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# Local IPO Waves, Local Shocks, and the Going Public Decision

## Abstract

Local IPO waves occur when firms from different industries, but located in the same area, go public in the same time period. We classify IPOs within industry IPO waves and within local IPO waves, and see that the subsamples of IPOs on-the-wave by industry only slightly overlap IPOs on-the-wave by region; IPO waves by region are similar to IPO waves by industry, for example early-in-the-wave IPOs are equally more underpriced than late-in-the-wave IPOs. We also find the listing decision is sensitive not only to high valuations of firms in the same industry, but also to high valuations of firms in the same region but in different industries. Results do not support information spillover as a driver of local IPO waves as the post-IPO fall in profitability is more pronounced for on-the-wave than for off-the-wave IPO firms and the IPO price revision is not sensitive to the information revealed by concurrent IPOs. Using a difference-in-difference approach, we show that regions hosting IPO waves experience a parallel increase in several economic ratios post-wave. Overall, our results provide support to local IPO waves originating in positive local shocks.

**Keywords:** IPO Waves, Local Shock, Information Spillover, Going Public Decision, Underpricing

**JEL Classification:** G14, G32

## 1. Introduction

The existence of IPO waves, or 'hot' IPO markets has been widely documented since Ibbotson and Jaffe (1975). Recent research relates IPO waves to entrepreneurs taking their firms public when stock market conditions are sufficiently favorable (e.g., Pástor et al., 2009; Pástor and Veronesi, 2005), to information spillovers across concurrent IPOs (e.g., Alti, 2005; Benveniste et al., 2003; Colaco et al., 2009; Lowry and Schwert, 2002), to shocks in capital productivity (e.g., Yung et al., 2008), to product market competition (e.g., Chemmanur and He, 2011), and to customer-supplier relationships (e.g., Baxamusa and Jalal, 2018), among others. Although the driving forces are quite different from each other, all studies on IPO waves have one feature in common: IPO waves are essentially *industry IPO waves*, where firms in the same industry tend to go public in the same time-period and IPO waves are driven by industry specific factors (e.g., industry overvaluation, information spillover among IPOs in the same industry, etc.).

While the firm industry is indeed an important recipient of the driving forces behind an IPO wave, another recipient with similar specific dynamics that has not been analyzed so far in the literature is the firm location. In this paper, we posit that the timing of a firm's decision to go public and IPO waves also have a geographical pattern. More in particular, we posit the existence of *local IPO waves*, occurring when firms from different industries but located in the same area go public together. We see at least three motivations. First, firms tend to cluster (e.g., Krugman, 1991) with significant consequences on firm performance, for instance due to spillover of knowledge between nearby firms (e.g., Dougal et al., 2015; Jaffe et al., 1993).<sup>1</sup> As such, firms operating in different industries but located in the same area might boost each other toward listing. Secondly, mainly via world-of-mouth and observational learning, proximity facilitates spillover of information (e.g., Brown et al., 2008; Carosi, 2016; Gao et al., 2011; Fiordelisi et al., 2014; Hong et al., 2005, 2004; Kedia and Rajgopal, 2009), which is extremely important for IPO pricing (e.g., Benveniste et al., 2003, 2002; Ljungqvist and Wilhelm, 2003; Lowry and Schwert, 2002). For instance, Ljungqvist

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<sup>1</sup> See Duranton and Puga (2004) for a review of this literature.

and Wilhelm (2003) use the mean initial return of the issuer's contemporaries as the measure of the industry-specific information revealed in concurrent IPOs, and find that this information affects the IPO price revision according to a valuation factor common to firms that are attempting to go public. Therefore, firms operating in different industries but located in the same area might learn from local pioneering IPOs about a previously neglected local-specific valuation factor, thus finding it convenient to go public. Finally, a local IPO wave could even originate from a positive local shock that simultaneously affects all local firms, such as improvements in local political conditions (e.g., Colak et al., 2017), or favorable changes in municipal tax rates or real estate prices (e.g., Chaney et al., 2012). For instance, when land is used as collateral for debt financing, firms owning land in the same area experience simultaneous fluctuations in their ability to raise debt with positive effects on investments (e.g., Chaney et al., 2012), which might lead a few local companies to listing.

In our empirical strategy towards the relevance of local IPO waves, we start by verifying whether local IPO waves are truly present in IPO data, by checking how much local IPO waves overlap industry IPO waves. In practice, to infer the existence of local IPO waves, we need the subsample of IPOs defined on-the-wave according to a consistent criterion of locality to be at least partially different from the subsample of IPOs defined on-the-wave by industry. To consistently identify local IPO waves, we apply to any given region in our IPO sample (instead of "to any industry"), the same definition used in previous research for industry IPO waves (e.g., Baxamusa and Jalal, 2018; Chemmanur and He, 2011). Therefore, we define a local IPO wave as occurring when a region has more IPOs than the 75th percentile of IPOs, compared to its region time series. Industry IPO waves and local IPO waves only slightly overlap: 22% of the sample are IPOs on-the-wave by industry, 32% are IPOs on-the-wave by region, but only 13% are IPOs on-the-wave both by industry and by region. In addition, to support the idea of local IPO waves as analogous to traditional industry IPO waves but with different originations, also providing robustness to the identification of our local IPO waves, we then check how much the identified IPOs on-the-wave by region are similar to IPOs on-the-wave by industry. Recent research has shown that underpricing is significantly higher for early-in-the-wave IPOs (pioneers) than for late-in-the-wave IPOs (followers) (e.g., Banerjee et al., 2016). Consistently, we find that 'by industry' or 'by region'

early-in-the-wave IPOs have similar underpricing, at least two times larger than late-in-the-wave IPOs. We also show that IPOs on-the-wave by region are not underpriced differently than IPOs on-the-wave by industry.

Almost all theories of IPO waves acknowledge a window of opportunity perspective, according to which peaks in IPO volume coincide with periods where stocks are mispriced, as suggested by Ritter (1991), and companies recognizing that their peers are overvalued have an incentive to go public.<sup>2</sup> For instance, IPO waves are windows of opportunity for entrepreneurs in Pástor and Veronesi (2005) and Pástor et al. (2009). Empirically, a common approach for detecting and dealing with IPO waves is to look at the volume of IPOs (e.g., Benveniste et al., 2003; Lowry, 2003; Lowry and Schwert, 2002; Pástor and Veronesi, 2005). On the other hand, IPO samples are most likely affected by selection bias since only the set of firms going public is actually observed, while firms that could have gone public but decided to remain private do not enter into the analyses, thus telling only part of the story.<sup>3</sup> Per Lowry (2003), only a few papers systematically test the potential determinants of the IPO volume, by addressing determinants of the likelihood that a private firm goes public (e.g., Lerner, 1994; Bodnaruk et al., 2008; Chemmanur et al., 2010; Pagano et al., 1998). Systematic evidence on the probability of going public is very limited as privately held firms are typically not required to report their financial results, and so private firm data needed for this kind of analysis are not generally available (especially for U.S. firms). Yet they are readily

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<sup>2</sup> The "window of opportunity" hypothesis is first modeled and tested by Rajan and Servaes (1997), and is consistent with international time-series evidence in the 1980s (e.g., Loughran et al., 1994), with the cross-sectional clustering of IPOs near sectoral stock price peaks (e.g., Lerner, 1994; Ritter, 1984), and low long-run returns (e.g., Loughran and Ritter, 1995; Ritter, 1991).

<sup>3</sup> Bodnaruk et al. (2008) analyze 124 IPOs at Stockholm Stock Exchange together with 1,309 Swedish private firms in 1995-2001 and find significant self-selection bias. The EFIGE/Bruegel-UniCredit dataset (henceforth, simply EFIGE), allows for simple but direct evidence of how important the selection bias is in IPO research. Question F22 of EFIGE asks "*Does the firm intend to go public in the next three years?*" with possible outcomes "*Definitely yes*", "*Probably yes*", and "*No*". The comparison between frequencies of "*Definitely yes*" and "*Probably yes*" and the number of these firms that actually went public provides a rough but appealing quantification of self-selection bias in IPO samples: 175 of 14,514 EFIGE private firms, about 1.2% of the EFIGE sample, declare in F22 their intentions to go public in the next three years, 22 of these firms are definitely sure to go public; however, only 1 of those firms actually went public in 2009-2011. Helbing and Lucey (2018) show the 2008 financial crisis has contributed in few firms stepping back, even though the highest IPO withdrawal rate in 2011 is only 22%. Table A.1 in the Appendix shows EFIGE data.

available for Italy. For instance, recent IPO papers that use Italian private firm data as we do include Baschieri et al. (2015), Cattaneo et al. (2015), and Chemmanur et al. (2019), among others. Extending existing research with a sample of about 1,125,000 private firm-year observations, we investigate the determinants of the likelihood that a private firm goes public; importantly, it represents the universe of the domestic private firms with at least a minimal likelihood of going public.

Consistent with industry IPO waves originated by companies that time their IPOs to take advantage of industry-wide overvaluations, Pagano et al. (1998) find that the probability for a private firm to go public increases with the median market-to-book ratio of public firms in the same industry. In a similar vein, we test whether the probability to go public is not only positively affected by the market-to-book of public firms in the same industry, but also by the market-to-book of public firms located in the same region. In addition, to control for the clustering of firms in the same industry and in the same area (e.g., Brown, 1989; McCann and Folta, 2009), we further disentangle industry effects from local effects by separately considering the median market-to-book of public firms in the same industry but out of the same region (catching pure industry effects), the median market-to-book of firms in the same industry and in the same region (measuring local agglomeration economies), and the median market-to-book of firms out of the same industry but in the same region, which is expected to capture the local factors as driving forces behind the timing of a firm's decision to go public and creation of IPO waves. Across several model specifications, in addition to median market-to-book ratios of firms in the same industry, in and out of the region, we find that the probability of going public is positively affected by the median market-to-book of public firms out of the same industry but in the same region: consistent with local IPO waves, a bullish local market, regardless of the industries involved, strongly and positively affects the listing decision.

We then move forward by digging into the reasons behind the creation of local IPO waves. First, we test whether local IPO waves are driven by local factors which durably enhance the performance of the local firms, such as knowledge spillover among the nearby firms. To this end, we look at the ex-post performance of the IPO firms. Consistent with permanent positive performance effects leading firms to go public and generating local IPO

waves, we expect that the well-known post-IPO fall in profitability is less pronounced for on-the-wave IPO firms than off-the-wave IPO firms.<sup>4</sup> However, we find the opposite, i.e., after the listing on-the-wave IPOs largely underperform compared to off-the-wave IPOs.

Secondly, we test whether local IPO waves are driven by spillover of local information among the local firms going public. In particular, we proxy the new local-specific information revealed to the market by the mean initial return across all concurrent IPOs in the issuer's region, and test the relation between this mean contemporary local underpricing and IPO price revision. A positive relation between the mean contemporary underpricing across the concurrent IPOs in the region and the IPO price revision would support the spillover of local-specific information among local going public firms as driving force behind local IPO waves. However, we fail to find significant evidence.

Finally, by adopting a difference-in-difference approach, we test whether local IPO waves are consistent with exogenous area shocks, such as local shocks to labor or real estate values. More in particular, we collapse the dataset by region-year and consider the treatment group of the subsample of region-year that hosted at least one local IPO wave, where a region-year observation is treated by a local IPO wave in the years after the wave is occurred, and untreated otherwise. Then, we run a set of staggered diff-in-diff regressions taking in turn as dependent variable one among several local economic indicators, such as the volume of new firms or employees in the region, aggregate sales or earnings, among others. Consistent with local IPO waves originated by positive local area shocks, in all the cases the diff-in-diff coefficient is significant and positive, meaning that the increase in outcome from before-to-after-the-local-IPO-wave is significantly larger in treated regions that had hosted a local IPO wave rather than in untreated regions without a local IPO wave. Repeating the same analysis for industry IPO waves, we find similar but less robust evidence.

We see three clear contributions of this paper. First, as far as we know, we are the first to recognize the local nature of IPO waves. Secondly, we contribute to the IPO literature that uses geography, which so far has already helped in explaining underwriter reputation (e.g.,

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<sup>4</sup> The post-IPO reduction in profitability is documented since Degeorge and Zeckhauser (1993), Jain and Kini (1994), and Mikkelson et al. (1997).

Loughran, 2008), underpricing (e.g., Liu and Ritter, 2011; Nielsson and Wójcik, 2016), and the impact of the IPOs on the performance of industry competitors (e.g., Hsu et al., 2010) and on corporate market value of the neighboring firms (e.g., Baschieri et al., 2015). Third, we also contribute to the empirical literature on the going-public decision (e.g., Bodnaruk et al., 2008; Chemmanur et al., 2010; Lerner, 1994; Pagano et al., 1998). Lerner (1994) shows that companies tend to go public when equity valuations are generally high, Pagano et al. (1998) provide evidence that the listing decision relates to specific phases of the firm life-cycle (e.g., change in ownership structure), Bodnaruk et al. (2008) point out that diversification of the controlling shareholders is among the reasons for listing the company, and Chemmanur et al. (2010) find that IPOs are also determined by the firm's product market characteristics. We contribute to this literature by showing that the decision to go public is also affected by high valuations of local companies.

The rest of the paper is organized as follows. We describe our data and sample selection procedures in Section 2. We address IPO waves in Section 3, contrasting industry IPO waves and local IPO waves, and investigating IPO underpricing. We analyze the going public decision in Section 4. In Section 5, we investigate potential explanations for local IPO waves. We conclude in Section 6.

## **2. Data Description**

We employ two main data sources. The primary data for the empirical analyses consist of IPO data, which we draw from IPO prospectuses. Our initial sample consists of domestic firms completing an IPO on the Milan Stock Exchange (MSE) over the period 1999-2017. We exclude from our initial IPO sample spin-offs, ADRs, unit offerings, reverse LBOs, foreign issues, REITS, closed-end funds, financial firms (SIC 6000–6999), utilities (SIC 4900-4999), government firms (SIC 9100–9199), and “non-classified establishments” (SIC 9900-9999). We end up with 211 IPOs. Table 1 - Panel A reviews the IPO activity, and Table 1 - Panel B shows summary statistics for the IPO characteristics.

[Insert Table 1 about here]

The early 2000s saw intense IPO activity, with 67 new listings and €123 million in issuing activity per IPO. In the mid-2000s, issuing volume fell by roughly one third with an average of about €145 million per IPO from 2002 to 2005, even though 2006 and 2007 brought a new IPO wave with about 35 new listings and about €220 million in issuing activity. In the late 2000s, the financial crises marked the IPO activity at about €140 million per IPO and only 16 new listings during 2008-2012. The after-crisis period 2013-2017 shows a recovery in the IPO volume, with 74 new offerings and average of about €135 million per IPO. Average first-day returns show a consistent pattern, decreasing from 13.6% in the early 2000s to 2.7% in the mid-2000s, and rising to 6.5% in 2006 and 2007; in the 2008-2012 crisis period, average first-day returns increase to 10.3%, decreasing again after the crisis to 6.1%. The aftermarket performance of IPOs also varies over time. The 3-year Fama and French (2016) 5-factor model adjusted cumulative abnormal returns (CARs) are negative in 1999-2001, 2002-2005, 2006-2007 and 2008-2012, but positive in the after-crisis period 2013-2017; buy-and-hold returns (BHARs) are negative in 1999-2001, 2008-2012, and 2013-2017 sub-periods, but positive in 2002-2005 and 2006-2007; in all cases, the post-IPO performance over the 1999-2017 sample period is largely negative. All figures are consistent with existing literature and previous evidence on IPOs (e.g., Arosio et al., 2001; Ljungqvist, 2007; Vismara et al., 2012; Pereira and Sousa, 2017).<sup>5</sup> Looking at Table 1 - Panel B at the IPO characteristics, IPO share prices are usually revised upward from the original estimates by about 7.9% (median 6.1%), consistent with positive information acquisition during the book-building period (e.g., Hanley, 1993; Lowry and Schwert, 2004).<sup>6</sup> In line with further international evidence (e.g., Brennan and Franks, 1997; Habib and Ljungqvist, 2001), the majority of the tendered shares are newly issued stocks: in our sample, on average (median) 11.5% (5.4%) of the tendered shares are sold by the existing pre-issue shareholders; 26.9% (25.0%) are primary shares. Finally, most of the IPO issue, 81.2% (80.0%) of the tendered

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<sup>5</sup> In 2012, the development of Alternative Investment Market (AIM) segment for young and fast-growing firms, helps explain the significant issuing activity in the post-crisis period. Within these firms, Special Purpose Acquisition Company (SPAC) firms account for 65 listings, about 30% of the entire IPO sample. For robustness, we re-run our analyses excluding SPAC and results remain unchanged.

<sup>6</sup> Cassia et al. (2004) document similar evidence for Italian IPOs in 1985-2001.

shares, is allocated to institutional investors, which is also consistent with international evidence (e.g., Aggarwal et al., 2002).

The second data set we employ is on private firms, which is needed to address the firm decision to go public. Data on private firms come from Aida - Bureau Van Dijk. We collect data on the universe of Italian firms with available data in 1999-2017. We exclude firm-year observations by SIC consistent with the IPO sample, and with ROE exceeding plus or minus one. As per Pagano et al. (1998), we address the decision to go public in the subsample of private firms with at least €2.5 million in total assets, those firms that have at least a minimal probability of going public. We end up with 1,126,413 private firm-years. Table 1 - Panel C reports the summary statistics for these data, contrasting firms going public (IPOs) with firms remaining private.

### **3. IPO Waves**

#### **3.1. Industry IPO Waves**

Traditionally, IPO waves are industry waves, meaning that firms in the same industry tend to go public in the same time period, and that IPO waves are generated by factors specific to the industry in which the firm operates (e.g., Rajan and Servaes, 1997; Ritter, 1984). Similar to related research (e.g., Baxamusa and Jalal, 2018; Chemmanur and He, 2011; Helwege and Liang, 2004; Pástor and Veronesi, 2005), we define an *industry IPO wave* year as one in which an industry (1-digit SIC) has more IPOs than the 75th percentile of IPOs, compared to its industry time series.<sup>7</sup> More specifically, for each IPO in our dataset we consider a 1-year time window surrounding the issuance date, and we count the number of IPOs in the same 1-digit SIC in that time window. For each IPO, we therefore obtain the number of IPOs in the same industry and in the same time period (we call “peer IPOs”). Then, we compute the 75th

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<sup>7</sup> In light of potential similarities of firms located in the same area, the use of 1-digit SIC for industries, that is for an extensive industry definition, is purposely meant to classify in the same industry wave even firms that are partially dissimilar to each other, thus avoiding any potential artificial overlapping between industry IPO waves and local IPO waves. For robustness purposes, we when we switch to a 2-digit SIC, or use alternate definitions, such as Benchmark Input–Output Use Tables provided by the Bureau of Economic Analysis or Fama and French 49 Industry Portfolios, the evidence reported still holds.

percentile of the peer IPO variable and classify only those IPOs with a number of peer IPOs above the 75th percentile as belonging to a hot IPO market. Finally, we define *industry IPO wave* as all sequences of consecutive hot IPOs. Using the 75th percentile reduces the likelihood that the IPO wave variable is affected by random variations in the number of IPOs. Similar to Baxamusa and Jalal (2018) and Chemmanur and He (2011), we further reduce the possibility of misclassifying small numbers of IPOs as an IPO wave by dropping waves with less than three IPOs. We then identify how early a firm goes public in a particular wave according to its issuance date: IPO firms going public in the first quarter of the wave are early-in-the-wave IPOs, while the remaining firms going public in the wave are late-in-the-wave IPOs. Table 2 provides descriptive statistics for IPO waves by industry.

[Insert Table 2 about here]

Panel A highlights the distribution of IPO waves across 1-digit SIC industries. The 211 sampled IPOs define a total of 10 waves. The Life Science and Technology industry shows the highest number of waves, with 2 waves and an average of 5.5 listings per wave. The Energy and Transportation industry follows with 2 waves and a mean of 3.5 IPOs per wave. Overall, the main three industries by number of waves define 60% of the waves in the sample. An industry IPO wave lasts on average (median) 237 (230) days, with a duration that varies enormously from a minimum of 89 days to a maximum of 614 days (cf. Panel B). All statistics on wave durations are consistent with international evidence (e.g., Baxamusa and Jalal, 2018; Chemmanur and He, 2011). Finally, Panel C lists the three largest industry IPO waves in our sample. The Services industry has the biggest wave with 10 IPOs and an average of 5 listings per quarter. The Life Science and Technology industry follows, with a wave made of 8 IPOs, and a mean of about 2.7 IPOs per quarter. Finally, all the largest industry IPO waves took place in early 2000 or across the years 2006-2007, within the periods of intense IPO activity already highlighted in Table 1.

### **3.2. Local IPO Waves**

*Local IPO waves* is meant to indicate IPO waves that are generated by factors specific to the area in which the firm is located: a local IPO wave will occur when firms headquartered in the same area but not necessarily belonging to the same industry go public in the same time period. To identify local IPO waves, we apply the previously adopted definition for industry IPO waves, to any given region in our IPO sample.<sup>8</sup> More specifically, for each IPO in our sample we count the number of IPOs in the same region within a 1-year window surrounding the issuance date; then, we identify a hot local IPO market if the number of IPOs in the same region is equal or above the 75th percentile; lastly, we define *local IPO waves* as all sequences of consecutive hot local IPO periods that begin and end with a non-zero number of issuances. As for industry IPO waves, to minimize the possibility of misclassifying concurrent stand-alone IPOs as a tiny wave (such as those waves consisting of only two offerings), we reclassify *local IPO waves* by dropping those with a total number of offerings lower than three, and define IPOs in the first quarter of the local IPO wave as early-in-the-wave IPOs, while remaining firms going public in the local IPO wave as late-in-the-wave IPOs. Table 3 provides descriptive statistics for local IPO waves.

[Insert Table 3 about here]

Panel A highlights the distribution of local IPO waves. The 211 sampled IPOs define a total of 20 waves, which is a much higher number of waves (i.e., 10 waves) than those detected as *industry IPO waves*. The region of Lombardy shows the highest number of waves, with 2 waves and an average of 10 listings per wave. Emilia-Romagna follows with 2 waves and a mean of about 6 IPOs per wave. Overall, the main three regions by number of waves define only 30% of the local IPO waves, suggesting local IPO waves are quite widespread within the Italian territory. Panel B shows a local IPO wave lasts on average (median) 220 (169) days, with a duration that varies from a minimum of 75 days up to a maximum of 463 days. Finally, Panel C lists the three largest local IPO waves in our sample. Lombardy hosts the

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<sup>8</sup> Regions have been identified based on NUTS codes, the standard EU geocode for referencing the subdivisions of the EU member states for statistical purposes.

biggest wave with 18 IPOs and an average of 3 listings per quarter. Lazio and Emilia-Romagna follow, with a wave made of 7 IPOs, and a mean of about 2 IPOs per quarter. As for industry IPO waves, also local IPO waves took place in the early 2000 or across the years 2006-2007, within the highlighted hot market periods. Overall, defined local IPO waves do not look different from traditionally defined industry IPO waves.

### **3.3. Industry IPO Waves, Local IPO Waves and IPO Underpricing**

In providing evidence of local IPO waves, the first step of our empirical strategy is to detect whether the above defined local IPO waves are truly present in IPO data. In practice, we check if local IPO waves do not simply overlap industry IPO waves, expecting the subsample of IPOs defined on-the-wave according to our criterion of locality, is at least partially different from the subsample of IPOs defined on-the-wave by industry. Table 4 contrasts industry IPO waves and local IPO waves. In Block I the 211 sampled IPOs are grouped in on-the-wave vs. off-the-wave IPOs according to our definitions of industry IPO wave (in rows) and local IPO wave (in columns). For instance, the first (fourth) quadrant of Block I of Table 4, groups IPOs that are on-the-wave (off-the-wave) both by industry and by region; similarly, the second (third) quadrant contains IPOs that are on-the-wave (off-the-wave) by industry but off-the-wave (on-the-wave) by region; for each IPO group, the volume of listings (N, the number of IPOs, and the percentage on the whole sample) as well as the average underpricing are reported. Blocks II, III, and IV of Table 4 provide the same figures distinguishing on-the-wave IPOs in early-in-the wave and late-in-the-wave.

[Insert Table 4 about here]

Out of 211 sampled IPOs, 27 (13% of the sample) are on-the-wave IPOs both by industry and by region, while 124 IPOs (about 60% of the sample) are off-the-wave both by industry and by region; on the other hand, there are an additional 19 (9%) IPOs on-the-wave by industry but off-the-wave by region (therefore, there are a total of 46 IPOs on-the-wave by industry, i.e. 22% of the sample), and 41 (19%) IPOs on-the-wave by region but off-the-wave by industry (therefore 68 IPOs, or 32% of the sample, are on the wave by region). To sum up,

industry IPO waves and local IPO waves only overlap for a small fraction of IPOs, and local IPO waves emerge even after industry IPO waves have been accounted for.

As a second step of our empirical strategy towards the relevance of local IPO waves, we then check how similar the identified IPOs on-the-wave by region are to traditional IPOs on-the-wave by industry. The pattern of IPO underpricing reveals interesting evidence. Block I shows the 27 IPOs on-the-wave by industry and by region have average underpricing equal to 6.8%, which is about 40% higher than the underpricing of the 124 IPOs off-the-wave both by industry and by region, equal to 4.9%; furthermore, the 19 IPOs on-the-wave by industry only, and the 41 IPOs on-the-wave by region only, show an underpricing which is more than three times larger, equal to 19.4% and 15.7%, respectively. In Block III, the 27 IPOs on-the-wave both by industry and by region (underpricing 6.8%) and the 19 IPOs on-the-wave by industry but off-the-wave by region (19.4%) are divided into early-in-the-wave vs. late-in-the-wave IPOs according to the definition of industry IPO waves: 6 of the 27 IPOs (22%) are by industry early-in-the-wave with average underpricing of 22.1%; the remaining 21 by industry late-in-the-wave IPOs have underpricing equal to 2.4%. The 19 IPOs on-the-wave by industry only, show the same pattern: the subsample of 9 early-in-the-wave IPOs is underpriced by 26.3% while the subsample of 10 late-in-the-wave IPOs shows an average underpricing of 13.2%. A very similar pattern is detected in Block II when the subsample of 68 IPOs on the wave by region is divided in early-in-the-wave vs. late-in-the-wave IPOs according to the definition of local IPO waves: 13.9% and 26.5% for IPOs early-in-the-wave vs. 3.8% and 6.3% for the IPOs late-in-the-wave. Finally, Block IV shows that 4 out of 27 IPOs that are early-in-the-wave both by industry and by region have an average underpricing of 31.1%, while the remaining IPOs, late-in-the-wave either (both) by industry or (and) by region have first-day returns ranging from -3.2% to 4.5%. All in all, as per the IPO underpricing, local IPO waves by region looks pretty similar to industry IPO waves, with either by industry or region early-in-the-wave IPOs more deeply underpriced than late-in-the-wave IPOs. The evidence remains unchanged when median underpricing is considered (not reported for brevity), and it is confirmed in a multivariate analyses setting, reported hereafter.

Table 5 reports the multivariate analysis of IPO underpricing. Model 1 is our base specification, Model 2 includes a set of dummies detecting IPOs on- and off-the-wave by

industry and by region, and Model 3 is on the subsample of IPOs on-the-wave either by industry or by region and includes dummies for IPOs early-in-the-wave.<sup>9</sup>

[Insert Table 5 about here]

Model 2 shows that, on average, IPOs that are part of an IPO wave are not differently underpriced than IPOs off an IPO wave; this evidence holds for both traditional industry IPO waves and local IPO waves. Yet, Model 3 highlights that first-day returns are affected by the position of the IPO within the IPO wave. In fact, the underpricing is increasing when the issuing firm is early-in-the-wave both by industry and region ( $\alpha_{\text{Early-in-the-wave by Industry \& Early-in-the-wave by Region}} = 0.570^*$ ), when the IPO is early-in-the-wave by industry but off of the wave by region ( $\alpha_{\text{Early-in-the-wave by Industry \& Off-the-wave by Region}} = 1.730^{***}$ ), and when the issuing firm is off of the wave by industry but early-in-the-wave by region ( $\alpha_{\text{Off-the-wave by Industry \& Early-in-the-wave by Region}} = 0.403^{**}$ ). Therefore, early-in-the-wave IPOs have significantly larger underpricing than late-in-the-wave IPOs. This evidence is consistent with recent research on industry IPO waves (e.g., Banerjee et al., 2016). Importantly, this holds for early movers in local IPO waves, and even in IPO waves computed at the region level after industry IPO waves are considered. Overall, this is further evidence supporting local IPO waves.

#### **4. Industry IPO Waves, Local IPO Waves and the Going-Public Decision**

Any analyses of IPO waves based on the volume of IPOs or the underpricing of going public firms focuses on the outcomes of the listing process on the subsample of firms actually going

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<sup>9</sup> In line with the prevailing literature, in regressions we control for the market cycle before the IPO (e.g., Ibbotson and Jaffe, 1975; Ritter, 1984), IPO aftermarket volatility (e.g., Ritter, 1987), the IPO revision (e.g., Hanley, 1993; Ljungqvist and Wilhelm, 2003), the underwriter reputation (e.g., Carter and Manaster, 1990; Megginson and Weiss, 1991), the number of old shares sold and the number of new shares issued at the IPO, i.e., the incentives for insiders to underprice (e.g., Habib and Ljungqvist, 2001), the participation in the offer by institutional investors (e.g., Aggarwal et al., 2002; Hanley and Wilhelm, 1995), IPO gross proceeds, firm age and firm size, tackling the uncertainty about the offer (e.g., Ritter, 1987, 1984), and the local political alignment (e.g., Colak et al., 2018). In addition, all regressions include calendar-year dummies, industry dummies, and regional dummies.

public, and therefore most likely suffers from selection bias, as firms that could have gone public but decided to stay private are not considered. The most efficient way to overcome this selection bias is to look at the decision to go public rather than at any of the listing outcomes. Within this approach, the role played by industry IPO waves has been addressed in the literature using industry-year specific variables, such as the yearly median market-to-book of listed firms in the same industry or the industry sales growth in the previous year. Consistently, a good indication on whether IPO waves have a local origin can be found in the sensitivity of the likelihood a private firm will go public to the local version of these variables, e.g., the median market-to-book of listed firms located in the same area of the prospective going public private firm. To the extent the probability of an IPO is significantly affected by local-specific variables, IPO waves have a geographical pattern.

We estimate a probit model on the likelihood of a firm to stay private or go public and include among the explanatory variables the yearly median market-to-book of listed firms headquartered in the same region (*Region Median MTB*). The original ‘industry’ version of this variable (*Industry Median MTB*) was introduced by Pagano et al. (1998) to measure the buoyancy of the market-industry: as entrepreneurs manage to exploit the over-valuation of their companies by investors, firms in a particular industry tend to go public together when their market is particularly buoyant as also suggested by Lerner (1994) and Rajan and Servaes (1997); ultimately, a high number of listings in the same industry in the same time period defines an industry IPO wave. Therefore, the coefficient on *Industry Median MTB* is positive, revealing how much industry dynamics are relevant to generating IPO waves. Similarly, we predict the coefficient on *Region Median MTB* is positive, indicating a second, local nature, of IPO waves.

However, similar firms tend to cluster in the same area (e.g., Brown, 1989; McCann and Folta, 2009), and therefore the subsample of public firms in the same industry and the subsample of public firms in the same region can significantly overlap. As such, *Industry Median MTB* and *Region Median MTB* overlap for the listed firms in the same industry and in the same region, thus potentially generating confounding evidence. Specifically, the positive effect of *Region Median MTB* on the going public probability, could be generated by the fact

that listed firms in the region belong to the same industry, rather than by pure local-specific factors. To further distinguish industry effects from local effects, we consider,

- (i) the yearly median MTB of listed firms not headquartered in the same region but in the same industry (*In Industry Out Region Median MTB*). *In Industry Out Region Median MTB* catches the pure industry effect on the probability to go public; according to previous evidence and on IPO waves literature, a positive coefficient on *In Industry Out Region Median MTB* is expected.
- (ii) The yearly median MTB of listed firms headquartered in the same region but not the same industry (*Out Industry In Region Median MTB*). *Out Industry In Region Median MTB* is our key-variable addressing the local effects on the likelihood to go public. When the coefficient is positive and significant, evidence that IPO waves are also locally triggered is provided.
- (iii) The yearly median MTB of listed firms headquartered in the same region and in the same industry (*In Industry In Region Median MTB*). *In Industry In Region Median MTB* is more relevant the more similar firms are clustered in the same area. This variable would be especially relevant for instance for industrial districts. Therefore, this variable measures effects arising from the agglomeration economies. To the extent positive performance effects arise from firm agglomeration (e.g., Jaffe et al., 1993, and, more recently, Dougal et al., 2015), and firms with better performance can more easily go public (e.g., Chemmanur et al., 2010; Pagano et al., 1998), a positive coefficient *In Industry In Region Median MTB* is also predicted.<sup>10</sup>

More specifically, we estimate the following,

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<sup>10</sup> One might think that a fourth term *Out Industry Out Region Median MTB* is missing. For any firm-year observation, *Out Industry Out Region Median MTB* would be the median market-to-book of listed firms in all other industries and all other regions. *Out Industry Out Region Median MTB* is not consistent in cross-section and when included in regressions would provide confounding evidence due to correlation with other *Median MTB* variables. Immediate evidence of that emerges by considering, for instance, three industries, two of them are bullish and one is bearish: the median market-to-book out the industry will be low for bullish industries (one bullish and one bearish would be in the median) and high for the bearish industry (two bullish in the median). The logic is clearly the same if the local dimension is additionally considered.

$$\begin{aligned}
Pr(IPO_{i,t} = 1) = F(\alpha_1 In Industry Out Region Median MTB_{i,t} + \alpha_2 Out Industry In Region \\
Median MTB_{i,t} + \alpha_3 In Industry In Region Median MTB_{i,t} + \alpha_4 Log(1 + Age_{i,t}) + \\
+ \alpha_5 Log(Assets_{i,t-1}) + \alpha_6 Leverage_{i,t-1} + \alpha_7 ROA_{i,t-1}) \quad (1)
\end{aligned}$$

where *IPO* is a dummy variable that equals 1 if the firm goes public in year *t* and 0 if the firm remains private and *F(.)* is the cumulative distribution function of a standard normal variable. At any time *t*, the sample includes all firms that are private, and the firms that go public (had an IPO) in that year. After a firm goes public, it is dropped from the sample.<sup>11</sup> Table 6 reports the results of multivariate analysis.

[Insert Table 6 about here]

Results are consistent with local IPO waves. In Model 1, the likelihood a private firm will go public significantly increases for firms in bullish industries ( $\alpha_{Industry Median MTB} = 0.341^{***}$ ); this evidence is consistent with industry IPO waves and previous evidence. In Model 2, when we add *Region Median MTB*, the likelihood a private firm will go public is still significantly higher for firms in bullish industries ( $\alpha_{Industry Median MTB} = 0.338^{***}$ ), but is also positively affected by high valuations of listed firms headquartered in same region ( $\alpha_{Region Median MTB} = 0.045^{***}$ ).<sup>12</sup> In Model 3, we disentangle the effects of industries and regions, and results remain consistent. First, consistent with industry IPO waves, the coefficient of *In Industry Out Region Median MTB* is positive and highly statistically significantly ( $\alpha_{In Industry Out Region Median MTB} = 0.283^{***}$ ), meaning that regardless

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<sup>11</sup> Like Bodnaruk et al. (2008), in our model specification we follow Pagano et al. (1998). Note that *Median MTB* variables are calculated for any industry-region-year and catch any industry, regional, and year effects. For instance, for the same industry and region, *In Industry In Region Median MTB* in 2008 is different from *In Industry In Region Median MTB* in 2009, and the difference in values is attributed to 2009. Alternatively, we could estimate, e.g., *In Industry In Region Median MTB* across all years and add calendar year dummies in the model. When we do that, results remain unchanged.

<sup>12</sup> Against potential high correlation between *Industry Median MTB* and *Region Median MTB*, the coefficient on *Region Median MTB* doesn't change if *Region Median MTB* is not added but simply replaces *Industry Median MTB* in the model ( $\alpha_{Region Median MTB} = 0.048^{***}$ ). Evidence not reported for brevity.

of the location of industry peers, positive industry-market conditions increase the probability a private firm goes public. Second, consistent with local IPO waves, the coefficient on *Out Industry In Region Median MTB* is also positive and highly statistically significant ( $\alpha_{\text{Out Industry In Region Median MTB}} = 0.014^{**}$ ), suggesting that a bullish local market, regardless of the industries involved, also strongly affects the likelihood of an IPO. Finally, consistent with positive agglomeration economies, the probability of observing an IPO is positively affected by the valuations of similar local firms ( $\alpha_{\text{In Industry In Region Median MTB}} = 0.018^{***}$ ). Results on control variables also mimic previous evidence. The opportunity to tap public markets is particularly appealing to profitable ( $\alpha_{\text{ROA}} = 0.014^{***}$ ) and young companies ( $\alpha_{\text{Ln}(1+\text{Firm Age})} = -0.191^{***}$ ), and firms with high leverage ( $\alpha_{\text{Leverage}} = 0.073^*$ ), which is consistent with the changing issuer objective function hypothesis (e.g., Loughran and Ritter, 2004), and the financial constraint hypothesis (Pagano et al., 1998). Furthermore, small companies are adversely selected towards the listing ( $\alpha_{\text{Ln}(\text{Firm Size})} = 0.257^{***}$ ) (e.g., Bodnaruk et al., 2008; Chemmanur et al., 2010), for instance, because the considerable fixed costs of IPOs (e.g., administrative expenses and fees) (e.g., Ritter, 1987) weigh relatively more on small firms.

Our results could be driven by omitted variables, most plausibly related to the economic structure of the region. For instance, richer areas have better infrastructure for equity issuance (e.g., Loughran, 2008). In Model 4, we attempt to tease out these regional economic variations, by augmenting our model with several control variables. First, we include an indicator variable for firms headquartered in the North, which is the most economically successful and industrialized area of Italy (e.g., Guiso et al., 2008). Second, we include regional per capita disposable income (linear and squared), measuring both investor wealth and population density around the firm location and controlling for urban vs. rural effect (e.g., Loughran, 2008). Third, we include a dummy variable that equals 1 if the region hosts 10 or more listed firms with the same 2-digit SIC and 0 otherwise, thus controlling for

the presence in the region of industry clusters and potential spillover of knowledge (e.g., Alti, 2005; Engelberg et al., 2018).<sup>13</sup> Results are unchanged, and support previous evidence.

Finally, we deal with potential rare event bias, which could also affect our results. In these analyses, our dataset is made of 211 IPOs and 298,903 private firms: the very rare occurrence of IPOs implies the most popular statistical procedures can be grossly inefficient (e.g., King and Zeng, 2001). In Model 5, we deal with this issue by restricting the subsample of private firms according to the same criteria adopted in Pagano et al. (1998), keeping only private firms with (i) book value of shareholders' equity in excess of 10 billion lire (about 5.2 million euros), and (ii) positive earnings in the three years before listing.<sup>14</sup> We end with a sample of 80,133 observations, of which 211 are IPOs. In Model 5, results are unchanged when compared to prior evidence. As a further robustness check, we re-run our analyses further restricting the private firms subsample based on total assets value and by considering, first a 5% cut-off for rare events, as in King and Zeng (2001), and then a ratio of IPOs to private firms equal to 1:80, as implicitly in Pagano et al. (1998). We end with subsamples of about 4,000 and 17,000 observations on private firms, respectively. Results, again, remain unchanged (not reported for brevity).

## **5. Explaining Local IPO Waves**

### **5.1. IPO Waves, Knowledge Spillover , and Post-IPO performance**

It is consolidated that firms tend to cluster (e.g., Krugman, 1991) with long lasting positive consequences on performance, mainly due to spillover of knowledge among nearby firms (e.g., Jaffe et al., 1993). Consistently, in our going-public decision model, we find that in addition to high valuations of firms in the region (within the same or different industries), the presence of an industry district in the area is also extremely important in determining the IPO decision. Therefore, in digging into the reasons behind the creation of local IPO waves, we

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<sup>13</sup> Per Alti (2005), spillover of information is one of the primary drivers of IPO waves; Engelberg et al. (2018) show that firms in industry clusters have market prices that are more efficient than firms outside clusters, as geographic proximity allows for information spillovers and reduces marginal cost to information producers.

<sup>14</sup> Criteria used in Pagano et al. (1998) were mandatory listing requirements at MSE and consistently implemented in the research to select the sample of private firms truly eligible to listing. These criteria are no longer applicable.

first test whether local IPO waves are driven by some local factors which durably enhance the performance of the local firms. In this scenario, positive local externalities among firms operating in different industries but located in the same area, such as valuable knowledge spillovers between the nearby firms, would boost the performance of the local firms leading them to listing. Consistent with durable positive performance effects leading local firms to go public and generating local IPO waves, we expect that the well-known post-IPO fall in profitability is less pronounced for on-the-wave IPO firms than off-the-wave IPO firms. Per Degeorge and Zeckhauser (1993), the post-IPO fall in profitability is caused by entrepreneurs timing their issues to coincide with unusually high profitability or engaging in "window-dressing" of their corporate accounts at the time of the IPO. Therefore, to the extent firms in local IPO waves go public according to different criteria, i.e., based on local competitive advantages, their post-IPO fall in profitability should be less pronounced than the average.

To measure the post-IPO performance, we use the cumulative abnormal return for a firm from the day after the IPO to 1, 2, and 3-years after the IPO. As per Ritter (1991), we use a standard procedure where we first compute the benchmark-adjusted returns (or abnormal return) as the monthly raw return on a stock minus the monthly benchmark return for the corresponding period. Specifically, the benchmark-adjusted return for stock  $i$  in month  $t$  is defined as

$$AR_{i,t} = r_{i,t} - r_{b,t}$$

where  $r_{i,t}$  is the raw return for firm  $i$  in month  $t$  after going public (first day excluded) and  $r_{b,t}$  is the benchmark return in month  $t$ . To estimate  $r_{b,t}$ , we use the Fama and French (2016) 5-factor model, that is,

$$r_{i,t} - r_{f,t} = \alpha_i + \beta_i(r_{m,t} - r_{f,t}) + s_iSMB_t + h_iHML_t + r_iRMW_t + c_iCMA_t + \varepsilon_{i,t}$$

where  $r_{i,t}$  is the return on firm  $i$  for period  $t$ ,  $r_{f,t}$  is the risk-free rate of return,  $r_{m,t}$  is the return on the market portfolio,  $SMB_t$  is the return on a portfolio of small stocks minus the return on a portfolio of big stocks,  $HML_t$  is the difference between the returns on portfolios of high and low book-to-market stocks,  $RMW_t$  is the difference between the returns on portfolios of stocks with robust and weak profitability, and  $CMA_t$  is the difference between the returns on

portfolios of low and high investment firms stocks. The cumulative benchmark-adjusted aftermarket performance for months 1–12 after going public is then computed as the sum of the average benchmark-adjusted returns:

$$CAR_{0,1} = \sum_{t=1}^{12} AR_t$$

The 2- and 3-years cumulative benchmark-adjusted aftermarket performance are consistently computed.

Table 7 analyzes with a univariate perspective the cumulative abnormal returns for periods between 1 year and 3 years post-IPO, distinguishing on-the-wave by industry or by region IPOs vs. off-the-wave IPOs (Panel A), on- vs. off-the wave IPOs by industry (Panel B), on- vs. off-the wave IPOs by region (Panel C), early- vs. late-in-the-wave IPOs by industry (Panel D), and early- vs. late-in-the-wave IPOs by region (Panel E).

[Insert Table 7 about here]

Against the hypothesis that industry- or local-specific factors enhance the performance of the IPO firms in the wave, the post-IPO fall in performance is significantly more pronounced for on-the-wave than for off-the-wave IPOs both considering industry and local IPO wave definitions. In addition, while the on-the-wave post IPO performance is negative and statistically significant, the off-the-wave post-IPO performance is not statistically different from zero. For instance, the 3-year CAR for IPOs on-the-wave by industry averages -90.80% (p-value = 0.001\*\*\*), while for the off-the wave IPOs the drop in performance equals -12.50% (p-value = 0.363), with a highly statistically significant difference among the two groups (Diff. Test = 0.006\*\*\*). Similar results are reported when the IPO classification by region is considered (e.g., Panel C:  $CAR_{0,3\_On-the-Wave\ by\ Region} = -70.50\%***$ ,  $CAR_{0,3\_Off-the-Wave\ by\ Region} = -9.90\%$ , Diff. Test = 0.018\*\*).

The analysis of post-IPO performance, and in particular the comparison of post-IPO fall in profitability across early- and late-in-the-wave IPOs, can also help to address whether local IPO waves are generated by factors affecting the firm performance less permanently, such as the spillover of valuable information among the local private firms. In this alternative

scenario, a pioneer company decides to go public based on a suddenly recognized favorable change in a local factor affecting business profitability, and the other local companies follow after having found out about that local factor from the pioneer, trying to residually exploit it. Based on the premise that uncertainty is resolved (and thus private information revealed) over time, in this case early-in-the-wave IPOs (pioneers in the wave) should over-perform in the aftermarket late-in-the-wave IPOs (followers). Yet, when we compare the subsamples of early- versus late-in-the-wave IPOs, we do not find clear statistical evidence (e.g., Panel E:  $AR_{0,3\_Early-in-the-Wave\ by\ Region} = -53.80\%$ ,  $AR_{0,3\_Late-in-the-Wave\ by\ Region} = -81.40\%^{***}$ , Diff. Test = 0.545).

Fama and French (2016)'s 5-factor model that we use as a benchmark to compute the abnormal returns already accounts for market risk ( $\beta$ ), firm size (SMB), value/growth (HML), profitability (RMW) and investment (CMA) factors. For robustness, in what follows we further test the post-IPO performance using a multivariate approach, thus controlling for other factors that may influence post-IPO average profitability and ultimately our findings. Table 8 reports the results of multivariate analysis.

[Insert Table 8 about here]

Results confirm the previous evidence. Model 1 shows that on average IPOs belonging to an IPO wave have lower performance in the 3 years post-IPO compared to off-the-wave IPOs ( $\alpha_{On-the-wave\ by\ Industry\ or\ On-the-wave\ by\ Region} = -1.145^{***}$ ).<sup>15</sup> In Model 2, we distinguish IPOs on-the-wave by industry and by region, IPOs on-the-wave by industry only, and IPOs on-the-wave by region only, and results remain consistent. In Model 3, when we consider the subsamples of on-the-wave IPOs and test the difference of post-IPO performance across early- and late-in-the-wave IPOs, no significant evidence is found.

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<sup>15</sup> The evidence holds even when shorter time periods within the 3-year time-window are considered. The same coefficient for on-the-wave IPOs is equal to  $-0.317^{***}$  when the dependent variable is the cumulative abnormal return over 1-year post-IPO, equal to  $-0.283^{**}$  with  $CAR_{1,2}$ , and  $-0.438^{***}$  with  $CAR_{2,3}$ . Evidence not reported for brevity.

For robustness, we re-run our analyses of post-IPO performance using a matched control firm approach in computing CARs. As per Yung et al. (2008), we chose control firms using industry, market capitalization, and market-to-book ratio. More in particular, we first match an IPO firm with all existing firms with the same 1-digit SIC. To avoid matching with recent IPO firms, we require candidate control firms have at least three years of monthly data available. Second, within this sample we select firms with market capitalizations from 0.7 to 1.3 times the IPO firm's market capitalization. Third, we select those firms belonging to the same book-to-market ratio tertiles. When we re-run analyses in Table 8 using as dependent variable CARs estimated through this approach, results are unchanged and confirm previous evidence (not reported for brevity).

## **5.2. IPO Waves, Information Spillover Among IPOs, and IPO Price Revision**

Recent financial research strongly supports the spillover of information among potential concurrent firms going public as the primary driver for IPO waves. In this framework, pioneer IPOs reveal information about the listing, such as investors' indications of interest or improvements in the market conditions; as such, the pricing of subsequent IPOs becomes easier and expected profitability from listing increases, ultimately attracting several firms in the IPO market and triggering an industry IPO wave (e.g., Alti, 2005; Benveniste et al., 2003; Colaco et al., 2009; Lowry and Schwert, 2002). Therefore, the second driving force we test for local IPO waves is the spillover of local information among the local going public firms. Accordingly, within our local IPO waves framework, local firms that are thinking of going public learn from local pioneer IPOs about a local valuation factor previously neglected and relevant for the IPO pricing, thus finding it convenient, in the end, to go public and giving birth to an IPO wave at the region level.

To test whether local IPO waves are generated by spillover of information relevant for the IPO pricing we look at the IPO price revision. Ljungqvist and Wilhelm (2003) and Benveniste et al. (2002) argue that price revisions incorporate the information that spills over when issuer's industry-peer contemporaries start the bookbuilding phase and use the mean initial return of all IPOs in the issuer's industry that started trading during the bookbuilding phase as a measure of the industry-specific information revealed in concurrent IPOs and then

used in the IPO pricing. In the same vein, we use the mean initial return of all IPOs in the issuer's region that started trading during the bookbuilding phase as a measure of the local-specific information revealed in concurrent IPOs and relevant for the IPO pricing, and test whether it affects IPO price revision. A positive impact on IPO price revision of the average contemporary underpricing in the region would suggest the existence of a local valuation factor common to the going public firms in the area, eventually pushing private firms in the area to the IPO market.

Table 9 reports the results of multivariate analysis of IPO price revision. In Model 1 we consider the whole IPO sample and include among the explanatory variables the mean contemporary underpricing in the industry as in Ljungqvist and Wilhelm (2003). Model 2 is on the subsample of late-in-the-wave IPOs by industry, which are the IPOs in the wave that are supposed to benefit the most from observing the valuation process by the early-in-the-wave peers. In Model 3 we focus on the late-in-the-wave IPOs by region and replace the mean contemporary underpricing in industry with the mean contemporary underpricing in region thus testing for local spillover of information among contemporaries listings of the issuer headquartered in the same area.

[Insert Table 9 about here]

Results do not support spillover of information as driver of IPO waves both at industry and local level. The mean contemporary underpricing in industry does not affect IPO price revision both when the whole sample and the subsample of late-in-the-wave IPOs by industry are investigated (e.g., Model 1:  $\alpha_{\text{Mean contemporary underpricing in Industry}} = 13.298$ ). When the effect of mean contemporary underpricing in region is tested as determinant of IPO price revision in Model 3, we still fail to find significant evidence.

### **5.3. IPO Waves and Industry and Area Shocks**

We finally wonder whether local IPO waves can be generated by exogenous area shocks that simultaneously affect all local firms, such as local shocks to local political conditions, labor or real estate values. For instance, when land is used as collateral for debt financing, a

positive shock on real estate values makes firms owning land in the same general area experience simultaneous fluctuations in their ability to raise debt with positive effects on investments (e.g., Chaney et al., 2012); this increased investment capacity could lead to higher profitability and ultimately to listings of a few local companies.

To test for this hypothesis we adopt a staggered difference-in-difference approach.<sup>16</sup> Specifically, we collapse the dataset by region-year and consider the treatment group of the subsample of region-year that had hosted at least one local IPO wave, where a region-year observation is treated by a local IPO wave in the years after the wave is occurred, and untreated otherwise. Then, we run a set of diff-in-diff regressions taking in turn as dependent variable one among several local economic indicators, such as the volume of new firms or employees in the region, aggregate sales or earnings, among others. In this framework, local IPO waves generated by exogenous area shocks would determine a positive coefficient of the diff-in-diff variable, meaning that the increase in outcome from before- to after-the-local-IPO-wave is significantly larger in treated regions that had hosted a local IPO wave rather than in untreated regions without a local IPO wave. Table 10 reports the empirical evidence.

[Insert Table 10 about here]

In Table 10 - Panel A, consistent with local IPO waves originated in positive local area shocks, in all the cases the diff-in-diff coefficient is highly significant. In particular, compared with the untreated regions, after the local IPO wave the treated regions show an increase in the number of firms located in the area ( $\alpha_{DiD\_Number\ of\ Firms} = 1.816^{***}$ ), in the number of new local firms ( $\alpha_{DiD\_Number\ of\ New\ Firms} = 0.006^*$ ), in the number of employees ( $\alpha_{DiD\_Employees} = 1.070^{***}$ ), in aggregate sales ( $\alpha_{DiD\_Sales} = 0.035^{**}$ ), assets ( $\alpha_{DiD\_Assets} = 0.056^{**}$ ), and generated earnings ( $\alpha_{DiD\_Earnings} = 8.140^{***}$ ); furthermore, after the local IPO wave, the average value of firm leverage in the region also decreases more than in regions not experiencing a local IPO wave ( $\alpha_{DiD\_Leverage} = -$

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<sup>16</sup> The difference-in-difference analysis has been widely used in the literature since Snow (1855); see, Abadie (2005) for an extensive review on this methodology.

1.169\*\*\*). To sum up, results show that after a local IPO wave the region presents a generalized increase of all economic indicators. Ultimately, the permanent change at region level of all variables investigated strongly supports the existence of a positive shock spread throughout the local environment. In Table 10 – Panel B, we repeat the same analysis for industry IPO waves. Interestingly, we find similar but quite less robust evidence.

## **6. Conclusion**

In this paper, we posit the existence of local IPO waves, occurring when firms from different industries but located in the same area go public together. First, we define local IPO waves consistently with industry IPO waves and see that the subsamples of IPOs on-the-wave by industry and by region only slightly overlap; on the other hand, local IPO waves mimic industry IPO waves, e.g., showing the same underpricing pattern across early- and late-the-wave IPOs. Secondly, we show that the probability of going public is not only positively affected by high valuations of listed firms in the same industry, but also by high valuations of listed firms in markedly different industries but located in the same region. Third, against any knowledge or information spillovers among nearby firms, permanently or semi-permanently affecting the IPO firms performance, we show that early- and late-in-the-wave IPOs equally underperform off-the-wave IPOs in the long-run, and that IPO price revision is not sensitive to the information revealed by concurrent local IPOs. Fourth, consistent with an exogenous area shock that simultaneously affects all local firms, we find significant evidence in a set of diff-in-diff regressions using several local economic indicators as dependent variables (e.g., volume of new firms, employees in the region, local aggregate sales) and where treated regions are regions that had hosted at least one local IPO wave. Overall, our results support rational local IPO waves as mainly originating from positive local shocks.

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## **Data Availability Statement**

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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**Table 1**  
**Summary Statistics for the Samples Used in Estimation**

This table provides descriptive statistics for the investigated sample of IPOs and private firms. The IPO sample consists of 211 IPOs on the MSE over the period 1999–2017; ADRs, units, REITS, spin-offs, reverse LBOs, foreign issues, close-end funds, financial firms (SIC 6000–6999), utilities (SIC 4900-4999), government firms (SIC 9100–9199), and “non-classified establishments” (SIC 9900-9999) are excluded. Average 3-year returns are calculated from the first closing market price to the earlier of the three-year anniversary price or the delisting price. *IPOs* is the equally weighted average 3-year raw return (capital gains plus dividends). *CARs* is the equally weighted average 3-year cumulative abnormal return. *BHARs* is the equally weighted average 3-year buy-and-hold abnormal return. Abnormal returns are calculated using Fama and French (2016) 5-factor model. The rest of the variables are defined in Table A.2 in the Appendix. The private firm sample consists of 1,126,413 Italian private firm-years over the period 1999–2017 with available data in AIDA - Bureau Van Dijk, with ROE within plus and minus one range, and with at least € 2.5 million in total assets; private financial firms (SIC 6000–6999), utilities (SIC 4900-4999), government firms (SIC 9100–9199), and “non-classified establishments” (SIC 9900-9999) are excluded. In Panel C all variables are measured the year before the listing. The last two columns report the *t*- and the *z*-statistics for the test of difference in means and the distributions between the sample of the IPOs and the sample of the private firms, respectively. \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels.

**Table 1 – continued**

Panel A - Number of IPOs, Initial Returns, Gross Proceeds, Amount of Money Left on the Table, and Long-run Performance, by Cohort Year, 1999 to 2017							
Year	Number of IPOs	Average Initial Return	Average Gross Proceeds (€ million)	Aggregate Money Left on the Table (€ million)	Average 3-Year Return		
					IPOs	CARs	BHARs
1999	17	0.155	88.03	120.45	1.1%	-80.0%	-59.3%
2000	37	0.178	152.65	1,043.56	0.3%	-92.8%	-36.8%
2001	13	-0.011	129.77	-5.18	0.0%	35.5%	0.7%
2002	4	0.004	107.22	992.87	-1.9%	-197.3%	41.5%
2003	2	-0.022	30.95	-0.56	-0.2%	-39.1%	9.3%
2004	5	0.024	130.80	44.65	-9.6%	19.0%	64.0%
2005	8	0.053	197.62	31.18	-2.5%	-75.7%	-12.4%
2006	16	0.101	266.04	-55.81	2.9%	-14.4%	9.0%
2007	19	0.035	180.67	109.37	0.7%	6.9%	-1.0%
2008	4	0.022	21.71	-1.63	1.3%	-25.0%	-0.5%
2009	2	0.172	61.00	10.86	-1.1%	-43.4%	38.3%
2010	3	0.049	410.96	-0.91	-1.3%	-112.4%	-61.1%
2011	4	0.108	153.09	40.39	-6.8%	21.7%	-14.9%
2012	3	0.211	62.58	86.87	10.8%	-40.6%	-133.2%
2013	13	0.046	113.42	359.03	12.5%	-50.6%	-37.1%
2014	14	0.070	58.53	16.00	-2.3%	4.1%	-20.7%
2015	20	0.060	279.30	99.81	-1.5%	4.1%	4.0%
2016	10	0.063	107.87	100.01	5.7%	201.3%	46.7%
2017	17	0.064	68.78	95.46	.	.	.
1999-2001	67	0.136	123.48	1,158.83	0.5%	-64.6%	-35.8%
2002-2005	19	0.027	145.47	1,068.13	-3.9%	-72.5%	19.5%
2006-2007	35	0.065	219.69	53.56	1.6%	-2.8%	3.4%
2008-2012	16	0.103	141.87	135.58	0.7%	-34.9%	-36.9%
2013-2017	74	0.061	134.86	670.32	2.5%	9.4%	-9.7%
1999-2017	211	0.085	137.95	3,086.42	0.8%	-31.1%	-16.5%

**Panel B - Summary statistics for IPO characteristics**

Measure	Obs.	Mean	Median	Std.	Min	Max
Revision (% change from mid-point range)	202	7.9	6.1	15.1	0.0	132.3
Secondary shares (% of pre-IPO shares outstanding)	192	11.5	5.4	13.9	0.0	60.0
Primary shares (% of pre-IPO shares outstanding)	192	26.9	25.0	19.0	0.0	106.3
Institutional allocated shares (% of offer size)	180	81.2	80.0	18.3	0.0	100.0
Gross Proceeds (€ million)	194	131.0	36.7	332.1	0.9	3,364.0
Firm Age at IPO data (years)	201	19.0	15.0	17.7	0.0	96.0
Underwriter reputation (% relative market share)	191	4.9	0.4	10.6	0.0	34.7

**Panel C - Private Firms: firm's balance sheet database**

	Firms Going Public (IPOs)			Firms Remain Private			Tests of differences: IPOs – Firms Remain Private	
	Obs	Mean	Median	Obs	Mean	Median	Mean diff <i>t</i> -test	Kruskal-Wallis test
Firm Age (years)	211	18.6	18.4	1,125,786	22.2	20.0	-6.408***	63.361***
Assets (€ th)	211	505,614	43,563	917,992	22,010	5,857	1.504	226.294***
Leverage	211	3.12	1.15	817,139	3.21	0.76	-0.160	7.862***
ROA (%)	211	9.11	6.65	917,653	4.91	3.48	5.168***	45.149***

**Table 2**  
**Descriptive Statistics on IPO Waves by Industry, 1999–2017.**

This table presents descriptive statistics on IPO waves by industry between 1999 and 2017 at MSE; IPOs of ADRs, units, REITS, spin-offs, reverse LBOs, foreign issues, close-end funds, financial firms (SIC 6000–6999), utilities (SIC 4900-4999), government firms (SIC 9100–9199), and “non-classified establishments” (SIC 9900-9999) are excluded. The final sample consists of 211 IPOs. For any industry (SIC 1), we define an IPO wave when an industry has more IPOs than the 75th percentile of IPOs, compared to its industry time series (e.g., Baxamusa and Jalal, 2018; Chemmanur and He, 2011).

Panel A – Distribution of IPO waves by industry across 1-digit SIC industries							
	Industry	Number of waves	%	Mean number of IPOs in the wave	Median number of IPOs in the wave	Minimum number of IPOs in the wave	Maximum number of IPOs in the wave
1st	Life Science and Technology	2	20%	5.5	5.5	3.0	8.0
2nd	Energy and Transportation	2	20%	3.5	3.5	3.0	4.0
3rd	Trade & Services	2	20%	3.5	3.5	3.0	4.0
Rest		4	40%	7.0	7.5	3.0	10.0
Total		10	100%	4.6	3.0	3.0	10.0

  

Panel B – Duration of IPO waves by industry across 1-digit SIC industries				
Mean duration (days)	Median duration (days)	Std. of duration	Min duration (days)	Max duration (days)
237	230	186	89	614

  

Panel C – The 3 largest IPO waves in the sample by industry across 1-digit SIC industries									
	Industry	Number of IPOs	Beginning month of wave	Ending month of wave	Mean no. of IPOs per quarter	Median no. of IPOs per quarter	Std. of IPO volume across quarter	Minimum no. of IPOs per quarter	Maximum no. of IPOs per quarter
1st	Services	10	May 2000	Oct. 2000	5.0	5.0	1.4	4.0	6.0
2nd	Life Science and Technology	8	Nov. 2006	Jul. 2007	2.7	3.0	1.5	1.0	4.0
3rd	Wholesale and Retail Trade	8	Dec. 1999	Dec. 2000	1.6	1.0	2.1	0.0*	5.0

\* The only quarter that has zero IPOs in the wave is March-May 2000.

**Table 3**  
**Descriptive Statistics on IPO Waves by Region, 1999–2017**

This table presents descriptive statistics on IPO waves by region between 1999 and 2017 at MSE; IPOs of ADRs, units, REITS, spin-offs, reverse LBOs, foreign issues, close-end funds, financial firms (SIC 6000–6999), utilities (SIC 4900-4999), government firms (SIC 9100–9199), and “non-classified establishments” (SIC 9900-9999) are excluded. The final sample consists of 211 IPOs. Consistent with the definition of industry IPO wave (e.g., Baxamusa and Jalal, 2018; Chemmanur and He, 2011), for any region (NUTS2) we define an IPO wave when a region has more IPOs than the 75th percentile of IPOs, compared to its region time series.

Panel A – Distribution of IPO waves by region							
	Region (NUTS2)	Number of waves	%	Mean number of IPOs in the wave	Median number of IPOs in the wave	Minimum number of IPOs in the wave	Maximum number of IPOs in the wave
1st	Lombardy (ITC4)	2	10%	10.5	10.5	3.0	18.0
2nd	Emilia-Romagna (ITH5)	2	10%	5.5	5.5	4.0	7.0
3rd	Tuscany (ITI1)	2	10%	3.5	3.5	3.0	4.0
Rest		14	70%	3.3	3.0	3.0	7.0
Total		20	100%	3.4	3.0	3.0	18.0

  

Panel B – Duration of IPO waves by region				
Mean duration (days)	Median duration (days)	Std. of duration	Min duration (days)	Max duration (days)
220	169	155	75	463

  

Panel C – The 3 largest IPO waves in the sample by region									
	Region (NUTS2)	Number of IPOs	Beginning month of wave	Ending month of wave	Mean no. of IPOs per quarter	Median no. of IPOs per quarter	Std. of IPO volume across quarter	Minimum no. of IPOs per quarter	Maximum no. of IPOs per quarter
1st	Lombardy (ITC4)	18	Mar. 2000	Jul. 2001	3.0	2.5	2.6	1.0	8.0
2nd	Lazio (ITI4)	7	May 2000	May 2001	1.8	1.5	1.0	1.0	3.0
3rd	Emilia-Romagna (ITH5)	7	May 2006	Jun. 2007	1.4	1.0	1.1	0.0*	3.0

\* The only quarter that has zero IPOs in the wave is Nov. 2006 - Jan 2007.

**Table 4**  
**IPOs on-/off-the-wave by Industry vs. IPOs on-/off-the-wave by Region, and IPO Underpricing**

This table contrasts industry IPO waves and local IPO waves. The sample consists of 211 IPOs on the MSE over the period 1999–2017. *On-the-wave by Industry (by Region)* is a dummy variable that equals 1 if the IPO belongs to an IPO wave by industry (region), and zero otherwise; IPOs not on-the-wave by Industry (by Region) are *Off-the-wave by Industry (by Region)*. *Early-in-the-wave by Industry (by Region)* is a dummy variable that equals 1 if the IPO belongs to an IPO wave by industry (region) and the firm went public in the first quarter of the wave, and zero otherwise; IPOs on-the-wave but not early-in-the-wave are *Late-in-the-wave by Industry (by Region)*. *N* is the number of IPOs. *Initial Return* is the average percentage difference between the IPO 1st trading-day market price and the offer price.

		Local IPO Wave by Region			
		On-the-wave	Off-the-wave	Early-in-the-wave	Late-in-the-wave
		Industry IPO Wave	On-the-wave	N = 27 (13%) Initial Return = 0.068	19 (9%) 0.194
Off-the-wave	41 (19%) 0.157		124 (59%) 0.049	19 (46%) 0.265	22 (54%) 0.063
Early-in-the-wave	6 (22%) 0.221		9 (48%) 0.263	4 (15%) 0.311	2 (8%) 0.045
Late-in-the-wave	21 (78%) 0.024		10 (52%) 0.132	4 (15%) -0.032	17 (62%) 0.037

**Table 5**  
**Industry IPO Waves, Local IPO Waves and IPO Initial Return**

This table reports results from multivariate analysis of IPO Initial Return. Model 1 and 2 are on the whole IPO sample, while Model 3 is on the subsample of IPOs on-the-wave either by industry or by region. *Initial Return* is the percentage difference between the first trading-day market price and the offer price. *On-the-wave by Industry (by Region)* is a dummy variable that equals 1 if the IPO belongs to an IPO wave by industry (region), and zero otherwise; IPOs not on-the-wave by industry (by region) are *Off-the-wave by Industry (by Region)*. *Early-in-the-wave by Industry (by Region)* is a dummy variable that equals 1 if the IPO belongs to an IPO wave by industry (region) and the firm went public in the first quarter of the wave, and zero otherwise. The rest of the variables are defined in Table A.2 in the Appendix. All regressions include industry dummies, calendar-year dummies, and regional dummies. *t*-statistics based on White standard errors are reported in parentheses. \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels.

**Table 5 – continued**

	IPO Initial Return		
	All	All	On-the-Wave IPOs by Industry or by Region
	(1)	(2)	(3)
On-the-wave by Industry & On-the-wave by Region		-0.120 (-1.02)	
On-the-wave by Industry & Off-the-wave by Region		0.108 (1.05)	
Off-the-wave by Industry & On-the-wave by Region		0.080 (0.96)	
Early-in-the-wave by Industry & Early-in-the-wave by Region			0.570* (2.10)
Early-in-the-wave by Industry & Off-the-wave by Region			1.730*** (3.94)
Off-the-wave by Industry & Early-in-the-wave by Region			0.403** (2.37)
Market return 60dd pre-IPO	1.228*** (7.16)	1.076*** (5.06)	4.390** (2.61)
IPO stock return standard deviation 30dd post-IPO	2.075 (0.94)	2.061 (0.98)	7.681*** (6.10)
Revision	0.002*** (4.31)	0.001*** (5.20)	0.010* (2.01)
Underwriter reputation	-0.230* (-1.95)	-0.161 (-1.36)	1.777** (2.37)
Participation ratio	-0.344** (-2.94)	-0.333*** (-3.07)	-3.410** (-3.00)
Dilution factor	-0.001 (-1.74)	-0.001 (-1.60)	-3.048** (-2.83)
Institutional	0.151* (2.00)	0.146* (1.94)	2.391*** (8.82)
Ln(Gross Proceeds)	0.073*** (9.43)	0.069*** (6.02)	0.025 (0.47)
Ln(1+ Firm Age)	0.001 (0.02)	-0.001 (-0.04)	-0.080* (-1.86)
Ln(Firm Size)	-0.025** (-2.69)	-0.027*** (-3.12)	0.187 (1.76)
PAI	0.181 (0.48)	0.312 (0.58)	0.097 (0.27)
Constant	-0.604*** (-4.76)	-0.795*** (-3.71)	-5.619 (-1.60)
Industry fixed effect	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes
Region fixed effect	Yes	Yes	Yes
Adjusted R <sup>2</sup>	0.317	0.365	0.827
N	167	167	70

**Table 6**  
**The Firm Likelihood to Go Public and Local and Industry Market Buoyancy**

This table reports probit model estimation on the probability to go public. The sample of IPOs consists of 211 IPOs on the MSE over the period 1999–2017. The sample of private firms is consistently made of 1,126,413 Italian private firm-years over the period 1999–2017. The dependent variable equals 0 if the firm stays private and 1 otherwise. *Industry Median MTB* is the median market-to-book ratio of the listed firms in the firm industry. *Region Median MTB* is the median market-to-book ratio of the listed firms in the firm region. *In (Out) Industry In (Out) Region Median MTB* is the median market-to-book ratio of the listed firms in (out of) the firm industry and in (out of) the firm region. The rest of the variables are defined in Table A.2 in the Appendix. *Firm Size*, *Leverage* and *ROA* are lagged. *t*-statistics based on White standard errors are reported in parentheses. \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels.

	Stay Private (0) or Going Public (1)				
	(1)	(2)	(3)	(4)	(5)
Industry Median MTB	0.341*** (3.30)	0.338*** (3.26)			
Region Median MTB		0.045*** (2.74)			
In Industry In Region Median MTB			0.018*** (2.63)	0.033*** (4.19)	0.034*** (3.37)
In Industry Out Region Median MTB			0.283*** (4.13)	0.305*** (4.51)	0.377*** (4.31)
Out Industry In Region Median MTB			0.014** (2.05)	0.022*** (4.18)	0.023*** (3.77)
Ln(1+Firm Age)	-0.195*** (-5.26)	-0.196*** (-5.28)	-0.191*** (-5.22)	-0.174*** (-4.22)	-0.207*** (-3.85)
Ln(Firm Size)	0.262*** (14.74)	0.263*** (14.38)	0.257*** (14.60)	0.268*** (10.68)	0.161*** (3.77)
Leverage (x10 <sup>2</sup> )	0.059 (1.21)	0.058 (1.19)	0.073* (1.65)	0.090** (2.27)	1.071*** (3.04)
ROA	0.015*** (10.95)	0.015*** (11.25)	0.014*** (10.06)	0.014*** (7.76)	0.013*** (6.21)
North_D				0.047 (0.48)	0.034 (0.31)
Region Per Capita Income (x10 <sup>3</sup> )				0.198** (2.06)	0.176* (1.82)
Region Per Capita Income Squared (x10 <sup>3</sup> )				-0.007*** (-2.66)	-0.007*** (-2.60)
Cluster_D				0.510*** (2.69)	0.449* (1.72)
Constant	-6.296*** (-19.41)	-6.358*** (-19.19)	-6.146*** (-22.37)	-7.465*** (-7.34)	-5.797*** (-4.58)
Pseudo-R <sup>2</sup>	0.152	0.155	0.145	0.162	0.115
N	801,774	749,717	559,941	299,114	80,133

**Table 7**  
**Post-IPO Performance of On- vs. Off-the-Wave IPOs and Early- vs. Late-in-the-wave IPOs, by Industry and by Region**

This table compares the post-IPO (offering day +1 to day +765) cumulative abnormal stock returns for firms in the IPO sample, distinguishing on-the-wave by industry or by region IPOs vs. off-the-wave IPOs (Panel A), on-vs. off-the wave IPOs by industry (Panel B), on- vs. off-the wave IPOs by region (Panel C), early- vs. late-in-the-wave IPOs by industry (Panel D), and early- vs. late-in-the-wave IPOs by region (Panel E). CAR is the cumulative abnormal return, Fama and French (2016) 5-factor model benchmarked. \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels, respectively.

Panel A. Abnormal Returns for On-the-Wave by Industry or Region IPOs and Off-the-Wave IPOs						
Variable	On-the-Wave by Industry or Region (n = 87)		Off-the-Wave (n = 124)		Diff. Tests	
	Mean	P-Value	Mean	P-Value	P-Value	
CAR <sub>0,1</sub>	-24.60%	0.001 ***	-2.90%	0.602	0.017 **	
CAR <sub>0,2</sub>	-40.90%	0.001 ***	-0.20%	0.989	0.016 **	
CAR <sub>0,3</sub>	-68.50%	0.000 ***	-1.20%	0.940	0.006 ***	

  

Panel B. Abnormal Returns for On-the-Wave by Industry and Off-the-Wave IPOs						
Variable	On-the-Wave by Industry (n = 46)		Off-the-Wave by Industry (n = 165)		Diff. Tests	
	Mean	P-Value	Mean	P-Value	P-Value	
CAR <sub>0,1</sub>	-34.10%	0.002 ***	-5.60%	0.251	0.008 ***	
CAR <sub>0,2</sub>	-57.80%	0.001 ***	-5.80%	0.545	0.008 ***	
CAR <sub>0,3</sub>	-90.80%	0.001 ***	-12.50%	0.363	0.006 ***	

  

Panel C. Abnormal Returns for On-the-Wave by Region and Off-the-Wave IPOs						
Variable	On-the-Wave by Region (n = 68)		Off-the-Wave by Region (n = 143)		Diff. Tests	
	Mean	P-Value	Mean	P-Value	P-Value	
CAR <sub>0,1</sub>	-25.00%	0.005 ***	-5.60%	0.279	0.043 **	
CAR <sub>0,2</sub>	-40.40%	0.008 ***	-6.30%	0.531	0.049 **	
CAR <sub>0,3</sub>	-70.50%	0.002 ***	-9.90%	0.488	0.018 **	

  

Panel D. Abnormal Returns for Early-in-the-Wave by Industry and Late-in-the-Wave IPOs						
Variable	Early-in-the-Wave by Industry (n = 15)		Late-in-the-Wave by Industry (n = 31)		Diff. Tests	
	Mean	P-Value	Mean	P-Value	P-Value	
CAR <sub>0,1</sub>	-23.60%	0.207	-39.20%	0.003 ***	0.473	
CAR <sub>0,2</sub>	-52.80%	0.125	-60.20%	0.004 ***	0.838	
CAR <sub>0,3</sub>	-65.60%	0.222	-102.20%	0.001 ***	0.507	

  

Panel E. Abnormal Returns for Early-in-the-Wave by Region and Late-in-the-Wave IPOs						
Variable	Early-in-the-Wave by Region (n = 27)		Late-in-the-Wave by Region (n = 41)		Diff. Tests	
	Mean	P-Value	Mean	P-Value	P-Value	
CAR <sub>0,1</sub>	-22.20%	0.103	-26.80%	0.024 **	0.796	
CAR <sub>0,2</sub>	-36.30%	0.128	-43.00%	0.033 **	0.827	
CAR <sub>0,3</sub>	-53.80%	0.142	-81.40%	0.007 ***	0.545	

**Table 8**  
**Mean Abnormal Returns for On-the-Wave and Off-the-Wave IPOs, by Industry and by Region**

This table reports results from multivariate analysis of post-IPO (offering day +1 through day +756) cross-sectional average cumulative abnormal returns, Fama and French (2016) 5-factor model benchmarked for firms in the IPO sample. The dependent variable is the 3-year cumulative abnormal return  $j$ . *On-the-wave by Industry (by Region)* is a dummy variable that equals 1 if the IPO belongs to an IPO wave by industry (region), and zero otherwise; IPOs not on-the-wave by Industry (by Region) are *Off-the-wave by Industry (by Region)*. *Early-in-the-wave by Industry (by Region)* is a dummy variable that equals 1 if the IPO belongs to an IPO wave by industry (region) and the firm went public in the first quarter of the wave, and zero otherwise. The rest of the variables are defined in Table A.2 in the Appendix. All regressions include industry dummies, calendar-year dummies, and regional dummies.  $t$ -statistics based on White standard errors are reported in parentheses. \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels, respectively.

	CAR <sub>0,3</sub>		
	All	All	On-the-Wave IPOs by Industry or by Region
	(1)	(2)	(3)
On-the-wave by Industry or On-the-wave by Region	-1.145*** (-6.06)		
On-the-wave by Industry & On-the-wave by Region		-1.635*** (-5.98)	
On-the-wave by Industry & Off-the-wave by Region		-1.293** (-2.22)	
Off-the-wave by Industry & On-the-wave by Region		-1.445** (-2.38)	
Early-in-the-wave by Industry or Early-in-the-wave by Region			0.289 (0.67)
Underwriter reputation	-0.788 (-0.43)	-0.116 (-0.08)	9.549 (0.96)
Overhang	-2.299 (-1.11)	-1.797 (-1.29)	-3.599 (-0.41)
Institutional	-0.969 (-1.69)	-1.029 (-1.65)	-1.035 (-1.11)
Constant	2.755* (1.77)	-6.021* (-1.90)	3.884 (0.37)
Industry fixed effect	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes
Region fixed effect	Yes	Yes	Yes
Adjusted R <sup>2</sup>	0.021	0.015	0.003
N	150	150	67

**Table 9**  
**Industry IPO Waves, Local IPO Waves and IPO Price Revision**

This table reports results from multivariate analysis of IPO price revision. Model 1 is on the whole sample made of 211 IPOs on the MSE over the period 1999–2017. Model 2 is on the subsample of 31 IPOs late-in-the-wave by industry, Model 3 is on the subsample of 41 IPOs late-in-the-wave by region. The dependent variable is the percentage change between the offer price and the middle of the range of prices in the prospectus. *Mean contemporary underpricing in Industry (in Region)* is the average initial return of all IPOs in the issuer's industry (region) that started trading during the bookbuilding phase. The rest of the variables are defined in Table A.2 in the Appendix. All regressions include industry dummies, calendar-year dummies, and regional dummies. *t*-statistics based on White standard errors are reported in parentheses. \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels.

	IPO Price Revision		
	All	Late-in- the-Wave by Industry	Late-in- the-Wave by Region
	(1)	(2)	(3)
Mean contemporary underpricing in Industry	13.298 (1.50)	52.699 (0.57)	
Mean contemporary underpricing in Region			1.737 (0.07)
Underwriter reputation	14.128** (2.62)	253.456 (0.89)	-17.181 (-0.55)
Ln(1+Firm Age)	0.731 (0.55)	29.771 (1.07)	2.375 (0.42)
Constant	25.801* (1.82)	-276.807 (-1.03)	11.281 (0.57)
Industry fixed effect	Yes	Yes	Yes
Year fixed effect	Yes	Yes	Yes
Region fixed effect	Yes	Yes	Yes
Adjusted R <sup>2</sup>	0.004	0.006	0.004
N	192	31	39

**Table 10**  
**IPO Waves and Industry and Area Shocks**

This table reports staggered difference-in-difference estimates for the regions (industries) with a local IPO wave and the control regions (industries) without IPO waves. The sample consists of 211 IPOs on the MSE over the period 1999–2017. The initial dataset is collapsed by region-year (Panel A) and industry-year (Panel B): the treatment group is the subsample of region-year (industry-year) that had hosted at least one local IPO wave (industry IPO wave); a region-year (industry-year) observation is treated by a local IPO wave (industry IPO wave) in the years after the wave is occurred, and untreated otherwise. Dependent variables are computed at region level in Panel A and at industry level in Panel B. All variables are defined in Table A.2 in the Appendix. *Leverage* is the average value of *Leverage* in the region (industry). In Panel A, regressions include calendar-year dummies and region dummies. In Panel B, regressions include calendar-year dummies and industry dummies. *t*-statistics based on White standard errors are reported in parentheses. \*\*\*, \*\*, \* indicate significance at the 1%, 5%, and 10% levels.

Panel A – Local IPO wave							
	Number of Firms (x 10 <sup>3</sup> )	Number of New Firms (x 10 <sup>3</sup> )	Employees (x 10 <sup>5</sup> )	Sales (x 10 <sup>9</sup> )	Assets (x 10 <sup>9</sup> )	Earnings (x 10 <sup>5</sup> )	Leverage
	(1)	(2)	(3)	(4)	(5)	(6)	(8)
DiD	1.816*** (3.02)	0.006* (1.91)	1.070*** (3.15)	0.035** (2.31)	0.056** (2.57)	8.140*** (2.70)	-1.169*** (-2.83)
Region Treated	2.885*** (3.96)	0.033*** (3.10)	1.490*** (3.71)	0.035* (1.82)	0.009 (0.37)	9.920*** (2.69)	1.467* (1.71)
Constant	0.784*** (3.25)	-0.005 (-1.43)	0.332*** (3.36)	0.006 (0.66)	0.075 (0.71)	3.970*** (3.24)	1.997*** (3.82)
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R2	0.858	0.487	0.916	0.373	0.385	0.738	0.866
N	338	338	338	338	338	338	338
Panel B – Industry IPO wave							
	Number of Firms (x 10 <sup>3</sup> )	Number of New Firms (x 10 <sup>3</sup> )	Employees (x 10 <sup>5</sup> )	Sales (x 10 <sup>9</sup> )	Assets (x 10 <sup>9</sup> )	Earnings (x 10 <sup>5</sup> )	Leverage
	(1)	(2)	(3)	(4)	(5)	(6)	(8)
DiD	0.337*** (3.09)	-0.001 (-1.38)	1.555*** (3.53)	0.011*** (3.33)	0.010*** (3.05)	3.320*** (5.02)	-0.063 (-0.16)
Industry Treated	2.052*** (8.63)	0.021*** (4.32)	17.200*** (13.56)	0.030*** (4.26)	0.038*** (4.84)	2.240 (1.44)	0.330 (0.66)
Constant	-0.398*** (-2.56)	-0.005*** (-3.94)	-2.360*** (-4.67)	-0.006*** (-1.91)	-0.008*** (-2.28)	0.587 (0.75)	8.458*** (9.67)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R2	0.834	0.306	0.855	0.245	0.138	0.616	0.511
N	1,202	1,202	1,202	1,202	1,202	1,202	1,202

## Appendix

**Table A.1**

### **Firms that Could Have Gone Public and Firms that Actually Go Public**

This table provides frequencies about private firms in EFIGE 2008 that declare in question F22 their intentions to go public in the next three years (possible outcomes are "*Definitely yes*", "*Probably yes*", and "*No*"), and firms that actually went public in 2009-2011. Data on EFIGE firms IPOs are taken from Orbis - Bureau Van Dijk. In matching EFIGE with Orbis, 243 missing were generated: from these 243 missing, 3 have answered definitely yes, 6 have answered probably yes, and 220 have answered no. EFIGE is a survey dataset that covers a representative and cross-country comparable sample of 14,759 manufacturing firms (NACE rev. 1.1 from 1500 to 3768) across seven European countries (Austria, France, Germany, Hungary, Italy, Spain and UK) for the year 2008. Previous papers that have also used EFIGE include, e.g., Alguacil et al. (2017), Bartoli et al. (2013), Giannetti (2019), and Guida and Sabato (2017). For detailed information about EFIGE see Altomonte and Aquilante (2012).

Country	All Listed Firm	Private Firm	Does the firm intend to go public in the next three years?			Manufacturing IPOs in 2009-2011	
			Definitely yes	Probably yes	No		
Austria	482	10	470	0	7	461	0
France	2,973	77	2,896	9	14	2,873	1
Germany	2,973	62	2,908	2	73	2,824	0
Hungary	488	7	481	2	1	478	0
Italy	3,020	23	2,997	2	27	2,968	0
Spain	2,832	36	2,796	1	8	2,787	0
UK	2,117	129	1,988	6	23	1,948	0
Total	14,885	344	14,536	22	153	14,339	1

**Table A.2**  
**Variable Definitions**

<b>Variable</b>	<b>Description</b>
CAR (BHAR)	The cumulative (buy-and-hold) abnormal return Fama and French (2016) 5-factor model benchmarked.
Cluster_D	A dummy variable that equals 1 if a firm region includes 10 or more listed firms with the same 2-digit SIC, and 0 otherwise.
Dilution Factor	The number of primary (new) shares in IPO relative to pre-IPO shares outstanding.
Early/Late-in-the-wave by Industry (Early/Late-in-the-wave by Region)	A dummy variable that equals 1 if the IPO belongs to an IPO wave by industry (region) and the firm went public in the first quarter of the wave. IPOs on-the-wave but not early-in-the-wave are late-in-the-wave.
Employees (Sales) [Assets] {Earnings}	The number of employees (aggregate sales) [aggregated assets] {aggregated earnings} of firms headquartered in a given region/belonging to a given industry.
Firm Age	The number of years since the firm's foundation.
Firm Size	Total assets.
Gross Proceeds	The amount raised from investors in € million (global offering amount excluding overallotment options).
In Industry In Region Median MTB (In Industry Out Region Median MTB) [Out Industry In Region Median MTB]	The yearly median market-to-book ratio of listed firms [not] in the firm same industry (1-digit SIC) and headquartered [in] (outside) the firm same region (NUTS2)
Industry Median MTB (Region Median MTB)	The yearly median market-to-book ratio of listed firms in the firm industry (region).
Initial Return	The percentage difference between the IPO 1st trading-day market price and the offer price.
Institutional	The percentage of the IPO issue allocated to institutional investors.
IPO stock return standard deviation 30dd post-IPO	The daily standard deviation of the IPO stock raw returns in the 30 trading days after the offering date.
Leverage	The ratio of debt to equity book value.
Market return 60dd pre-IPO	The average of daily industry-specific index returns in the 60 trading days before the offering date.
Mean Contemporary Underpricing in Industry (Region)	For firms in the same industry (region), the mean underpricing of the issuer's contemporaries, that is firms completing an IPO between the issuer's registration and offering dates.
North_D	A dummy variable that equals 1 if the firm is headquartered in the North of the country, and 0 otherwise.
Number of (New) Firms	The number of firms (with age less than 1 year) headquartered in a given region or belonging to a given industry.
On/Off-the-wave by Industry (On/Off-the-wave by Region)	A dummy variable that equals 1 if the firm belongs to an IPO wave by industry (region), and 0 otherwise. We define an IPO wave by industry (region) when a 1-digit SIC (NUTS2) has more IPOs than the 75th percentile of IPOs, compared to its industry (region) time series. IPOs not on-the-wave are off-the-wave.
Overhang	Shares retained by existing pre-issue shareholders divided by primary shares sold.
PAI	The ratio of the votes obtained in a province by the coalition that won the 2013 Italian political elections to the total number of votes in the same province.

Participation Ratio	The number of secondary (old) shares in IPO relative to pre-IPO shares outstanding.
Primary shares	The percentage of new shares sold in the IPO relative to the pre-IPO shares outstanding.
Region per Capita Income (Squared)	The (squared) per capita Disposable Income of households living in the same region. Disposable Income is computed as: Primary Income - Current Taxes - Social Contributions + Social Benefits + Other Net Transfers.
Revision	The percentage change between the offer price and the middle of the range of prices in the prospectus.
Roa	The ratio of EBITDA to total assets.
Secondary shares	The percentage of secondary shares sold in the IPO relative to the pre-IPO shares outstanding.
Underwriter Reputation	The Megginson and Weiss, (1991)'s measure of underwriter reputation (underwriter relative market share).

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