{Proceeds}_i + \beta_2 * \text{institutional\%}_i + \beta_3 * \text{institutional\%} * \text{EGC}_i \\ + \beta_4 * \text{D\_Underwriter}_i + \beta_5 * \text{D\_Above priced range}_i + \text{other controls}_i + \varepsilon_i$$

(3) Original institutional allocation is positive correlated with future stock return.

This hypothesis is a natural extension of the underwriter-institutional investor collusion hypothesis because if there is indeed collusion between the underwriter and institutional investor, institutional investors might quickly flip the shares and harvest risk-free profit. On the other hand, serious holders would hold the shares in long time investment to enjoy total return, a positive relationship might occur. Very little literature discusses the following firm performance for severe underpricing issuers. Aggarwal, Krigman, and Womack (2002b) find no independent effect of underpricing on returns, and underpricing affects returns through increased research coverage. Degeorge and Zeckhauser (1993) study stock performance of reversed leveraged buyouts(LBO) which went public between 1983 and 1987 and find that information asymmetry problem leads to disappointing performance after IPO and superior performance before the offer. Coakley, Hadass, and Wood (2009) find in the UK context that venture capitalists and reputable underwriters play an important role in normal period for significant increases in underpricing and a decline in operating quality such as median sales and EBIT. Chemmanur, He, and Hu (2009) find that institutions are able to identify and obtain more allocations with better long-run stock returns in the context of SEOs because of access to private information, and not due to manipulative trading. I use one week, one month to six months and one-year returns from the IPO's first day closing price as four dependent variables to measure post-IPO performance. In addition, it is worth studying the quality of investment from institutional investors in the early IPO stage. As previous stated, if stock performance is positively correlated with institutional investor allocation, it shows these investors indeed have valuable information about the firm. Otherwise it

indicates they are not long-time holders. I also include GDP growth rate to control the macroeconomic condition and other controls appeared in previous specifications. The regression is

$$\text{Period Return}_i = \alpha + \beta_1 * \text{Procceds}_i + \beta_2 * \text{institutional}\%_i + \beta_3 * \text{GDP growth}\%_i + \text{growth}\%_i + \epsilon_i$$

## 4.2 Data set

The dataset is constructed based on 961 US IPO deals from September 2009 to December 2014<sup>8</sup> from the Bloomberg terminal.<sup>9</sup> The dataset provides comprehensive information on the IPO-issuing and issuer firms, which includes issuer background information such as name, industry, number of employees and financial statement information at the time of IPO like balance sheet data and financial ratios, underpricing returns, proceedings, institutional shareholders, EGC status and JOBS Act provisions that each issuer elects. As in previous literatures (Gupta and Israelsen (2014), Barth, Landsman, and Taylor (2014), Chaplinsky, Hanley, and Moon (2014)), the main group of interest is 362 firms that obtained EGC status after JOBS Act. The control group consists of firms with less than \$1 billion in revenue and could have received EGC status if the JOBS Act existed before 2012. There are 233 ‘control EGC’ firms in my dataset. The other control group is issuers whose revenue is larger than \$1 billion after the JOBS Act passed. I mainly use this group as a test for regression analysis.<sup>10</sup> One potential problem is that issuers may have deliberately delayed their IPO timing, until the JOBS Act was passed, so as to enjoy the EGC status, since the original draft of law was made public several months before its final passing. Figure 4 shows the monthly histogram of small IPO for pre- and post JOBS Act period. The number of IPOs that enjoyed EGC status after April 2012 actually declined compared to that in February and March. Therefore, there is no evidence firms postponed timing of IPO until the passing of the law.

Table 1 compares firm and IPO characteristics of EGC firms with the two control groups. For firm characteristics, mean value for revenue, total asset and liability are not significantly different for EGC

---

<sup>8</sup> It excludes closed-end funds, REITS, Equity funds deals, IPOs with an offer price below \$5.00.

<sup>9</sup> This is in contrast to Thomson Reuter SDC database most literature depend on. Bloomberg has more detail information on IPO offer information and different measures of offer price and underpricing.

<sup>10</sup> A better control group is issuers that satisfy the EGC status but choose not to elect to be, but only nine firms are such firms.

IPOs and control EGC IPOs pre-JOBS Act period. The t-test of mean difference is significant for return on assets and profit margins, and hence profitability of issuer is much higher for pre-JOBS control EGC firms than EGC firms. The median revenue is 4.7 billion dollar for large non-EGCs and only 210 million for large EGCs, suggesting that company size matters. In terms of profitability the median value of return on asset (ROA) and profit margin are both statistically smaller than EGC IPOs but the mean value for the two measures are larger for big firms, indicating there is wider spread for small immature firms and some start-ups have strong balance sheet condition while others do not. In terms of issuing characteristics, underpricing, return from offer price to the first open price and first week return are all significantly higher for EGCs, showing underpricing is statistically higher in post-JOBS Act period. Interestingly, returns from offer price to first open price accounts for much of the existing underpricing, while the first trading day return started from the open price is not significantly different between treatment group and the two control groups. It shows institutional investors that make heavy subscriptions of EGC IPO offering benefit the most from underpricing while retail investors who enter the stock market later gain little for EGC stocks.

Table 2 confirms the special favors bestowed upon the institutional investors by identifying different degrees of underpricing using the same dataset. Similar to Krigman, Shaw, and Womack (1999), I categorize first day return as below 0, between 0 and 10%, between 10% and 50%, and above 50% each for cold, cool, hot and extra hot IPOs respectively. Negative first day return means the IPO is so unpopular that not enough public demand supports the stock price. Returns indicate higher underpricing and return over 50% clearly reflects either very strong public demand for shares or failure to price the firm accurately. One key finding is that the percentage held by institutional investors for underpriced IPO is larger than that for one IPO. For issuers earning between 0 and 10% first day return, institutional holding on average (32.7%) is 10% higher than those with negative return (22.5%). This is a preliminary evidence to support the underwriter-institutional investor collusion hypothesis. There is a possibility that underwriters grant more shares to institutions when they believe there is strong market demand for a particular IPO. As oversubscription often leads to higher first day return, higher institutional allocation lets investors enjoy more money left on the table, and directly benefits

institutional investors. In return, underwriters maintain long-term relationship with those investors. In a later section, I use empirical analysis, more rigorous technique is applied to prove this causality.

Another observation in table 2 is IPO subsequent return pattern for each underpricing category is different. Similar to the conclusion from Krigman, Shaw, and Womack (1999), issuers with good first day return still enjoy great performance within one year using SP500 as benchmark. Cool and hot IPOs consistently outperform cold IPOs with a wider margin over the year. It's interesting that extra hot IPOs with over 50% return in the first trading days fail to maintain momentum thereafter, showing some irrational behavior in the beginning. Overall, underpricing does have significant effect on the following performance. It's also remarkable that on average IPOs from all categories do not catch up with the SP500 index return after 6 months with relative return from -4% to as low as -20% (Also see figure 5). However, Morningstar website reports that overall US small caps persistently performed better than large caps since 2009, the same time period covered in this paper. It shows that recent IPOs that enjoy EGC status perform worse than the small cap stocks before 2009. The JOBS Act may energize the IPO market by making public financing accessible to small business, yet the quality and prospect of those firms are not much improved.

Overall, descriptive statistics show that there is clear disparity between different types of IPOs in various aspects, from firm level characteristics to general market environment. Multiple variables could have some bearing on this opaque IPO pricing process and in the next section I will study how variables influence underpricing interactively based on two main hypotheses.

## 5. Empirical results - Asymmetric information

### 5.1 Basic OLS regression

Table 3 shows OLS estimations with each column presenting results for a differ specification. The sample size varies because there are missing values for several accounting variables. Regressions include all EGC IPOs and IPOs that could have qualified for EGC status if the JOBS Act was passed earlier. Full underpricing in the first three regressions is defined as the first day stock price return from

offering price to closing price. The dependent variable in columns 4 through 9 is underpricing from offer price to first day open price and underpricing from open price to close price on the first day for comparison purpose. We first pay close attention to variables related to IPO procedure. In full underpricing regression, EGC dummy is statistically significant and positive, and EGC issuers on average have 4-5% higher underpricing than similar non-EGC issuers. Given that the mean difference of underpricing for the two groups is 4.8% (see table 1), the JOBS Act dummy accounts for most of the underpricing increase in recent years. I use pricing above the range dummy to represent oversubscription of an IPO. The issuer usually publishes the offer price range before the final IPO offer. Final offer priced above that range indicates strong pre-market demand for the stocks. Result indicates it is also decisively significant and positive. Booth and Chua (1996) show a higher level of oversubscription, results in greater underpricing because of larger total information cost. Another dummy variable that contributes to higher underpricing is top underwriter. Literature regarding the effect of top underwriters on underpricing is controversial. The positive coefficient on this dummy in my results is in contrast to some previous literature (Carter, Dark, and Singh (1998), Carter and Manaster (1990), Booth and Chua (1996)), but consistent with others (Aggarwal, Krigman, and Womack (2002b), Beatty and Welch (1996)). For example, Beatty and Welch (1996) speculate that high-quality underwriters may insure themselves by underpricing relatively more or that the relation between IPO underpricing and underwriter quality is due to differences in the economic environment, but without defining economic environment. It is also believed that the big underwriters become monopsonies in the underwriting market, granting themselves more powerful to undervalue the firm's value to earn higher commissions from investors or capture at least a fraction of the rents indirectly (Tinic (1988)). Results from this regression model support a similar argument that prestigious underwriters take advantage of their market positions to gain profits from the IPO process. For business operation variables, balance sheet variable and profitability are not important determinants of underpricing in this setting. In addition, because high tech industry has more uncertainty for valuation of the firm due to the rapid evolution of technology and the market, it's worth looking at whether technology IPOs have higher underpricing due to higher uncertainty. But that dummy variable is not

significant, consistent with Gupta and Israelsen (2014). Full underpricing regressions show that the JOBS Act plays a critical role in increasing underpricing and some key IPO procedure variables are also significant determinants.

Next, I look at the two separate periods and regress each period underpricing on the same independent variables. Control variables basically stay the same except that the dummy for pricing above the range becomes insignificant in second period and the dummy for top underwriters loses significance in first period. The most obvious result is that EGC dummy still stays significantly positive in determining underpricing from offer price to first day open price in one specification and marginally significant in the other two. However, the variable has no statistical significance for all three regressions in the following trading period. It further confirms the fact that underpricing from the first period largely determines the total underpricing since EGC issuers are only effective in raising underpricing by raising the first period underpricing as the coefficients on the full period and first period are close. In other words, investors from EGC issuers are gaining the benefit of underpricing mainly in the first period before the IPO goes to the market and those investors are predominately institutional investors who are granted large part of subscription of IPO shares. Overall from table 3, we see clear evidence of information asymmetry involving IPO underpricing and significant first period underpricing hints that institutional investors benefit more than retail investors.

Several researchers also study the marginal effect of each provision of Title I JOBS Act on underpricing (Gupta and Israelsen (2014), Chaplinsky, Hanley, and Moon (2014), Dambra, Field, and Gustafson (2014)). Chaplinsky, Hanley, and Moon (2014) find that the primary determinant of lower underpricing among EGCs is the choice to delay compliance with SOX 404(b) and Dodd-Frank Say on Pay votes. Gupta and Israelsen (2014) show that firms omitting a discussion of executive compensation in their prospectus and disclosing fewer years of selected financial data tend to have more informed trading. However, table 4 shows that none of the provisions have marginal effect on underpricing. This can be attributed to two reasons; first, this sample data covers a longer period, and second, multicollinearity exists (for auditor attestation dummy, which only one firm in my dataset is not electing this provision).

## 5.2 Other Regression Specifications

Table 5 tests the main results using robust standard errors, and shows similar results as the previous specifications. Table 6 further separates the sample into two groups, above and below mean revenue of 103 million dollars, and regresses the main specifications for each group. Underpricing is significantly higher (8-9% higher than non-EGC issuers) for those below mean revenue if they elect EGC status. The statistical significance disappears for relatively larger firm with revenue over 103 million but less than 1 billion. This shows that the transparency issue is more serious for very small issuers, whose valuation and true market price are more difficult to assess. This result has important policy implications. The purpose of the JOBS Act is to energize public equity market and expand firms' capital reserve for business expansion. Underpricing is a resultant financial phenomenon of asymmetric information and potential underwriter collusion, which occurs mostly to relatively smaller firms. Therefore, revenue cutoff for the EGC status should be flexible and rather than only excluding the very big private firms, the extremely small firms could be excluded as well.<sup>11</sup> It would greatly reduce the IPO underpricing if those firms less than 100 million revenue were required to disclose as much as the large firms.

Next, I compare the marginal effect of JOBS Act on underpricing in terms of profitability below and above mean. The below mean group of profitability measure shows significance in two out of three regressions and the coefficient is 8-9%, almost the same as the previous results. EGC status does not appear to significantly affect profitability. This indicates that issuers with better business operations withstand scrutiny from investors while worse performing issuers experience more uncertainty due to less disclosure and explanation of their business operations. Investors sometimes behave less when they suffer from loss aversion instead of risk aversion. This behavioral response is even stronger for individual investors who are trying to avoid loss in their short-term portfolio investment. As a result, investors may avoid investing in firms with low profitability reported in recent financial reports and may demand a higher equity premium for investing in these firms. Last, table 8 accounts for outliers in

---

<sup>11</sup> Extremely small firms, eg. revenue less than 10 million, are preferred to finance privately as they still need to expand their business in initial development stage such as venture capital financing.

underpricing. The largest and smallest 1% IPO underpricing observations are winsorized and results show that magnitude of significance of coefficients becomes stronger, further proving the causality relationship.

### 5.3 Propensity Score Matching Method

I use the propensity score matching method to test the effect of JOBS Act on underpricing after controlling for other explanatory variables. This method does not impose a specific functional form of underpricing or the control variables. However one-to-one match is required in the sample (Barth, Landsman, and Taylor (2014)). Average treatment effect on the treated is estimated. Here, the treated group consists of firms with EGC IPOs and the control group is comprised of firms that could have qualified for EGD IPOs had the JOBS Act been passed earlier.

$$E(Y1 - Y0|D = 1) = E(Y1|D = 1) - E(Y0|D = 1) \quad (1)$$

In order to implement the matching method, we need to assume that all relevant differences between the two groups are captured by the observables  $X$  (control variables). In other words, the critical event given the control variables is orthogonal to the treated variable (Equation 2). In addition, the control group is selected from the non-treated pool in which the distribution of observed variables is as similar as possible to the distribution of observed variables in the treated group. Matching is performed over the common support region (Equation 3). Satisfying these two assumptions (Sianesi (2001)), a logistic regression is estimated using those control variables  $X$  to get the propensity score for the event. Equation 4 shows the one-by-one nearest neighbor matching process.  $C^0(P_i)$  is the set of neighbors of treated  $i$  in the control group and  $W_{ik}$  is the weight on control  $k$  in forming a comparison with treated  $j$ . For each treated unit, a member of the control group with the closest propensity score  $P_j$  is selected. If the best available  $j$  is not statistically defined close to  $i$ , the unit is dropped from the analysis. With reiterations of this process, every observation in the treatment group is matched with exactly one observation in the control group. In the context of this

paper, issuers with EGC status are matched with issuers who could have enjoyed the EGC status had they been in market after JOBS Act passed. There are 213 treated and 213 controls.

$$Y_0 \perp D|X \quad (2)$$

$$0 < \text{Prob}\{D = 1|X = x\} < 1 \text{ for } x \in \tilde{X} \quad (3)$$

$$C^0(p_i) = \{j : |p_i - p_j| = \min_{k \in \{D=0\}} |p_i - p_k|\} \text{ s.t. } w_{ik} = 1(k=j) \quad (4)$$

Table 6 shows the full sample results. Results of the propensity score matching method indicate that the differences in full and first period underpricing between the two groups are statistically significant. Issuers with EGC status on average have 6% higher underpricing than similar issuers without EGC status. This is close to the 4% difference we obtain from regression analysis. In addition, the second period of underpricing is not statistically significant for the difference of two groups, again indicating that immediately after the issuers go public, investors targeting EGC firms fail to gain extra profit compared to pre-JOBS issuers. It is likely that pricing search from market forces pushes the stock price back to equilibrium before the closing price in the first day. I restrict the sample to 6,12,18 and 24 months before and after the JOBS Act to measure the time evolution effect on underpricing. I fail to find any statistical significance in T-tests within 18 months of the cutoff date. However, the difference of underpricing becomes significant and higher for treatment group when the time period being considered reaches two years.<sup>12</sup> I offer two plausible explanations for this result. The sample size is relatively small for short time intervals, making comparison between two groups less powerful. Another possible explanation is that firms, particularly small issuers, are waiting to observe market reactions to the JOBS Act and to understand the pros and cons of adopting EGC status. These firms are relatively small firms with less transparent public financial conditions and thus require a higher underpricing at IPO to compensate investors.

---

<sup>12</sup> The T-stat becomes significant for 18-months period underpricing difference in the first trading week because of the negative outlier for control group. One stock declines 47% after the IPO in the first week.

## 5.4 Regression Discontinuity

Regression discontinuity (RD) design allows for evaluating causal effects of interventions and assignment to a treatment, where treatment status is determined at least partly by the value of an observed covariate lying on either side of a fixed threshold (Imbens and Lemieux (2008)). The simplest case is linear relationship between  $Y$  and  $X$ .

$$Y_i = \beta_0 + \beta_1 T_i + \beta_3 X_i + \varepsilon_i \quad (5)$$

$T_i = 1$  if subject  $i$  received treatment and  $T_i = 0$  otherwise.  $X$  is the assignment variable that would "force" the cutoff point  $c$  to happen. Therefore, we have the following equation and treatment effect if given by  $\beta_1$ .

$$Y_i = \beta_0 + \beta_1 T_i + \beta_3 (X_i - c) + \varepsilon_i \quad (6)$$

$$E(Y | T = 1, X = c) - E(Y | T = 0, X = c) = \beta_1 \quad (7)$$

$$Y_i = \beta_0 + \beta_1 T_i + \beta_3 X_i + \beta_4 X_i^2 + \beta_5 X_i * T_i + \beta_6 X_i^2 * T_i + \varepsilon_i \quad (8)$$

In this research, one billion dollar revenue is the natural cutoff for EGC status and non-EGC status issuers. Figure 6 uses regression with a quadratic function (equation 8) of adjusted revenue as control variables on both sides of the cutoff point where log function is used to convert one billion revenue to zero on the horizontal axis. The scatter points to the left of the zero adjusted revenue refers to the EGC issuers with revenue less than one billion dollar and those on the right refers to all the other non-EGCs. The difference between two cutoff points from regression line and zero adjusted revenue is around 9%, indicating that underpricing of EGC issuers are higher than that of large non-EGC issuers. Figure 7 restricts the sample size to eliminate the extremely small firms that has revenue less than 50 million dollars. With this sample restriction, the results become even more clear that the underpricing among EGC issuers is overwhelmingly larger than that of non-EGC issuers by about 7%. Figure 8 uses the triangle kernel regression with bandwidth 100 on both sides to estimate the discontinuity of the cutoff. It takes into account potential structure change of the dataset so we can see more clearly how underpricing changes. The difference is 5% higher for EGC issuers, consistent with previous findings.

## 6. Empirical results - Collusion

### 6.1 Institutional Investors and Underpricing

In the previous section, we discuss large underwriters who become monopsonies in the underwriting market, granting themselves power to undervalue firms' value to earn higher commissions from investors or capture at least a fraction of the rents indirectly and improve long-term relationship with institutional investors (Tinic (1988)). One way to test such an implicit collusion is to look at the relationship between institutional investors and underpricing. Table 11 regresses underpricing on percentage of outstanding shares held by institutional investors. The main explanatory variable is the interaction term. Benveniste and Spindt (1989) find that underpricing arises as a cost of compensating investors with positive information about the value of the stock for truthful disclosure of their private information. Distributional priority is given to underwriters' regular investors. Institutional investors have are well-connected with venture capitalists and underwriters and participate in road shows where they obtain specific issuers' information, while retail investors have access only to the published documents (Field and Lowry (2009)). As institutions have much stronger ties with underwriters than retail investors, they are more likely to get subscription of the IPO offer. The larger the proportion of shares held by an investor, the more power they have to determine the offer price in conjunction with the underwriters without the public and other small investors awareness of this arrangement. Underwriters, for their part, want to maintain long-term relationships with institutional investors to book all IPO shares on time. Thus, they grant favorable allocations with strong premarket demand to those institutional investors. Result indicate that while institutional allocation is not statistically significant in affecting full underpricing, the interaction term between institutional allocation and the JOBS Act dummy variable are all statistically positive. Underpricing is about 10% higher among issuers who sold all of their IPO proceeds to institutional investors than among those selling shares to individual investors and issuers' employees after passing of the JOBS Act. However, for two separate underpricing periods, variables representing institutional investors are not significant

after the stock market opens, indicating that holding of shares by institutional investors affects the first period and the whole period of trading. It also shows those investors targeting EGC issuers are likely to get preferential treatment from underwriters. This result is in contrast with the traditional asymmetric information hypothesis in which case institutional investors have more knowledge about the issuers and therefore should require less underpricing due to more information.

Other literature (Habib and Ljungqvist (2001), Aggarwal, Krigman, and Womack (2002b)) also discusses the consequence of underpricing in terms of entrepreneurial wealth loss as inside holders have direct interest in the degree of underpricing. Few papers track the effect of underpricing or subscription allocation on the issuers' stock market subsequent performance. Chemmanur, Hu, and Huang (2010) suggest that institutional investors retain residual information advantage in post-IPO trading and net buying from institutional investors affects subsequent IPO abnormal performance. One potential problem is that net buying can be from many different institution investors and flipping rate could be high among institutional investors for hot IPOs (Aggarwal (2003)). It's not possible to judge the intention of institutional investors in terms of long-term investment. If investors are only chasing underpricing profit with underwriters, the original allocation would have no bearing on the future stock price. On the other hand, if the investors are serious about the IPO issuer and make investments based on future business prospects, given then information advantage they have over retail investors, then original institutional allocation will have positive influence on issuer's stock price in the following period. Field and Lowry (2009) find that newly public firms with the highest levels of institutional investment significantly outperform those with the lowest levels and much of the difference reflects better interpretation of readily available public information. I use six periods of stock returns as the buy-and-hold return (calculated from the IPO's first-day closing price) to measure the firm's post-IPO performance. Table 12 shows the results. From one week to two month return, original allocation is negatively correlated with stock return. The coefficient on allocation is not significant for longer time periods, and the R-square value on these specifications is low at about 2%. These results indicate that allocation from institutional investors at the time of the IPO only focuses on very th short term and have no consideration on stock performance in the long run. This is in

contrast with Chemmanur, Hu, and Huang (2010) where institutional trading has predictive power for long-run IPO performance. This increases the likelihood that institutional investors may collude with underwriters for high short-term high underpricing return.

Sherman (2000) explains the total discretion from the underwriter allows allocations to be based on long-term relationships between underwriters and investors. One possibility is that underwriters are granting IPO offers to institutions in exchange for future public offer booking. And they maintain this brokerage relationship by granting investors more shares and opportunities to earn profits. If this long-term underwriter-investor hypothesis is founded, issuers with large rates of underpricing should see a continuously high institutional allocation. Figure 5 shows this trend. Issuers with over 20% underpricing are increasingly dominated by institutional investors, with almost 80% of shares outstanding being held by institutional investors after a year of the IPO (however, not necessarily the same institutional investors hold shares as investors they may flip shares (Aggarwal (2003)), but other holders may follow in and invest in the stocks). Issuers with overpricing case also receive higher institutional allocation but are capped at around 60% in six months. The gap of institutional allocation becomes wider from original 10% to almost 20% one year later. This figure is not a direct proof for underpricing collusion, instead, it shows hot IPOs with large underpricing continue to receive large proportion of institutional shares and are dominated by institutions. It creates a friendly financial atmosphere in which there is long-time brokerage relationship between investors and underwriters.

## 6.2 Other Regression Specifications

Table 13 replaces control groups of small issuers with large issuers after JOBS Act is passed and tests the main results from tables 3 and 11. All the IPOs occur in the post-JOBS period. The results are similar as EGC issuers contribute to higher first day underpricing, and the interaction term between EGC and institutional allocation shows strong evidence for the effect of institutional holdings on underpricing. Industry fixed effect provides some explanatory power, but most of the power in terms of R-square comes from other control variables such as above pricing dummy. In addition, table 14

uses one week instead of the traditionally defined one-day period to measure underpricing. EGC issuers are still positively correlated with underpricing and, in this case, the interaction term between EGC and institutional allocation becomes insignificant. I also compare the marginal effect of institutional investor on underpricing in terms of profitability and revenue below and above mean. Two regression models in table 15 show significance for the interaction term between EGC and institutional percentage for the same reason explained above, namely that extremely small IPOs contribute more to higher underpricing. Table 16 shows a similar result with less significance on the interaction term. Table 17 shows Winsorized results for the sample, after eliminating largest and smallest 1% underpricing. Here, the coefficient on the interaction term between EGC and institutional allocation is even more significant than in previous regression specifications.

## 7. Conclusion and Future Work

This chapter studies the potential determinants of IPO underpricing in the context of JOBS Act and tests two main hypotheses. Empirical results show that the JOBS Act, which significantly reduced disclosure requirements before IPO, raised average underpricing mainly during the first period, which from offer price to first open price, while having no significant influence on the second period, which is from first day open until the first day close. In addition, oversubscription caused by strong market demand for hot IPOs significantly increased underpricing level from the dummy pricing above the offer price. Top underwriters enjoy virtually monopoly status and can communicate with investors to maximize their own profits by maximizing underpricing. In terms of 'direct beneficiaries' of underpricing, institutional investors tend to reap much of the benefits since they are the major subscribers of IPO offers. Regression results show that IPO offers traded by all institutional investors on average have 7% higher underpricing than offers traded by none of such investors. This result is in contrast to the previous literature, which shows that institutional investors have more understanding of the issuer, and thus high institutional allocation would lead to less

underpricing (Ljungqvist and Jr. (2002)). The fundamental reason for this is underwriters receive huge commissions or kickbacks from favoring long time institutional investors. And, by granting more institutional allocation, underwriters are guaranteed successful placement in issues with weak market demand (Rocholl (2009)).

Book building is often criticized in the United States because restricting specific investors' access is seen as a way of giving special favors to institutional investors at the expense of everyone else (Sherman (2000)) and causes misalignment between the economic incentives of underwriters and that of issuers (Ritter (2012)). This paper shows that it is indeed true that institutional investors receive most benefit from underpricing. More subscription data would allow us to look at the history of transactions between underwriter and institutional investors. The longer their brokerage relationship, the more likely it is that they would collude with each other. But it is not clear whether the collusion theory or the cost of information is the main explanation for underpricing. Even with intentional underpricing, preferential institutional allocation can be motivated to be more "informed" about market demand or by the desire for kickbacks from commission trades and future commitment. The former underpricing has a "good" intention for price searching while the latter one distort the financial market and hurt the interest of issuers and small shareholders (Benveniste and Spindt (1989)). A few other papers defend the book building system (Sherman (2000)). They believe the discretion given to underwriters allows them to form repeat investors who can participate in every offering and these long-term relationships allows the underwriters to lower average underpricing and at the same time ask investors to reveal true information. Compared to auctions or hybrid offerings, book building method is more attractive to most countries. However, which IPO method is more useful and efficient is an area that still needs to be studied.

This paper can be strengthened with data on detailed subscription IPO allocation. I currently use the proportion of outstanding shares held by institutional investors on the first weekend after IPO as a proxy for IPO subscription ratio for institutional investor. It's not a perfect proxy and I still need information on retail investor as a comparison. In addition, more information on brokerage relationships will help better explore the collusion hypothesis. New York Stock Exchange daily

trades and quotes (TAQ) offers trade and quote information in high frequency data that I might use in the future in terms of flipping rate. The general idea is to look at the first five days stock trading data. If institutional investors are serious about the IPO stock, they should hold them for a while and flipping rate would not be high compared to retail investors.

## References

- Aggarwal, R., 2003. Allocation of initial public offerings and flipping activity. *Journal of Financial Economics* 68 (1), 111–135.
- Aggarwal, R., Prabhala, N. R., Puri, M., 2002a. Institutional allocation in initial public offerings: Empirical evidence. *The Journal of Finance* 57 (3), 1421–1442.
- Aggarwal, R. K., Krigman, L., Womack, K. L., 2002b. Strategic ipo underpricing, information momentum, and lockup expiration selling. *Journal of Financial Economics* 66 (1), 105–137.
- Barth, M. E., Landsman, W. R., Taylor, D. J., 2014. The jobs act and information uncertainty in ipo firms. Beatty, R. P., Welch, I., 1996. Issuer expenses and legal liability in initial public offerings. *JL & Econ.* 39, 545.
- Benveniste, L. M., Spindt, P. A., 1989. How investment bankers determine the offer price and allocation of new issues. *Journal of Financial Economics* 24 (2), 343–361.
- Booth, J. R., Chua, L., 1996. Ownership dispersion, costly information, and ipo underpricing. *Journal of Financial Economics* 41 (2), 291–310.
- Carter, R., Manaster, S., 1990. Initial public offerings and underwriter reputation. *The Journal of Finance* 45 (4), 1045–1067.
- Carter, R. B., Dark, F. H., Singh, A. K., 1998. Underwriter reputation, initial returns, and the long-run performance of ipo stocks. *Journal of Finance*, 285–311.
- Chaplinsky, S., Hanley, K. W., Moon, S. K., 2014. The jobs act and the costs of going public. Available at SSRN 2492241.
- Chemmanur, T. J., He, S., Hu, G., 2009. The role of institutional investors in seasoned equity offerings. *Journal of Financial Economics* 94 (3), 384–411.
- Chemmanur, T. J., Hu, G., Huang, J., 2010. The role of institutional investors in initial public offerings. *Review of Financial Studies*, hhq109.
- Chiang, Y.-M., Qian, Y., Sherman, A. E., 2009. Endogenous entry and partial adjustment in ipo auctions: Are institutional investors better informed? *Review of Financial Studies*, hhp066.
- Coakley, J., Hadass, L., Wood, A., 2009. Uk ipo underpricing and venture capitalists. *The European Journal of Finance* 15 (4), 421–435.
- Cornelli, F., Goldreich, D., 2001. Bookbuilding and strategic allocation. *The Journal of Finance* 56 (6), 2337–2369.

- Dambra, M., Field, L. C., Gustafson, M., 2014. The jobs act and ipo volume: Evidence that disclosure costs affect the ipo decision. *Journal of Financial Economics (JFE)*, Forthcoming.
- Degeorge, F., Zeckhauser, R., 1993. The reverse lbo decision and firm performance: Theory and evidence. *Journal of Finance*, 1323–1348.
- Dharmapala, D., Khanna, V. S., 2014. The costs and benefits of mandatory securities regulation: Evidence from market reactions to the jobs act of 2012.
- Field, L. C., Lowry, M., 2009. Institutional versus individual investment in ipos: The importance of firm fundamentals. *Journal of Financial and Quantitative Analysis* 44 (03), 489–516.
- Gao, X., Ritter, J. R., Zhu, Z., 2013. Where have all the ipos gone? *Journal of Financial and Quantitative Analysis* 48 (06), 1663–1692.
- Gupta, S., Israelsen, R. D., 2014. Indirect costs of the jobs act: Disclosures, information asymmetry, and post-ipo liquidity. *Kelley School of Business Research Paper (2014-34)*.
- Habib, M. A., Ljungqvist, A. P., 2001. Underpricing and entrepreneurial wealth losses in ipos: Theory and evidence. *Review of Financial Studies* 14 (2), 433–458.
- Imbens, G. W., Lemieux, T., 2008. Regression discontinuity designs: A guide to practice. *Journal of econometrics* 142 (2), 615–635.
- Jenkinson, T., Jones, H., 2009. Ipo pricing and allocation: a survey of the views of institutional investors. *Review of Financial Studies* 22 (4), 1477–1504.
- Jensen, M. R., Marshall, B. B., Jahera, J. S., 2015. Jobs act: Has it brought back the ipo? *Journal of Corporate Accounting & Finance* 26 (2), 9–17.
- Krigman, L., Shaw, W. H., Womack, K. L., 1999. The persistence of ipo mispricing and the predictive power of flipping. *The Journal of Finance* 54 (3), 1015–1044.
- Ljungqvist, A. P., Jr., W. J. W., 2002. {IPO} allocations: discriminatory or discretionary? *Journal of Financial Economics* 65 (2), 167 – 201.
- Loughran, T., Ritter, J. R., 2004. Why has ipo underpricing changed over time? *Financial management* 33 (3).
- Martin, T. A., 2012. The jobs act of 2012: Balancing fundamental securities law principles with the demands of the crowd. Available at SSRN 2040953.
- Ritter, J. R., 2012. Re-energizing the ipo market<sup>1</sup>. *small* 250 (300), 350.
- Rocholl, J., 2009. A friend in need is a friend indeed: Allocation and demand in IPO bookbuilding. *Journal of Financial Intermediation* 18 (2), 284–310.

Rock, K., 1986. Why new issues are underpriced. *Journal of financial economics* 15 (1), 187–212.

Rodrigues, U., 2014. The effect of the jobs act on underwriting spreads. *Kentucky Law Journal*, Forthcoming. Shah, I. P. A., Singh, N., 2014. Understanding foreign currency borrowing by firms. Working paper.

Sherman, A. E., 2000. Ipos and long-term relationships: an advantage of book building. *Review of Financial Studies* 13 (3), 697–714.

Sianesi, B., 2001. Implementing propensity score matching estimators with stata.

Tinic, S. M., 1988. Anatomy of initial public offerings of common stock. *The Journal of Finance* 43 (4), 789–822.

Figure 1 Underpricing and number of IPOs 2001-2013

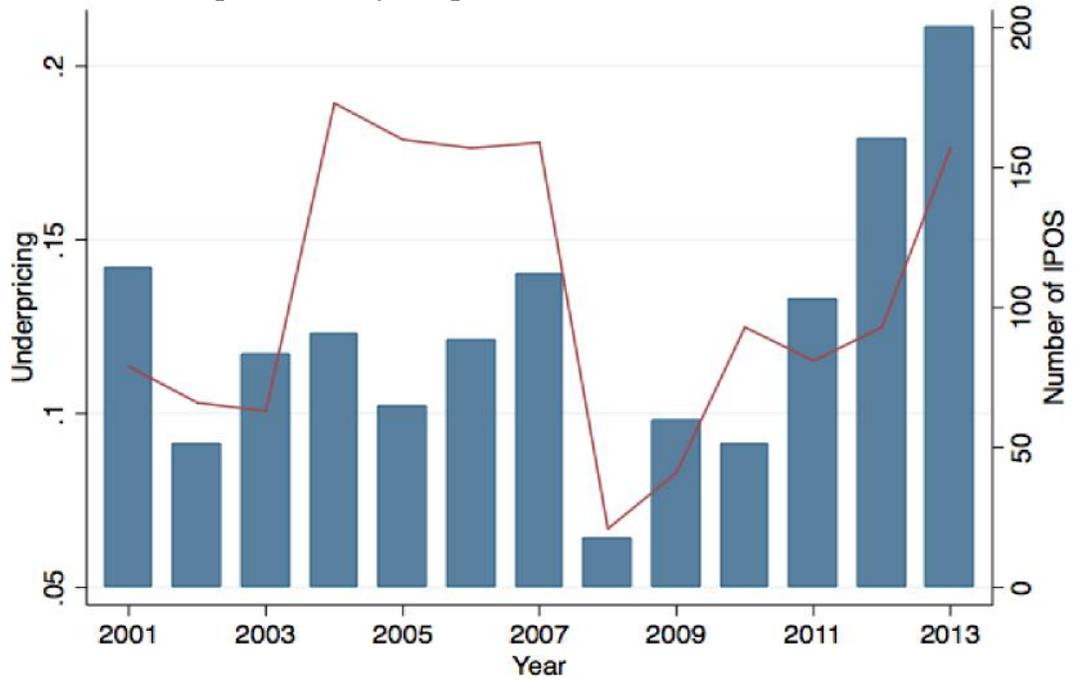
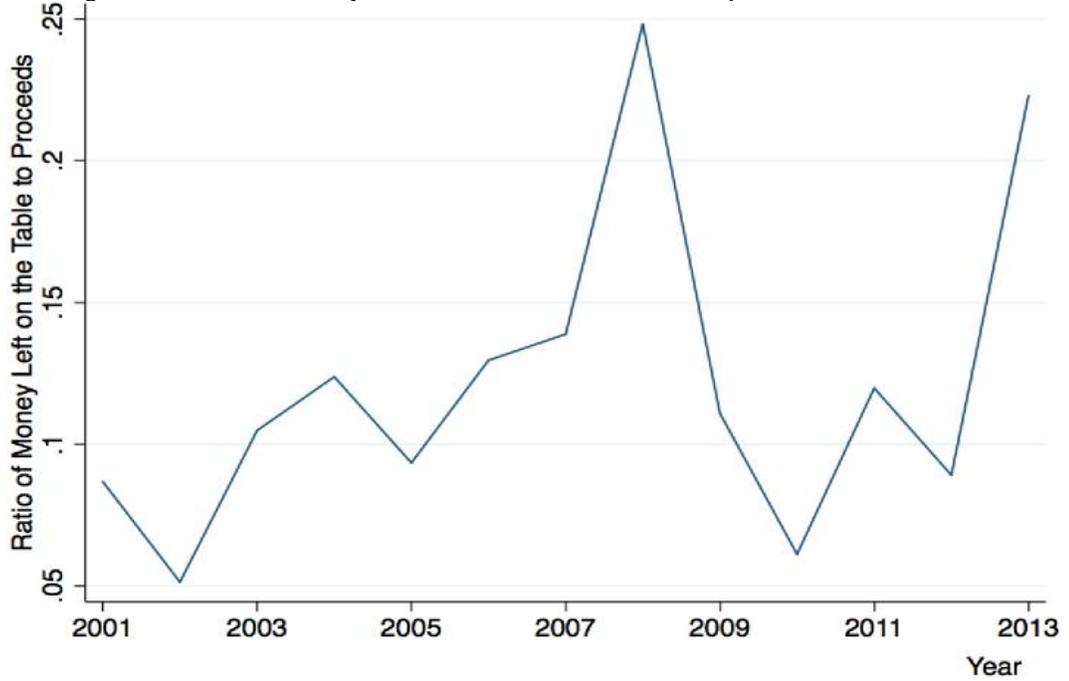
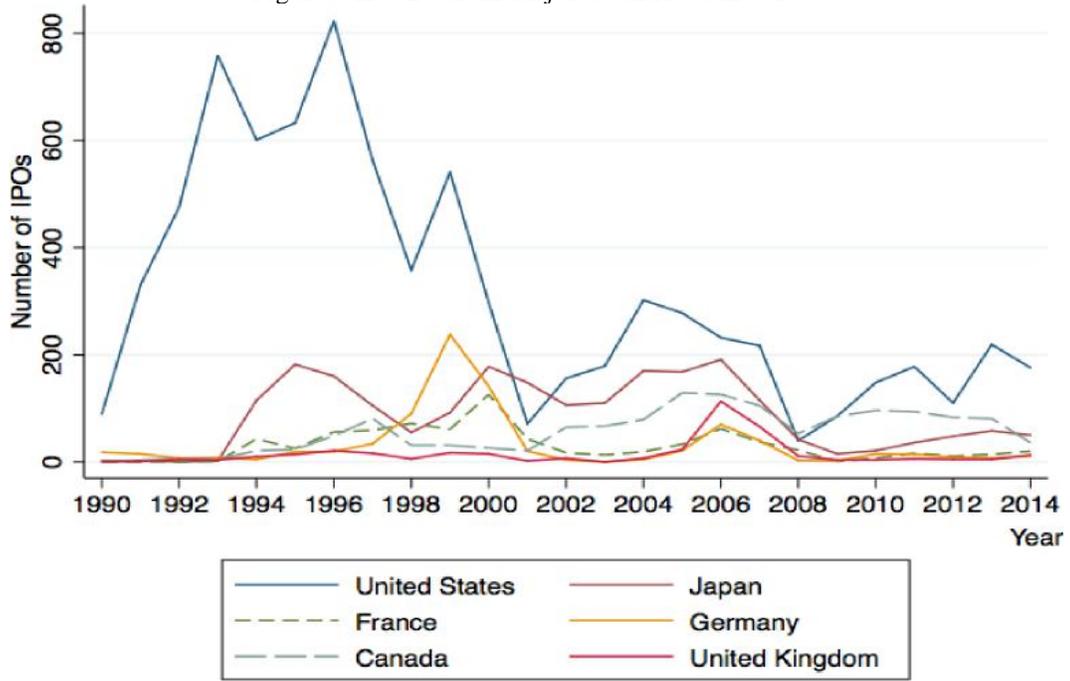


Figure 2 Ratio of money left on the table to the total proceeds 2001-2013



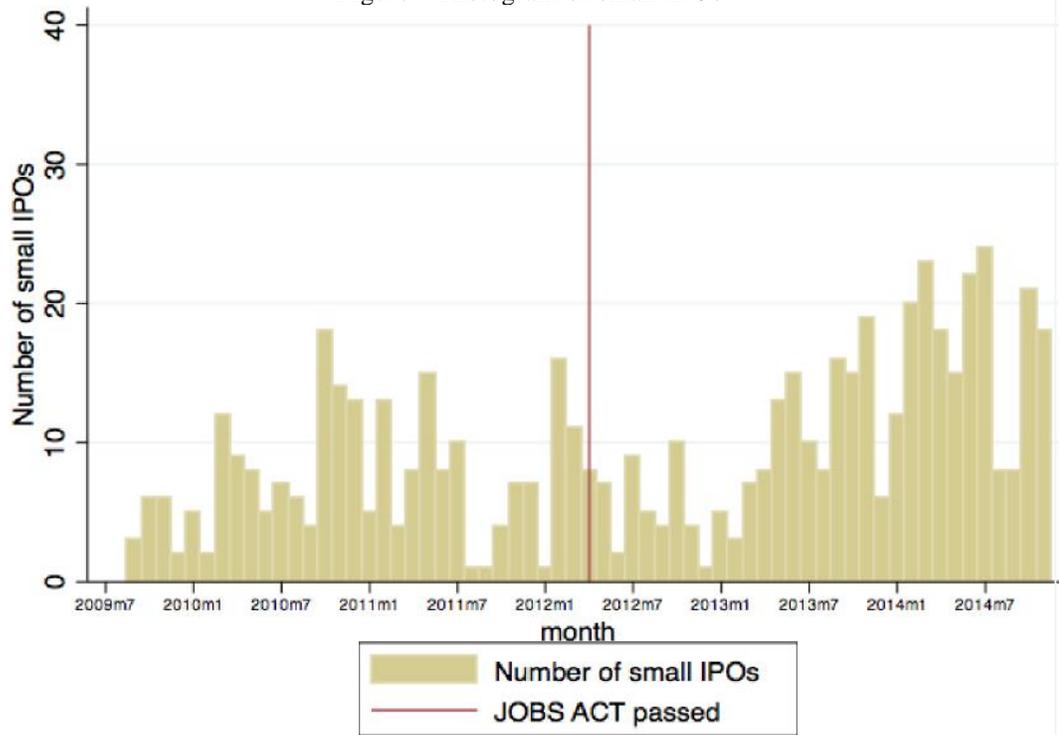
Source: Jay R. Ritter (2014)

Figure 3 IPO Deals in Major Countries Since 1990



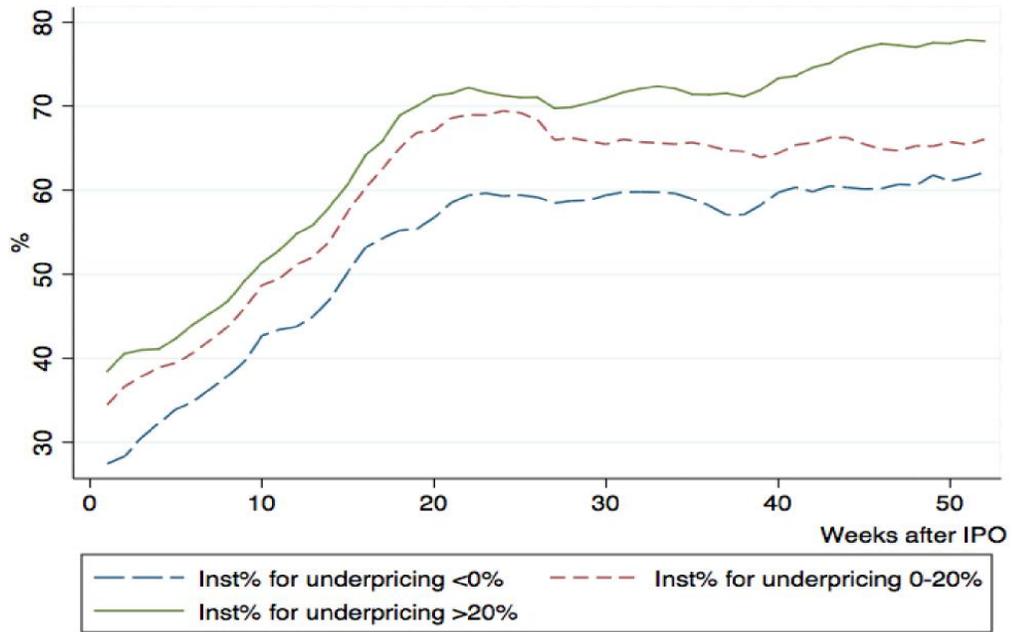
Source: Bloomberg

Figure 4 Histogram of small IPOs



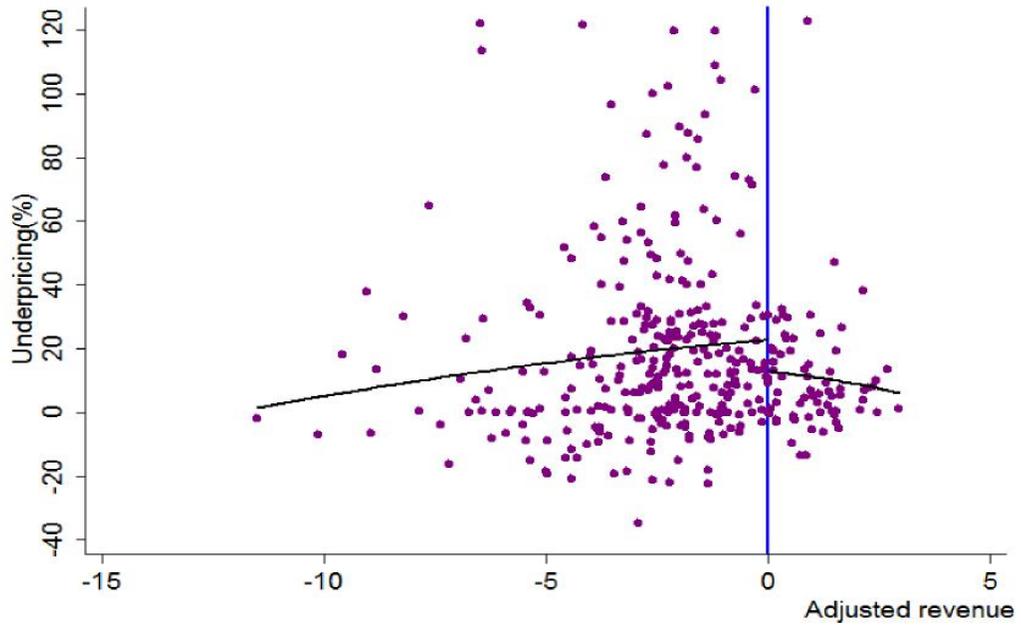
Source: Bloomberg

Figure 5 Institutional allocation for different underpricing issuers



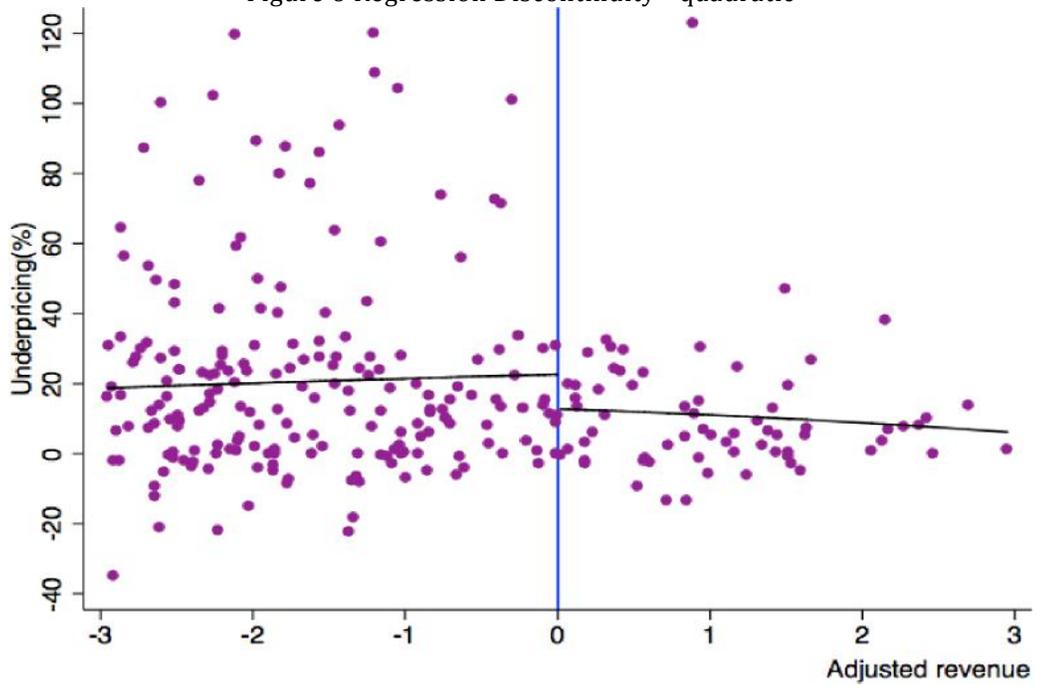
Source: Bloomberg

Figure 6 Regression Discontinuity - quadratic

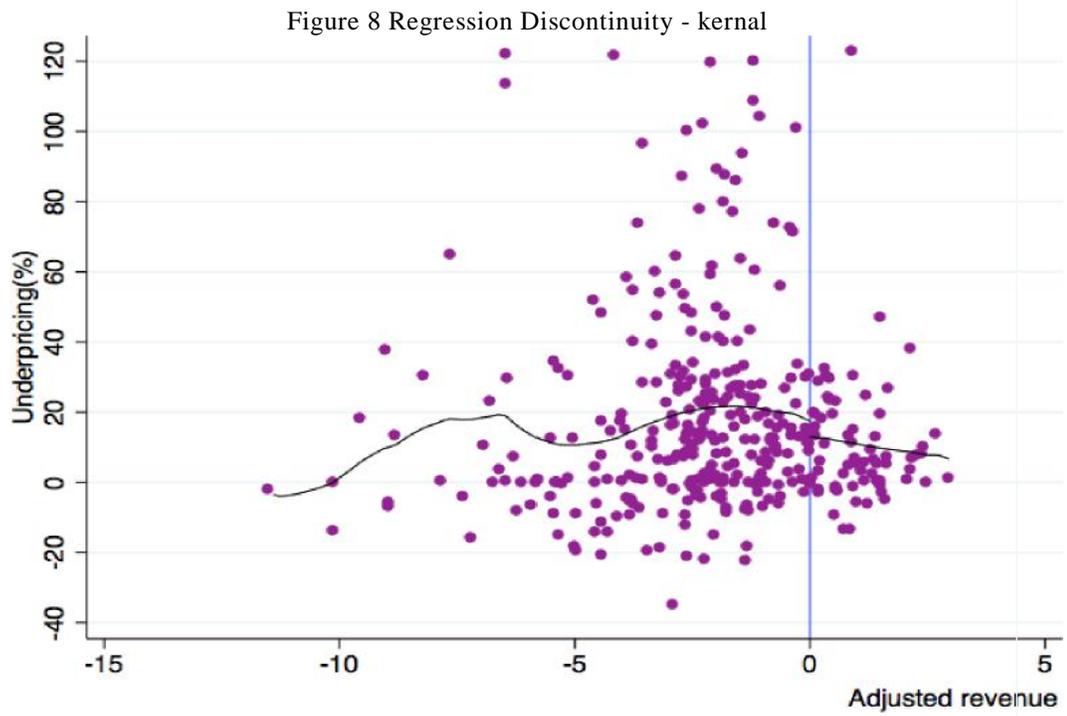


Source: Bloomberg

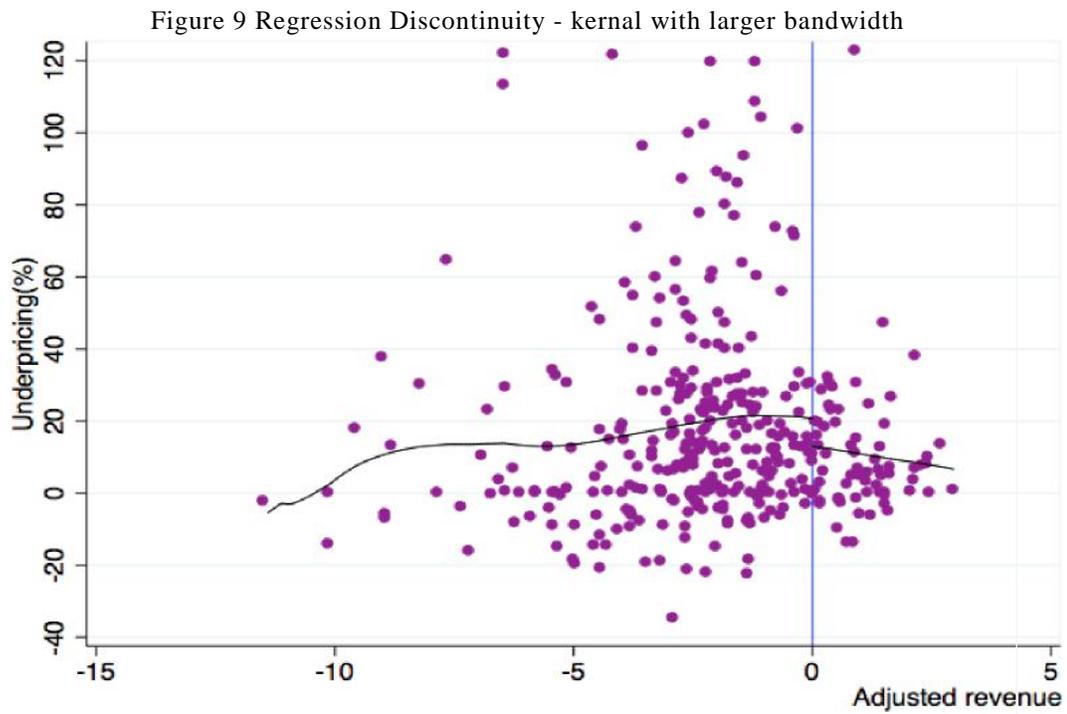
Figure 6 Regression Discontinuity - quadratic



Source: Bloomberg



Source: Bloomberg



Source: Bloomberg

Table 1 Statistics for EGC, control EGC, large non-EGC

Variable	EGC IPOs			Control EGC IPOs (N=233)			Large Non-EGC IPOs (N=61)		
	Mean	Media	Std.Dev.	Mean	Median	Std.Dev.	Mean	Median	Std.Dev.
<b>Firm Charateristics</b>									
Revenue (\$M)	248.8	210.0	574.0	250.2**	231.7**	226.2	4065.7***	2685.9***	3632.6
Total asset	578.8	300.6	1646.58	719.9	379.8***	1484.0	11675.3**	4298.7***	32516.7
Total liabilities	368.3	116.3	1175.6	435.9	165.2***	1200	10221.7**	3470.3***	29631.7
Net Income	14.0	13.7	82.0	20.4	18.9**	44	97.7	20.3***	739.8
ROA	-24.6	5.39	63.4	-11.3***	4.16***	48.5	-2.6***	2.0***	32.1
Profit margin	-27.2	9.37	57.0	-12.5***	10.97**	44.0	-0.3***	1***	11.6
Big4 auditor%	77.6	100	41.7	71.7*	100	45.2	96.7	1	17.9***
Foreign issuer%	82.3	1	38.2	27.5***	0	44.7	85.2	1	35.8
<b>Issuer Charateristics</b>									
Proceeds (\$M)	193.2	94.0	856.8	139.0	102.2	137.4	1161.0**	470.6***	3195.3
Offer price	14.2	14	5.7	12.8***	12	5.4	19.3***	18***	9.0
IPO days <sup>a</sup>	83.8	44	101.4	435.9	107	1200	173.6***	112***	213.9
<b>Underpricing</b>	19.5	12.2	31.7	14.7*	9.1	25.9	9.6***	5.6***	18.6
<b>Offer to 1st open<sup>b</sup></b>	16.7	9.2	24.6	12.2***	3.1***	23.4	8.2***	6.5	14.9
<b>1st open to 1st close</b>	0.3	1.0	15.9	0.8	1.1	4.9	0.5	1.0	4.6
1st week return	19.4	11.9	33.1	13.6**	7.1	27.6	12.5	9.1	21.2
Bid Ask Spread <sup>c</sup>	0.50	0.31	0.91	0.71	0.504	1.58	0.175***	0.267***	0.256
Priced Above Range <sup>d</sup>	20.2	0	40.2	18.5	0	38.9	13.1	0	34.1
Institutional <sup>e</sup>	30.6	27.361	29.8	29.4	20.893	30.1	42.199**	50.233	40.043
Money on the table(\$M)	37.7	11.8	103.8	22.47**	8.3	48.9	224.9	34.2*	1216.7

\*, \*\* and \*\*\* denote significance at 10 percent, 5 percent and 1 percent, respectively

a total number of days from announcement date to offer date

b is the change of first day open price compared to offer price

c is the difference between ask and bid divided by their mid point

d is the percentage of IPOs whose offer price is higher than the upper limit of the price range

e is the percentage of outstanding shares held by institutional investors the first weekend after IPO

Table 2 Statistics for underpricing below 0%, between 0% and 10%, between 10% and 50% and above 50%

Variable	Cold	Cool	Hot	Extra Hot
	Underpricing <0%	0<Underpricing<10%	10<Underpricing<50%	Underpricing>50%
<b>Issuer Characteristics</b>	N=142	N=123	N=219	N=111
Total asset (\$M)	511.2	1205.8	493.7	894.4
Proceeds (\$M)	109.7	281.7	160.8	282.6
Offer price	11.8	13.1	14.6	13.9
Gross spread%	6.8	6.5	6.5	6.5
Underpricing%	-9.2	3.9	23.8	79.7
<b>Institutional%</b>	22.5	32.7	33.1	30.9
<b>Period return%</b>				
1 week	0.25	0.23	0.15	0.76
1 month	-1.40	0.89	0.25	0.52
2 month	-3.17	0.28	-0.53	-0.81
3 month	-11.19	0.59	1.77	-0.97
6 month	-9.38	-1.27	-5.01	-6.53
1 year	-20.25	-3.72	-11.3	-10.82

Period returns use SP500 as a benchmark.

a Difference of returns between stock price and SP500.

Table 3 JOBS Act effect on underpricing

Independent Variables	Dependent variable: Underpricing								
	Full Underpricing			Offer to 1st Open Return			1st Open to Close Return		
Proceeds	5.547*** (1.514)	-0.753 (1.788)	-0.427 (1.674)	4.707** (1.454)	-0.193 (2.014)	-1.170 (1.708)	0.157 (0.290)	-0.355 (0.440)	0.0697 (0.374)
EGC	4.991* (2.405)	3.897* (2.073)	4.030* (2.366)	4.203* (2.390)	2.817 (1.917)	3.192 (2.240)	0.318 (0.537)	0.504 (0.488)	-0.142 (0.629)
Revenue	0.361 (0.676)		-0.615 (0.920)	0.228 (0.610)		-0.413 (0.698)	0.00342 (0.284)		-0.300 (0.370)
Total Asset		-0.344 (1.062)			-0.101 (1.084)			-0.0848 (0.437)	
Profit Margin		0.0000190 (0.0000124)			0.0000193 (0.0000102)			0.00000806 (0.00000465)	
ROA			-0.00406 (0.0387)			-0.00160 (0.0264)			0.0237 (0.0241)
IPO Days			-0.0163* (0.00681)			-0.0201* (0.00789)			0.0000145 (0.00186)
Above Pricing		33.31*** (3.465)	34.06*** (3.855)		30.35*** (3.162)	31.99*** (3.460)		-0.359 (0.422)	-0.0805 (0.380)
Big4 Auditor			1.392 (2.542)			0.628 (2.303)			-0.216 (0.685)
Top Underwriter		6.628** (2.534)	4.352 (2.537)		1.720 (2.122)	2.168 (2.315)		2.293* (1.087)	1.585* (0.661)
US accounting		6.023 (6.300)			1.260 (5.090)			3.878 (2.258)	
Foreign			-0.352 (3.632)			0.497 (3.126)			-1.623 (1.172)
High-tech	3.984 (3.570)	-0.220 (3.034)	16.40* (7.469)	2.869 (2.975)	15.01** (4.922)	2.615 (3.328)	0.389 (0.688)	0.202 (1.646)	1.379 (0.793)
EGC*hightech	5.434 (6.738)	6.239 (5.595)		8.065 (5.722)			0.396 (1.410)		
Industry FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Constant	-89.95*** (26.49)	13.99 (29.19)	1.853 (29.70)	-72.96** (25.64)	-5.015 (32.11)	29.77 (30.56)	-2.188 (5.189)	2.736 (6.282)	0.0273 (5.932)
Observations	497	494	390	439	437	350	495	492	389
R2	0.047	0.282	0.351	0.039	0.387	0.417	0.001	0.035	0.083

Robust standard errors in parentheses \* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01

Table 4 JOBS Act Provisions on underpricing

Independent Variables	Dependent variable							
	One week							
Proceeds	10.59*** (3.323)	10.58*** (3.322)	10.56*** (3.323)	11.20*** (3.336)	10.63*** (3.304)	10.86*** (3.345)	10.59*** (3.339)	11.79*** (3.432)
Auditor attestation	-5.339 (28.51)							
Compensation disclosure		2.967 (19.83)						-6.267 (29.28)
Compensation vote			0.379 (28.11)					10.19 (41.03)
PCAOB optout				-8.147 (6.465)				-10.17 (6.948)
Accounting standard					-7.717 (6.918)			-8.421 (7.127)
Confidential filing						-4.070 (5.022)		-4.905 (5.778)
Testing the water							0.119 (5.486)	2.641 (6.296)
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES
Constant	-182.8** (76.44)	-190.9** (75.11)	-188.0** (76.32)	-200.3*** (72.11)	-188.9*** (71.53)	-193.6*** (72.36)	-184.2*** (67.12)	-218.7*** (79.24)
Observations	129	129	129	129	129	128	128	128
R2	0.148	0.148	0.148	0.159	0.157	0.152	0.148	0.177

Standard errors in parentheses\* p &lt; 0.10, \*\* p &lt; 0.05, \*\*\* p &lt; 0.01

Table 5 JOBS Act effect on underpricing using robust standard error

Independent Variables	Dependent variable: Underpricing								
	Full Underpricing			Offer to 1st Open Return			1st Open to Close Return		
Proceeds	5.592*** (1.515)	-0.684 (1.783)	-0.427 (1.674)	4.755*** (1.450)	-0.193 (2.014)	-1.170 (1.708)	0.161 (0.290)	-0.355 (0.440)	0.0697 (0.374)
EGC	4.167* (2.644)	2.950 (2.297)	4.030* (2.366)	2.920 (2.694)	2.817 (1.917)	3.192 (2.240)	0.258 (0.611)	0.504 (0.488)	-0.142 (0.629)
Revenue	0.353 (0.676)		-0.615 (0.920)	0.221 (0.612)		-0.413 (0.698)	0.00282 (0.284)		-0.300 (0.370)
Total Asset		-0.353 (1.061)			-0.101 (1.084)			-0.0848 (0.437)	
Profit Margin		0.0000192 (0.0000121)			0.0000193* (0.0000102)			0.00000806 (0.00000465)	
ROA			-0.00406 (0.0387)			-0.00160 (0.0264)			0.0237 (0.0241)
IPO days			-0.0163** (0.00681)			-0.0201** (0.00789)			0.000014 (0.00186)
Above Pricing		33.36*** (3.464)	34.06*** (3.855)		30.35*** (3.162)	31.99*** (3.460)		-0.359 (0.422)	-0.0805 (0.380)
Big4 Auditor			1.392 (2.542)			0.628 (2.303)			-0.216 (0.685)
Top Underwriter		6.528** (2.531)	4.352* (2.537)		1.720 (2.122)	2.168 (2.315)		2.293** (1.087)	1.585** (0.661)
US Accounting		6.110 (6.222)			1.260 (5.090)			3.878* (2.258)	
Foreign			-0.352 (3.632)			0.497 (3.126)			-1.623 (1.172)
Technology	0.959 (3.878)	-3.699 (3.161)	16.40** (7.469)	-1.447 (3.767)	15.01*** (4.922)	2.615 (3.328)	0.168 (0.856)	0.202 (1.646)	1.379* (0.793)
EGC*hightech	5.434 (6.738)	6.239 (5.595)		8.065 (5.722)			0.396 (1.410)		
Industry FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Constant	-90.28*** (26.45)	13.28 (29.07)	1.853 (29.70)	-73.02*** (25.53)	-5.015 (32.11)	29.77 (30.56)	-2.217 (5.207)	2.736 (6.282)	0.0273 (5.932)
Observations	497	494	390	439	437	350	495	492	389
R2	0.048	0.284	0.351	0.043	0.387	0.417	0.001	0.035	0.083

Robust standard errors in parentheses \* p &lt; 0.10, \*\* p &lt; 0.05, \*\*\* p &lt; 0.01

Table 6 JOBS Act effect based on groups above mean and below mean of revenues

Independent Variables	Dependent variable: Underpricing					
	Below mean	Above mean	Below mean	Above mean	Below mean	Above mean
Proceeds	6.806*** (2.386)	5.257** (2.568)	-0.541 (3.013)	1.222 (2.742)	2.627 (3.760)	-1.116 (2.651)
EGC	7.843** (3.766)	3.985 (3.486)	9.164** (3.802)	1.956 (2.924)	9.729** (4.295)	1.715 (3.201)
Revenue	-0.0158 (1.013)	-4.964* (2.772)			-0.111 (1.394)	-1.906 (2.751)
Total Asset			2.270 (1.446)	-4.370** (1.757)		
Profit Margin			-0.00000521 (0.0000448)	-0.0231 (0.0534)		
ROA					-0.0120 (0.0265)	0.0119 (0.112)
IPO days					-0.0100 (0.0178)	-0.0171 (0.0131)
Above Pricing			28.05*** (5.691)	33.92*** (3.292)	36.09*** (6.904)	32.62*** (3.688)
Big4 Auditor					-1.019 (5.091)	3.960 (4.314)
Top Underwriter			6.581* (3.839)	5.933 (3.821)	5.595 (4.898)	4.609 (4.319)
US Accounting			8.899 (6.485)	-0.217 (6.880)		
Foreign					4.419 (5.568)	-2.423 (3.933)
Technology	6.004 (5.502)	0.111 (4.650)	2.529 (5.178)	-3.524 (3.859)	-1.087 (23.56)	8.588 (24.20)
Industry FE	NO	NO	YES	YES	YES	YES
Constant	-115.1*** (41.88)	-51.90 (43.53)	-7.624 (50.66)	9.897 (44.65)	-40.41 (68.32)	28.14 (50.00)
Observations	209	288	206	288	142	248
R2	0.077	0.026	0.214	0.339	0.286	0.396

Robust standard errors in parentheses \* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01

Table 7 JOBS Act effect based on groups above mean and below mean of profit margin

Independent Variables	Dependent variable: Underpricing					
	Below mean	Above mean	Below mean	Above mean	Below mean	Above
Proceeds	8.062*** (2.992)	3.341 (2.118)	-1.718 (3.625)	0.330 (2.274)	-0.291 (3.988)	-1.582 (2.299)
EGC	6.985 (4.501)	3.020 (3.008)	7.926* (4.127)	1.010 (2.634)	9.227* (4.708)	0.542 (2.886)
Revenue	0.956 (1.197)	1.047 (1.519)			-0.995 (1.628)	-0.507 (1.568)
Total Asset			1.960 (1.787)	-1.743 (1.375)		
Profit Margin			-0.00000257 (0.0000518)	-0.000139 (0.000296)		
ROA					-0.00440 (0.0311)	0.0745 (0.127)
IPO days					-0.00890 (0.0194)	-0.0175 (0.0118)
Above Pricing			34.54*** (5.001)	32.17*** (3.306)	37.38*** (5.588)	30.64*** (3.691)
Big4 Auditor					4.268 (6.258)	1.812 (3.666)
Top Underwriter			11.29** (4.706)	2.396 (3.123)	7.557 (5.408)	2.935 (3.754)
US Accounting			-4.553 (7.835)	12.23** (5.698)		
Foreign					13.92** (6.319)	-7.054* (3.603)
Technology	5.183 (5.760)	1.170 (4.300)	-3.401 (5.250)	0.285 (3.668)	-2.295 (27.01)	14.53 (15.25)
Industry FE	NO	NO	YES	YES	YES	YES
Constant	-136.8*** (52.40)	-53.27 (35.19)	26.85 (60.61)	-0.418 (36.74)	9.803 (71.99)	28.01 (41.72)
Observations	211	286	209	285	159	231
R2	0.087	0.028	0.285	0.320	0.403	0.362

Standard errors in parentheses \* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01

Table 8 JOBS Act effect on underpricing eliminating outliers

Independent Variables	Dependent variable: Underpricing								
	Full Underpricing			Offer to 1st Open Return			1st Open to Close Return		
Proceeds	5.178*** (1.575)	-0.486 (1.781)	-0.747 (1.801)	4.587*** (1.653)	-0.320 (1.761)	-1.593 (1.796)	0.152 (0.467)	-0.353 (0.632)	0.0581 (0.472)
EGC	5.812** (2.354)	4.362** (2.082)	4.770** (2.237)	5.209** (2.437)	3.036 (2.052)	3.900* (2.266)	0.315 (0.695)	0.522 (0.732)	-0.147 (0.586)
Revenue	0.594 (0.730)		-0.483 (0.901)	0.349 (0.767)		-0.624 (0.894)	0.00528 (0.215)		-0.288 (0.236)
Total Asset		-0.432 (0.913)			-0.162 (0.996)			-0.0793 (0.350)	
Profit Margin		0.0000187 (0.0000404)			0.0000154 (0.0000358)			0.00000898 (0.0000139)	
ROA			-0.00391 (0.0226)			0.000309 (0.0216)			0.0235*** (0.00593)
IPO days			-0.0149 (0.00913)			-0.0203** (0.00939)			0.00000389 (0.00239)
Above		32.22*** (2.562)	32.50*** (2.803)		29.71*** (2.369)	30.83*** (2.673)		-0.354 (0.897)	-0.124 (0.734)
Big4 Auditor			1.545 (2.821)			1.707 (2.919)			-0.225 (0.738)
Top		6.755*** (2.422)	4.452 (2.773)		2.906 (2.463)	2.904 (2.845)		2.226*** (0.858)	1.579** (0.727)
US		7.201 (4.451)			-0.913 (4.579)			4.368*** (1.576)	
Foreign			-3.250 (2.828)			-1.039 (2.989)			-1.725** (0.740)
High-tech	3.101 (3.214)	-1.205 (2.762)	14.85 (14.91)	2.573 (3.247)	15.11 (11.45)	13.02 (13.93)	0.388 (0.948)	0.197 (4.434)	1.379 (3.902)
Industry FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Constant	-85.19*** (27.28)	7.854 (29.50)	7.315 (34.35)	-71.62** (28.65)	-1.514 (30.96)	26.78 (33.91)	-2.106 (8.090)	2.203 (11.04)	0.208 (9.005)
Observations	490	487	384	415	413	330	488	485	383
R2	0.056	0.316	0.386	0.046	0.415	0.441	0.001	0.037	0.084

Standard errors in parentheses \* p &lt; 0.10, \*\* p &lt; 0.05, \*\*\* p &lt; 0.01

Table 9 Propensity Score Matched Sample on effects of JOBS Act in Full Period

Variable	PS Matched Control group	Treatment group	Difference	T-stat
Differences in Control Variables				
Proceeds	18.519	18.568	0.486	0.59
Assets	5.797	5.876	-0.791	0.59
Top underwriter	0.737	0.682	0.056	1.16
Above filing range	0.285	0.240	0.447	0.959
Differences in Underpricing				
Full underpricing	14.745	20.826	6.081	2.59
From offer to 1st day open	15.858	21.218	5.360	2.0
From 1st open to 1st close	0.785	1.135	0.451	0.78
From 1st open to 1st week	1.422	1.028	-0.394	0.87

This table presents results from using propensity score matching to match EGC issuers with similar issuers before JOBS Act passed. Propensity score is calculated using logistic model.

Table 10 Propensity Score Matched Sample on effects of JOBS Act for Different Periods

Variable	PS Matched	Treatment group	Difference	T-stat
Differences in Underpricing	Control group			
6 months				
Full underpricing	13.137	18.332	5.195	1.09
From offer to 1st day open	18.249	17.808	-0.441	0.09
From 1st open to 1st close	1.559	1.604	0.045	0.06
From 1st open to 1st week	0.929	0.895	-0.033	0.08
12 Months				
Full underpricing	16.597	19.042	2.446	0.73
From offer to 1st day open	20.589	17.551	-3.038	0.93
From 1st open to 1st close	1.143	1.013	-0.130	0.14
From 1st open to 1st week	0.861	1.064	0.203	0.72
18 Months				
Full underpricing	15.761	23.338	5.987	1.73
From offer to 1st day open	18.595	22.627	4.032	1.14
From 1st open to 1st close	0.689	1.209	0.6030	0.86
From 1st open to 1st week	0.681	1.217	0.536	2.89
24 Months				
Full underpricing	14.745	20.826	6.081	2.35
From offer to 1st day open	15.858	21.218	2.681	2.00
From 1st open to 1st close	0.785	1.135	0.350	0.78
From 1st open to 1st week	1.422	1.292	-0.130	-0.27

This table compares underpricing difference 6,12, 18 months before and after the JOBS Act and uses same propensity score method as full period table. None of control variables show statistically difference between matched control group and treatment group (not shown in table).

Table 11 Institutional allocation on underpricing

Independent Variables	Dependent variable: Underpricing								
	Full Underpricing			Offer to 1st Open Return			1st Open to Close Return		
Proceeds	5.600*** (1.429)			4.629*** (1.304)			0.865 (0.653)		
Institutional%	-0.0370 (0.0564)	-0.0616 (0.0495)	-0.0658 (0.0462)	-0.0180 (0.0520)	-0.0387 (0.0430)	-0.0383 (0.0429)	0.00908 (0.0257)	0.00121 (0.0264)	0.0152 (0.0109)
Post*Institutional%	0.103* (0.0613)	0.105* (0.0549)	0.107** (0.0540)	0.0639 (0.0551)	0.0733 (0.0465)	0.0912* (0.0484)	-0.00718 (0.0279)	0.00841 (0.0293)	-0.00467 (0.0128)
Revenue			-1.133 (0.884)			-1.149 (0.784)			-0.598*** (0.209)
Total Asset		0.767 (0.774)			0.00120 (0.664)			1.298*** (0.414)	
ROA			0.0677* (0.0398)			0.0570 (0.0352)			0.0725*** (0.00941)
Above Pricing		35.96*** (2.796)	35.73*** (2.896)		32.56*** (2.316)	32.58*** (2.554)		-0.276 (1.493)	0.210 (0.684)
Big4 Auditor		-1.172 (2.709)			-0.561 (2.381)			0.456 (1.450)	
Top Underwriter			4.574* (2.738)			1.774 (2.599)			1.337** (0.647)
Technology	4.498 (3.660)	16.61 (12.83)	17.83 (15.70)	3.465 (3.321)	16.23 (11.98)	14.01 (13.66)	0.759 (1.667)	2.209 (6.852)	0.560 (3.709)
Industry FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Constant	-87.28*** (26.30)	-9.312 (13.41)	-2.869 (16.25)	-69.16*** (24.06)	-6.230 (12.53)	0.876 (14.14)	-15.68 (12.03)	-8.272 (7.162)	3.043 (3.840)
Observations	525	514	366	469	459	327	524	513	366
R2	0.038	0.303	0.385	0.033	0.384	0.444	0.004	0.026	0.176

Standard errors in parentheses \* p &lt; 0.10, \*\* p &lt; 0.05, \*\*\* p &lt; 0.01

Table 12 Original institutional allocation on subsequent return

	One_Week	One_Month	Two_Month	Three_Month	Six_Month	One_Year
Proceeds	-0.260 (0.298)	0.255 (0.924)	-0.317 (1.682)	0.177 (1.874)	2.082 (2.177)	1.242 (2.136)
EGC	-0.344 (0.456)	-0.361 (1.418)	-1.045 (2.555)	0.00857 (2.800)	3.652 (3.253)	5.603 (3.231)
Institutional%	-0.0139 (0.00749)	-0.0495* (0.0233)	-0.0782 (0.0420)	0.00457 (0.0456)	-0.0532 (0.0533)	-0.0124 (0.0528)
Top Underwriter	0.481 (0.540)	1.269 (1.684)	3.040 (3.045)	7.257* (3.350)	1.930 (3.960)	2.835 (3.790)
GDP growth	16.89 (22.67)	-50.66 (70.23)	-49.45 (125.5)	8.100 (139.2)	-140.2 (154.6)	-41.31 (159.8)
Industry FE	YES	YES	YES	YES	YES	YES
Constant	2.075 (6.070)	-2.730 (18.80)	8.604 (34.08)	-8.246 (38.05)	-23.47 (46.28)	-21.83 (43.45)
N	523	507	495	519	434	510
R2	0.027	0.016	0.012	0.023	0.023	0.015

Standard errors in parentheses \* p &lt; 0.05, \*\* p &lt; 0.01, \*\*\* p &lt; 0.001

Table 13 JOBS Act effect on underpricing using large issuers control groups

Independent Variables	Dependent variable: Underpricing						
	First day underpricing				Institutional allocation		
Proceeds	5.469*** (1.712)	6.971*** (1.712)	-0.488 (2.015)	-0.427 (2.007)	6.130*** (1.505)	0.187 (1.923)	-0.223 (1.876)
EGC	5.002* (2.550)	3.318 (2.535)	3.609 (2.325)	4.030 (2.480)			
Institutional%					-0.0517 (0.0558)	-0.0614 (0.0496)	-0.0660 (0.0463)
EGC*Institutional%					0.0917 (0.0622)	0.104* (0.0557)	0.108** (0.0545)
Revenue	0.440 (0.789)	-0.654 (0.845)	-1.249 (0.937)	-0.615 (0.998)			-1.078 (0.998)
Total Asset			1.171 (1.285)			0.708 (0.986)	
Profit Margin			0.0000343 (0.0000469)				
ROA				-0.00406 (0.0253)			0.0671* (0.0402)
Above Pricing			31.56*** (2.839)	34.06*** (3.091)		35.87*** (2.929)	35.80*** (2.963)
IPO days				-0.0163 (0.0102)			
Big4 Auditor				1.392 (3.149)		-1.245 (2.813)	
Top Underwriter			5.764** (2.735)	4.352 (3.092)			4.688 (2.906)
Foreign				-0.352 (3.091)			
US Accounting			6.439 (4.704)				
Industry FE	NO	YES	YES	YES	YES	YES	YES
Constant	-88.27*** (29.62)	-119.2*** (33.10)	-6.659 (35.15)	1.853 (38.30)	-104.5*** (32.10)	-12.39 (34.41)	10.37 (35.28)
Observations	497	497	494	390	525	514	366
R2	0.044	0.114	0.310	0.351	0.090	0.303	0.385

Robust standard errors in parentheses \* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01

Table 14 One week underpricing regression

Independent Variables	Dependent variable				
	One week underpricing				
Proceeds	5.493*** (1.832)	3.334 (2.250)	3.151* (1.792)	5.264** (2.158)	3.270 (2.384)
EGC	5.962** (2.712)	5.543* (3.009)			
Institutional%			-0.0594 (0.0594)	-0.0682 (0.0572)	-0.0855 (0.0566)
EGC*Institutional%			0.0695 (0.0674)	0.0899 (0.0644)	0.0829 (0.0649)
Revenue	-0.196 (0.891)				-0.349 (1.108)
Total Asset		0.299 (1.156)		0.359 (1.128)	-0.411 (1.524)
Big4 Auditor		-0.756 (3.301)		1.065 (3.274)	-0.601 (3.433)
Top Underwriter		8.117** (3.231)	7.903** (3.195)		10.95*** (3.418)
US Accounting		6.689 (5.221)			4.760 (5.625)
EGC*hightech		5.676 (7.389)	7.655 (7.311)		
Industry FE	YES	YES	YES	YES	YES
Constant	-93.45*** (35.69)	-79.99** (40.38)	-63.99* (36.47)	-89.00** (39.34)	-53.96 (42.36)
Observations	533	582	567	554	503
R2	0.082	0.095	0.080	0.070	0.093

Standard errors in parentheses \* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01

Table 15 Institutional allocation on underpricing based on groups above and below mean of revenues

Independent Variables	Dependent variable: Underpricing					
	Below mean	Above mean	Below mean	Above mean	Below mean	Above mean
Proceeds	6.156** (2.498)	4.912** (2.125)	1.851 (3.226)	0.411 (2.591)	1.034 (3.334)	-0.589 (2.458)
Institutional%	-0.0676 (0.0943)	-0.0508 (0.0716)	-0.0691 (0.0890)	-0.0536 (0.0617)	-0.0585 (0.0864)	-0.0702 (0.0573)
EGC*Institutional%	0.172* (0.0991)	0.0652 (0.0819)	0.144 (0.0943)	0.0835 (0.0714)	0.188** (0.0909)	0.0692 (0.0702)
Revenue					-0.0131 (1.401)	-1.366 (2.633)
Total Asset			3.537** (1.596)	-1.117 (1.333)		
ROA					0.0765* (0.0432)	-0.0327 (0.108)
Above Pricing			31.44*** (5.965)	36.33*** (3.467)	41.41*** (6.914)	33.48*** (3.461)
Big4 Auditor			-7.540* (4.514)	2.803 (3.784)		
Top Underwriter					7.077 (4.731)	5.078 (3.914)
Industry FE	YES	YES	YES	YES	YES	YES
Constant	-106.8** (51.98)	-95.15** (45.29)	-35.38 (58.81)	-2.533 (46.22)	-10.71 (61.23)	15.25 (46.00)
Observations	195	330	192	322	128	238
R2	0.083	0.090	0.235	0.345	0.367	0.417

Robust standard errors in parentheses \* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01

Table 16 Institutional allocation on underpricing based on above and below mean of profit margin

Independent Variables	Dependent variable: Underpricing					
	Below mean	Above mean	Below mean	Above mean	Below mean	Above mean
Proceeds	12.22*** (4.097)	4.279* (2.185)	-0.196 (5.484)	1.349 (2.871)	2.680 (5.094)	-0.810 (2.716)
Institutional%	-0.173 (0.125)	0.0916 (0.0843)	-0.224** (0.105)	0.0581 (0.0736)	-0.243** (0.102)	0.0487 (0.0778)
EGC*Institutional%	0.192 (0.127)	0.0527 (0.104)	0.206* (0.106)	0.0804 (0.0904)	0.147 (0.102)	0.0964 (0.0962)
Revenue					-3.483 (2.485)	-0.216 (1.868)
Total Asset			1.978 (2.993)	-1.046 (2.058)		
ROA					0.241* (0.141)	0.0717 (0.149)
Above Pricing			40.22*** (6.342)	29.48*** (4.256)	41.03*** (6.082)	30.40*** (4.399)
Big4 Auditor			8.416 (7.911)	1.142 (4.119)		
Top Underwriter					13.08** (6.357)	0.296 (4.416)
Industry FE	NO	NO	YES	YES	YES	YES
Constant	-209.2*** (78.39)	-86.75* (46.94)	-6.955 (88.00)	-25.67 (50.14)	-33.64 (84.79)	10.52 (52.30)
Observations	93	158	93	158	90	147
R2	0.196	0.136	0.472	0.369	0.538	0.372

Standard errors in parentheses \* p < 0.10, \*\* p < 0.05, \*\*\* p < 0.01

Table 17 Institutional allocation on underpricing eliminating outliers

Independent Variables	Dependent variable: Underpricing								
	Full Underpricing			Offer to 1st Open Return			1st Open to Close Return		
Proceeds	5.188*** (1.249)			4.336*** (1.265)			0.221 (0.364)		
Institutional%	-0.0181 (0.0493)	-0.0392 (0.0423)	-0.0386 (0.0416)	-0.0144 (0.0497)	-0.0290 (0.0406)	-0.0306 (0.0422)	0.000218 (0.0143)	0.00143 (0.0148)	0.0153 (0.0111)
Post*Institutional%	0.0871 (0.0535)	0.0878* (0.0469)	0.101** (0.0484)	0.0765 (0.0529)	0.0763* (0.0439)	0.0944** (0.0477)	-0.00118 (0.0155)	0.00221 (0.0164)	-0.00470 (0.0129)
Revenue			-1.162 (0.797)			-1.553* (0.803)			-0.601*** (0.212)
Total Asset		0.429 (0.670)			-0.341 (0.647)			0.164 (0.235)	
ROA			0.0724** (0.0356)			0.0633* (0.0349)			0.0725** (0.00948)
Above Pricing		32.55*** (2.407)	33.58*** (2.615)		30.49*** (2.197)	31.14*** (2.527)		0.106 (0.842)	0.196 (0.696)
Big4 Auditor		-0.114 (2.321)			1.110 (2.280)			-0.775 (0.814)	
Top Underwriter			4.224* (2.463)			2.254 (2.594)			1.342** (0.655)
Technology	3.544 (3.205)	11.67 (12.52)	14.71 (14.05)	2.996 (3.189)	13.69 (11.14)	12.84 (13.25)	0.328 (0.929)	0.684 (3.825)	0.557 (3.737)
Industry FE	NO	YES	YES	NO	YES	YES	NO	YES	YES
Constant	-80.55*** (22.99)	-4.459 (13.11)	-1.278 (14.55)	-63.67*** (23.33)	-3.367 (11.73)	3.556 (13.79)	-3.122 (6.696)	0.253 (4.008)	3.061 (3.870)
Observations	515	504	361	438	429	310	514	503	361
R2	0.043	0.331	0.406	0.036	0.404	0.449	0.001	0.005	0.175

Standard errors in parentheses \* p &lt; 0.10, \*\* p &lt; 0.05, \*\*\* p &lt; 0.01