

# The Global Digital Divide and Capital Markets: The Effect of Internet Penetration on IPO Underpricing

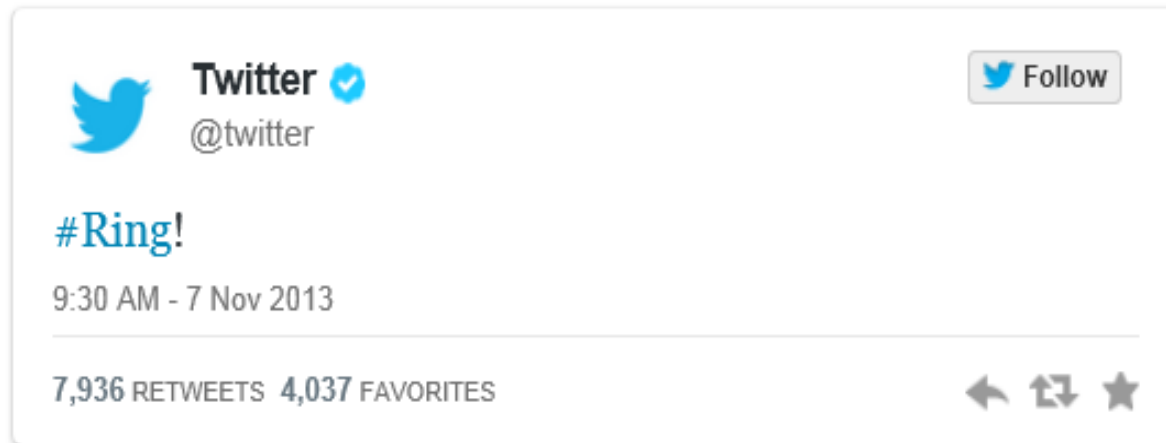
Thomas J. Boulton  
Nayanan Ramasubbu  
Scott Smart  
Chad Zutter

# Twitter IPO



IPO date November 7, 2013

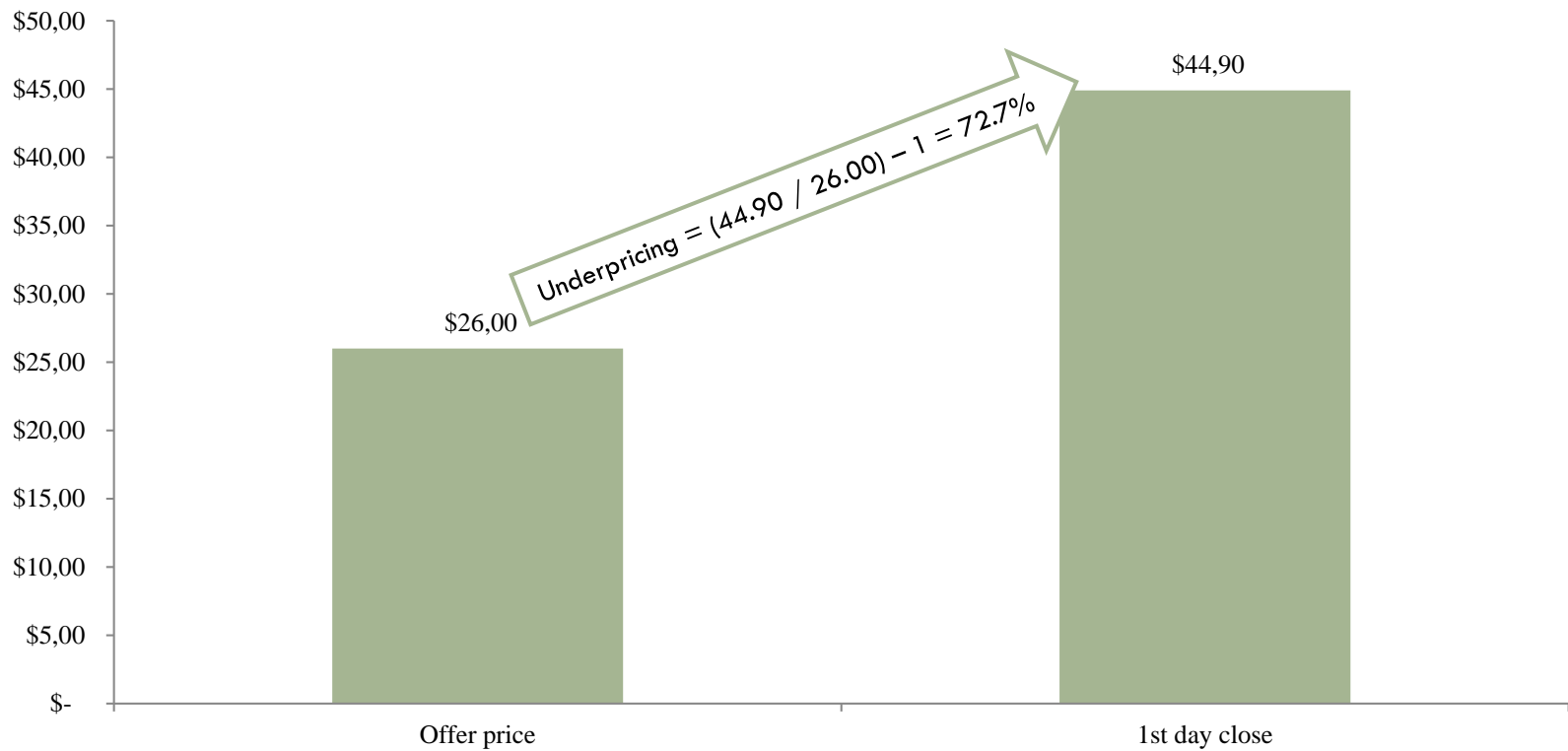
- Offer price = \$26.00 per share
- Shares sold = 80.5 million, including overallotment
- Net proceeds = \$2.025 billion



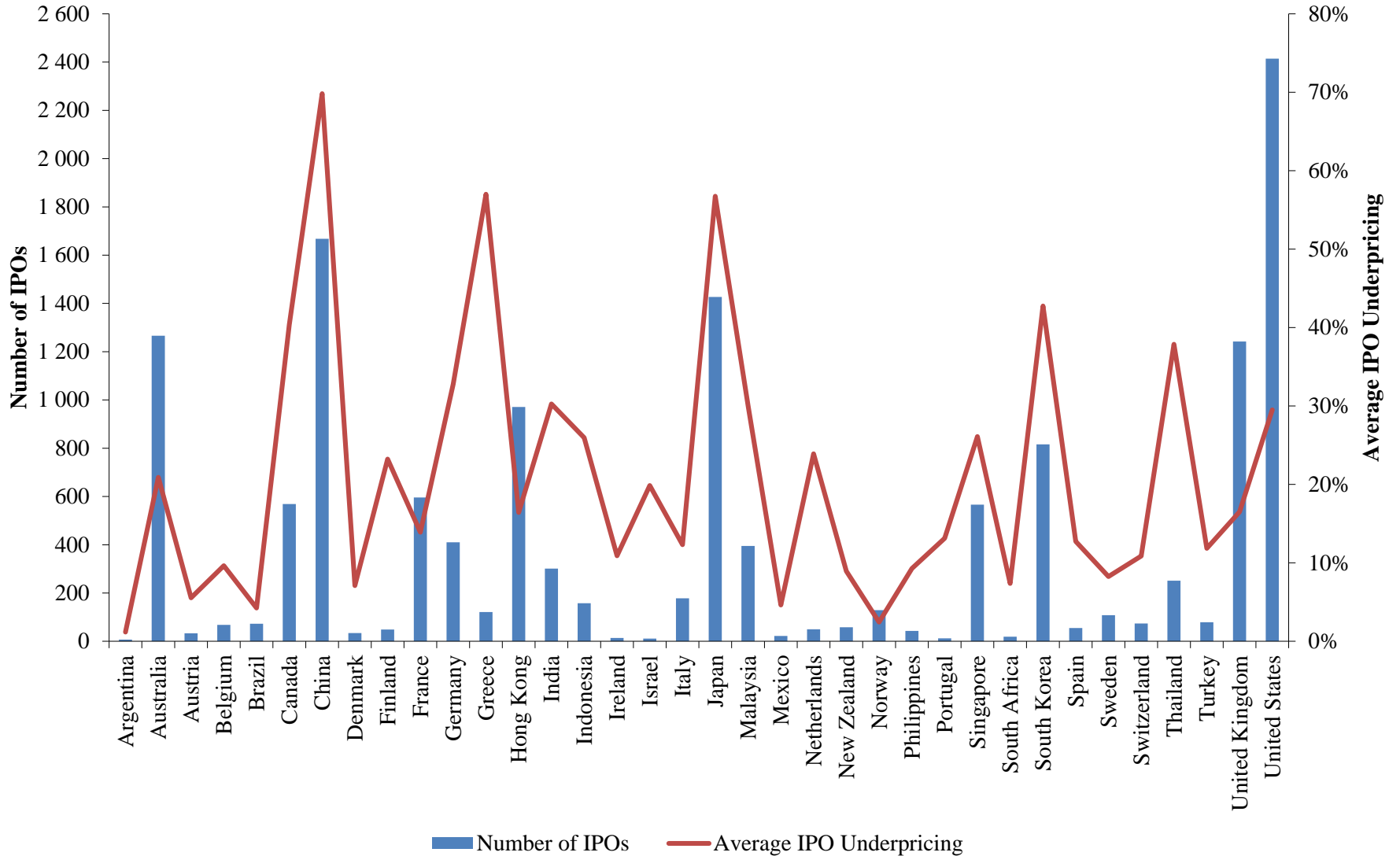
# Twitter IPO



## IPO Underpricing



# IPO Underpricing (1998-2014)



# IPO Underpricing

Why are IPOs underpriced? (Ljungqvist, 2007)

Information asymmetry:

- Winner's curse (Rock, 1985)
- Signaling (Allen and Faulhaber, 1989; Grinblatt and Hwang, 1989; Welch, 1989)

Institutional explanations

- Legal liability (Tinic, 1988; Hughes and Thakor, 1992)

Ownership and control

- Reduced monitoring (Brennan and Franks, 1997; Boulton, Smart, and Zutter, 2010)

Behavioral explanations

- Cascades (Welch, 1992; Amihud, Hauser, and Kirsh, 2003)

Agency problems (issuer-underwriter):

- Ritter and Welch (2002)

# IPO Underpricing

Information asymmetry and underpricing:

Issuers and investment banks (e.g., Baron, 1992)

- Issuers that are more uncertain about the market reception for their securities accept a lower offer price.

Issuers and investors (e.g., Welch, 1989)

- Issuers utilize the underpricing mechanism to convey a signal of quality to investors.

Among different investor groups (e.g., Rock, 1986)

- Uninformed investors require underpricing to stay in the IPO market due to winner's curse potential.

# Research question

What drives country-level variation in IPO underpricing?

- Loughran, Ritter, and Rydqvist (1994): differences in regulatory burden, offering mechanisms, and firm-characteristics
- Boulton, Smart, and Zutter (2010, 2011): investor protections and the quality of reported earnings

Does country-level variation in internet penetration explain variation within the international cross-section of underpricing?

# Internet Penetration

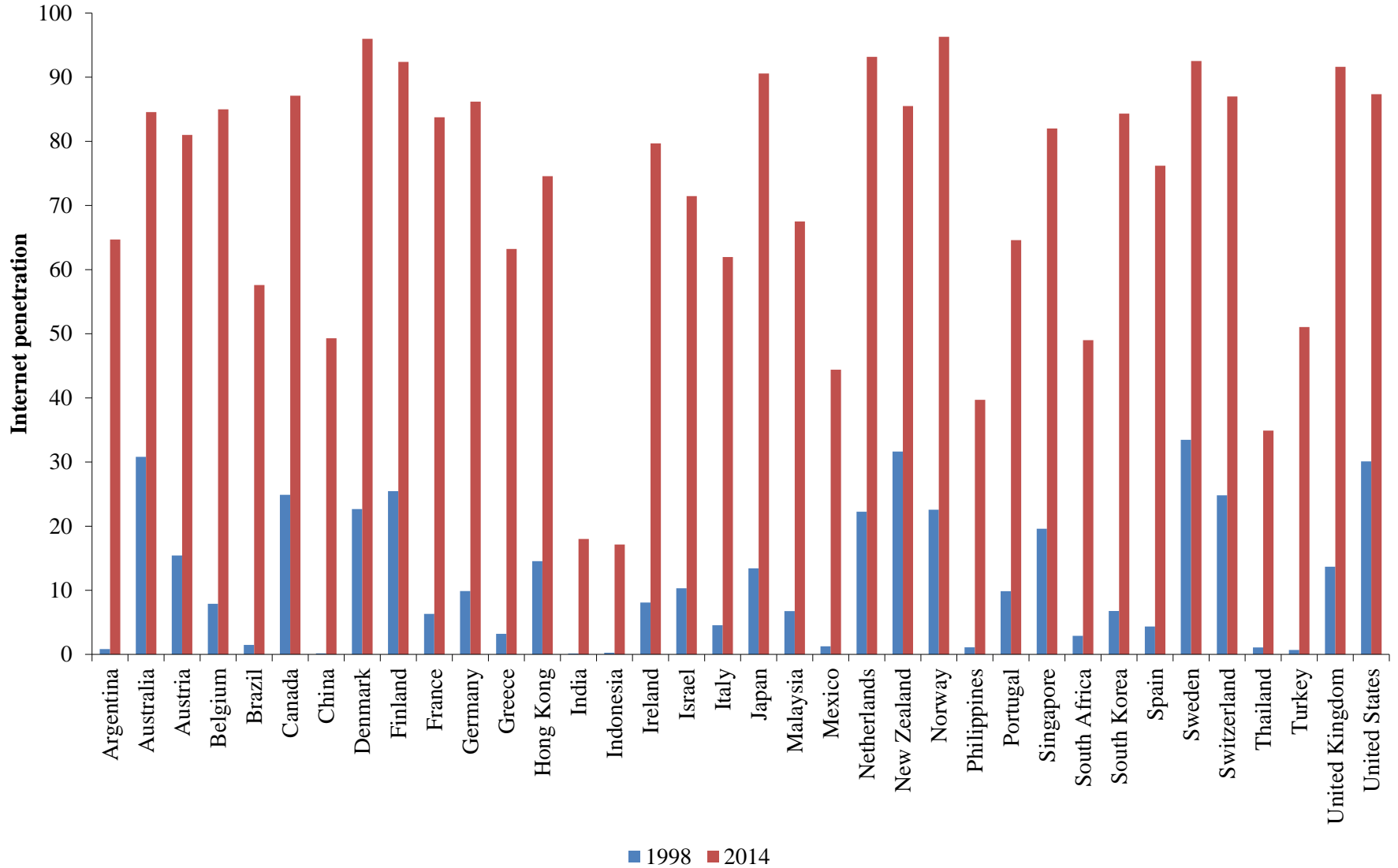
Research finds that the Internet has had profound effects on several markets:

- Life insurance (Brown and Goolsbee, 2002)
- Automobiles (Zettelmeyer, Morton, and Silva-Risso, 2006)
- Used books (Ghose, Smith, and Telang, 2006)
- Airlines (Orlov, 2011)

Common takeaways from this literature are that the Internet reduces the cost of information acquisition, lessens information asymmetry, helps overcome adverse selection problems, and leads to more competitive markets.



# Internet Penetration



# Hypotheses

At the IPO, greater internet penetration may reduce information asymmetry between issuers and IPO market participants:

*H1: Internet penetration is negative correlated with initial returns.*

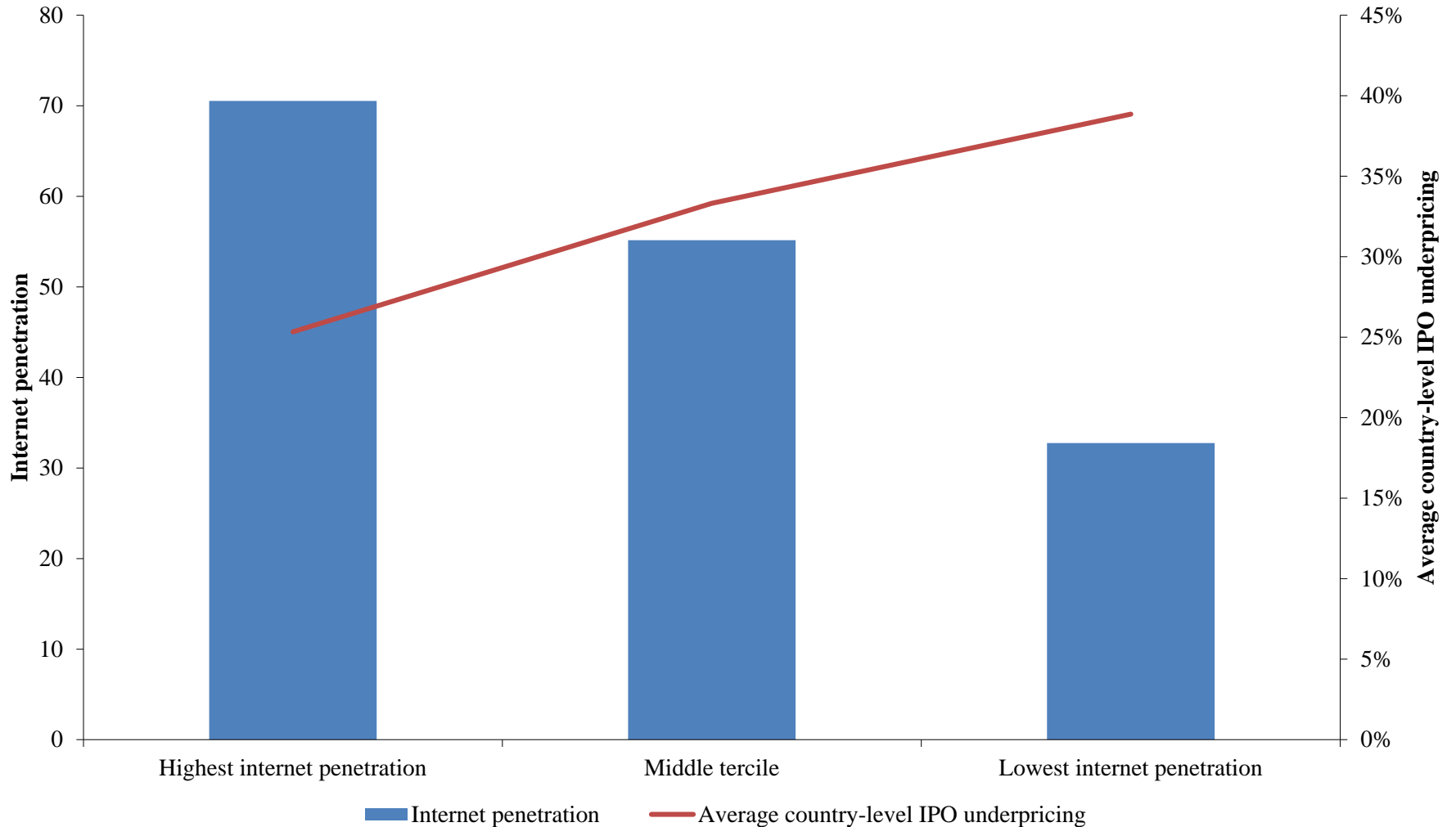
Pre-IPO, greater internet penetration may reduce uncertainty in setting a final offer price:

*H2: Internet penetration is positively correlated with offer price precision.*

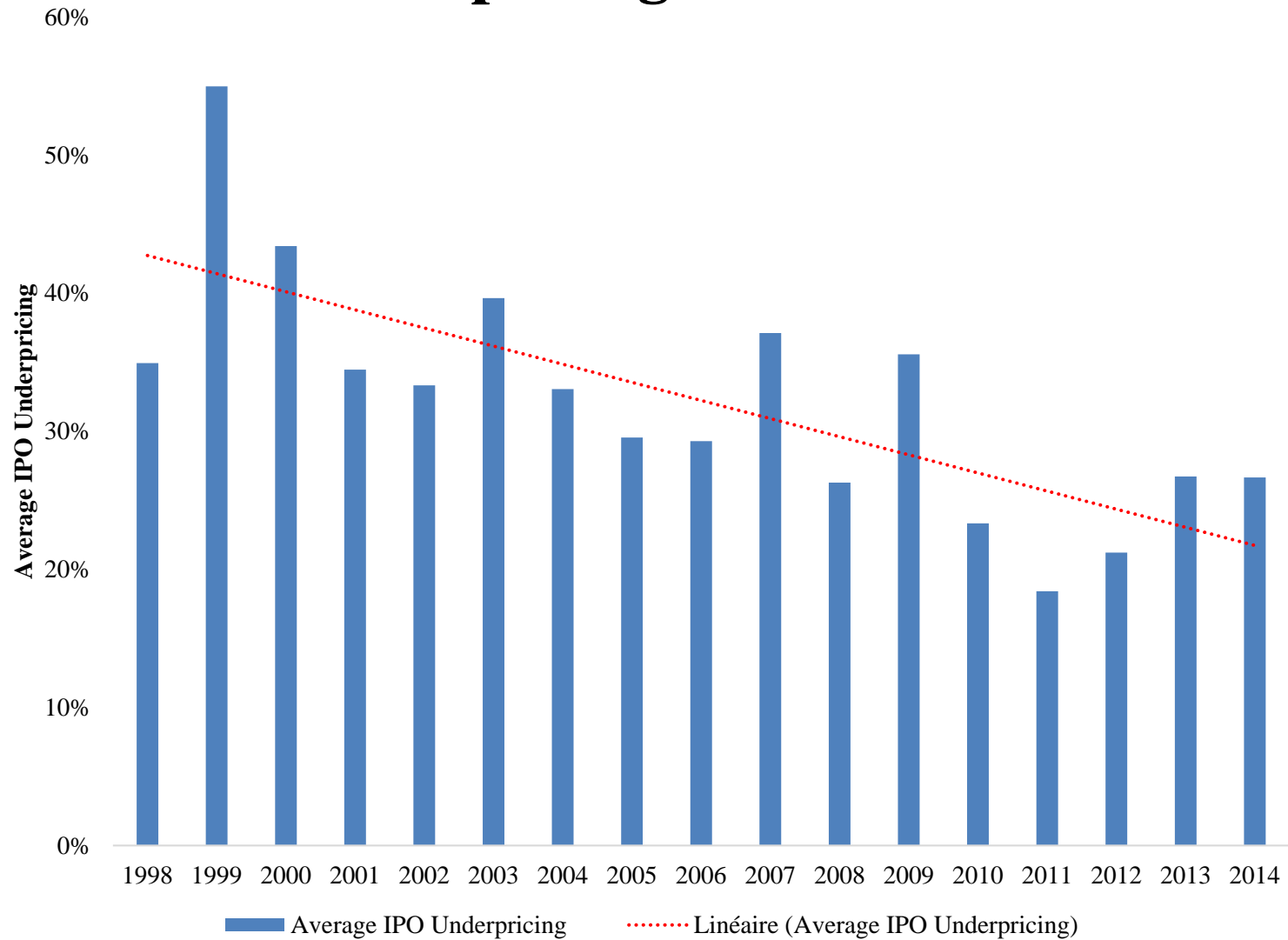
Post-IPO, greater internet penetration may impact shareholders willingness / desire to establish large blockholdings:

*H3: Internet penetration is positively / negatively correlated with post-IPO blockholdings.*

# Internet Penetration & Underpricing



# Underpricing Over Time



# Preview of results

First day returns tend to be lower for IPOs issued in countries with greater internet penetration.

- A one sigma increase in internet penetration (approximately 24 users per 100 population) is associated with an approximately 9-12 percentage point decrease in underpricing (sample average underpricing = 33.5 percent).

Integer offer prices are less common for IPOs issued in countries with greater internet penetration.

- A one sigma increase in internet penetration is associated with a 2.5 percentage point decrease in the likelihood that an IPO firm sets an integer offer price.

Post-IPO blockholdings tend to be larger for IPOs issued in countries with greater internet penetration.

- Evident for up to one year after the IPO. Effect dissipates with time.

# Underpricing

$$\text{Underpricing} = \beta_0 + \beta_1 \text{Internet penetration} + \sum \beta_n (\text{Firm- \& deal- characteristics}) + (\text{Industry dummies}) + (\text{Year dummies}) + \varepsilon$$

Characteristic	Prior literature
Pricing technique	Derrien and Womack (2003); Kaneko and Pettway (2003); Sherman (2005)
Offering technique	DeGeorge; Derrien and Womack (2005)
Price uncertainty	Hanley (1993); Bradley, Cooney, Jordan, and Singh (2004)
Recent IPO activity	Ritter (1984); Yung, Çolak, and Wang (2008)
Underwriter reputation	Carter and Manaster (1990); Megginson and Weiss (1991); Loughran and Ritter (2004)
Offer size	Ritter (1984)
Stock market turnover	Ellul and Pagano (2006)
Equity carve-out	Schipper and Smith (1986); Prezas, Tarimcilar, and Vasudevan (2000)
Institutional factors	Boulton, Smart, and Zutter (2010); Engelen and van Essen (2010)

**Table 1 – Descriptive statistics**

	N	Average	Std. Dev.	Minimum	Maximum
Internet penetration	14,287	50.227	24.687	0.139	96.300
Newspaper circulation	14,287	3.230	2.748	0.345	18.381
Trust	12,449	0.386	0.117	0.028	0.742
Initial return	14,287	0.335	0.568	-0.341	3.778
Integer offer price	14,287	0.482	0.500	0.000	1.000
Top tier underwriter	14,282	0.254	0.435	0.000	1.000
Price stabilization	14,287	0.011	0.021	-0.059	0.105
IPO activity	14,178	0.056	0.037	0.000	0.198
Recent market return	14,287	0.028	0.102	-0.488	1.132
Stock market turnover	14,173	1.127	0.648	0.036	8.003
<u>Antidirector rights index</u>	14,287	3.767	1.101	2.000	6.000
Offer size	14,285	129.804	570.200	0.001	26,216.697
Volatility	14,176	0.047	0.040	0.000	1.571
<u>Bookbuilt</u>	13,696	0.665	0.472	0.000	1.000
Firm commitment	14,213	0.622	0.485	0.000	1.000
Equity carve-out	14,179	0.064	0.245	0.000	1.000

**Table 2 – IPO underpricing**

	Model 1	Model 2	Model 3
Intercept	0.398*	0.603*	0.533**
Internet penetration	-0.005**		-0.004*
Newspaper circulation		-0.032**	-0.020*
Top tier underwriter	0.045	0.003	0.033
Price stabilization	-0.053	-1.273	-0.337
IPO activity	0.654	0.818	0.632
Recent market return	0.868***	0.944***	0.890***
Stock market turnover	0.127**	0.083*	0.107**
<u>Antidirector rights index</u>	0.018	-0.036	-0.005
Offer size (log)	-0.039*	-0.029	-0.036*
Integer offer price	0.036	0.052	0.050
<u>Bookbuilt</u>	-0.107	-0.102	-0.098
Firm commitment	0.091*	0.082	0.077
Equity carve-out	-0.024	-0.029	-0.025
Industry dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Adjusted $R^2$	0.126	0.120	0.133
Number of observations	13,463	13,463	13,463



**Table 3 – IPO underpricing (Fama-MacBeth estimations)**

	Model 1	Model 2	Model 3
Intercept	0.440***	0.500***	0.514***
Internet penetration	-0.008***		-0.007***
Newspaper circulation		-0.031***	-0.015**
Top tier underwriter	0.047*	0.009	0.041*
Price stabilization	-0.010	-1.823***	-0.306
IPO activity	1.983**	2.281***	2.621***
Recent market return	0.714***	0.813***	0.718***
Stock market turnover	0.174***	0.090***	0.152***
<u>Antidirector rights index</u>	0.022	-0.035	0.003
Offer size (log)	-0.053***	-0.044***	-0.052***
Integer offer price	0.029	0.040	0.039
<u>Bookbuilt</u>	-0.030	-0.040	-0.023
Firm commitment	0.092***	0.090***	0.087***
Equity carve-out	-0.010	-0.013	-0.006
Industry dummies	Yes	Yes	Yes
Number of observations	17	17	17

**Table 5 – Likelihood of integer offer price**

	Model 1	Model 2	Model 3
Internet penetration	0.000		-0.001***
Newspaper circulation		0.020***	0.022***
Medium offer price	0.118***	0.124***	0.127***
High offer price	0.242***	0.254***	0.259***
Volatility	0.685***	0.632***	0.664***
Top tier underwriter	0.143***	0.145***	0.152***
IPO activity	-2.332***	-2.249***	-2.320***
Stock market turnover	0.277***	0.287***	0.290***
Offer size (log)	0.004	-0.003	-0.006*
Pseudo $R^2$	0.2392	0.2514	0.2522
Log likelihood	-7809	-7694	-7688

**Table 6 – Trust**

	Continuous <u>trust measure</u>	Above median trust indicator	Above 75 <sup>th</sup> percentile trust indicator
Intercept	-0.525***	0.261	0.282*
Internet penetration	0.008***	-0.002	-0.001
Trust	2.579***	0.539**	0.887***
Internet penetration x Trust	-0.036***	-0.007*	-0.014***
Top tier underwriter	0.058*	0.035	0.073**
Price stabilization	0.690	0.974	0.301
IPO activity	-0.023	0.219	0.038
Recent market return	0.911***	0.891***	0.845***
Stock market turnover	0.067	0.105*	0.036
<u>Antidirector rights index</u>	0.042*	0.028	0.041**
Offer size (log)	-0.056***	-0.050***	-0.068***
Integer offer price	0.065	0.039	0.096
<u>Bookbuilt</u>	-0.068	-0.080	-0.031
Firm commitment	0.034	0.026	0.057
Equity carve-out	-0.011	-0.013	0.011
Industry dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
<i>F</i> -test ( <i>p</i> -value)	0.0002	0.0066	0.0000
Adjusted <i>R</i> <sup>2</sup>	0.194	0.179	0.213
Number of observations	11,794	11,794	11,794

**Table 8 – Instrumental variables**

	Telephone subscriptions (1960)	Cellular penetration	Broadband penetration
Intercept	0.188***	0.403***	0.396***
Predicted Internet penetration	-0.003***	-0.009***	-0.004***
Top tier underwriter	0.094***	0.069***	0.036***
Price stabilization	0.889***	0.794**	-0.379
IPO activity	0.470**	0.438***	0.737***
Recent market return	1.035***	0.823***	0.885***
Stock market turnover	0.030**	0.141***	0.122***
<u>Antidirector rights index</u>	0.045***	0.037***	0.010*
Offer size (log)	-0.064***	-0.044***	-0.037***
Integer offer price	0.133***	0.042***	0.034***
<u>Bookbuilt</u>	0.023*	-0.097***	-0.110***
Firm commitment	0.074***	0.077***	0.097***
Equity carve-out	-0.004	-0.020	-0.025
Industry dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Adjusted $R^2$	0.131	0.120	0.111
Number of observations	10,945	13,463	13,463

**Table 9 – Post-IPO ownership concentration**

	6 months	1 year
Intercept	−18.042***	−18.848***
Internet penetration	−0.043**	−0.028*
Initial return	0.640***	0.553**
Offer size (log)	−0.256**	−0.059
Top tier underwriter	0.142	0.321
Stock market turnover	0.025	−0.379
Underdevelopment index	0.142***	0.143***
Equity carve-out	0.917***	0.842**
Industry dummies	Yes	Yes
Year dummies	Yes	Yes
Adjusted $R^2$	0.134	0.153
Number of observations	6,561	8,267

# Summary

Consistent with the conjecture that Internet access helps to reduce information asymmetry among IPO participants, we find that...

IPO underpricing is lower in countries with greater internet penetration.

- A one sigma increase in internet penetration (approximately 24 users per 100 population) is associated with an approximately 9-12 percentage point decrease in underpricing (sample average underpricing = 33.5 percent).

IPO offer prices are more precise in countries with greater internet penetration.

- A one sigma increase in internet penetration is associated with a 2.5 percentage point decrease in the likelihood that an IPO firm sets an integer offer price.

Post-IPO blockholdings are smaller in countries with greater internet penetration.

- Evident for up to one year after the IPO. Effect dissipates with time.