CSEF

Centre for Studies in Economics and Finance

WORKING PAPER NO. 399

Access to Public Capital Markets and Employment Growth

Alexander Borisov, Andrew Ellul and Merih Sevilir

April 2015

University of Naples Federico II

University of Salerno

Bocconi University, Milan

CSEF - Centre for Studies in Economics and Finance
DEPARTMENT OF ECONOMICS – UNIVERSITY OF NAPLES
80126 NAPLES - ITALY
Tel. and fax +39 081 675372 – e-mail: csef@unisa.it

CSEF
Centre for Studies in Economics and Finance

WORKING PAPER NO. 399

Access to Public Capital Markets and Employment Growth

Alexander Borisov[*], Andrew Ellul[**] and Merih Sevilir[***]

Abstract

This paper investigates the importance of accessing public capital markets through an initial public offering (IPO), and the consequent relaxation of firms' financial constraints, for firm-level long term employment decisions. We find that firms significantly increase post-IPO investment in human capital compared to the pre-IPO stage. To address endogeneity concerns, we use a novel dataset of private firms and compare employment growth of IPO firms with two different control groups: First, private firms that file for an IPO but eventually withdraw their offering due to exogenous market conditions, and second, a propensity score matched sample of private firms that never file for an IPO. Firms that complete the IPO process experience higher employment growth in the post-IPO period relative to each control group. Importantly, our results show that the most likely channel for the realization of higher employment growth is the relaxation of financial constraints, allowing the newly public firms to access *both equity and debt markets* for funding investment in human capital, and not only capital expansion. Overall, our results highlight the importance of public capital markets for job creation over long term horizons.

JEL Classification: G32, G34.

Keywords: Employment growth, Human capital, IPOs, Financial constraints, Corporate growth.

Acknowledgements: We thank Sumit Agarwal, Utpal Bhattacharya, Paolo Fulghieri, Craig Holden, Tullio Jappelli, Mark Leary (discussant), Chen Lin, Lars Norden, Marco Pagano, Elvira Solji, Cong Wang, Kuo Zhang and seminar participants at the Chinese University of Hong Kong, Indiana University, University of Rotterdam and the CSEF-IGIER Conference. We would like to thank the Edward Lowe Foundation's Institute for Exceptional Growth Companies, especially TJ Becker and Gregg Cole, for graciously giving us access to the National Establishment Time-Series (NETS) database. Andrew Ellul acknowledges financial support from the ERC (FINLAB project no. 295709).

[*] University of Cincinnati

[**] Indiana University, CEPR, CSEF and ECGI

[***] Indiana University

Table of contents

1. Introduction

Slow employment growth in the aftermath of the Great Recession has become an important issue in various countries, including the United States. At the same time, there are significant concerns about the decline in the number of small companies making the decision to list on a stock exchange through an initial public offering (IPO). The potential connection between the number of IPO firms and employment growth has led the current U.S. administration to introduce the Jumpstart Our Business Startups (JOBS) Act, whose objective is to make it easier for small companies to go public and raise the capital they need to hire new employees and put Americans back to work. This process is crucial to the economy as 92 percent of job growth occurs soon after a company's decision to go public.[1] The importance of accessing public capital markets for firms' ability to hire new employees has also been recognized outside the US.[2] In the presence of binding financial constraints, firms may have to adjust *both* capital and labor. Yet, existing empirical literature has focused exclusively on the impact of financial constraints on physical capital and ignored human capital.

In this paper we use the IPO context as a laboratory to investigate how access to public capital markets influences firm-level employment decisions. One of the most cited reasons for an IPO, present explicitly or implicitly in many theoretical models, is the relaxation of firms' financial constraints through its access not just to equity capital markets but also to debt markets. By disseminating information across different classes of investors, a firm can increase its funding opportunities beyond bank loans, which are the predominant source of external financing used by

[1] See Venture Impact (2007) by IHS Global Insight.

[2] European stock exchanges have started significant initiatives to make it easier for small firms to raise financing in public capital markets. For example, in April 2012, Borsa Italiana established the Elite program to help growing, small firms to raise capital through an IPO. In March 2013, the London Stock Exchange Group set up a new High Growth segment of its main market with relaxed listing requirements for fast-growing and high-tech businesses. Finally, in May 2013, NYSE Euronext started a new program, EnterNext, supporting the small and medium-sized companies already listed on the exchange and pursuing to attract new firms (see "Capital Remedy: Financing Europe's Small Businesses", The Economist, Oct 26, 2013.)

many private firms. An IPO thus gives a greater bargaining power to the firm vis-à-vis its lenders and can also attract a larger supply of debt, lower its cost, or both (Rajan (1992)). This line of research emphasizes the firm's newly acquired access to capital markets, rather than just the initial infusion of cash through the IPO proceeds, as the major channel through which organic investment as well as mergers and acquisitions can be realized. Theories that explain the IPO decision as largely driven by the need to access new funding sources predict higher growth in the post-IPO period. Whether this higher growth leads to an increase in employment, rather than exclusively an increase in capital investment, is an empirical question that has not yet been addressed by the literature.

There are a number of theoretical reasons why better access to external finance may influence firm-level employment decisions. First, labor may not constitute only a variable cost to the firm but it can also have a fixed component due to the hiring and training involved (Oi (1962), Farmer (1985), Hamermesh (1989), and Hamermesh and Pfann (1996)). Second, in the presence of a mismatch between the firm's cash flow generation and payments to labor (Greenwald and Stiglitz (1988)), ability to finance working capital may influence labor retention and attraction. Third, due to complementarities between labor and capital, the availability of external finance could have a positive spillover effect on labor if it impacts capital investments (Benmelech, Bergman and Seru (2012)).

Other theories about the IPO decision predict no impact on growth. If an IPO is driven by a desired change of ownership and control, and thus serves as an exit mechanism for the founder or other investors (Zingales (1995)), we should not expect an impact on firm-level employment growth. Ritter (1991) also proposes that IPOs are driven by founders' intention to exploit a window of opportunity when their industry is perceived as overvalued. Furthermore, existing

literature has identified a hot-cold cycle of IPOs and that managers of firms going public in a hot market issue more equity at the IPO stage than firms going public in a cold market, but do not invest more in the IPO year and subsequent years (Alti (2006)).[3] If the IPO decision is driven by such motivations, firm-level investment in human capital may not change significantly around the going-public stage.

In order to investigate the importance of the very early stage of the firm's public life for the process of job creation, we begin our analysis by documenting the time-series profile of employment growth experienced by a sample of 2,914 IPO firms that went public from 1990 to 2010. Our data allow us to track the employment dynamics of these IPO firms over a horizon spanning multiple years *before and after* their private to public transition. For the average firm in our sample, the annual employment growth rate during the 10-year period prior to going public hovers around 20% per year. The typical firm has around 620 employees as of the year prior to going public. The annual employment growth rate increases from 31% (27%) in the pre-IPO year (in the preceding two pre-IPO years) to 38% during the IPO year and goes further up to 40% during the first post-IPO year. Thus, firms nearly double the size of their labor force during the 3-year period after their IPO. Following the third post-IPO year, the average annual employment growth rates decline monotonically over the public life of the sample firms. Our initial analysis of the patterns of firm-level employment suggests that firms hire more during the years when they have better access to public equity markets than at any other point during their life-cycle.

The observed positive relation between the IPO event and employment growth does not necessarily imply that the increase in firm's workforce is more pronounced than expected. Estimating the IPO effect on firm-level employment growth using a within-firm variation is inherently challenging because of self-selection issues, making it difficult to establish causality.

[3] See Ibbotson and Jaffe (1975), Ritter (1984), and Ibbotson, Sindelar, and Ritter (1988, 1994).

For example, a firm may decide to have an IPO because of a positive innovation shock as in Pastor, Taylor, and Veronesi (2009) or expected growth opportunities. To address these concerns, we compare the firm-level employment dynamics for IPO firms with those of two different control groups. The first group consists of propensity score matched private firms that remained private over our sample period. The second group is a sample of private firms that filed an initial registration statement with the SEC for an IPO but withdrew their filing for exogenous reasons and remained private. The latter comparison is a powerful test as it allows an assessment of the employment decisions made by firms that are at a similar stage in their life cycle and with similar growth opportunities to those that carried out successfully their IPO. Crucially for our tests, relative to private firms that completed their IPO, firms that filed for an IPO and withdrew their filing continue to face limited access to capital markets. This difference between the treated and control groups allows us to identify the impact of the IPO on employment growth.

To conduct these tests, we use a novel dataset of private companies obtained from the National Establishment Time-Series (NETS) database. The first step in our analysis is to confirm that private firms that decide to access the public equity market experience a larger employment growth in the post-IPO period (the IPO year, as well as during the first and second post-IPO years), compared to a control group of private firms matched on industry, year, and propensity to go public, where the propensity is estimated using firms' sales, employment, and growth rates. Specifically, we show that the IPO firms experience 34% greater employment growth compared to the control group in the IPO year, 35% in the year following the IPO and 26% in the second post-IPO year.

Although this analysis shows that firms' employment dynamics in the post-IPO period are different from those of private firms with similar characteristics that did not have an IPO, it

does not fully address the concern that the private firms in the control group did not attempt to access the public equity market due to unobserved reasons. We thus move to a different test where we investigate the maintained hypothesis by comparing the employment dynamics of the IPO firms to those of a sample of *private firms that also file to go public but eventually withdraw their offerings* for exogenous reasons. Given that such firms begin the going-public process, they should be fundamentally more similar in their growth opportunities to our sample of IPO firms and the difference in the employment growth of the two groups should not reflect differences in their willingness to go public. We find that, while the IPO sample and the sample of firms with withdrawn offerings exhibit similar employment growth prior to filing, the firms that completed the IPO experience a significantly more pronounced employment growth in the post-IPO years. Specifically, relative to the sample of firms with a withdrawn offering, the IPO sample has approximately 18% greater employment growth in the IPO year, around 28% in the first year following the IPO and 16% in the second post-IPO year. We further confirm that the pronounced increase in the employment around the IPO of a firm also holds in a multivariate analysis that controls for various firm-specific characteristics, industry-factors and firm fixed effects, both with respect to our samples of comparable private firms and withdrawn offerings. Put together, our findings from different tests support the view that accessing public capital markets through an IPO has a significant positive effect on firms' ability to make investment in human capital.

Although our results from benchmarking IPO firms to firms that file for an IPO but withdraw the offering support the idea that accessing public equity markets is important for employment growth, they could reflect unobservable firm characteristics that correlate with firm-level employment growth and firm's withdrawal decision. To address this possibility, we conduct an instrumental variable analysis where we instrument the decision to withdraw with

presence of unfavorable post-filing (short-term) market conditions as these are often argued to be a primary determinant of the decision to complete an offering. To create variation unrelated to post-IPO / post-withdrawal employment dynamics of the individual firm, we capture unfavorable market conditions through the average daily return on the S&P500 over the 5 trading days with the lowest return during the 2-month period following the filing date and the log of the average daily volume on S&P500 during these 5 trading days. The results from the instrumental variables analysis confirm the pronounced increase in employment growth in the post-IPO period for the firms completing their offering. We also include year fixed effects in all specifications, and thus any market-wide effects in the post-IPO period are fully absorbed. To the extent that our instruments – *short term* market conditions - are not correlated with unobservable firm characteristics that affect employment decisions over the *long term*, these results suggest a causal effect from the newly established access to capital markets through going public on employment growth.

After documenting the significant increase in firms' long term employment growth in the post-IPO period, using different control samples and tests, we proceed to investigate possible channels for the realization of this effect and the *ex post* consequences of the IPO decision. Consistent with existing theories, we start by investigating the relaxation of financial constraints channel. There are two important dimensions to consider. First, an IPO provides an immediate access to public equity capital, in the form of the initial proceeds, relaxing *short-term capital constraints*. Second, by gaining access to the equity market and following listing and regulatory requirements, a firm also disseminates a whole gamut of information and makes it accessible to both equity and debt investors. This means that the consequences of an IPO could rather have *long-term implications* for the firm's financial constraints.

Starting with the short-term implications, the importance of an IPO for relaxation of capital constraints might be more pronounced for firms with a greater dependence on external equity finance and larger infusion of capital at the IPO stage. As a result, such firms might be hiring more aggressively immediately after their initial access to the public equity market. Consistent with this conjecture, we find that firms with higher dependence on external equity finance experience a significantly larger increase in employment during the first few post-IPO years. Moreover, firms that raise more through the sale of primary shares, rather than secondary shares (allowing insiders to cash out), increase their total employment by almost twice as much as firms with a smaller amount of primary shares sold at the IPO. Thus, IPO proceeds appear to alleviate short-term financial constraints and employment growth can be more readily financed.

Going public should also affect a firm's ability to hire through an improved post-IPO access to debt and equity capital markets in the long run. Consistently, we find that both equity and debt capital raised after the IPO are positively related to employment growth. The impact of the debt channel is consistent with the view expressed by Pagano et al. (1998) that going public improves firm's ability to utilize debt financing due to a reduction in borrowing cost.

Our analysis offers three additional insights related to this channel. First, in a multivariate setting spanning the first three post-IPO years, we find that the association between primary proceeds and employment growth exists in the IPO year and the first post-IPO year, but ceases to exist afterwards. More importantly, subsequent new funding, especially debt issues, becomes the dominant factor for employment growth. These dynamics indicate that while IPO proceeds may be important to alleviate short-term constraints, the IPO also alleviates long-term constraints by giving the firm a better access to debt markets as well. Second, we investigate the cross-sectional heterogeneity of IPO firms and find that firms that experience the largest reduction in their cost

of debt are associated with higher employment growth. Third, and most importantly, we focus on the sensitivity of employment decisions to firm-level cash flows. Existing literature argues that external finance availability should affect employment indirectly through its impact on firm level capital investment. When capital market frictions exist, investment in physical capital will be limited by the availability of internal funds and due to complementarities that exist between labor and capital, firms will adjust employment accordingly. The argument is reminiscent of the investment-cash-flow sensitivity literature (Fazzari et al. (1998) and Rauh (2006), among others). Our results show that the sensitivity of employment growth to cash flows declines significantly in the post-IPO period, suggesting that better access to financial markets after the IPO positively impacts employment decisions also through the complementarities with capital investment.

Finally, an important dimension of our analysis is an attempt to discern "organic" employment growth at the firm level from new employment achieved through acquisitions. This speaks directly to the concern of policymakers regarding firms' ability to generate new jobs. When a firm enters the public equity market, its ability to engage in acquisitions is enhanced by the capital infusion at the IPO, subsequent access to both equity and debt capital markets, and by availability of "acquisition currency", i.e. firm's publicly traded shares. Celikyurt, Sevilir and Shivdasani (2010) document evidence that IPO firms are very active acquirers starting in their IPO year. While we find that the M&A behavior of IPO firms is an important growth driver, we also observe that even firms without acquisition activity in their early post-IPO years exhibit a significant increase in employment. In other words, the IPO decision is associated with organic employment growth. This result is important from a broader economic perspective because it suggests that IPO firms are associated with new employment.

Our results contribute to two different strands of the literature. First, our paper adds to the growing literature on labor and finance. So far, the latter has focused mostly on the impact of leveraged buyouts and private equity transactions on employment. Kaplan (1989), Muscarella and Vetsuypens (1990), Lichtenberg and Siegel (1990), Davis et al. (2011) present some U.S. evidence, Boucly, Sraer and Thesmar (2012) focus on French private equity transactions, while Wright, Thompson and Robbie (1992) and Amess and Wright (2007) offer U.K. insights. We believe that our study is the first to investigate the impact of accessing public capital markets on employment growth and to shed light on potential channels through which the link arises. Our results are also related to the literature that examines how changes in ownership influence employment and productivity (Lichtenberg and Siegel (1987), Long and Ravenscraft (1993), McGukin and Nguyen (2001) and Harris, Siegel and Wright (2005)). Our different tests show that in the presence of binding financial constraints, firms adjust *both* capital and labor. While existing empirical literature has focused exclusively on the impact of financial constraints on physical capital, it has largely ignored the impact on firms' human capital.

Second, our paper also makes a contribution to the literature investigating determinants of the going public decision. Existing research on why firms go public establishes several motives. Pagano et al. (1998) study a sample of Italian firms and find that firms go public not to raise capital for financing future investments and growth, but to rebalance their capital structure and to exploit sectoral misvaluation. On the other hand, Mikkelson, Partch and Shah (1997) document that investment financing is the primary motivation for US firms to go public. Lowry (2003) shows that demand for capital and investor sentiment are major determinants of IPO volume. Using a sample of German firms, Boehmer and Ljungqvist (2004) show that firms go public when their investment opportunities and valuations become attractive. Kim and Weisbach

(2008) provide evidence that financing of capital expenditures and desire to benefit from potential overvaluation are motives for seasoned equity offerings (SEOs) and IPOs. Celikyurt, Sevilir and Shivdasani (2010) study acquisition motives in IPOs and show that IPO firms are prolific acquirers with substantial acquisition expenditures. Our paper adds a novel aspect by studying the dynamics of firm employment around the IPO stage. We find that public firms experience the most significant increase in their employment at the IPO stage of their public life cycle.[4] In addition to that, our analysis using private firm data shows that IPO firms experience greater post-IPO employment growth relative to similar private firms as well as to similar firms that attempt an IPO but eventually withdraw. This corroborates our argument for more than a simple association between going public and employment growth.

The rest of the paper is organized as follows. Section 2 describes our sample construction and data. Section 3 investigates the employment patterns for IPO firms and various control groups. Section 4 focuses on post-IPO employment dynamics and underlying channels. Section 5 concludes.

2. Data and Descriptive Statistics

To examine the relation between going public and employment we first use a sample of IPOs that took place in the period 1980-2010. To construct this sample, we begin with all IPOs by US firms available at Thomson Reuters' Global New Issues (GNI) database. Following common filtering criteria, we exclude real estate investment trusts, closed-end funds, rights, units, foreign issues, and ADRs. Our search yields 8,569 offerings between January 1980 and December 2010. We then merge this sample with CRSP and Compustat in order to obtain stock

[4] A contemporaneous report by Kenney, Patton and Ritter (2012) examines revenue and employment growth of IPO firms in the US from 1996 to 2010 and finds that IPO firms exhibit a significant increase in employment and revenues starting in the IPO year and peaking in the first ten years after the IPO.

market data and information from the firms' financial statements, which results in 7,953 offerings. For the firms that complete their offering, we start by obtaining data on firm employment from Compustat. The focus of Compustat is on public firms, but it backfills information for some firms even prior to the IPO when such data are available. Although public firms are required to file audited financial statements for up to several years prior to their IPO, the information on pre-IPO employment is often missing. We are able to compute the change in total employment during the IPO year for only 3,654 firms. For expositional purposes, we refer to this sample of offerings as the "Compustat IPOs sample" in our analysis.[5]

The key drawback of using only this sample of firms for our empirical analysis of employment dynamics around the IPO stage is that it does not allow us to draw inferences as to the (unobservable) counterfactual employment growth had the firm remained private.[6] Hence, our identification approach, which we discuss in detail in the next section, utilizes a strategy that relies on constructing two groups of comparable private firms that allow us to benchmark the employment patterns for IPO firms. The first control group we use consists of matched private firms that remain private, while the second group consists of firms that file for an IPO but eventually withdrew the offering. The data for these two samples of private firms come from the National Establishment Time-Series (NETS) database.

The NETS database is hosted by Walls & Associates and constructed in collaboration with Dun and Bradstreet (D&B). Specifically, it links D&B's annual cross-sectional snapshots of the full Duns Marketing Information (DMI) file. The file, organized by D&B, captures annually the entire universe of establishments in the US. Every January, D&B completes its data collection process by making more than 100 million telephone calls, collecting information

[5] Table 1 in Appendix B provides descriptive statistics as well as the time-series distribution of the IPOs prior to merging with the NETS data which we discuss next.
[6] A second drawback is that Compustat provides almost no data on employment beyond one or two pre-IPO years.

through court filings, news, electronic reports, company filings, the U.S. postal service, etc. Detailed information on the data collection effort and the individual annual files can be found in Kolko and Neumark (2007).

In collaboration with D&B, Walls & Associates develops procedures for linking the annual cross-sections into a longitudinal file. This makes it possible to follow businesses and their units over time. Thus, the NETS database is a panel that tracks every establishment from its birth to ultimate disappearance (via acquisition, bankruptcy, etc.) through any organizational and geographic changes. Moreover, each establishment is uniquely identified through its Data Universal Numbering System (DUNS) number assigned by D&B. The database reports information on the establishments' physical location, sector of activity, annual employment and sales figures, name and business address, and "Family Tree", i.e. headquarter linkages that connect the establishments to their respective headquarters and/or subsidiaries, if any.

The extract of the NETS dataset we obtained covers the period 1990-2012. In order to generate specific business-level information on firms' employment dynamics, we aggregate the establishment-level data up to the respective parenting headquarters. Thus, we obtain annual employment and sales figures, as well as a measure of credit worthiness and industry classification. We first match our sample of IPO firms to the resultant NETS dataset using the DUNS numbers provided by the GNI database. It should be noted that the GNI database has DUNS number for approximately 50% of the sample of completed offerings. In addition to that, due to data coverage, our analysis is restricted to the period 1990-2010 which is the overlapping period common to both data sources. We refer to these IPOs as the "NETS IPOs sample" in the subsequent analysis.

We then move to use a control group of private firms that filed for an IPO but withdrew the offering and remained private.[7] We extract a sample of withdrawn offerings from the GNI database. We match these withdrawn offerings to the NETS database using their DUNS number. However, the data availability rate regarding DUNS identifiers is much smaller for the sample of withdrawn offerings. To alleviate this issue, we manually search for information about each firm with withdrawn offering in the Hoover's Database in order to identify its DUNS number. The withdrawn offerings sample, called "Withdrawn IPOs control group" in our analysis, consists of 536 cases.

The idea of this analysis is that both samples of firms, with completed and withdrawn offerings, are comparable in terms of their motivation to go public as they all filed for IPO. If the withdrawal decision is random, any subsequent difference in the employment dynamics can be viewed as a realization of the firm's access to public equity market via the completed IPO. As the decision might not be random, we instrument for the IPO withdrawal decision. Specifically, Bernstein (2013), among other proponents of the idea, suggests that the decision to withdraw is frequently associated with unfavorable post-filing market conditions. To capture unfavorable market conditions we rely on the following two instruments: average daily return on S&P500 over the 5 trading days with the lowest return during the 2-month period following the filing date for the offering and the log of the average daily volume on S&P500 during these 5 trading days. We instrument the withdrawal decision for each firm using these two variables to create variation unrelated to the post-IPO/post-withdrawal employment dynamics of the individual firm.

[7] When a firm first decides to have an IPO, it submits an initial registration statement to the SEC, usually form S-1. It contains essential firm-level business and financial data. Following this stage, prospective issuers normally start the book-building process but still retain the option to withdraw the offering by using the RW form. IPO filing withdrawals are not uncommon: Bernstein (2012) reports that approximately 20 percent of all IPO filings are withdrawn. There may be various reasons behind the withdrawal decision (Busaba (2006) and Busaba et al. (2001)), but Bernstein (2012) suggests that the most common reason is weak market conditions that may limit the success of the IPO offering.

Our alternative identification approach is to construct a sample of comparable private firms based on observable characteristics, i.e. "Private firms control group". To the extent that IPO decisions and public-private status could be completely explained by such factors, the difference in the employment dynamics between the group of private firms and IPO sample in the post-IPO period could be attributed to the latter group's access to public equity capital. The control group of private firms utilized as part of our identification strategy is derived from one-to-one matching with replacement based on year, industry, and propensity to go public (PS), where we estimate PS using sales, employment, and growth rates in sales and employment using the entire NETS database.

[Insert Table 1]

Table 1 provides summary statistics on the three samples of firms used in our analysis, namely: NETS IPOs sample, Withdrawn IPOs control group, and Private firms control group. It reports employment and sales figures for the firms as well as a measure of credit worthiness. *Log(Sales)* measures the sales of a firm, while Δ*Log(Sales)* is the annual change in log of sales. *PayDex* is a numerical score assigned by D&B that measures firms' credit worthiness using the risk of late payments. The score goes from 0 to 100, with the higher score meaning lower risk of late payments.

Panel A of Table 1 presents summary statistics for the NETS IPOs sample discussed above. An average, an IPO firm has 620 employees one year before going public, although the median is only 100. The average growth rate, i.e. change in log-employment, during the IPO year is about 38%. By the end of the 2nd post-IPO year, the cumulative growth is about 98%, on average. We also note from Panel A that the average firm has $70 million of sales before going public.

In Panel B of Table 1 we report summary statistics for the "Withdrawn IPOs control group". We also indicate whether the respective summary statistic (mean or median) for each variable is significantly different from its counterpart in the NETS IPOs sample. We note that firms with withdrawn offerings are similar to firms with successful IPOs presented in Panel A in terms of employment and sales levels. Consistent with our arguments, their employment growth differs significantly after the withdrawal compared to the sample of completed IPOs. During the withdrawal year, these firms have an average employment growth of about 20%, which is significantly different from the growth observed in the sample of completed IPOs. Over the following 2 years, the cumulated growth in employment is only about 40%, which again is significantly different from what we observe for the completed IPO sample.

Lastly, Panel C of Table 1 provides summary statistics for the sample of private control firms, i.e. the "Private firms control group". The sample of control firms is created from one-to-one matching based on year, industry, and propensity to go public (PS). In order to obtain PS, we use the sample of matched IPOs and the entire NETS database to estimate a probit model, where the IPO decision is modeled as a function of pre-IPO sales and employment, as well as annual and 3-years cumulative growth rates in employment and sales. Albeit with a similar probability of going public, the firms in the control sample appear to be growing not as fast as the firms in the sample of completed IPOs.

3. Employment Growth and the IPO Event

3.1. Graphical Representation

We start our analysis of the importance of accessing public equity capital by examining the employment dynamics of our three samples: NETS IPOs sample, Withdrawn IPOs control group, and Private firms control group, over a longer horizon.

Figure 1 Panel A presents the time profile of employment for the NETS IPOs sample where time-point 0 is the IPO year. It plots the annual change in log employment, *ΔLog(EMP)*, for the average firm in the IPOs sample from 10 years *before* to 15 years *after* the IPO event. The average firm in our IPOs sample experiences an annual employment growth of 38% during its IPO year. Employment grows at a rate of 31% during the year preceding the IPO, and at a rate of 40% during the first post-IPO year. Starting with the second post-IPO year, employment growth rates decline monotonically. These patterns suggest that firms experience the most pronounced increase in their labor force during the first one or two post-IPO years, thus highlighting the importance of access to public capital markets for job creation.

In Panel B, we plot the difference between the average employment growth of the firms in the NETS IPOs sample and those in the Withdrawn IPOs control group, where time-point 0 is the IPO year for the NETS IPOs sample and the withdrawal year for the Withdrawn IPOs control group. Consistent with Table 1, we note that although both groups of firms exhibit similar level of employment growth initially, firms with a withdrawn offering experience smaller employment growth relative to IPO firms during the IPO year and the subsequent years. While there is only a modest difference in the employment growth rates of these two samples in the two year period preceding the IPO, IPO firms exhibit 18% greater employment growth during the IPO year and 28% during the first post-IPO year.

Lastly, Panel C presents the employment growth of the firms in the NETS IPO sample relative to that of firms in the Private firms control group by plotting the difference in their

average annual employment growth. Although IPO firms appear to have a higher employment growth rate relative to the firms in the control group in the pre-IPO period, the difference in the employment growth rates more than quadruples in the post-IPO period. Specifically, while IPO firms exhibit 7% greater employment growth on average in the ten year period preceding the IPO year relative to firms in the control group, the difference reaches 34% in the IPO year, and 35% in the first post-IPO year.

[Insert Figure 1]

3.2. Employment Dynamics – Multivariate Analysis

We next proceed to formally test the employment dynamics observed in Figure 1 in a multivariate framework that allows us to control for various factors. The estimation results are presented in Table 2. Panel A shows the results from panel regressions of the annual change in employment for the NETS IPOs sample and the Private firms control group. Panel B uses the NETS IPOs sample and the Withdrawn IPOs control group.

[Insert Table 2]

The dependent variable is the annual change in log-employment. The graphical analysis suggests that firms experience the largest increase in employment around the IPO stage. Hence, we construct a variable *D(IPO Year)* which takes on the value of one for firms in their IPO year and zero otherwise. Similarly, *D(IPO+n)* for n = 1,2 and 3 is defined as an indicator that takes the value of one for a firm in its n-th post-IPO year. Note that our models are estimated with year fixed effects and firm fixed effects in order to absorb time-invariant firm characteristics and aggregate macroeconomic factors.

Columns (1) thorough (3) show that IPO firms increase employment more significantly than the sample of private control firms in the IPO year as well as in the first, second and the third year after the IPO. Noticeably, the employment growth is much more pronounced during the IPO year and the first post-IPO year relative to the remaining post-IPO years. We also note that smaller firms and firms with better credit scores experience greater employment growth. Overall, these results suggest that employment growth is positively related to going public, relative to employment growth observed in otherwise similar firms that remain private.

In Panel B of Table 2 we examine how employment dynamics change around the IPO event using the withdrawn IPOs control group as a benchmark. Hence, the analysis is conducted on a sample that combines the NETS IPOs sample and the withdrawn IPOs control group. To capture the potential impact of withdrawals, we define a new set of indicator variables and augment our specifications. *D(Withdrawal Year)* takes the value of one if a firm withdrew its offering in that year and zero otherwise. *D(Withdrawal Year +n)* for n = 1,2 and 3 takes the value of one for a firm in its n-th post-withdrawal year, and zero otherwise. The results confirm that employment growth is associated with the actual initial access to public equity markets. Our results are not driven by characteristics of the filing firms, as indicated by the insignificant coefficients of the withdrawal time indicators.

As an alternative perspective, Table 3 presents the results from cross-sectional analyses of the change in employment in the IPO year as well as the cumulative change in employment in the one- and two-year periods following the IPO. Following the organization of Table 2, the estimation in Panel A uses the NETS IPOs sample and the Private firms control group. *D(IPO Firm)* is defined as an indicator variable that takes the value of one for an IPO firm and zero otherwise. Panel A of Table 3, with the exception of Column 3, shows that IPO firms, relative to

the firms in the control group, experience greater employment growth in the IPO year and during the one- and two-year periods following the IPO year. Overall, the results indicate that the IPO impact on employment growth is not merely a short-term phenomenon that disappears immediately after the IPO but rather a more persistent one.

[Insert Table 3]

Panel B of Table 3 uses the NETS IPOs sample and the control group of withdrawn IPOs. *D(Complete)* takes the value of one for firms that complete the IPO successfully and zero for firms that attempted an IPO but eventually withdrew their offering. All columns in Panel B of Table 3 show that firms with a completed offering experience positive employment growth in the post-IPO period, relative to firms with withdrawn offerings. Based the specification in Column 9, the typical firm with a completed offering has 45% greater employment growth by the end of the second post-IPO year than a typical firm with a withdrawn offering. Given that firms that filed for an IPO should have very similar growth opportunities, and are at similar stages in their life cycle, the difference in employment growth between firms with a completed IPO and those with a withdrawn IPO should be due to the difference in access to public capital markets.

Thus far, we have documented the time profile of firms' employment dynamics and established a significant change in these dynamics around the IPO stage. The patterns of human capital investment for the sample of IPO firms are robust to the introduction of benchmarks based on private firms or firms that file for an IPO but withdraw their offering, and are also robust to examining firms over long periods of their life-cycle. They are also confirmed in multivariate analysis that controls for industry factors, firm fixed effects and various firm-specific characteristics. Next, we proceed with an instrumental variable analysis to address the

possibility that the decision to withdraw an IPO filing is related to unobservable firm characteristics which correlate with firm-level employment growth.

3.3. Employment Dynamics – Instrumental Variable Analysis

Admittedly, the decision to complete an offering is not random and might be influenced by some unobservable characteristics that could also affect firm-level employment dynamics. Therefore, we instrument for the IPO withdrawal decision using the average daily return on S&P500 over the 5 trading days with the lowest return during the 2-month period following the filing date for the offering and the log of the average daily volume on S&P500 during these 5 trading days. The idea is to reflect the oft-cited reason for withdrawal based on unfavorable market conditions, and thus to find variation in firm's withdrawal decision that does not correlate with unobservable firm-level characteristics that may be determinants of employment growth. Since firms filing for an IPO are sensitive to stock market fluctuations, it is plausible to expect that the likelihood of a withdrawal decision will be greater when the market return is lower as well as when the average daily trading volume in days with the lowest returns is higher given that the trading volume in days with low returns is likely to be driven by sell orders.

Our instrumental variables analysis uses the NETS IPOs sample and the withdrawn IPOs control group. In the first-stage of the approach, we estimate a regression where the dependent variable is an indicator variable defined as one if the filing firm completes its IPO successfully and zero otherwise and the independent variables are the two instrumental variables described above, as well as the other exogenous variables. The second-stage equation estimates the impact of going public on the employment growth of the firm where the indicator variable showing if a firm went public is the predicted value from the first-stage regression.

Table 4 presents the results of the instrumental variable analysis. The indicator variable *D(Complete)* is significant in all columns, at the 1% level in 8 out of 9 specifications, suggesting that firms completing their offering experience higher employment growth relative to firms that choose to withdraw their offering due to exogenous market conditions unlikely to be related to firm characteristics relevant for firms' hiring decision. As before, firms with more sales exhibit smaller employment growth, while firms with greater credit worthiness have greater employment growth around the IPO date.

For our instruments to be valid, they should affect the decision to complete an IPO, and should not affect the future (long term) employment profile of the firm for any reason except through the completion decision. The first-stage regression results (not reported for sake of brevity) show that both of our instruments are highly correlated with the withdrawal decision. This is also confirmed by the first-stage F-statistics reported in Table 4. As all of them exceed the respective critical values, we could infer that our instruments are relevant. As we have more than one instrument, we can also infer that the null hypothesis that our instruments are uncorrelated with the residuals cannot be rejected at conventional levels. The p-values of these tests are reported in Table 4. Lastly, we also examine the predictive power of our instruments with respect to firm employment dynamics and do not observe any significant correlations. Thus, we could gain some insight into the validity of our approach.

All our specifications include year fixed effects. Thus, any market-wide effects in the post-IPO period cannot be driving the employment growth differences between firms that complete their IPO and those that withdraw their IPO filing. The results from the instrumental analysis support a casual effect of going public on employment to the extent that our instruments,

which capture short term market performance, are not correlated with observed and unobserved firm characteristics that may affect future employment decisions over the long term horizon.

4. Underlying Channels and Economic Implications

4.1. Cross-sectional Determinants of Post-IPO Employment

We now move to investigate the channels through which the association between initial access to public equity and employment obtains. To do so, due to lack of data on key metrics, we concentrate exclusively on the Compustat IPOs sample as it allows us to construct various firm characteristics using accounting data. A study of the associations between these characteristics and employment growth can shed light on the relevant economic channels. In our analysis we investigate employment over the IPO year and the first two years after the IPO. While arbitrary, this period strikes a balance between investigating exclusively the short-term *ex post* consequences of the IPO decision on employment growth and the long-term dynamics that can arise over time from improved access to capital markets.

We start the analysis by investigating the cross-sectional cumulative changes in total employment from the beginning of the IPO year to the year-end of various post-IPO horizons. For instance, *ΔLog(EMP) Year 0* is the change in log-employment from the beginning to the end of the IPO year, while *ΔLog(EMP) Year 0-2* is the change in log-employment from the beginning of the IPO year to the end of the 2nd post-IPO year. To explore the employment patterns, we begin with various sub-sample analyses, using the relevant firm-level characteristics, and present our results in Table 5.

[Insert Table 5]

An IPO not only provides a firm with an immediate infusion of equity capital raised through the sale of primary shares at the IPO, but also allows the firm to access public equity markets through subsequent SEOs. Both forms of equity capital would be more important for firms that rely relatively more on external equity to finance operations, and hence, firms with greater equity finance dependence should be expected to hire more around their IPO. To examine this conjecture, we classify our firms into two groups. The first group consists of firms operating in sectors of the economy with above-median dependence on external equity finance, while the second includes firms in industries with a level of equity finance dependence below the sample median. Using an industry-level measure, we can circumvent endogeneity issues that arise with firm-level measures and thus derive stronger results. The first row in Table 5 shows that, compared to firms in industries with lower dependence on external equity (*Finance Dependence: Low*), firms in industries with higher dependence (*Finance Dependence: High*) experience larger increases in employment during the IPO year and during post-IPO horizons up to the 2nd post-IPO year. This finding suggests that going public relaxes more the financing constraints of firms in industries that are more dependent on external equity finance. Thus, it allows them to invest relatively more in human capital through the equity capital raised at the IPO. The difference becomes less pronounced over longer post-IPO horizons.

The next row investigates the impact of the reduction in the cost of debt following an IPO on employment growth. If an IPO leads to an increase in the bargaining power of a firm vis-à-vis its lenders, then cost of debt should decrease leading to an additional relaxation of financial constraints as suggested by Rajan (1992). We follow Pagano et al. (1998) and define the variable Relative Cost of Credit (RCC) as 1 plus the cost of debt for the IPO firm, scaled by 1 plus the median cost of debt for all Compustat firms for that calendar year. Cost of debt is captured by the

ratio of total interest expense (XINT) to total long-term and short-term debt (DLTT + DLC). Firms with above-median (below-median) change in RCC from the beginning of the IPO year to the end of the respective post-IPO year are categorized as *High* (*Low*). We find an interesting effect of the RCC on employment growth: There is no difference between high and low RCC firms in the IPO year but starting from the first year after the IPO, firms with the smaller change in RCC, i.e. firms with relatively larger decrease in their cost of credit, are associated with higher employment growth. This suggests that the effect from the IPO on firm's access to debt markets is not immediate but as the firm disseminates more information in the post-IPO period its access to debt markets improves with a consequent enhanced ability to invest in human capital.

The third row of Table 5 examines the employment dynamics based on firms' acquisition behavior. If an IPO improves a firm's ability to undertake acquisitions, as suggested by Celikyurt, Sevilir and Shivdasani (2010), it might be possible that the high employment growth at IPO firms is a manifestation of their acquisition intensity, rather than their ability to generate new jobs. In other words, IPO firms exhibit a high rate of employment growth not because going public allows them to create new jobs, but because it allows them to acquire other firms and increase the number of their employees. To investigate, we split the sample firms into firms with and without acquisition activity during the respective post-IPO horizon. As Table 5 shows, although IPO firms engaging in M&As experience greater employment growth, even IPO firms with no acquisition activity exhibit a meaningful employment growth starting in the IPO year and extending over time. This result suggests that employment dynamics at IPO firms cannot be completely explained by these firms' acquisition behavior.

Celikyurt, Sevilir and Shivdasani (2010) show that IPO firms use the capital they raise at the IPO to grow their assets and productive capacity through CAPEX and R&D. If firms need

new hires to complement their investment in physical assets, one might expect that IPO firms with greater growth needs in terms of assets should also increase their employment more than IPO firms with lower growth. To investigate, we split the sample into IPO firms in high-growth and in low-growth industries. We note that, while industry growth dynamics are important, both types of firms experience a pronounced growth in employment around their IPOs.

There are two types of shares issued and sold at an IPO. Primary shares are issued to raise investment capital for the firm, whereas secondary shares are sold by insiders and founders to cash out. If firms go public with a motive to improve their ability to invest in human capital through the hiring of new employees, we would expect this motive to be stronger for firms that raise relatively more capital for investment during the offering. To capture such incentives, we identify firms with a greater amount of investment capital raised at the IPO by examining the amount of primary proceeds raised during the offering. Specifically, we classify the sample firms into IPOs with above-median and below-median *Log(Primary Proceeds)*. The fifth row in Table 5 confirms our intuition by showing that firms with primary proceeds above the sample median have higher employment growth. Moreover, despite being significant even at longer horizons, the relative magnitude of the gap between the two types of firms decreases over time.

We also examine the employment growth of IPO firms as a function of their age when becoming public firms. Private firms that are younger at the time of their IPO might be more growth oriented and more capital constrained than older firms to the extent that they choose to go public at an earlier age. Hence, such firms should be in greater need for human capital and use the IPO to raise capital for hiring new employees. Moreover, firms that have existed as private firms for a long period of time are more likely to have alternative financing channels, such as well-established banking relationships, which could have made their long private existence

possible. Hence, the IPO might relax financial constraints for such firms to a lesser extent. To investigate, we examine how the employment growth rate at the IPO stage of our sample firms varies with their time as private entities before the IPO. Supportive of this idea, row six in Table 5 shows that younger firms, that is, firms with private age below the sample median experience a greater increase in their employment levels than firms with above-median private age. This finding emphasizes the importance of public capital markets in providing capital for young and growth-oriented firms to create new jobs and employment.

We also examine the employment growth profile of IPO firms based on whether they are VC-backed or not. If VC-backed firms are more growth and innovation oriented, and likely have greater dependence on equity finance, it may be plausible to expect that they exhibit greater employment growth around their IPO. By contrast, if the IPO decision for these firms reflects mainly the VCs' incentive to exit, one might observe the opposite effect. Confirming our former conjecture, the seventh row in Table 5 shows that, relative to non VC-backed firms, VC-backed IPO firms experience a greater increase in employment during their IPO year as well as in the subsequent one-, two- and three-year periods. This finding stresses the importance of public equity markets in fostering entrepreneurship and new firm creation given that VCs would have greater incentives to provide financing and other services to new start-ups if they expect they could raise sufficient financing at a future IPO for realizing the growth prospects of their portfolio firms.

Finally, we use the Z-score, as modified by Sufi (2009), to capture the change of the firm's default risk around the IPO year.[8] We find that firms that experience larger increase in Z-score (thus, the largest decline in default risk) are associated with higher employment growth.

4.2. Multivariate Analysis of Underlying Channels

We next move to examine the underlying channels highlighted by the cross-sectional patterns documented so far in a multivariate framework that takes into account differences in firm characteristics. We show the regression results from three different specifications in Table 6.

[Insert Table 6]

To understand the relation between employment growth, and investment and financing patterns, we begin in Panel A of Table 6 by estimating a cross-sectional regression in which the dependent variable is the change in log-employment estimated from the beginning of the IPO year to the end of the *n*-th post-IPO year, where *n* covers horizons from 0 to 2 years. Specifically, the first two columns in Panel A use the employment growth from the beginning of the IPO year to the end of the IPO year. Columns (3) and (4) focus on the cumulative growth estimated from the beginning of the IPO year to the end of the first post-IPO year. Columns (5) and (6) extend the time horizon by measuring the growth in employment from the beginning of the IPO year to the 2nd post-IPO year.

We adopt three different specifications for our analysis. The first specification uses industry-level measures of dependence on external equity (*High Finance Dependence*) to capture financial constraints. This is an indicator variable that takes the value of 1 if the firm is in a

[8] The modified Z-score is constructed as the sum of the following: 3.3×(Earnings before Interest and Tax (EBIT) / Total Assets (AT)), 1.4×(Retained Earnings (RE) / Total Assets), 1.2×(Net Working Capital (WCAP) / Total Assets), (Sales (SALE) / Total Assets).

sector with high, i.e. above-median, dependence on external equity finance and zero otherwise. When using this type of specification we cannot include industry fixed effects. We do so in the second and third specifications to control for unobservable time-invariant heterogeneity at industry level. Panel A shows the specification with industry-level financial dependence, while Panels B and C show the specification with industry fixed effects.

In our estimation models, we include as explanatory variables the amount of investment capital generated via the offering, measured by the amount of primary proceeds raised at the IPO scaled by firm's pre-IPO assets, i.e. *Log(Primary Proceeds)*. We control for presence of venture capital financing through an indicator that takes into account whether the going-public firm is backed by a VC or not (*VC-Backed*). We also include the logarithmic transformation of 1 plus the difference between the IPO year and the founding year of the firm (*Time as Private*). As a major determinant of firms' hiring needs might be their expansion of physical assets and investment in capacity, we also include the cumulative amount of capital expenditures (CAPX) made during the relevant horizon as a fraction of the firm's pre-IPO total assets (*Capx/Assets*). Similarly, since employment levels in a firm are expected to depend on the amount of M&A activity the firm undertakes, we also include a measure of firm's cumulative M&A activity (AQC) over the various time horizons we consider, normalized by the book value of the firm's pre-IPO total assets (*Acquisitions/Assets*).

An IPO allows the firm to expand its hiring not only through the equity capital raised at the IPO, but also through an easier access to equity and debt capital markets post IPO. To test this conjecture, we also consider the total amount of equity and debt capital raised by the firm during the respective time horizon, normalized by the firm's pre-IPO total assets. Specifically, *Net Debt Issue/Assets* and *Net Equity Issue/Assets* measure the debt and equity financing raised

by the firm during the respective horizon, scaled by the firm's pre-IPO total assets. Net debt issue is defined as the issuance of long-term debt (DLTIS) minus retirement of long-term debt (DLTR), while net equity issue is defined as the sale of common and preferred stock (SSTK) minus purchase of common and preferred stock (PRSTKC).

Finally, in all models in Table 6, we control for aggregate economic conditions at the time of the IPO through year fixed effects.

To separate financing decisions from investment effects, we estimate the odd-numbered columns in Table 6 including measures of firm's capital expenditures and acquisition activity during the relevant post-IPO horizon. The even-numbered columns reflect capital infusion through debt and equity issuance.

Our results show that the relative magnitude of investment capital raised through primary proceeds at the IPO is positively related to employment growth during the IPO year but loses its importance once the firm enters and becomes more established in the public domain, i.e. over longer horizons. The coefficient on *Log(Primary Proceeds)* in columns (1) through (4) of Panel A is positive and statistically significant at the 1% level. However, it loses significance once longer horizons are introduced. This is consistent with the notion of temporary alleviation of financial constraints around the IPO event. Thus, firms raising more capital for investment purposes, rather than merely allowing insiders to cash out, increase substantially the number of their employees and the amount of human capital.

The coefficient of the indicator variable that shows whether the firm is VC-backed is positive, but not significant. This could reflect the nuanced incentives of VC investors and the types of firm they finance. Younger firms experience a greater growth in employment at the IPO year as well as during the one- and two-year periods following the IPO date. In addition to that,

we also find, as expected, that firms with greater investment in fixed assets increase employment at a greater rate during the IPO year, as well as in the subsequent post-IPO years, as indicated by the positive and significant coefficients of *Capx/Assets* in all columns of Panel A. The importance of physical capital expansion as a determinant of human capital expansion remains significant in the post-IPO period starting from the IPO year and extending to subsequent years. Similarly to capital expenditures, acquisition activity is also positively related to employment growth, consistent with the view that part of the employment growth observed in the IPO firms is due to the acquisition activity undertaken by these firms.

Moving to financial constraints, our analysis offers a number of insights. First, and different from the univariate results, we do not find robust evidence that firms in industries with high dependence on external equity exhibit a greater increase in employment beyond the IPO year. The coefficient on *High Finance Dependence* is significant only in Column (1) of Panel A. Second, debt capital raised subsequent to the IPO is positively related to employment growth over the early post-IPO period. This result suggests that an IPO allows the firm to hire both through the use of primary proceeds raised at the IPO and debt capital raised subsequent to the IPO. Third, similar to debt capital, equity capital raised after the IPO is also positively related to the employment growth at the IPO firms over one and two-year periods following the IPO. This result emphasizes the role of IPO in providing the firm with a continuous access to public equity markets. In terms of economic magnitude, 1% increase in debt capital raised over the period from the IPO year to one year after the IPO, as a proportion of asset value, is associated with approximately 0.1% increase in the employment growth in the same period. By contrast, the same percentage increase in equity capital raised over the period from the IPO year to two years after the IPO, as a proportion of pre-IPO asset value, is associated with a much smaller increase

in employment growth. The finding that the economic significance of debt capital is more pronounced than that of equity capital is consistent with the arguments in Pagano et al. (1998), who show that firms going public experience an improvement in their ability to borrow. It is also consistent with the evidence in Celikyurt et al. (2010) that an IPO improves the firm's ability to raise debt financing and to undertake debt-financed acquisition opportunities.

In Panel B of Table 6 we include industry fixed effects to control for unobservable heterogeneity across industries, defined at the 2-digit SIC level. The importance of the amount of investment capital raised at the offering is confirmed by the positive and significant coefficient on *Log(Primary Proceeds)* in columns (1) and (2) of Panel B. Our findings with respect to the other determinants of employment growth remain mostly unchanged, with the exception that VC financing appears an important determinant of employment growth once industry fixed effects are included.

In Panel C we investigate the robustness of our results to the inclusion of *pre-IPO* asset growth rates. It can be argued that the employment growth we find in the IPO year and the period immediately after is the direct result of the trend in growth rate experienced by the firm in the pre-IPO stage and not due to the access of new sources of funding obtained through the IPO decision. The evidence in Panel C is not consistent with this argument: The results documented above, especially the impact of primary proceeds, equity and debt issues, remain unchanged.

Thus, our univariate tests and multivariate analyses establish a robust positive association between the going-public event and employment growth. To obtain a deeper understanding of the underlying mechanisms, we augment our multivariate specifications with measures intended to reflect improvement in a firm's ability to borrow after it goes public.

[Insert Table 7]

In Panel A of Table 7, we extend our baseline model from Panel B in Table 6 by including two new variables. The first variable measures the pre-IPO leverage ratio of a firm (*Debt/Assets (Pre-IPO)*). The second variable, *D(ΔZ-score > P75)*, is an indicator that takes the value of 1 if the change in the firm's *Z-score* from the beginning of the IPO year to the year-end of the respective post-IPO year exceeds the 75th percentile of sample changes, and 0 otherwise. We note from Panel A of Table 7 that firms with a lower pre-IPO leverage experience greater increase in employment at the IPO year as well as over the one- and two-year periods following the IPO. To the extent that a lower leverage ratio before the IPO implies a greater degree of financing constraints due to borrowing inability, the negative and significant coefficient on the pre-IPO leverage measure suggest that going public relaxes financing constraints, and improves hiring ability the most for firms which exhibit a greater degree financial constraints before going public. We also find that firms with more pronounced reductions in default probability have larger increases in employment, as indicated by the positive and significant coefficient on the variable that measures large changes in firm's default probability, i.e. *D(ΔZ-score > P75)*. This result is consistent with IPO firms' improved access to debt capital markets. In addition, it is supportive of the notion that going public may imply a greater supply of labor willing to work at public firms characterized with a lower default risk.

One would expect most of the effects to be much stronger for young start-ups where the information asymmetry of access to capital markets is more severe. We examine this conjecture in the even-numbered columns of Panel A in Table 7 by interacting firm's age at IPO with its improvement in credit risk. We note that younger IPO firms which experience larger decline in probability of default increase employment the most, as suggested by the negative and significant coefficient on the interaction between *Time as Private* and *D(ΔZ-score > P75).* As information

asymmetry is more pronounced for such young firms, the observed reduction in default risk is more informative than that for relatively more established firms. Finally, the positive effect of decline in the probability of default on post-IPO employment is greater for firms with a lower pre-IPO leverage, although significant only in the one year period following the IPO. This result suggests that the positive effect of improved access to debt capital markets on employment is greater for IPO firms that were more likely to be financially constrained and rationed out of the debt markets before going public.

In Panel B of Table 7, we explore the change in cost of credit, and thus improvement in firm's borrowing ability, as a mechanism underlying the increase in total employment for firms accessing public equity for the first time. Specifically, we define an indicator *D(ΔRCC < P25)* that takes the value of 1 if the change in the firm's *RCC* from the beginning of the IPO year to the year-end of the respective post-IPO year is below the 25th percentile of sample changes, and 0 otherwise. Thus, these are firms that experience relatively larger improvement in the price of credit. Column (1) in Panel B of Table 7 shows that firms with the smallest change (i.e., greatest reduction) in their cost of debt in the IPO year exhibit greater employment growth. Similarly, firms which experience the greatest reduction in their cost of debt in the one year period after the IPO have greater employment growth over the first two years after going public. Columns (2) and (4) show that the positive relation between the reduction in cost of debt and employment is stronger for firms with higher pre-IPO leverage ratios. This suggests that going public and the related enhanced ability to borrow are more important for firms relying on a greater amount of debt financing.

In order to offer additional insights into the economic channels underlying the dynamics of employment growth around the IPO, we focus on the sensitivity of employment growth at the

firm level to firm-level cash flows. Existing literature argues that external finance availability affects employment indirectly through its impact on investment. When capital market frictions exist, investment in physical capital will be limited by the availability of internal funds and due to complementarities between labor and capital, firms will adjust employment accordingly. This argument is reminiscent of the investment-cash-flow sensitivity literature (Fazzari et al. (1998) and Rauh (2006), among others) but we apply it to firm's investment in human capital. Existing studies (e.g., Benmelech et al. (2012)) use firm's profitability as a proxy for cash flows and focus on the coefficient of profitability as a measure of the sensitivity of employment to cash flows. Fazzari et al. (1998) argue in a neoclassical model of investment that in the absence of friction in financial markets the coefficient on cash flows is zero. In the presence of frictions, however, we expect a positive and significant coefficient as firms suffer from financial constraints due to limited access to external financing and thus need to use internal cash flows. This in turn should impact their ability to invest in human capital.

We investigate whether better access to financial markets after the IPO is completed changes firm's employment-cash flow sensitivity. To do so, we return back to our NETS IPOs sample as it allows us to examine how the sensitivity changes before and after the IPO, while the Compustat data are extremely sparse in the pre-IPO period. However, we are restricted along two dimensions: First, the number of firm-level control variables we can include in the estimation is limited, and second, the NETS database does not contain information on profitability, used in the existing literature as a proxy for cash flows. To address the first issue, we include firm fixed effects to control for time-invariant heterogeneities across firms. We address the second issue by using sales as a proxy of our intended measure. We also note that we are using contemporaneous

sales in these estimations to be consistent with the underlying theoretical motives. We show the results from several specifications in Table 8.

[Insert Table 8]

There are two coefficients of interest to test the employment-cash flow sensitivity: The coefficient on sales (that determines the baseline relationship), and the coefficient on the interaction between sales and the Post IPO dummy (that shows how the relationship changes after the IPO). A positive coefficient on the sales variable implies that due to binding financial constraints, the firm's ability to realize employment growth is constrained by the availability of internal funds. A negative coefficient on the interaction between sales and the Post IPO dummy implies that the constraints are relaxed after the IPO.

The results show that the coefficient on sales is statistically different from zero in all specifications, controlling for firm fixed effects and year fixed effects. This is inconsistent with the neoclassical model with no frictions and is consistent with the view that firm's financial constraints play a role in the employment decision. Importantly, the coefficient of the interaction between sales and the post IPO dummy is negative and has statistical and economic significance in all specifications. This result is confirmed when we use sales growth and credit ratings as firm-level controls together with firm fixed effects. This result shows that the sensitivity of employment growth to firm-level cash flows declines significantly in the post-IPO period, suggesting that better access to financial markets after the IPO positively impacts employment decisions also through the complementarities with capital investment.

Our last set of results should be interpreted with caution given the well-known concerns found by the investment-cash flow sensitivity literature regarding omitted variables and potential endogeneity issues. In an attempt to mitigate these concerns, we note that our analysis includes a

number of relevant firm-level control variables and also firm fixed effect that should absorb any firm-level unobserved heterogeneity. Furthermore, it should also be noted that any impact of financial constraints on employment growth can be of a direct nature or can happen indirectly through the adjustment of capital investment. Lack of data about capital investments makes it impossible for us to distinguish between these two competing hypotheses.

To further alleviate some of the concerns, we next investigate whether the change to the employment-cash flow sensitivity after the IPO holds when we compare the effects documented in the NETS IPOs sample to those observed in the withdrawn IPOs control group. If the change in the employment-cash flow sensitivity shown in Table 8 is due to better access to public capital markets after the IPO, we should expect this result to hold only for firms that complete the IPO and not for those that withdrew their offering. We show the results from several specifications, using firm and year fixed effects, in Table 9.

[Insert Table 9]

Our focus is on two coefficients of interest: One that measures how the employment-cash flow sensitivity changes for the firms with completed IPO, i.e. the interaction between sales and the Post IPO dummy, and one that captures this change for firms in the Withdrawn IPOs control group, i.e. the interaction between sales and the Post Withdrawn IPO dummy. We find that the employment-cash flow sensitivity decreases, in a statistically significant way, only for the IPO firms and there is no impact on the withdrawn IPO control firms.

Finally we also investigate if the change in the employment-cash flow sensitivity is more pronounced in non-service firms (defined as firms in all 2-digit SIC codes industries excluding those between 60 and 89) compared to service firms (defined as firms in the 2-digit SIC codes from 70 to 89). The nature of labor costs in these two groups may be very different and thus a

relaxation of financial constraints may affect adjustment and employment dynamics differently. Table 10 shows our estimation results using the NETS IPOs sample and the Withdrawn IPOs control group.

[Insert Table 10]

The results for the firms in the service sectors are shown in Columns (1) to (4), while those for firms in the non-service sectors are in the remaining ones. We note that the magnitude of the coefficient of sales (first row) is larger for firms in the non-service industries, implying that any impact of financial constraints on employment growth is larger in these sectors. Second, the impact on employment growth of the IPO relaxing these constraints is mostly experienced among the non-service firms, while results are much weaker for service firms.

5. Conclusions

Going public represents one of the most significant steps in a firm's lifecycle as it enables it to raise funds needed for investing in human capital and physical assets. Although the existing research in the IPO literature establishes the importance of going public for funding expansion through capital expenditures and acquisitions, there has been little focus on the implications of IPOs for employment dynamics and firm investment in human capital. The potential association between access to public equity and employment has also attracted significant attention from policymakers given the contribution small and growth-oriented firms in the U.S. economy make towards employment growth.

This paper examines the employment dynamics of a sample of IPO firms and provides evidence that firms exhibit significant employment growth at the IPO stage. During its IPO year and the first post-IPO year, the average firm in our sample experiences an annual employment

growth of almost 39% per year. By contrast, the annual growth rate of employment for firms between their 10^{th} and 20^{th} post-IPO year is less than 5%.

Our analysis recognizes a potential endogeneity concern that both employment and going public decisions might be influenced by unobservable firm-level factors. To address the concern we use a novel database of private firms to construct various control groups. First, we show that IPO firms exhibit larger employment growth around their IPO relative to a control sample of private firms with similar characteristics. Second, we find that IPO firms also experience larger employment growth compared to a sample of private firms that file for an IPO but eventually withdraw the offering and remain private. The results are consistent with a positive causal impact of firms' decision to go public on their ability to invest in human capital and hire more.

We also study possible economic channels underlying the relationship between IPO and employment growth. Our analysis points to the relaxation of firm's financial constraints both in the immediate aftermath of the IPO, through the initial capital infusion, as well as in the longer term, through enhanced ability to access both debt and equity capital markets. Firms that raise more funds at the IPO stage and firms with a more pronounced reduction in borrowing costs following the IPO experience the largest increase in post-IPO employment growth.

References

Alti, A., 2006, How persistent is the impact of market timing on capital structure?, *Journal of Finance* 61, 1681-1710.

Amess, K. and M. Wright, 2007, The wage and employment effects of Leveraged Buyouts in the UK, *International Journal of the Economics and Business* 14, 179-195.

Benmelech, E., N. K. Bergman, and A. Seru, 2012, Financing labor, *working paper*.

Bernstein, S., 2013, Does going public affect innovation, *working paper*.

Boehmer, E., and A. Ljungqvist, 2004, On the decision to go public: Evidence from privately-held firms, *working paper*.

Boucly, Q., D. Sraer, and D. Thesmar, 2012, Leveraged buyouts: Evidence from French deals, *Journal of Financial Economics*.

Busaba, W.Y. 2006, Bookbuilding, the option to withdraw, and the timing of IPOs, *Journal of Corporate Finance* 12 (2): 159-186.

Busaba, W.Y., L. M. Benveniste, and R-J. Guo, 2001, The option to withdraw IPOs during the premarket: empirical analysis, *Journal of Financial Economics* 60 (1): 73-102.

Celikyurt, U., M. Sevilir, and A. Shivdasani, 2010, Going public to acquire? The acquisition motive in IPOs, *Journal of Financial Economics* 96, 345-363.

Davis, S., J. Haltinwanger, R. Jarmin, J. Lerner, and J. Miranda, 2011, Private equity and employment, *working paper*.

Farmer, R. E., 1985, Implicit contracts with asymmetric information and bankruptcy: The effect of interest rates on layoffs, *Review of Economic Studies*, 52(3) 427-442.

Fazzari, S., G. Hubbard, and B. Petersen, 1988, Financing constraints and corporate investment, Brookings Papers on Economic Activity, 141-195.

Greenwald, B. and J. E. Stiglitz, 1986, Externalities in economies with imperfect information and incomplete markets", *Quarterly Journal of Economics*, 101 229-264.

Hamermesh, D., 1989, Labor demand and the structure of adjustment costs, *American Economic Review*, 79, 674-689.

Hamermesh, D., and G. Pfann, 1996, Adjustment costs in factor demand, *Journal of Economic Literature*, 34, 1264-1292.

Harris, R., D. Siegel, and M. Wright, 2005, Assessing the impact of management buyouts on economic efficiency: Plant-level evidence from the United Kingdom, *Review of Economics and Statistics* 87, 148-153.

Ibbotson, R., and J. Jaffe, 1975, "Hot issue" markets, *Journal of Finance* 30, 1027-1042.

Ibbotson, R., J. Sindelar, and J. Ritter, 1988, Initial public offerings, *Journal of Applied Corporate Finance* 1, 37-45.

Ibbotson, R., J. Sindelar, and J. Ritter, 1994, The market's problem with the pricing of initial public offerings, *Journal of Applied Corporate Finance* 7, 66-74.

IPO Task Force Report, 2011, Rebuilding the IPO On-Ramp: Putting Emerging Companies and the Job Market Back on the Road to Growth, presented to the U.S. Department of the Treasury.

Kaplan, S., 1989, The effects of management buyouts on operating performance and value, *Journal of Financial Economics* 24, 217-254.

Kaplan, S., and L. Zingales, 1997, Do investment-cash flow sensitivities provide useful measures of financing constraints?, *Quarterly Journal of Economics* 112, 169-215.

Kenney, M., D. Patton, and J. Ritter, 2012, Post-IPO employment and revenue growth for U.S. IPOs, June 1996-2010, *working paper*.

Kim, W., and M. Weisbach, 2008, Motivations for public equity offers: An international perspective, *Journal of Financial Economics* 87, 281-307.

Kolko, J., and D. Neumark, 2007, *Business Location Decisions and Employment Dynamics in California*, Public Policy Institute of California.

Lamont O., C. Polk, and J. Saá-Requejo, 2001, Financial constraints and stock returns, *Review of Financial Studies* 14, 529-554.

Lichtenberg, F. and D. Siegel, 1987, Productivity and changes in ownership of manufacturing plants, *Brookings Papers on Economic Activity: Microeconomics*, 643-683.

Lichtenberg, F. and D. Siegel, 1990, The effects of leveraged buyouts on productivity and related aspects of firm behavior, *Journal of Financial Economics* 27, 165-194.

Long, W. and D. Ravenscraft, 1993, The financial performance of whole company LBOs, *working paper*.

Lowry, M., 2003, Why does IPO volume fluctuate so much?, *Journal of Financial Economics* 67, 3-40.

McGuckin, R. and S. Nguyen, 2001, The impact of ownership changes: A view from labor markets, *International Journal of Industrial Organization* 19, 739-762.

Mikkelson, W.H., M. Partch, and K. Shah, Ownership and Operating Performance of Companies that Go Public, 1997, *Journal of Financial Economics* 44, 281-307.

Muscarella, C. and M. Vetsuypens, 1990, Efficiency and organizational structure: A study of reverse LBOs, *Journal of Finance* 45, 1389–1413.Oi, W., 1962, Labor as a quasi-fixed factor, *Journal of Political Economy*, 70, 538-555.

Pastor, L., L. Taylor, and P. Veronesi. 2009, Entrepreneurial learning, the IPO decision, and the post-IPO drop in firm profitability, *Review of Financial Studies* 22 (8): 3005.

Pagano, M., F. Panetta, and L. Zingales, 1998, Why do companies go public? An empirical analysis, *Journal of Finance* 53, 27-64.

Rajan, R., and L. Zingales, 1998, Financial dependence and growth, *American Economic Review* 88, 559-586.

Rajan, R., 1992, Insiders and outsiders: The choice between informed and arm's length debt, *Journal of Finance* 47, 1367-1400.

Rauh, J., 2006, Investment and financing constraints: Evidence from the funding of corporate plans, *Journal of Finance* 61(1), 33-71.

Ritter, J., 1984, The "hot issue" market of 1980, *Journal of Business* 57, 215-240.

Ritter, J., 1991, The long-run performance of initial public offerings, *Journal of Finance* 46, 3-27.

Sufi, A., 2009, Bank lines of credit in corporate finance: An empirical analysis, *Review of Financial Studies* 22, 1057–1088.

Wright, M., S. Thompson, and K. Robbie,1992, Management-led Leveraged Buyouts: A European perspective, *Journal of Business Venturing* 7, 45-71.

Zingales, L., 1995, Insider ownership and the decision to go public, *The Review of Economic Studies* 62, 425-448.

Table 1: Summary Statistics

The table shows selected summary statistics for three samples used in the analysis. Panel A reports measures for the sample of firms that complete an IPO during 1990-2010 and could be matched to the NETS database (NETS IPOs sample). Panel B reports measures for the sample of firms that file for an IPO during 1990-2010 but subsequently withdraw the offering and could be matched to NETS (Withdrawn IPOs control group). Panel C reports the matched sample of private firms that remain private (Private firms control group). The sample of private control firms is created from one-to-one matching with replacement based on the propensity to go public (PS), industry (2-digit SIC code) and year. PS is estimated using the following characteristics: log of pre-IPO sales, log of pre-IPO employment, pre-IPO 3-year change in log employment, pre-IPO 3-year change in log sales, pre-IPO 1-year change in log employment, and pre-IPO 1-year change in log sales. The variables are described in Appendix A. *, **, and *** indicate whether the mean and median of the respective variable for the two control groups shown in Panels B and C are statistically different from the respective values of the completed IPOs (NETS IPOs sample) shown in Panel A at the 10%, 5%, and 1% levels, respectively.

	ΔLog(Emp) Year -1	ΔLog(Emp) Year 0	ΔLog(Emp) Year 0-2	ΔLog(Sale) Year -1	Log(Sale) Year -1	Sale Year -1	Log(Emp) Year -1	Emp Year -1	Paydex
Panel A: Completed IPOs in NETS Dataset (N = 2,914)									
Mean	0.31	0.38	0.98	0.33	16.21	70,048,941	4.65	620.44	70.82
Median	0.06	0.13	0.68	0.10	16.30	12,017,478	4.61	100.00	72.00
SD	0.72	0.92	1.29	0.81	1.96	455,159,632	1.73	3,676.83	7.47
Panel B: Withdrawn IPOs in NETS (N = 536)									
Mean	0.33	0.20***	0.40***	0.35	16.17	100,228,460	4.62	853.75	69.72***
Median	0.00***	0.00***	0.15***	0.06***	16.29	11,856,450	4.60	99.00	71.50
SD	0.94	0.84	1.10	1.00	2.19	447,250,168	1.97	5,547.60	8.19
Panel C: Private Firms Control Group (N = 1,825)									
Mean	0.19***	-0.02***	-0.09***	0.23***	16.52*	96,205,568	4.82	698.80	71.50
Median	0.00***	0.00***	0.00***	0.04***	16.52	15,000,000	4.84*	127*	71.50
SD	0.64	0.46	0.77	0.68	1.87	725,186,091	1.79	4,036.17	3.29

Table 2: Annual Employment Changes after the IPO

The table shows results from panel regressions of the annual change in log-employment. The estimation in Panel A uses the NETS IPOs sample and the Private firms control group. The sample of private control firms is created from one-to-one matching with replacement based on the propensity to go public (PS), industry (2-digit SIC code) and year. PS is estimated using the following characteristics: log of pre-IPO sales, log of pre-IPO employment, pre-IPO 3-year change in log employment, pre-IPO 3-year change in log sales, pre-IPO 1-year change in log employment, and pre-IPO 1-year change in log sales. The estimation shown in Panel B uses the NETS IPOs sample and the Withdrawn IPOs control group, where the withdrawn IPOs control group consists of firms that file for an IPO during 1990-2010 but subsequently withdraw the offering and could be matched to the NETS database. The samples are defined in Table 1. The variables are described in Appendix A. Robust standard errors clustered at firm level are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. All specifications include firm and year fixed effects.

Panel A

	(1)	(2)	(3)
D(IPO Year)	0.162***	0.169***	0.095***
	(0.019)	(0.018)	(0.018)
D(IPO Year + 1)	0.168***	0.212***	0.142***
	(0.018)	(0.017)	(0.017)
D(IPO Year + 2)	0.076***	0.158***	0.097***
	(0.017)	(0.016)	(0.016)
D(IPO Year + 3)	0.004	0.098***	0.036***
	(0.014)	(0.014)	(0.014)
Log(Sales)		-0.163***	-0.194***
		(0.006)	(0.009)
ΔLog(Sales)			0.004
			(0.012)
PayDex			0.002**
			(0.001)
Constant	0.216***	2.692***	3.036***
	(0.012)	(0.086)	(0.151)
Year FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	55,962	55,962	24,934
R-squared	0.026	0.110	0.151

Table 2 continued.
Panel B

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
D(IPO Year)	0.202***		0.202***	0.198***		0.198***	0.107***		0.107***
	(0.018)		(0.018)	(0.017)		(0.017)	(0.016)		(0.016)
D(IPO Year + 1)	0.231***		0.231***	0.263***		0.264***	0.187***		0.188***
	(0.017)		(0.017)	(0.016)		(0.016)	(0.015)		(0.015)
D(IPO Year + 2)	0.080***		0.080***	0.165***		0.166***	0.115***		0.116***
	(0.015)		(0.015)	(0.014)		(0.014)	(0.013)		(0.013)
D(IPO Year + 3)	-0.010		-0.010	0.090***		0.091***	0.062***		0.063***
	(0.013)		(0.013)	(0.012)		(0.012)	(0.012)		(0.012)
D(Withdrawal Year)		0.016	0.028		0.072	0.090*		0.040	0.056
		(0.052)	(0.052)		(0.047)	(0.047)		(0.045)	(0.045)
D(Withdrawal Year + 1)		0.004	0.014		0.064	0.081		0.058	0.071
		(0.054)	(0.054)		(0.051)	(0.051)		(0.045)	(0.045)
D(Withdrawal Year + 2)		-0.018	-0.009		0.064	0.080*		0.007	0.020
		(0.048)	(0.048)		(0.045)	(0.045)		(0.049)	(0.049)
D(Withdrawal Year + 3)		-0.046	-0.040		0.028	0.039		0.019	0.029
		(0.036)	(0.036)		(0.033)	(0.033)		(0.031)	(0.032)
Log(Sales)				-0.203***	-0.200***	-0.204***	-0.224***	-0.225***	-0.225***
				(0.006)	(0.006)	(0.006)	(0.008)	(0.008)	(0.008)
ΔLog(Sales)							0.002	0.008	0.002
							(0.009)	(0.009)	(0.009)
PayDex							0.002***	0.002***	0.002***
							(0.000)	(0.000)	(0.000)
Constant	0.288***	0.297***	0.288***	3.354***	3.310***	3.359***	3.495***	3.511***	3.496***
	(0.015)	(0.015)	(0.015)	(0.097)	(0.097)	(0.097)	(0.130)	(0.131)	(0.130)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	52,457	52,457	52,457	52,457	52,457	52,457	42,141	42,141	42,141
R-squared	0.039	0.030	0.039	0.148	0.136	0.148	0.168	0.161	0.168

Table 3: Cumulative Employment Changes in the Post-IPO Period

The table shows results from cross-sectional regressions of the cumulative change in log-employment over various post-IPO horizons. The estimation in Panel A uses the NETS IPOs sample and the Private firms control group. The sample of private control firms is created from one-to-one matching with replacement based on propensity to go public (PS), industry (2-digit SIC code) and year. PS is estimated using the following characteristics: log of pre-IPO sales, log of pre-IPO employment, pre-IPO 3-year change in log employment, pre-IPO 3-year change in log sales, pre-IPO 1-year change in log employment, and pre-IPO 1-year change in log sales. The estimation shown in Panel B uses the NETS IPOs sample and the Withdrawn IPOs control group, where the Withdrawn IPOs control group consists of firms that file for an IPO during 1990-2010 but subsequently withdraw the offering and could be matched to the NETS database. The samples are defined in Table 1. In columns (1) through (3) of each panel, *ΔLog(Emp) Year 0* is the change in log of total employment from the beginning of the event year to the end of the event year. In columns (4) through (6), *ΔLog(EMP) Year 0-1* is the change in log of total employment from the beginning of the event year to the end of the first post-event year. In columns (7) through (9), *ΔLog(EMP) Year 0-2* is the change in log of total employment from the beginning of the event year to the end of the second post-event year. The event year, i.e. Year(0), refers to the year of issue for the NETS IPOs sample and the year of withdrawal for the Withdrawn IPOs control group. The variables are described in Appendix A. Robust standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. All specifications include industry and year fixed effects.

Panel A

	ΔLog(Emp) Year 0			ΔLog(Emp) Year 0-1			ΔLog(Emp) Year 0-2		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
D(IPO Firm)	0.334***	0.327***	0.313	0.682***	0.671***	0.465*	0.942***	0.930***	0.836**
	(0.025)	(0.026)	(0.221)	(0.048)	(0.051)	(0.240)	(0.058)	(0.061)	(0.340)
Log(Sales)		-0.064***	-0.101***		-0.117***	-0.175***		-0.135***	-0.182***
		(0.009)	(0.017)		(0.018)	(0.024)		(0.023)	(0.036)
ΔLog(Sales)			0.006			0.007			-0.017
			(0.045)			(0.047)			(0.055)
PayDex			0.004**			0.008***			0.008**
			(0.002)			(0.003)			(0.003)
Constant	-0.027	1.021***	1.356**	0.151	2.043***	2.899***	0.041	2.234***	2.997***
	(0.149)	(0.217)	(0.564)	(0.261)	(0.328)	(0.759)	(0.260)	(0.424)	(1.028)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,733	3,733	1,633	3,588	3,588	1,609	3,282	3,282	1,503
R-squared	0.071	0.101	0.078	0.144	0.192	0.123	0.183	0.227	0.108

Table 3 continued.
Panel B

	ΔLog(Emp) Year 0			ΔLog(Emp) Year 0-1			ΔLog(Emp) Year 0-2		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
D(Complete)	0.211***	0.181***	0.177***	0.454***	0.406***	0.338***	0.590***	0.532***	0.447***
	(0.056)	(0.049)	(0.050)	(0.085)	(0.071)	(0.068)	(0.089)	(0.068)	(0.069)
Log(Sales)		-0.141***	-0.124***		-0.227***	-0.202***		-0.257***	-0.213***
		(0.017)	(0.019)		(0.022)	(0.024)		(0.029)	(0.031)
ΔLog(Sales)			0.005			0.026			0.021
			(0.033)			(0.029)			(0.035)
PayDex			0.006***			0.009***			0.006**
			(0.002)			(0.002)			(0.003)
Constant	0.274***	2.565***	1.818***	0.169	3.870***	2.750***	0.429***	4.617***	3.251***
	(0.091)	(0.274)	(0.380)	(0.117)	(0.305)	(0.451)	(0.132)	(0.403)	(0.598)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,231	3,231	2,516	3,158	3,158	2,461	2,972	2,972	2,305
R-squared	0.018	0.102	0.105	0.023	0.155	0.155	0.022	0.159	0.141

Table 4: Instrumental Variable Analysis

The table shows results from IV analysis of the cumulative change in log-employment over various post-IPO horizons. The estimation uses the NETS IPOs sample and the Withdrawn IPOs control group made up of firms that file for an IPO during 1990-2010 but subsequently withdraw the offering and could be matched to the NETS database. The samples are further defined in Table 1. In columns (1) through (3), *ΔLog(Emp) Year 0* is the change in log of total employment from the beginning of the event year to the end of the event year. In columns (4) through (6), *ΔLog(EMP) Year 0-1* is the change in log of total employment from the beginning of the event year to the end of the first post-event year. In columns (7) through (9), *ΔLog(EMP) Year 0-2* is the change in log of total employment from the beginning of the event year to the end of the second post-event year. The event year, i.e. Year(0), refers to the year of issue for the IPOs sample and the year of withdrawal for the Withdrawn IPOs control group. The instruments used in the analysis are the average daily return on S&P500 over the 5 trading days with the lowest return during the 2-month period following the filing date for the offering and the log of the average daily volume on S&P500 during these 5 trading days. The variables are described in Appendix A. Robust standard errors are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. All specifications include industry and year fixed effects.

	ΔLog(Emp) Year 0			ΔLog(Emp) Year 0-1			ΔLog(Emp) Year 0-2		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
D(Complete)	0.560***	0.450***	0.290*	1.180***	0.985***	0.581***	1.280***	1.050***	0.836***
	(0.175)	(0.167)	(0.162)	(0.234)	(0.217)	(0.210)	(0.257)	(0.238)	(0.233)
Log(Sales)		-0.138***	-0.123***		-0.222***	-0.202***		-0.252***	-0.213***
		(0.008)	(0.008)		(0.010)	(0.011)		(0.011)	(0.012)
ΔLog(Sales)			0.003			0.027			0.015
			(0.018)			(0.023)			(0.026)
PayDex			0.005***			0.009***			0.005*
			(0.002)			(0.003)			(0.003)
Constant	0.177	2.802***	2.246***	0.116	4.353***	4.012***	0.272	5.109***	4.333***
	(0.665)	(0.652)	(0.580)	(0.869)	(0.828)	(0.737)	(0.943)	(0.900)	(0.788)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,426	3,426	2,676	3,339	3,339	2,613	3,136	3,136	2,442
R-squared	0.052	0.139	0.152	0.034	0.173	0.199	0.057	0.187	0.194
First-stage F statistic	128.22	127.75	99.28	124.37	123.89	98.05	125.24	124.62	98.68
Sargan test (p-value)	0.444	0.332	0.237	0.949	0.832	0.241	0.669	0.408	0.176

Table 5: Cross-sectional Determinants of Employment Growth

The table reports mean and median changes in log of firm's total employment for various sub-samples and over various post-IPO horizons. The analysis uses the Compustat IPOs sample. *ΔLog(EMP) Year 0* is the change in log of total employment from the beginning of the IPO year to the end of the IPO year. *ΔLog(EMP) Year 0-1* is the change in log of total employment from the beginning of the IPO year to the end of the first post-IPO year. *ΔLog(EMP) Year 0-2* is the change in log of total employment from the beginning of the IPO year to the end of the second post-IPO year. The line *All IPOs* shows the respective variables for the entire sample. The *p-values* are from t-test for the Mean columns and Wilcoxon-Mann-Whitney test for the Median columns. *High* (*Low*) *Finance Dependence* refers to IPOs in industries, defined at the 2-digit SIC level, with above-median (below-median) measure of finance dependence. *High* (*Low*) *ΔRelative Cost of Credit* refers to IPOs with above-median (below-median) change in their relative cost of credit. IPO firms without (with) positive acquisition activity are categorized into *No* (*Yes*) *Acquisition Activity* group. IPOs without (with) backing by venture capital (VC) are categorized into *No* (*Yes*) *VC-Backed* group. IPOs in industries, defined at the 2-digit SIC level, with below-median (above-median) asset growth are categorized into *No* (*Yes*) *High Growth Assets* group. *High* (*Low*) *Log(Primary Proceeds)* refers to IPOs with above-median (below-median) amount of primary proceeds raised at the IPO. *High* (*Low*) *Age at IPO* refers to IPOs with above-median (below-median) age at the time of their IPO. *High* (*Low*) *ΔZ-score* refers to IPOs with above-median (below-median) change in their Z-score. The variables are described in Appendix A.

Table 5 continued.

		ΔLog(EMP) Year 0		ΔLog(EMP) Year 0-1		ΔLog(EMP) Year 0-2	
		Mean	Median	Mean	Median	Mean	Median
Finance Dependence	Low	0.23	0.14	0.43	0.31	0.57	0.46
	High	0.32	0.24	0.53	0.44	0.62	0.54
	p-value	0.00	0.00	0.00	0.00	0.07	0.02
ΔRelative Cost of Credit	Low	0.28	0.19	0.49	0.38	0.62	0.51
	High	0.28	0.21	0.45	0.36	0.55	0.49
	p-value	0.79	0.45	0.06	0.07	0.02	0.02
Acquisition Activity	No	0.27	0.20	0.43	0.34	0.50	0.43
	Yes	0.37	0.26	0.61	0.49	0.71	0.60
	p-value	0.00	0.00	0.00	0.00	0.00	0.00
High Growth (Assets)	No	0.25	0.17	0.45	0.34	0.56	0.47
	Yes	0.33	0.25	0.54	0.45	0.64	0.55
	p-value	0.00	0.00	0.00	0.00	0.00	0.00
Log(Primary Proceeds)	Low	0.20	0.14	0.37	0.29	0.48	0.42
	High	0.43	0.35	0.67	0.60	0.76	0.69
	p-value	0.00	0.00	0.00	0.00	0.00	0.00
Age at IPO	Low	0.41	0.33	0.64	0.56	0.74	0.67
	High	0.22	0.16	0.40	0.32	0.50	0.44
	p-value	0.00	0.00	0.00	0.00	0.00	0.00
VC-Backed	No	0.27	0.18	0.47	0.35	0.57	0.47
	Yes	0.35	0.28	0.57	0.51	0.67	0.60
	p-value	0.00	0.00	0.00	0.00	0.00	0.00
ΔZ-score	Low	0.30	0.22	0.48	0.42	0.55	0.50
	High	0.33	0.24	0.55	0.43	0.69	0.56
	p-value	0.00	0.02	0.00	0.02	0.00	0.00
All IPOs	All	0.30	0.22	0.51	0.41	0.61	0.51

Table 6: IPO Decision and Employment Growth

The table reports results of cross-sectional analysis of changes in log-employment over different horizons relative to the firm's IPO. The analysis uses the Compustat IPOs sample. The specification shown in Panel A does not include industry fixed effects since it includes industry-specific measure of financial constraints (*High Finance Dependence*). The specifications in Panels B and C include industry fixed effects. In columns (1) and (2) of each panel, *ΔLog(EMP) Year 0* is the change in log of total employment from the beginning of the IPO year to the end of the IPO year. In columns (3) and (4), *ΔLog(EMP) Year 0-1* is the change in log of total employment from the beginning of the IPO year to the end of the first post-IPO year. In columns (5) and (6), *ΔLog(EMP) Year 0-2* is the change in log of total employment from the beginning of the IPO year to the end of the second post-IPO year. Accounting variables are winsorized at the 1st and 99th percentile. Industry FE are defined at the 2-digit SIC level. *P-values* based on robust standard errors are in parentheses. The variables are described in Appendix A. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A – No Industry Fixed Effects and with Industry-level Financial Constraints

	ΔLog(EMP) Year 0		ΔLog(EMP) Year 0-1		ΔLog(EMP) Year 0-2	
	(1)	(2)	(3)	(4)	(5)	(6)
High Finance Dependence	0.029**	0.003	0.031	-0.003	0.033	-0.016
	(0.024)	(0.837)	(0.126)	(0.906)	(0.228)	(0.585)
Log(Primary Proceeds)	0.111***	0.168***	0.082***	0.132***	-0.017	-0.012
	(0.001)	(0.001)	(0.001)	(0.001)	(0.531)	(0.758)
VC-Backed	0.018	0.011	0.047**	0.016	0.075***	0.049*
	(0.106)	(0.983)	(0.011)	(0.454)	(0.003)	(0.083)
Time as Private	-0.046***	-0.052***	-0.073***	-0.083***	-0.085***	-0.101***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Capx/Assets	0.198***		0.131***		0.116***	
	(0.001)		(0.001)		(0.001)	
Acquisitions/Assets	0.215***		0.149***		0.106***	
	(0.001)		(0.001)		(0.001)	
Net Debt Issue/Assets		0.098***		0.091***		0.073***
		(0.001)		(0.001)		(0.001)
Net Equity Issue/Assets		0.002		0.011***		0.019***
		(0.512)		(0.007)		(0.001)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	No	No	No	No	No	No
Observations	3,352	2,855	3,160	2,921	2,895	2,754
R-squared	0.602	0.564	0.604	0.568	0.569	0.530

Table 6 continued.
Panel B – Industry Fixed Effects

	ΔLog(EMP) Year 0		ΔLog(EMP) Year 0-1		ΔLog(EMP) Year 0-2	
	(1)	(2)	(3)	(4)	(5)	(6)
Log(Primary Proceeds)	0.126***	0.186***	0.107***	0.162***	0.008	0.021
	(0.001)	(0.001)	(0.001)	(0.001)	(0.778)	(0.613)
VC-Backed	0.031***	0.017	0.068***	0.039*	0.095***	0.074**
	(0.008)	(0.212)	(0.001)	(0.069)	(0.001)	(0.011)
Time as Private	-0.043***	-0.043***	-0.067***	-0.073***	-0.083***	-0.093***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Capx/Assets	0.196***		0.128***		0.114***	
	(0.001)		(0.001)		(0.001)	
Acquisitions/Assets	0.208***		0.142***		0.102***	
	(0.001)		(0.001)		(0.001)	
Net Debt Issue/Assets		0.093***		0.081***		0.067***
		(0.001)		(0.001)		(0.001)
Net Equity Issue/Assets		0.002		0.011***		0.021***
		(0.573)		(0.008)		(0.001)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3,352	2,855	3,160	2,921	2,895	2,754
R-squared	0.618	0.587	0.621	0.591	0.586	0.554

Table 6 continued.
Panel C – Industry Fixed Effects and Pre-IPO growth

	ΔLog(EMP) Year 0		ΔLog(EMP) Year 0-1		ΔLog(EMP) Year 0-2	
	(1)	(2)	(3)	(4)	(5)	(6)
Log(Primary Proceeds)	0.134***	0.087**	0.079**	0.110**	-0.056	-0.054
	(0.001)	(0.016)	(0.027)	(0.034)	(0.257)	(0.437)
VC-Backed	0.017	0.007	0.069*	0.041	0.068	0.061
	(0.414)	(0.791)	(0.064)	(0.319)	(0.144)	(0.268)
Time as Private	-0.042***	-0.049***	-0.060***	-0.077***	-0.054**	-0.059**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.019)	(0.013)
Pre-IPO Asset Growth	0.003	0.005	-0.006*	-0.008**	-0.007	-0.010*
	(0.208)	(0.111)	(0.091)	(0.034)	(0.128)	(0.051)
Capx/Assets	0.206***		0.188***		0.162***	
	(0.001)		(0.001)		(0.001)	
Acquisitions/Assets	0.205***		0.152***		0.110***	
	(0.001)		(0.001)		(0.001)	
Net Debt Issue/Assets		0.089***		0.080***		0.078***
		(0.010)		(0.001)		(0.001)
Net Equity Issue/Assets		0.016***		0.023***		0.033***
		(0.004)		(0.001)		(0.001)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,268	997	1,123	994	1,009	934
R-squared	0.643	0.618	0.620	0.593	0.581	0.534

Table 7: IPO and Employment Growth

The table reports results of cross-sectional analysis of changes in total employment over different horizons relative to the firm's IPO year. The analysis uses the Compustat IPOs sample. In columns (1) and (2) of each panel, *ΔLog(EMP) Year 0* is the change in log of total employment from the beginning of the IPO year to the end of the IPO year. In columns (3) and (4), *ΔLog(EMP) Year 0-1* is the change in log of total employment from the beginning of the IPO year to the end of the first post-IPO year. In columns (5) and (6), *ΔLog(EMP) Year 0-2* is the change in log of total employment from the beginning of the IPO year to the end of the second post-IPO year. Accounting variables are winsorized at the 1st and 99th percentile. Industry FE are defined at the 2-digit SIC level. *P-values* based on robust standard errors are in parentheses. The variables are described in Appendix A. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel A – Change in Z-score

	ΔLog(Emp) Year 0		ΔLog(Emp) Year 0-1		ΔLog(Emp) Year 0-2	
	(1)	(2)	(3)	(4)	(5)	(6)
Log(Primary Proceeds)	0.125***	0.124***	0.091***	0.097***	-0.031	-0.032
	(0.001)	(0.001)	(0.001)	(0.001)	(0.330)	(0.310)
VC-Backed	0.014	0.017	0.033*	0.033*	0.059**	0.056**
	(0.252)	(0.174)	(0.094)	(0.098)	(0.027)	(0.034)
Time as Private	-0.041***	-0.034***	-0.056***	-0.052***	-0.084***	-0.065***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Capx/Assets	0.226***	0.222***	0.152***	0.154***	0.133***	0.132***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Acquisitions/Assets	0.247***	0.245***	0.162***	0.162***	0.117***	0.116***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Debt/Assets (Pre-IPO)	-0.067***	-0.064***	-0.190***	-0.128***	-0.218***	-0.189***
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)
D(ΔZ-score > P75)	0.034*	0.170***	0.118***	0.208***	0.199***	0.460***
	(0.051)	(0.004)	(0.001)	(0.004)	(0.001)	(0.001)
Time as Private×D(ΔZ-score > P75)		-0.070**		-0.021		-0.112***
		(0.010)		(0.484)		(0.002)
Debt/Assets (Pre-IPO)×D(ΔZ-score > P75)		-0.007		-0.130**		-0.048
		(0.834)		(0.026)		(0.619)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,963	2,963	2,791	2,791	2,559	2,559
R-squared	0.639	0.641	0.649	0.650	0.618	0.620

Table 7 continued.
Panel B – Change in Relative Cost of Credit (RCC)

	ΔLog(Emp) Year 0		ΔLog(Emp) Year 0-1		ΔLog(Emp) Year 0-2	
	(1)	(2)	(3)	(4)	(5)	(6)
Log(Primary Proceeds)	0.140***	0.143***	0.126***	0.127***	0.033	0.036
	(0.001)	(0.001)	(0.001)	(0.001)	(0.354)	(0.321)
VC-Backed	0.037***	0.038***	0.061***	0.059***	0.088***	0.089***
	(0.005)	(0.004)	(0.004)	(0.005)	(0.003)	(0.003)
Time as Private	-0.035***	-0.037***	-0.052***	-0.058***	-0.072***	-0.057***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Capx/Assets	0.170***	0.169***	0.133***	0.133***	0.114***	0.113***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Acquisitions/Assets	0.223***	0.216***	0.164***	0.16***	0.120***	0.120***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Debt/Assets (Pre-IPO)	-0.037**	-0.058***	-0.142***	-0.197***	-0.166***	-0.198***
	(0.049)	(0.003)	(0.001)	(0.001)	(0.002)	(0.003)
D(ΔRCC < P25)	0.038***	-0.014	0.029	-0.115*	0.113***	0.212**
	(0.009)	(0.718)	(0.219)	(0.087)	(0.001)	(0.028)
Time as Private×D(ΔRCC < P25)		0.006		0.021		-0.061*
		(0.683)		(0.353)		(0.053)
Debt/Assets (Pre-IPO)×D(ΔRCC < P25)		0.106**		0.245***		0.127
		(0.033)		(0.002)		(0.300)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2,490	2,490	2,312	2,312	2,065	2,065
R-squared	0.612	0.613	0.634	0.637	0.615	0.617

Table 8: Employment Growth and Cash Flows for IPO Firms

The table shows results from panel regressions of the annual change in log-employment. The estimation uses the NETS IPOs sample and restricts the time period from year -3 to year +3, relative to the firm's IPO. The sample is further defined in Table 1. The variables are described in Appendix A. Robust standard errors clustered at firm level are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. All specifications include firm and year fixed effects.

	(1)	(2)	(3)	(4)	(5)
Log(Sales)	0.333***	0.334***	0.404***	0.336***	0.406***
	(0.014)	(0.014)	(0.017)	(0.014)	(0.017)
Post IPO		0.132***	0.139***	0.132***	0.138***
		(0.020)	(0.020)	(0.020)	(0.020)
Log(Sales) × Post IPO		-0.005***	-0.004***	-0.005***	-0.004***
		(0.001)	(0.001)	(0.001)	(0.001)
ΔLog(Sales)			-0.249***		-0.249***
			(0.017)		(0.017)
D(PayDex > Median)				0.070***	0.061***
				(0.014)	(0.014)
Constant	-4.380***	-4.364***	-5.589***	-4.449***	-5.661***
	(0.212)	(0.215)	(0.254)	(0.218)	(0.257)
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	18,829	18,829	17,099	15,627	14,541
R-squared	0.159	0.162	0.255	0.164	0.256

Table 9: Employment Growth and Cash Flows for IPO Firms and Firms with Withdrawn IPO

The table shows results from panel regressions of the annual change in log-employment. The estimation uses the NETS IPOs sample and the Withdrawn IPOs control group, where the withdrawn IPOs control group consists of firms that file for an IPO during 1990-2010 but subsequently withdraw the offering and could be matched to the NETS database. The samples are further defined in Table 1. The analysis restricts the time period from year -3 to year +3, relative to the IPO for firms in the NETS IPOs sample and relative to the withdrawal for firms in the withdrawn IPOs control group. The variables are described in Appendix A. Robust standard errors clustered at firm level are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively. All specifications include firm and year fixed effects.

	(1)	(2)	(3)	(4)	(5)
Log(Sales)	0.329***	0.335***	0.408***	0.313***	0.384***
	(0.013)	(0.013)	(0.016)	(0.017)	(0.020)
Post IPO		0.082***	0.084***	0.083***	0.075***
		(0.021)	(0.020)	(0.022)	(0.022)
Post Withdrawal		0.018	0.069*	0.026	0.066
		(0.041)	(0.038)	(0.042)	(0.041)
Log(Sales) × Post IPO		-0.008***	-0.007***	-0.005***	-0.004***
		(0.001)	(0.001)	(0.001)	(0.001)
Log(Sales) × Post Withdrawal		0.001	-0.001	0.004	0.002
		(0.002)	(0.002)	(0.003)	(0.002)
ΔLog(Sales)			-0.251***		-0.233***
			(0.015)		(0.017)
D(PayDex > Median)				0.061***	0.056***
				(0.013)	(0.013)
Constant	-4.311***	-4.453***	-5.703***	-4.191***	-5.395***
	(0.199)	(0.207)	(0.247)	(0.261)	(0.310)
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	22,333	22,333	20,325	18,532	17,281
R-squared	0.157	0.161	0.256	0.141	0.236

Table 10: Employment Growth and Cash Flows (Service and Non-Service Firms)

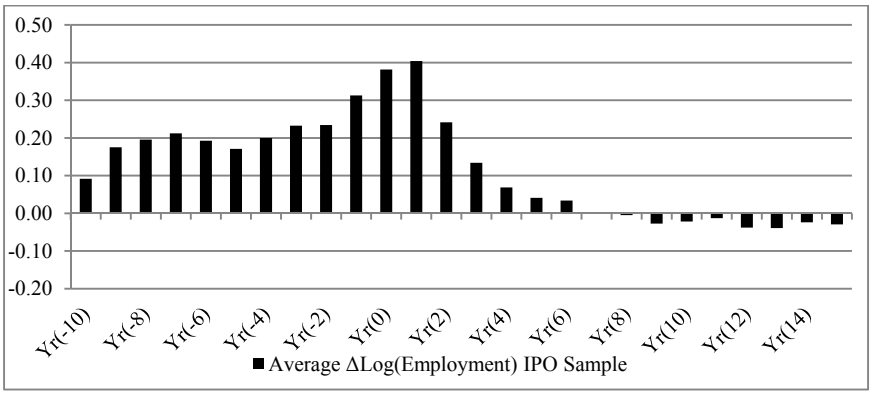
The table shows results from panel regressions of the annual change in log-employment. The estimation uses the NETS IPOs sample and the Withdrawn IPOs control group, where the withdrawn IPOs control group consists of firms that file for an IPO during 1990-2010 but subsequently withdraw the offering and could be matched to the NETS database. The samples are defined in Table 1. The analysis restricts the time period from year -3 to year +3, relative to the IPO for firms in the NETS IPOs sample and relative to the withdrawal for firms in the withdrawn IPOs control group. Columns (1) to (4) show results for firms in the service sector (2-digit SIC codes from 70 to 89). Columns (5) to (8) show results for firms in the non-service sector (2-digit SIC codes excluding 60 to 89). The variables are described in Appendix A. Robust standard errors clustered at firm level are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively. All specifications include firm and year fixed effects.

	Service Sector Firms				Non-Service Sector Firms			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log(Sales)	0.309***	0.372***	0.289***	0.344***	0.382***	0.464***	0.355***	0.441***
	(0.021)	(0.029)	(0.027)	(0.035)	(0.021)	(0.023)	(0.024)	(0.028)
Post IPO	0.031	0.037	0.023	0.029	0.091***	0.098***	0.117***	0.103***
	(0.035)	(0.036)	(0.036)	(0.037)	(0.028)	(0.027)	(0.029)	(0.028)
Post Withdrawal	0.052	0.125**	0.063	0.127**	0.045	0.065	0.026	0.037
	(0.058)	(0.053)	(0.063)	(0.057)	(0.057)	(0.055)	(0.057)	(0.052)
Log(Sales) × Post IPO	-0.006***	-0.006***	-0.002	-0.002	-0.008***	-0.007***	-0.005***	-0.004**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Log(Sales) × Post Withdrawal	0.001	-0.002	0.003	-0.000	-0.001	-0.001	0.003	0.003
	(0.003)	(0.003)	(0.004)	(0.003)	(0.004)	(0.003)	(0.004)	(0.004)
ΔLog(Sales)		-0.217***		-0.209***		-0.286***		-0.266***
		(0.030)		(0.033)		(0.017)		(0.019)
D(PayDex > Median)			0.069***	0.049**			0.055***	0.060***
			(0.022)	(0.022)			(0.019)	(0.018)
Constant	-3.785***	-4.873***	-3.558***	-4.514***	-5.388***	-6.749***	-5.000***	-6.413***
	(0.321)	(0.421)	(0.419)	(0.510)	(0.330)	(0.353)	(0.389)	(0.439)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	7,541	6,945	6,592	6,205	12,176	11,080	10,304	9,572
R-squared	0.155	0.232	0.142	0.221	0.183	0.302	0.155	0.274

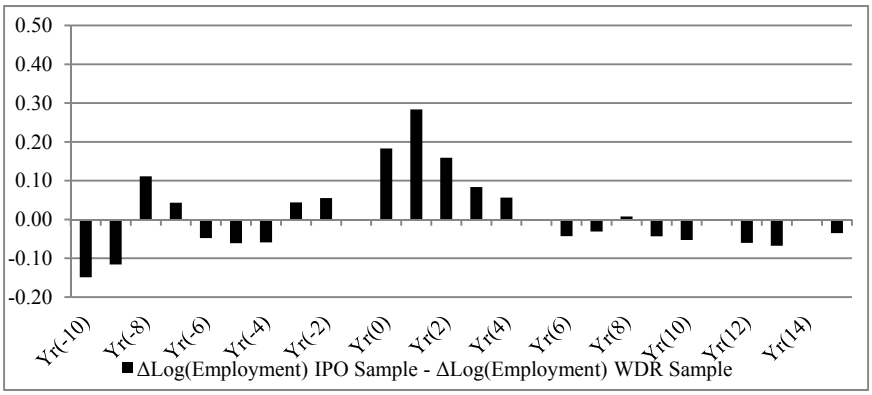
Figure 1: Employment Growth around IPO Year

The figure presents annual changes in log-employment for different samples. Panel A shows the average annual changes in log-employment for the NETS IPOs sample. Panel B shows differences in the average annual changes in log-employment between the NETS IPOs sample and the Withdrawn IPOs control group. Panel C shows differences in the average annual changes in log-employment between the NETS IPOs sample and Private firms control group. The samples are defined in Table 1. Yr(0) refers to the year of the issue for the IPOs sample and the year of withdrawal for the Withdrawn IPOs control group.

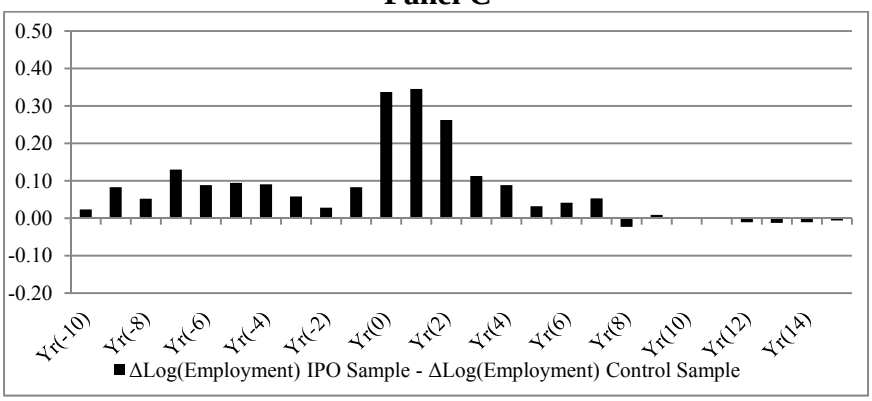
Panel A



Panel B



Panel C



Appendix A
Variable Definitions

Log(Emp)	Natural logarithm of firm's employment
ΔLog(Emp) Year X	Change in the natural logarithm of total employment during year X relative to the year of the firm's event (IPO or withdrawal). For example, *ΔLog(Emp) Year 0* is the change in total employment during the IPO year for the NETS IPOs sample.
ΔLog(EMP) Year 0-Y	Change in the natural logarithm of total employment from the beginning of the firm's event year (IPO or withdrawal) to the end of the Y-th post-event year. For example, *ΔLog(Emp) Year 0-2* is the change in total employment from the beginning of the IPO year to the end of 2nd post-IPO year for the NETS IPOs sample.
Log(Sales)	Natural logarithm of firm's sales
PayDex	Numerical score assigned by D&B that captures firms' credit worthiness using the risk of late payments. The score goes from 0 to 100, with a higher score meaning lower risk of late payments.
D(IPO Year)	Indicator variable that takes the value of 1 for firms in the NETS IPOs sample in their IPO year and 0 otherwise. Set to 0 for firms in the Private firms control group or the Withdrawn IPOs control group.
D(IPO Year + n)	Indicator variables for n = 1, 2 and 3 that take the value of 1 for firms in the NETS IPOs sample in their n-th post-IPO year, and 0 otherwise. Set to 0 for firms in the Private firms control group or the Withdrawn IPOs control group.
D(Withdrawal Year)	Indicator variable that takes the value of 1 for firms in the Withdrawn IPOs control group in the year of withdrawal and 0 otherwise. Set to 0 for firms in the NETS IPOs sample
D(Withdrawal Year + n)	Indicator variables for n = 1, 2 and 3 that take the value of 1 for firms in the Withdrawn IPOs control group in their n-th post-withdrawal year, and 0 otherwise. Set to 0 for firms in the NETS IPOs sample
Finance Dependence:	Measure of external equity dependence of the firm's industry (2-digit SIC code) where industries with above-median (below-median) equity dependence are categorized as *High* (*Low*)

Acquisition Activity: The sum of the acquisition expenditures made by the firm during the relevant period. Firms with (without) positive acquisition expenditures are categorized as *Yes* (*No*).

High Growth (Assets): Indicator variable that takes the value of 1 for industries (2-digit SIC code) with above-median aggregate growth based on total assets, and 0 otherwise. Firms in industries with above-median (below-median) assets growth are categorized as *Yes* (*No*).

Log(Primary Proceeds): The natural logarithm of 1 + the amount of primary proceeds raised in the offering, scaled by the book value of the firm's pre-IPO total assets. Offerings with above-median (below-median) primary proceeds are categorized as *High* (*Low*).

Age at IPO: The number of years between the founding year of the firm and its IPO year. Firms with above-median (below-median) age are categorized as *High* (*Low*).

VC-Backed: Indicator variable that takes the value of 1 if the firm is backed by VC (*Yes*), and 0 otherwise (*No*).

ΔRCC: The change in the firm's RCC from the beginning of the IPO year to the end of the respective post-IPO year as outlined in the construction of *ΔLog(EMP) Year 0-X*. Firms with above-median (below-median) change in RCC are categorized as *High* (*Low*). RCC is defined as 1 plus the cost of debt for the IPO firm, scaled by 1 plus the median cost of debt for all Compustat firms for that calendar year. Cost of debt is captured by the ratio of total interest expense (XINT) to total long-term and short-term debt (DLTT + DLC).

ΔZ-score: The change in the firm's Z-score from the beginning of the IPO year to the end of the respective post-IPO year as outlined in the construction of *ΔLog(EMP) Year 0-X*. Firms with above-median (below-median) change in Z-score are categorized as *High* (*Low*). Z-score is constructed as the sum of the following: 3.3×(Earnings before Interest and Tax (EBIT)/Total Assets (AT)), 1.4×(Retained Earnings (RE)/Total Assets), (Sales (SALE)/Total Assets), 1.2×(Net Working Capital (WCAP)/Total Assets).

High Finance Dependence: Indicator variable that takes the value of 1 if the firm operates in an industry with high dependence on external equity, and 0 otherwise.

Time as Private:	Natural logarithm of 1 + the number of years between the founding year of the firm and its IPO year.
Capx/Asset:	Capital expenditures made by the firm during the relevant time horizon scaled by the book value of the firm's pre-IPO total assets.
Acquisitions/Assets:	Acquisitions (AQC) made by the firm during the relevant time horizon scaled by the book value of the firm's pre-IPO total assets.
Net Debt Issue/Assets:	Net debt issue raised by the firm during the respective period, scaled by the book value of the firm's pre-IPO total assets. Net debt issue is defined as the issuance of long-term debt (DLTIS) minus retirement of long-term debt (DLTR)
Net Equity Issue/Assets:	Net equity issue raised by the firm during the respective period, scaled by the book value of the firm's pre-IPO total assets. Net equity issue is defined as the sale of common and preferred stock (SSTK) minus purchase of common and preferred stock (PRSTKC)
Pre-IPO Asset Growth:	Growth rate in the firm's total assets during the pre-IPO year measured as negative 1 + the ratio of the book value of the firm's total assets at the beginning of the IPO year to the book value of the firm's total assets at the beginning of the pre-IPO year.
Debt/Assets (Pre-IPO):	The ratio of the firm's total debt (DLTT + DLC) to the book value of its total assets (AT), as of the beginning of the IPO year.
D(ΔZ-score > P75):	Indicator variable that takes the value of 1 if the change in the firm's *Z-score* from the beginning of the IPO year to the year-end of the respective post-IPO year exceeds the 75^{th} percentile of the sample changes, and 0 otherwise.
D(ΔRCC < P25):	Indicator variable that takes the value of 1 if the change in the firm's *RCC* from the beginning of the IPO year to the year-end of the respective post-IPO year is below the 25^{th} percentile of the sample change, and 0 otherwise.

Appendix B
Table 1: Time-series Distribution

The table presents time-series of selected variables for the sample of firms that went public during 1980-2010. Specifically, it reports the mean for the respective variable for all firms that have an IPO in that calendar year and employment data. *All IPOs* is the total number of firms going public during the respective calendar year. *IPOs with EMP* is the number of firms that go public during the respective calendar year and have available data to compute the change in their total employment (Emp) during the IPO year, i.e. firms in the Compustat IPOs sample. *Growth Rate EMP* is the annual employment growth rate for a firm during its IPO year. *ΔLog(EMP)* is the change in log of the firm's total employment from the beginning to the end of the IPO year. *High Finance Dependence* is an indicator variable takes the value of 1 if the firm operates in an industry (2-digit SIC code) with above-median dependence on external equity, and 0 otherwise. *VC-Backed* is an indicator that takes the value of 1 if the firm is backed by VC, and 0 otherwise. *Log(Primary Proceeds)* is the natural logarithm of 1 + the amount of primary proceeds raised in the offering, scaled by the book value of the firm's pre-IPO total assets. *Age at IPO* is the number of years between the founding year of the firm and its IPO year. *High Growth (Assets)* is an indicator variable that takes the value of 1 if an IPO firm operates in an industry (2-digit SIC code) with above-median aggregate growth based on total assets, and 0 otherwise. Industry-specific measures are calculated using all Compustat firms during 1980-2010.

Year	All IPOs	IPOs with Emp	Growth Rate Emp	ΔLog (Emp)	High Finance Dep	VC-Backed	Log(Primary Proceeds)	Age at IPO	High Growth (Assets)
1980	91	17	0.32	0.25	0.65	0.41	0.56	14.64	0.59
1981	230	85	0.38	0.26	0.81	0.36	0.77	13.96	0.66
1982	85	65	0.39	0.27	0.80	0.38	0.74	9.13	0.68
1983	466	136	0.44	0.31	0.82	0.39	0.85	11.76	0.63
1984	210	162	0.38	0.29	0.75	0.31	0.64	12.75	0.65
1985	231	68	0.43	0.30	0.74	0.34	0.63	10.97	0.57
1986	471	151	0.35	0.25	0.66	0.26	0.59	20.44	0.53
1987	347	179	0.37	0.27	0.63	0.28	0.57	18.16	0.53
1988	141	83	0.47	0.31	0.67	0.31	0.67	18.19	0.59
1989	123	47	0.35	0.26	0.66	0.32	0.53	16.36	0.47
1990	127	73	0.44	0.30	0.74	0.36	0.63	15.13	0.62
1991	279	97	0.29	0.22	0.73	0.49	0.75	17.02	0.59
1992	398	222	0.32	0.24	0.76	0.47	0.74	19.64	0.57
1993	552	232	0.36	0.26	0.71	0.41	0.67	18.35	0.60
1994	436	216	0.43	0.30	0.67	0.35	0.71	14.09	0.52
1995	447	170	0.43	0.31	0.76	0.50	0.73	14.76	0.62
1996	658	278	0.57	0.40	0.81	0.48	0.94	14.08	0.69
1997	471	209	0.55	0.37	0.81	0.34	0.87	16.60	0.66
1998	302	191	0.50	0.34	0.78	0.28	0.86	15.62	0.66
1999	455	160	0.82	0.54	0.91	0.49	1.11	12.61	0.84
2000	334	199	0.73	0.47	0.96	0.71	1.29	9.25	0.84
2001	70	56	0.31	0.21	0.89	0.50	0.74	22.11	0.71
2002	69	42	0.22	0.16	0.83	0.33	0.63	20.07	0.76
2003	75	23	0.34	0.23	0.83	0.43	0.44	26.39	0.78
2004	196	119	0.28	0.22	0.84	0.52	0.75	16.21	0.56
2005	175	110	0.23	0.17	0.81	0.25	0.52	29.56	0.65
2006	158	83	0.22	0.18	0.81	0.39	0.63	22.50	0.61
2007	169	82	0.38	0.28	0.85	0.45	0.72	15.43	0.68
2008	25	25	0.25	0.20	0.88	0.48	0.87	24.36	0.68
2009	49	12	0.20	0.17	0.83	0.58	0.41	33.55	0.75
2010	113	62	0.21	0.17	0.84	0.31	0.53	16.68	0.61
All	7,953	3,654	0.43	0.30	0.78	0.41	0.77	16.20	0.64