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The structure of equity markets across countries: Scarcity and stock valuations

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ABSTRACT

We build a dataset of the industrial composition of the stock market and the economy for 26 countries. This composition is far from representative of that of the economy, particularly in less-developed markets. Based on this, we build a measure of scarcity of investable securities and show that industries that are underrepresented relative to the economy exhibit higher valuations. Moreover, valuation differences are shown to be more important when informational issues make it more difficult for firms to get listed.

1. Introduction

In the classical tradition, the effect on prices of changes in the balance between supply and demand for financial assets is typically considered of second order. Most of the literature views assets as perfect substitutes with perfectly-elastic demand curves. This vision, however, was challenged by a literature documenting that changes in either demand or supply do affect prices. For instance, individual stocks that see their demand increase following the addition to an index exhibit abnormal positive returns (see Shleifer (1986) as an early reference). When emerging markets integrate to world markets their stock index goes up because they typically face an increase in demand due to their low world betas (Henry (2000)). The market price level tends to fall after periods of active issuance (Baker and Wurgler (2000)). Increases in the supply of individual securities, through the expiration of IPO lockup

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periods, induce a fall in their value (Ofek and Richardson (2001)). Across U.S. census regions, the price of stocks decreases with a measure of relative supply (Hong et al., 2008). Large IPOs in emerging markets reduce the stock price of firms that are closer to them (Braun and Larrain (2009)). Moreover, the phenomenon is not confined just to equity but also extends to fixed-income securities (Newman and Rierson (2004)).

Given the results above it is natural to ask whether valuations are dependent on the structure of equity markets. As pointed out by Roll (1977), the equity market portfolio is not the true total wealth portfolio but just a proxy of it. It does not contain all the assets representative of flows in the economy because there is no supply of financial claims to each one of them.

To see whether this conjecture has empirical content we see if securities that are scarce in a particular market exhibit higher valuations. We build a dataset by putting together stock market and production figures for 10 sectors in each of 26 countries observed annually from 2000 to 2009. Merging an economy-wide and a stock market database is not regularly done. The industrial composition varies considerably across countries, being sometimes far from representative of the underlying economy (Astudillo et al., 2011). We take advantage of this fact and compute a scarcity measure which is the ratio of the weight of an industry in the entire economy over its proportion in the stock market. We find a positive relation between valuations and scarcity that is strong statistically and important in economic terms. An increase in our measure of scarcity from the 10th to the 90th percentile is associated with a 9.7% and 13.4% increase the ratio of price to book and price to earnings of the average firm in the industry, respectively.

Now, if listed firms in industries with limited supply fetch higher valuations this should induce privately-held firms in the same industry to go public. That is, supply would increase to eliminate the differences in relative valuations. However, if supply is for some reason constrained, there would be no reaction and no convergence of prices. One obvious candidate for constraints on supply is the role of information asymmetry and agency. We show that the discrepancy between the share of a sector in the stock market vis-à-vis its weight in the economy is negatively correlated to proxies for the quality of the informational environment and investor protection in the country. Moreover, valuation differences are shown to be more important where information asymmetries make it more difficult for firms to get listed. In particular, the correlation is stronger for industries with smaller firms, especially when located in less financially-developed markets that are characterized by poor disclosure rules, less reliable accountancy, and weak protection to investors. In support of the mechanism we propose, the number of firms is also shown to grow less in the underrepresented sectors, especially in those that are more affected by these same constraints.

Most of the related literature relies on experiments at the individual stock level, very often in a particular country. We study industries and show that these issues are relevant in the aggregate as well. Moreover, the effects are not a peculiarity of a few (generally rich) places but are found systematically across many markets. We also extend the financial development literature by showing that the lack of information and protection not only is related to the size and depth of equity markets but also to their composition and pricing.

The flipside of our approach based on industries is that the scope for endogeneity is greater. Indeed, scarcity may partly be a consequence of market valuations. The industrial composition of the economy, investors' choices, information asymmetry, and the structure of the stock market might be simultaneously determined. We can ease somewhat the concern that an important omitted variable is driving both valuations and scarcity because our panel data allow us to control non-parametrically for a number of other characteristics, including country and industry ones (that can even vary in time). We also provide evidence of the mechanism we postulate by linking it to supply restrictions. Some of these restrictions are less likely to be endogenous, such as the size of the typical firm in the industry or whether the sector is regulated or is an industry that produces consumer goods. Since tackling the issue completely is difficult given the space constraint, at this point we do not wish to claim to have established a causal effect going from scarcity to valuations. We just argue that there is a pervasive correlation that is consistent with our hypothesis that deserves to be studied in more detail.

In Section 2 we comment on the data and methodology. Section 3 presents the results. We conclude in Section 4.

2. Measurement and methodology

Our benchmark regression is the following:

$$\begin{aligned}\text{MarketValuation}_{c,s,t} = {} & \alpha_{c,s,t} + \beta \cdot \text{Scarcity}_{c,s,t} + \gamma_1 \cdot \text{Profit}_{c,s,t} + \gamma_2 \cdot \text{InvOpp}_{c,s,t} + \gamma_3 \cdot \text{Capx}_{c,s,t} \\ & + \gamma_4 \cdot \text{Payout}_{c,s,t} + \gamma_5 \cdot \text{Beta}_{c,s} + \gamma_6 \cdot \text{StdDev}_{c,s} + \gamma_7 \cdot \text{Leverage}_{c,s,t} + \gamma_x \\ & \cdot \text{Size}_{c,s,t} + \sum \lambda_{c,t} \cdot I_{c,t} + \sum \delta_{s,t} \cdot I_{s,t} + \text{error}_{c,s,t} \end{aligned} \quad (1)$$

where the subscripts c, s and t stand for country, sector and year, respectively. $I_{c,t}$ and $I_{s,t}$ are country-year and sector-year fixed effects. We assume the errors to be clustered at the country-industry level.[1]

Our hypothesis is that valuations are relatively high in sectors that are scarcely represented in the stock market. In the specification above, we test whether β is positive and significant.

In order to account for the differences in the industrial composition of production across countries, we measure scarcity in relation to the total production of the sector in the economy. In particular, we take the ratio of production of a sector in the country to the sales of the listed firms in that sector. Scarcity should, therefore, be interpreted as measuring how the industry is under-represented in the equity market relative to the economy. The choice of using production and sales is, to a great extent, determined by the data that are available. Ideally, one would consider cash flows because it is them that in conjunction with discount rates that determine valuations. Unfortunately, those figures are not available for unlisted firms. For these, we just have data on value added and production. Value added is closer to cash flows but a comparable figure cannot be computed from income statements. Of course, there is a correspondence between cash flows and sales or production, but the wedge between the two does vary across industries and, potentially, across countries as well. Differing margins and the cost structure are some of the reasons behind this. The level of inventories, and therefore the relation between production and sales, can also change. We address these (and a number of other) issues by focusing mainly on the within-country variation of scarcity.

Our *Scarcity* variable is computed as the logarithm of the share of each industry in a country's total production divided by the share of the industry in the stock market's total sales. We normalize each variable using the country's and market's aggregates because we do not want to focus on the effect of differences across countries. A major such difference, which would introduce noise in the variable, is the size of the market as a whole relative to the economy. Moreover, the way sales and production are recorded and the completeness of the data can affect the precision of the proxy if we do not normalize.

For market valuations we use the log of the ratio of the market to book value of equity, and that of price to earnings.[2] Since economy-wide data are reported at an annual frequency, we average out our monthly valuation ratios into yearly figures. We exclude the observations in the 10^{th} and 1^{st} deciles of the dependent variables to avoid having results that might be too dependent on extreme observations. Truncating at other levels does not change the results materially. We consider the influence of outliers further in the robustness section.

Our data correspond to 10 sectors in each of 26 countries observed annually from 2000 to 2009.[3] These are all the countries for which there are data on both the structure of the economy and that of the stock market at the same time.[4] Production figures at the ISIC v3 37-industry level come from the STAN

[1] Following Petersen (2009's) guidelines one concludes that there is no strong indication of biased standard errors in our benchmark specification when clustering at the country level. However, to be on the safe side we compute errors clustered at both the country and industry dimensions. The errors are very similar and therefore the conclusions, both quantitative and qualitative, do not change.

[2] Accounting standards differ across countries and may have an effect on valuation ratios making them not entirely comparable. The issue is mitigated when controlling for country and industry fixed-effects since the noise would need to be correlated in a persistent way with scarcity beyond country (and industry) differences. Although this is less likely, it is always a concern. The fact that the result is robust to using other valuation variables that are less subject to accounting differences helps.

[3] These are Austria, Belgium, Canada, Switzerland, Czech Republic, Germany, Denmark, Spain, Finland, France, United Kingdom, Greece, Hungary, Ireland, Israel, Italy, Japan, Korea, Mexico, Netherlands, Norway, New Zealand, Poland, Portugal, Sweden, and the United States.

[4] STAN does not have production data for Australia and Chile. Slovak Republic, Luxembourg, Estonia, Iceland, and Slovenia are not part of the MSCI All Country Index.

2009 dataset. Market and accounting figures for each of 10 sectors are produced by MSCI. The production data were aggregated into the MSCI sectors.[5] While the classification of industries is evident almost all the time, we applied judgment for the few industries where there was some ambiguity, and left out the three sectors where there was more doubt.[6] The stock market data allow us computing the share that the industry represents in the market dividing its sales by the sales in the market as a whole. In an analog way, we compute from STAN the share that each sector production's represents in that of the economy. We obtained additional cross-country data from the traditional sources. The benchmark sample consists of 1029 data points. Ours is not a perfectly balanced panel because the number of industry observations varies at the country and time dimensions.[7] The results are not dependent on this, though.

Aside from the variable of interest, the specification considers a number of controls. There is a literature examining the determinants of both price to book and price to earnings ratios (see, for instance, the early study by Beaver and Morse (1978)). Since virtually all the factors identified can be motivated by the Gordon-growth model, we take this as our starting point. As a proxy for investment opportunities we use the current rate of production growth in the industry. We measure this rate at the entire economy level instead of using that of the listed firms to avoid endogeneity. To take into account how investment can be financed, leverage, current profitability – measured with ROE – and the payout ratio are also included as controls. We also consider whether the firms in each sector are indeed taking advantage of their opportunities with the ratio of capital expenditures to assets. Risk, which enters via the discount rate, is measured with country-sector betas and the standard deviation of returns. We add size measured with the (log of) the market capitalization of the average firm in the sector.

We also include country-year and sector-year fixed effects in our benchmark regression. The question we are asking the data is whether, in the average country, the sectors that are comparatively underrepresented in the stock market relative to the economy exhibit higher valuations. The identification does not come from differences across sectors or across countries. Indeed, the very reason for putting together this dataset was to avoid having this kind of differences as the source for identification. We explored how the effect is altered when we change the source of identification, obtaining similar results. This comforts us that we are not just picking omitted variable or measurement biases. Of course, we are not guaranteed to have solved all the potential problems because they are quite general in nature. However, the relation we document between this effect and information-related variables that are likely to restrict supply help ease some concerns.

We also computed an aggregate deviation index to measure how far the structure in the stock market differed from that of the economy in each country. The variable is constructed each year as the sum of the squared deviation between the (log of the) share of the industry in the country's total production and the share of the industry in the market's total sales. We explored how the aggregate deviation correlated with other country characteristics that are typically associated to the degree of the development of the stock market: the availability and quality of information and the protection that minority shareholders enjoy. We also include per capita GDP and year effects.

$$StructureDeviation_{c,t} = \alpha_{c,t} + \beta \cdot CountryCharacts_c + \sum \lambda_t \cdot I_t + error_{c,t} \quad (2)$$

where the subscripts c and t stand for country and year, respectively, and I_t an indicator for year t. We compute robust errors assuming they are clustered at the country level.

[5] Consumer Discretionary, Consumer Staples, Energy, Financial, Health, Industrial, Information Technology, Materials, Telecoms, and Utilities.

[6] The correspondence is available in the internet appendix.

[7] The mean and standard deviation of the log of price to book, log of price to earnings and scarcity are 0.751, 0.319, 2.806, 0.355, 0.016 and 1.065, respectively. The scarcest sectors in the typical country include consumer discretionary and industrials, while the ones with the highest representation are energy and information technology. The countries in which the average sector is smallest in the market relative to the economy are New Zealand, Hungary, and Greece. In The Netherlands, France, Switzerland, and the U.S. industries are, on average, most overrepresented. Valuations are highest in Japan, the U.S. and the U.K. and lowest in Korea, Hungary, and Poland. The industry composition in the market is most similar to that in the economy in the U.S. and Japan and most dissimilar in Poland and Hungary. For a detailed exposition of the differences in the industry composition of the stock market vis-à-vis that in the economy, see Astudillo et al. (2011). Due to space considerations we do not provide a table describing the data in more detail. Summary statistics, including sector and country distribution are available in the internet appendix.

Basic statistics

The industrial composition of the stock market is, in general, different from that of the economy. If the stock market composition were an exact replica of that of production, the structure deviation indicator would be zero. At 0.13, the average figure across countries is significantly higher than that. If there were just two sectors in the economy, this level would obtain, for instance, with one of the sectors representing 63% of production and just 37% in the market. These are relevant departures from equality. The degree of deviation is far from being homogenous across countries. The figures for markets such as Mexico and Greece are around two and a half times larger than those of the U.S. More generally, the discrepancy tends to go hand in hand with financial development: the index is around fifty percent higher in emerging markets than in developed ones. We use this ample variation in the representativeness of equity markets to see whether this is reflected in relative valuations.

3. Results

The first column in panel a and b of Table 1 contain the main result of the paper. Following Eq. (1), we regress the pricing variables on the industry-country-time scarcity measure. Consistent with our hypothesis, we get a strong positive relation between scarcity and valuations. The estimated coefficient is statistically significant for both valuation ratios.

As for the economic significance, an increase of our measure of scarcity from the 10th to the 90th percentile is associated with an increase from 2.25 to 2.47 in the price to book ratio and from 17.9 to 20.4 in price to earnings. If there were only two sectors in the economy, this variation in scarcity is roughly commensurate to one of the sectors being four times as large as the other in relation to the economy. This is not very different to what we find in a country like Portugal, where the telecommunications and utilities sector represent 26% and 27% of the market, while they account for only 7% and 5.8% of the economy. The economic magnitudes for both valuation metrics are similar in percentage terms (9.7% and 13.4%, respectively), which is reassuring.

The coefficient for ROE is positive for the price to book ratio. This was expected since profitability should increase value. In the case of price to earnings the elasticity is negative, most likely reflecting that part of its correlation is mechanical and explained by the way we normalize valuations. Growth opportunities, as measured with the growth rate in the sector's production, on the other hand, are not positively correlated with valuations. By their very nature, measuring these is not easy. For obvious reasons we cannot use the market to book ratio as an assessment of the market's beliefs on the matter. In the robustness section, we come back to this and use alternative measures. Market risk – beta – does not correlate significantly with the valuations ratios. These last two results are not atypical of the literature (see, for instance, Beaver and Morse (1978)). Similarly, the coefficient for idiosyncratic risk is negative but not nearly significant. As is commonly the case, sectors with large firms get higher valuations. The coefficient for capital expenditures to assets is in both cases negative. Instead of measuring total investment, the variable could be more representative of the intensity of use of *physical* assets as opposed to that in *intangible* ones. If that were the case, the negative coefficient would be consistent with higher valuations of intangibles (and therefore could also be capturing investment opportunities). The payout ratio has the expected positive sign and is statistically significant in both cases. Leverage has no discernible effect on valuations, which may reflect that managers are just balancing the tax-saving with the bankruptcy effects when determining its level.

In the following three columns we consider different combinations of fixed effects to determine whether other dimensions of our panel tell a similar story. When we do not consider any fixed effect, that is, when we rely on all the sources of variation by looking at pooled data, we still get a significant and positive coefficient (column 2). The size of the effect is somewhat smaller, which is simply saying that there are country and industry characteristics related to valuations, and correlated with our variable of interest, that were subsumed in the industry and country-year fixed effects. Said differently, it is more difficult to unearth the effect through casual observation because countries and industries are very diverse. This shows the importance of having this three-dimensional dataset that allows controlling for these unobservable features. Having said that, it is comforting that even without controlling for other conditions, some portion of the effect can be seen directly on the raw data.

Table 1
Scarcity and pricing, basic results. The specification is that of Eq. (1). The dependent variable for all columns is the log of the ratio of price to earnings. Scarcity is computed as the logarithm of the share of each industry in a country's total production divided by the share of the industry in the stock market's total sales. All the variables are computed at the industry-country-year observation. Different sets of fixed effects are included as indicated. Errors clustered at the country level are reported in parentheses.

	PANEL A: Ln (Price to Book)				PANEL B: Ln (Price to Earnings)				PANEL C: Other dependent variables					
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	Ln (Price to Dividends)	Ln (Price to Sales)	Ln (Price to Free Cash Flow)	Average return	Ln (Market to Book Assets)	Ln (Total Capital to Sales)
Scarcity	0.058**	0.048**	0.068***	0.240***	0.071***	0.049**	0.080***	0.234***	0.087**	0.313***	0.290	−0.032**	0.078**	0.907***
	(0.019)	(0.015)	(0.018)	(0.043)	(0.020)	(0.016)	(0.019)	(0.048)	(0.035)	(0.043)	(0.197)	(0.012)	(0.025)	(0.068)
Beta	−0.001	0.007	−0.002	.	0.000	0.006	0.002	.	−0.016	0.022	−0.019	0.002	−0.001	−0.028
	(0.019)	(0.026)	(0.021)	.	(0.019)	(0.024)	(0.020)	.	(0.026)	(0.024)	(0.145)	(0.015)	(0.025)	(0.064)
Std. Deviation	−0.058	−0.186	−0.052	.	−0.039	−0.153	−0.061	.	0.180	−0.011	−0.159	−0.155	−0.060	−0.810**
	(0.131)	(0.135)	(0.124)	.	(0.125)	(0.134)	(0.121)	.	(0.231)	(0.177)	(1.086)	(0.111)	(0.174)	(0.400)
Leverage	0.007	−0.013	0.017	0.058**	0.012	−0.018	0.017	0.041*	0.027	0.040*	0.033	0.016**	−0.562***	0.629***
	(0.016)	(0.012)	(0.013)	(0.023)	(0.017)	(0.013)	(0.014)	(0.022)	(0.020)	(0.020)	(0.073)	(0.005)	(0.065)	(0.067)
Payout	0.099**	0.095**	0.133***	0.137**	0.226***	0.179***	0.268***	0.303***	−0.018***	0.000	0.001	−0.000	0.123*	−0.002
	(0.049)	(0.048)	(0.038)	(0.052)	(0.052)	(0.045)	(0.042)	(0.066)	(0.002)	(0.001)	(0.004)	(0.000)	(0.064)	(0.156)
Return on equity	3.516***	3.209***	3.374***	2.352***	−3.509***	−4.004***	−3.572***	−4.474***	−2.979***	0.689	−0.428	0.245**	4.603***	6.734***
	(0.323)	(0.235)	(0.259)	(0.232)	(0.310)	(0.232)	(0.250)	(0.266)	(0.699)	(0.516)	(1.976)	(0.117)	(0.422)	(0.979)
Production growth	−0.086**	−0.014	−0.068**	−0.163***	−0.059	0.001	−0.036	−0.148**	−0.029	−0.285**	0.258	0.003	−0.099*	−0.916***
	(0.041)	(0.043)	(0.033)	(0.043)	(0.050)	(0.047)	(0.040)	(0.049)	(0.110)	(0.081)	(0.330)	(0.025)	(0.055)	(0.175)
Ln (Average Market Cap)	0.050**	0.059**	0.079***	0.312***	0.066**	0.054**	0.089***	0.293***	0.093**	0.355***	0.205	−0.043**	0.062**	−0.094
	(0.023)	(0.018)	(0.022)	(0.041)	(0.025)	(0.017)	(0.023)	(0.044)	(0.041)	(0.040)	(0.229)	(0.014)	(0.031)	(0.087)
Capital expenditure/ assets	−0.056**	−0.029	−0.053**	−0.074**	−0.068**	−0.023	−0.062**	−0.069***	−0.034	−0.168***	3.782**	−0.017	−0.086**	−0.290***
	(0.025)	(0.019)	(0.021)	(0.023)	(0.027)	(0.019)	(0.021)	(0.019)	(0.037)	(0.038)	(1.440)	(0.010)	(0.033)	(0.062)
Observations	1029	1029	1029	1029	1029	1029	1029	1029	1029	1029	695	1029	1027	1029
R-squared	0.735	0.339	0.660	0.821	0.760	0.420	0.689	0.815	0.811	0.806	0.756	0.726	0.753	0.969
Country-year fixed effects	YES	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO	NO	NO	NO
Industry-year fixed effects	YES	NO	YES	NO	YES	NO	YES	NO	YES	YES	YES	YES	YES	YES
Country fixed effects	–	NO	YES	–	–	NO	YES	–	YES	YES	YES	YES	YES	YES

Year fixed-effects	–	NO	NO	YES	–	NO	NO	YES	NO	NO	NO	NO	NO	NO
Country-industry fixed effects	NO	NO	NO	YES	NO	NO	NO	YES	NO	NO	NO	NO	NO	NO

* Significance: 10%.
** Significance: 5%.
*** Significance: 1%.

By comparing the first four columns, one understands the importance of controlling for the location of the sector and for time-varying industry characteristics. In column 4 we control for country-industry fixed effects to rely just on the way scarcity varies through time within the same country. This specification addresses a number of potential biases due to omitted variables because it controls for all the differences an industry might have, even those that vary across countries. These include, for instance, the risk measures we had before. The coefficient is still positive and significant. Its larger magnitude suggests that introducing further controls is not likely to wipe out the effect. We do not use this as our benchmark because it is not the variation we are interested in. We use the time-based data not because it is interesting per-se, but rather to get more observations to test our hypothesis. Also, the use of a large number of fixed effects may risk running into over-identification issues.

3.1. Robustness

We run a series of robustness tests that, due to space considerations, do not report all of them but they are available from the author upon request. Notwithstanding differences in magnitudes, we always get the positive relation between valuations and scarcity. The specific way in which the balance of supply and demand, or the importance of a sector in the market relative to its importance in the economy are measured, turns out not to be material for the results. We experimented with the share of the sector in the country's total value added instead of its portion in production as the denominator. Using the share in the total book value of equity or assets in the market as the proxy for supply did not change the results either. The same is true when we use the share of the sector in the total assets in the market.

We looked at a number of different proxies for growth opportunities, including the growth rate in the sales of listed firms, the actual average growth rate of production in the following two periods, and the sector's research and development intensity. In all cases the coefficient for scarcity remains positive and significant. The sample does not matter much either. We look at the effect of dropping industries that may be somewhat special such as petroleum, financial, and information technology. The results do not support the measurement error or influential outliers' hypotheses since the estimated coefficients are invariant to excluding outliers in terms of the dependent and independent variables. Also, when one keeps just the most recent data, on the assumption that they are perhaps of better quality, we still get the same basic result. Our findings also hold when restricting the sample to industries in which the definition of the industry is tighter in the sense that listed and unlisted firms are more similar (Energy, Financial, Consumer Staples, Utilities, and Telecoms.)

We measured valuation using price to book and price to earnings ratios because these two indicators are the most frequently used in the financial industry. However, we also tried alternative dependent variables that have been used in the literature[8]: price to dividends, price to sales, price to cash flows, market to book assets –market value of equity plus book value of debt over book value of assets-, and total capital to sales –market assets to sales-. In all cases the coefficient is positive as expected and, except in the case of cash flows, they are also as significant as before (see panel c of Table 1). Our hypothesis implies that high relative supply should go hand in hand with high expected returns that are the flipside of valuations. We find that the effect of scarcity on average returns is indeed negative as expected and statistically significant. Finally, we considered other assumptions regarding the standard errors. Clustering at the country-industry level turns out to be the most conservative assumption in our benchmark regressions.

3.2. Further results

If listed firms in some industries fetch higher valuations this would induce privately-held firms in the same sector to list, thereby increasing supply and eliminating the differences in valuations. Conversely, if for some reason supply is constrained, it will not react to prices and no convergence of val-

[8] See, for instance, Berger and Ofek (1995), Gompers et al. (2003), Fauver et al. (2003), among others.

Table 2
Structure deviation, information and protection. The specification is that of equation (2). The dependent variable is constructed each year as the sum of the squared deviation between the share of the industry in the country's total production and the share of the industry in the stock market's total sales. Accounting standards measures the quality of accounting information. Information disclosure requirements is the extent to which investors are protected through disclosure of ownership and financial information. Investor protection measures how well minority shareholders are protected. Creditor rights is an index aggregating different characteristics of the legal system related to the protection of creditors. In the last column investor protection is instrumented with the origin of the country's the legal system. The regressions also include year fixed effects. Errors are clustered at the country level and reported in parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)
Log per capita GDP	−0.011	−0.014	−0.003	−0.038	−0.005	0.034
	(0.026)	(0.018)	(0.025)	(0.027)	(0.024)	(0.042)
Accounting standards	−0.002*					
	(0.001)					
Inform disclosure req		−0.101**				
		(0.046)				
Investor protection			−0.008**		−0.008**	−0.024*
			(0.004)		(0.004)	(0.014)
Creditor rights				0.003	0.009	
				(0.010)	(0.009)	
Observations	190	191	182	198	182	182
R-squared	0.126	0.116	0.129	0.071	0.152	0.106

*** Significance: 1%.
* Significance: 10%.
** Significance: 5%.

uations would obtain. Then, in our framework, the effect of scarcity on prices should be especially strong when supply is exogenously inhibited.

One obvious candidate for constraints on supply is the role of information asymmetries. As we said, the difference in the structure of the stock market relative to that of the economy across countries is not random. In particular, the discrepancy is significantly larger in countries with underdeveloped financial systems or emerging markets. Agency considerations have been shown to be at the heart of the way equity markets function across countries La Porta et al., 2002 is an early examples documenting the effects on valuations (see Shleifer and Wolfenzon, 2002 for formalization).

Following Eq. (2), we begin by exploring the determinants of scarcity by running a regression of the country-level discrepancy on the degree and quality of the information that investors have, and the protection they enjoy (see Table 2). We consider two variables related to information – an index of disclosure requirements of listed firms, and a rating on international accounting standards that the local system complies with- and one related to the degree of protection that minority shareholders enjoy.[9] Since countries with less developed markets are also poorer than the rest, we include GDP per capita in an effort to control for this and other omitted variables.[10]

[9] The index of disclosure equals the arithmetic mean of six indices that capture the need to present a prospectus when selling shares, the requirement to disclose compensation of directors, the ownership structure, special contracts, and the transactions with related parties. The index of accounting standards was created by examining the accounting statements of companies on the inclusion or omission of 90 items. The protection variable corresponds to an anti-directors rights index that measures the capacity of shareholders to mail their proxy vote, the requirement to deposit their shares before the meetings, cumulative voting or proportional representation of minorities on the board of directors is allowed, an oppressed minorities mechanism is in place, the minimum percentage of capital required to call an extraordinary meeting is less or equal to 10, and when shareholders have preemptive rights that can only be waved by a shareholders meeting. We also looked at creditor rights, an index formed by aggregating different characteristics of the legal system related to the protection of creditors, such as whether there is automatic stay on assets, secured creditors are paid first, restrictions for going into reorganization, and management staying in reorganization. These variables, that were first introduced by La Porta et al., 1997, 1998 and amended and expanded in subsequent work by the authors, were taken from Andrei Shleifer's webpage.

[10] We experimented including other controls, such as total GDP; they were typically insignificant and did not alter materially our results.

We find that the variables related to information are inversely associated to the discrepancy: the more information investors have, the closer the composition of the market is to that of the economy (see columns 1 and 2). That is, when information is difficult to interpret or is simply not available, the market does not represent the structure of the economy as well as when information is better. The effect is not only statistically significant, but is also of important economic magnitude. Moving from the first to the fourth quartile in the information variables is related to a decrease in the deviation commensurable to the difference between that of the UK and the one in Greece. The degree of protection of investors is also significantly correlated, in an inverse way, to the deviation (column 3). A one standard deviation increase in the indicator of protection is related to a decrease of around one-fourth of a standard deviation in the discrepancy.

Under our line of reasoning, these partial correlations suggest that supply may be restricted and not react instantaneously to these higher valuations. This result is relevant for the financial development literature because it shows that the lack of information and protection is not only correlated to the size and depth of equity markets but also to their composition.

The degree to which the rights of creditors are protected does not appear to be a significant determinant of the difference in the composition (column 4). This is interesting: since we are talking about a distortion in the *stock market* one would not expect a-priori a relationship with the development of and access to *credit markets*. Indeed, when we include both variables in the regression, the coefficient of investor protection is unchanged and that of creditor rights is still insignificant (column 5). We take this result as suggestive of a story related directly to frictions in the stock market rather than of more general problems linked to the financing of firms that may affect their value.

Finally, the variation that explains the relation is precisely the one that the literature has associated with one critical determinant of investor protection: the origin of the legal system (La Porta et al., 1997, 1998). Indeed, when we instrument protection with the legal indicators, the effect is still present, significant, and of similar economic magnitude (column 6).

We recognize that these kinds of cross-country regressions are plagued by problems, the most important being the omitted variable bias. We controlled for per capita GDP, the usual suspect that can drive the results in the financial development literature. But there might be many other important variables that we are not considering and therefore we do not take these correlations as definitive evidence. Also, at this level of aggregation the issue of endogeneity is important: the composition of markets, the quality of information, and investor protection can all be simultaneously determined. For this reason, we do not claim to have established a causal relation. Rather, we think of these as correlations suggesting that informational frictions may constrain supply, allowing these effects on valuations to persist.

In the next table we see whether the correlations we have documented are more important when supply is more likely to be restricted by these informational problems. We explore the issue by splitting the sample according to various dimensions and comparing the size and significance of the coefficient of scarcity.[11] In all the cases we use the median to split the sample. The results we get are generally consistent with the hypothesis above in the sense that the effect of scarcity on valuations is more pronounced when these issues are present. Also in support of the mechanism we propose, the number of firms is shown to grow less in the underrepresented sectors, especially in those that are more affected by these same constraints. The differences in the coefficients are not always significant in a statistical sense but are always important economically and, when taken together, are suggestive of the existence of this asymmetry. The fact that we find support for these ancillary implications of the theory gives us confidence that we are indeed underscoring a fundamental relationship.

We report the benchmark results, where we do not split the sample in the first column for ease of comparison. In the second and third columns, panel A we split the sample by size as measured with the market capitalization of the average firm in each sector. In the presence of fixed costs of getting

[11] One concern in these exercises is that we might be defining always the same groups when splitting the sample despite using different variables. This is because these are correlated, which is expected since they try to measure similar concepts. However, in practice despite being related the correlation of the indicators that define the groups is far from perfect; the groups are similar but not the same. The typical intersection of observations is about 60% when relying just on country variables, and around 50% for industries.

Table 3
Scarcity and pricing, supply constraints. The specification is (1). The sample data is modified as stated in each column. Only the coefficient for Scarcity is presented, however all the controls in the benchmark regression are also included. In each column the coefficient for the regression using either Ln(Price to Book) or Ln(Price to earnings) is presented in the first and second rows. In the third row the dependent variable is the growth rate in the number of firms from 2000 to 2009. There are no coefficients when the number of observations is not sufficient to split the sample. Country-year and Industry-year fixed effects are also included. Errors clustered at the country-industry level are reported in parentheses.

Panel A	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
		Costs of getting informed		Information quality		Info costs and quality		Info costs and quality	
	Benchmark	Average market cap		Disclosure index		Market cap & disclosure		Sales & disclosure Low	Employees & disclosure Low
		Low	High	Low	High	Low	High		
Ln (Price to Book)	0.058**	0.105**	0.039	0.105**	0.039	0.133**	0.018	0.096*	0.142***
	(0.019)	(0.033)	(0.029)	(0.033)	(0.029)	(0.053)	(0.037)	(0.051)	(0.036)
Ln (Price to Earnings)	0.071***	0.119***	0.049	0.119***	0.049	0.119***	0.049	0.129**	0.186***
	(0.020)	(0.035)	(0.031)	(0.035)	(0.031)	(0.035)	(0.031)	(0.050)	(0.039)
Observations	1029	507	522	444	552	210	285	241	200
Growth in the number of firms	−0.021*	−0.040*	−0.019	−0.053	−0.031				
	(0.011)	(0.021)	(0.050)	(0.029)	(0.033)				
Observations	85	52	33	32	46				

Panel B	(10)	(11)	(12)	(13)	(14)	(15)
	Development		Outside monitoring		Final consumer good	
			Regulated			
	Emerging	Developed	No	Yes	No	Yes
Ln (Price to Book)	0.137**	0.033	0.093***	0.025	0.045**	0.043
	(0.042)	(0.021)	(0.024)	(0.041)	(0.022)	(0.067)
Ln (Price to Earnings)	0.151**	0.043*	0.099***	0.023	0.058**	0.058
	(0.045)	(0.021)	(0.025)	(0.048)	(0.023)	(0.061)
Observations	193	836	644	385	830	199
Growth in the number of firms			−0.032	0.025		
			(0.027)	(0.135)		
Observations			52	33		

* Significance: 10%.
** Significance: 5%.
*** Significance: 1%.

informed, it will be more difficult for small firms to get listed as compared to larger ones. Some sectors will be more affected by these informational problems simply because they are characterized by having small firms, for instance, for technological or product market reasons. As a consequence, in these sectors the share of publicly listed to total firms will be lower and, therefore, the few listed corporations will command a scarcity premium. Indeed we find that the slope is about twice as high for sectors where the typical firm is smaller relative to industries with larger ones. The difference is statistically significant at conventional levels.

The underrepresentation of a sector in a particular market can also be lower because poor regulation and the informational environment make it more difficult to observe or trust the performance of the firms. As in the case of size, the few firms able to overcome these issues and get listed should command a premium. Following the analysis above, we measure the country-level costs of getting informed with the information disclosure requirements for listed firms. Columns four and five show that, in countries with fewer such requirements the coefficient of scarcity is three times as high. Moreover, when one puts both effects together (columns six and seven in panel a), one finds that the valuations of the sectors with small firms are an order of magnitude more affected by scarcity in countries with worse disclosure rules when compared to large firms in contexts with better information. In the following columns the result is shown to be robust to considering average sales and the number of employees as proxies for visibility. In all cases we find coefficients that are higher than the one using the large-size, good-information sample. Also, using these typical features of emerging markets or simply splitting by whether a market is developed or emerging yields the same conclusions (columns 10 and 11 in panel b).[12]

Industries differ in terms of the difficulty of getting informed about them beyond size. Regulated industries (Utilities, Telecoms, and Financial) are less likely to be affected by informational asymmetries because an external body does the work of getting informed for the investors. Also, investors might find firms in consumer goods industries more familiar since, at least, they know the goods that are being produced and have an idea on whether they are successful or not. Whether there are many or just a few firms in this kind of sectors should not be particularly related to valuations. On the contrary, when scarcity is related to this source of lack of information its impact will be stronger. Consistent with our hypothesis, the coefficients for unregulated and non-consumer goods sectors are significantly larger (columns twelve through fifteen in panel b) (see Table 3).

The dependent variable in the third row in each panel is the average growth rate in the number of firms in each country-sector from 2000 to 2009. As can be seen, the coefficient for scarcity in the first column is negative and significant. This means that, on average, (net) equity issuance is relatively limited when there is scarcity. Said differently, scarcity is indeed related to the lack of issuance. Moreover, this limitation is particularly strong when the average firm is smaller, in unregulated industries and in countries with poor disclosure (columns 2–5 and 12–13). These results are in line with the mechanics of our hypothesis in the sense that there would not be an increase in supply that eliminates the higher valuations. When informational problems are important, issuance is limited, securities are in short supply and valuations remain high.[13]

4. Concluding remarks

Relative stock prices do not just reflect the fundamentals of the different sectors. The shares of listed firms in sectors that are scarcely represented in the market also exhibit higher valuations. Since prices can act as signals or directly affect the financing possibilities of the firms and affect investment, the effect can induce misallocation of resources across industries and, subsequently, low growth.

[12] One has to interpret these differences with caution because MSCI's classification not always corresponds to what most people would think as an emerging and a developed market. For instance, MSCI considers Israel, Ireland, New Zealand and Portugal as developed markets. In any case, we get similar results when we add these countries to the MSCI's Emerging markets group.

[13] There are other variables that could also capture informational frictions for Tables 2 and 3. These include the number of analysts following, the post announcement drift, the adoption of IFRS, and the liquidity levels (we thank the referee for making these suggestions). Unfortunately, the information needed to compute such measures is unavailable for the MSCI industrial indices.

These distortions would be larger in less-developed markets since the structure of their equity markets differs more markedly from that of the economy. They would also be longer lasting since the informational and agency issues that characterize these markets prevent supply from dynamically responding and correcting the mispricing. As a consequence, investors in countries with underdeveloped equity markets may end up in a trap of low growth and little diversification. Changing things would not necessarily be easy since, of course, some agents clearly benefit from the status quo.

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Appendix A. Supplementary material

Supplementary data associated with this article can be found, in the online version, at http://dx.doi.org/10.1016/j.frl.2014.10.004.

References

Astudillo, A., Braun, M., Castañeda, P., 2011. The going public decision and the structure of equity markets. J. Int. Money Finan. 7 (30), 1451–1470.
Baker, M., Wurgler, J., 2000. The equity share in new issues and aggregate stock returns. J. Finan. 55, 2219–2257.
Beaver, W., Morse, D., 1978. What determines price-earnings ratios? Finan. Anal. J. 34 (4), 65–76.
Berger, P.G., Ofek, Eli, 1995. Diversification's effect on firm value. J. Financ. Econ. 37, 39–65.
Braun, Matías, Larrain, Borja, 2009. Do IPOs affect the prices of other stocks? Evidence from emerging markets. Rev. Financ. Stud. 22 (4).
Fauver, L., Houston, J., Naranjo, A., 2003. Capital market developmentinternational integration, legal systems, and the value of corporate diversification: a cross-country analysis. J. Financ. Quant. Anal. 38, 135–157.
Gompers, Paul, Ishii, Joy, Metrick, Andrew, 2003. Corporate governance and equity prices. Quart. J. Econ., 107–155.
Henry, P.B., 2000. Stockmarket liberalization, economic reform, and emergingmarket equity prices. J. Finan. 55, 529–564.
Hong, H., Kubik, J., Stein, J., 2008. The only game in town: stock-price consequences of local bias. J. Financ. Econ. 90, 20–37.
La Porta, R., López-de-Silanes, F., Shleifer, A., Vishny, R., 1997. Legal determinants of external finance. J. Finan. 52 (3), 131–1150, CIV.
La Porta, R., López-de-Silanes, F., Shleifer, A., Vishny, R., 1998. Law and finance. J. Polit. Econ. CIV, 1113–1155.
La Porta, R., López-de-Silanes, F., Shleifer, A., Vishny, R., 2002. Investor protection and corporate valuation. J. Finan. 57 (3), 1147–1170.
Newman, Y., Rierson, M., 2004. Illiquidity Spillovers: Theory and Evidence from European Telecom Bond Issuance. Working paper.
Ofek, E., Richardson, M., 2001. The IPO lock-Up Period: Implications for Market Efficiency and Downward Sloping Demand Curves. NYU Stern School of Business working paper.
Petersen, M., 2009. Estimating standard errors in finance panel data sets: comparing approaches. Rev. Financ. Stud. 22 (1), 435–480.
Roll, Richard., 1977. A critique of the asset pricing theory's tests. J. Financ. Econ. 4 (1977), 129–176.
Shleifer, A., 1986. Do demand curves for stocks slope down? J. Finan. 41, 579–590.
Shleifer, A., Wolfenzon, D., 2002. Investor protection and equity markets. J. Financ. Econ. 66 (1), 3–27.