

The Development of Venture Capital in Latin America: A comparative perspective.

Abstract.

Venture Capital (VC) helps financing high-growth ventures in the business ecosystem. The development of Latin American VC lags behind developed economies, but also behind China and India. Nonetheless, in the recent boom regional VC grew 30% yearly (2005-2012). VC investments in Latin America are less hi-tech, larger and more likely to be funded from abroad than in benchmark emerging regions. Deals are made by investors with less experience and in fewer rounds than comparables. VC was highly dependent on the macroeconomic business cycle. It shows symptoms of an early stage of development with relatively fewer high-tech ideas than money.

Key words: Venture Capital, Private Equity, Latin America, Cross-border private equity

JEL Classification: G24, L26

1. Introduction

According to Rajan (2012) the fundamental tension in entrepreneurial finance is caused by the interplay of two forces. On the one hand an entrepreneur has to produce new and differentiated assets that create new value, otherwise it would be redundant with what is already being done and would probably be dominated by incumbent products. On the other hand the entrepreneur has to be able to credibly promise a fraction of the value created by these new assets to an *external* investor, so she can get finance. The problem arises because the more differentiated and the less known the asset, the harder is to credibly pledge income of the project to a third party. And this creates limitations for new types of technologies, because potentially profitable projects may not be able to get funding simply because a third party would not invest due to these *pledge-ability* concerns.

Fortunately, this crucial limitation for new innovative business could be mitigated using a financing formula that departs from arms-length finance and - by being intensive in monitoring and conditional control rights -, improves the pledge-ability of income from the project as well as its odds of financing. We are referring to Venture Capital, which has had a spectacular growth in the last decades, being especially important for the financing of early stages of highly innovative ventures in the US.

At a much lower scale, VC has been also taking off in Latin America. Nonetheless, even if a few papers have touched on specific feature of this process, there is no academic work unveiling the basic stylized facts of recent VC development in the region. This is a problematic gap since governments in the Latin American region are putting increasing attention in these issues to foster the entrepreneurial ecosystem, and at the same time important development institutions are actively participating as partners of this process. For example, both the World Bank's IFC and the IADB's MIF have been Limited Partners in Private Equity financing in the region, with lots of attention in VC.¹

To start filling this gap, our current paper aims to provide a quantitative overview of Venture Capital investments in Latin American based companies. Whenever possible, we will try to provide a comparative perspective showing how the various characteristics of the Latin American VC investments differ from those in other regions of the world.

It is worth starting this process remarking our main limitations. The most important one stems from imperfect data availability. But at the same time private equity and especially venture capital could be tremendously relevant for private sector development in Latin America, so it is worth exploring the patterns that emerge from the available data. Waiting for more data until we are able to make any claims would be irresponsible. A second need for clarification comes from the very nature of our exploratory study, which aims to provide and helicopter view of VC in the

¹ Between 1996 and 2010 the investment Branch of IADB, MIF, invested a total of 215 million dollars in Private Equity in the Region. The early years of that period this represented a large fraction of recorded private equity investments, above 30%. Later on other players have been entering so the share of these types of institutions is decreasing.

region. We will make gross simplifications and we apologize in advance because we will be forgetting about many country-level specificities that are potentially relevant. Finally, a third clarification stems from the previous two. We know it is usually tempting to read comparative data across countries as if it were the FIFA ranking of national soccer teams, where even small differences that put you ahead of neighboring countries make you feel either proud or upset. There are very good reasons not to do that here, because data is very incomplete and volatile in the region, so it is hard to statistically distinguish nuisances and second order differences.

As mentioned, our goal is to complement the thin existing literature about VC in Latin America, looking more at quantitative broad patterns rather than focusing on either the relevant qualitative aspects or remarking a single economic mechanism. Having said that, our work is not the first to focus on VC in Latin America.

Bruton, Ahlstrom and Puky (2009) use experts' interviews and qualitative analysis to compare VC practices in East Asian and Latin American. Unlike their work, our efforts are mostly quantitative in nature, looking at the aggregates, as well as to the composition of investment. In that dimension we are closer to Khoury, Junkunc and Mingo (2012), who used Thomson's data 1995-2004 only for VC investments in Latin American, remarking that countries with poorer institutions within the region tend to have bigger average investment sizes per rounds. They argue this is because VCs avoid early stage investments that are more intensive in staging and multiple investment rounds, entering only to projects that are later stage and more developed.² Our approach is not only different from theirs in the time horizon – because we look until the recent developments in 2011 – but because we explicitly compare the Latin American VC investments with those in other regions in the world, to see what is different and distinctive in Latin America. We are also more interested in unveiling broad patterns rather than focusing on a single mechanism. Like us, Jimenez (2008) is also interested in VC patterns and policy, but his analysis only encompasses aggregate data for Brazil and Chile. Instead, we use two sources or micro-data, namely the new LAVCA database from 2008 to 2011 and ThomsonOne mostly from 2000 until today. When possible, we try to use two sources of data to explore whether a particular stylized fact is robust to small deviations in the way they are measured.³ Overall, our work complements the recent review of alternative investments in Emerging markets by Cumming and Zhang (2016), emphasizing the comparison of Latin America to other regions.

2 Liaoa et al (2014) explore the successful exit as Initial Public Offerings (IPOs) in emerging markets. Otcherea and Vongb (2016) explore how VC backed firms impact the pricing of IPOs in China.

3 Pereiro (2001) surveyed various sources of entrepreneurial finance in Argentina and compare them with out of sample estimates from developed countries, concluding that *“(1) it takes on average more money for the Argentinian entrepreneur to start a de novo venture than for his/ her counterparts in the US; (2) operational parameters of formal PE/VC funds are in line with international standards; and (3) Argentinian angels invest on average substantially higher amounts per venture than their counterparts in other countries, being also younger than the international average.”* Unlike his effort, we rely on comparable data across various Latin American countries and , in some cases, use data from the same databases in the region.

Our main findings are as follows. Coincident with other sources, we confirm that VC in Latin America is of course orders of magnitude below the one for developed economies. But more important, VC/GDP in the region is also well below China and India, despite their lower level of income per capita.

Even if starting from a low base, since 2005 VC investments in Latin American companies have been growing by more than 30% per year, on average, with around 40% of investments are made by foreigners.

We found various stylized facts about VC investments in the region. First is that VC investments in Latin America are less hi-tech than in benchmark regions. Second is that average project size is bigger than in benchmark regions, although the difference in size is mostly explained by non hi-tech projects being larger. Third, Latin American firms invest in fewer rounds. Fourth, Latin American investments are performed by firms with less experience than those in benchmark regions. Fifth is that changes in the pro-VC environment, summarized by a set of indicators compiled by LAVCA and the EIU, are associated to changes in VC flows. We find that countries that improved their ranking got more funds, while countries in the region that decrease in their quality of VC environment did worse. Finally, exploring the cross country variations on levels of VC development (i.e. VC/GDP) we find that the “demand of VC” coming from ideas and in particular the number of scientific articles carries an important predictive power. In contrast we did not find significant associations between VC/GDP and levels of financial development measured as market capitalization of listed companies. Big places with lots of scientific activity have more developed VC markets.

2. Data sources and basic facts

From a historical perspective the data collection of Venture Capital in less developed economies is still in its infancy, maybe like GDP measures were in the early 1900, or like empirical corporate finance of publicly traded companies use to be before standardized data was available. Unlike for the cases of GDP and public firms, we think the evolution of VC data is unlikely to be very fast since the great majority of the transactions are among private parties without obvious obligations to report to a centralized clearinghouse, unlike the State does for GDP figures or like the various stock exchanges and regulators do for publicly traded firms. In such a context it would be pointless to wait forever before we explore the available data. Equally erroneous would be to take at face value every single aggregate figure, since data collection is not only in its infancy, but also because the wrinkles of classification are already not standardized across reporting sources. For example, it is pretty clear that a new webpage to that receives half a million dollars to develop the new “EBay in Colombia” sounded like an early stage VC. But what about a family firm with a successful business model that wants to expand? We see that databases may have different classifications.

In short, we will describe gross trends and will be cautious of the differences and potential biases of the various sources.

Comparing the two sources: similarities and differences

Our two main sources of data would be, on the one hand, the newly updated dataset produced by the Latin American Venture Capital Association LAVCA, covering 2008-2011. On the other hand, we will use deal level information from ThomsonOne Private Equity (formerly VentureXpert) focusing on the period 2000 onwards and emphasizing the post 2005 trends. Although the data 2000 is certainly available, we prefer to stick to the new trends and limit our scope to a period where data, even if imperfect, has more density of deals. Otherwise the figures become too volatile to be able to say anything.

It is important to clarify that the two databases get their information from different reporting sources and might not be measuring exactly the same phenomenon.⁴

Thomson deals are reported by Limited Partners that invest in each round through various funds. Although it is not explicitly stated, the way the data is reported would tend to overweight large investments and investments where foreign firms are involved. In contrast, LAVCA data comes from surveying *VC firms* in Latin America under a contract of confidentiality. This makes the LAVCA data a comparatively better resource when looking at smaller domestic investors or investors that syndicate less with foreign VC firms, as well as for firms that prefer the confidentiality clauses to report their deals.

One big advantage of ThomsonOne is that we will be able to observe many more covariates like age of firms, type of technology, country of origin of the firm as well as the history of previous investments of a particular the country where the VC firm is located. With LAVCA we have access only to the technology and the value, but only for the most recent years in our sample.

In any case, it is reassuring to see that they have high correlation with each other and they are likely to be picking an important set of overlapping deals, as we can see in Figure 1 Investments in VC measured by Thomson and by LAVCA for some country-year combinations that overlap.

Overall, given the abovementioned characteristics, we see the two databases more as a complement rather than substitutes.

⁴ It is worth remarking that another lead source for VC research, namely Dow Jones VentureSource, simply does not cover deals in Latin America.

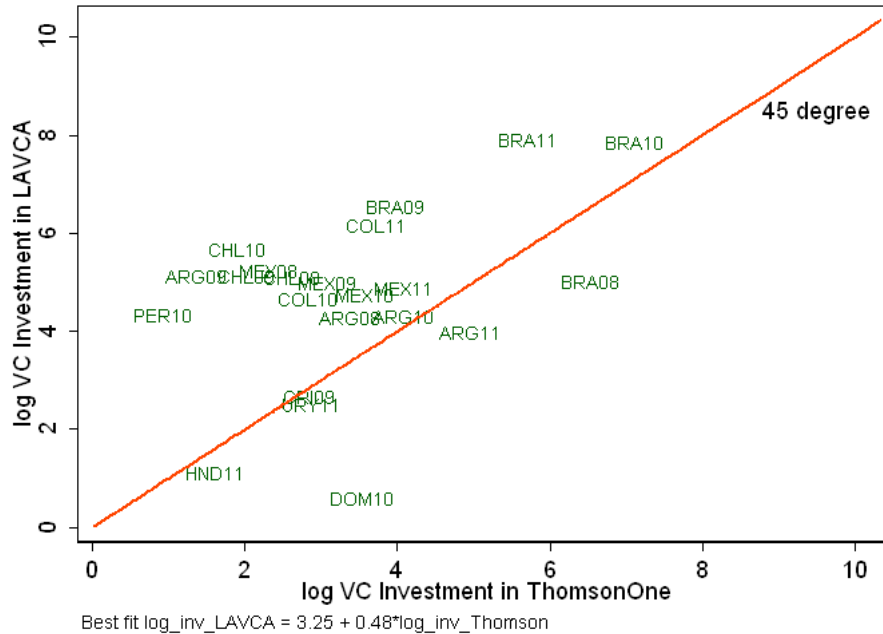
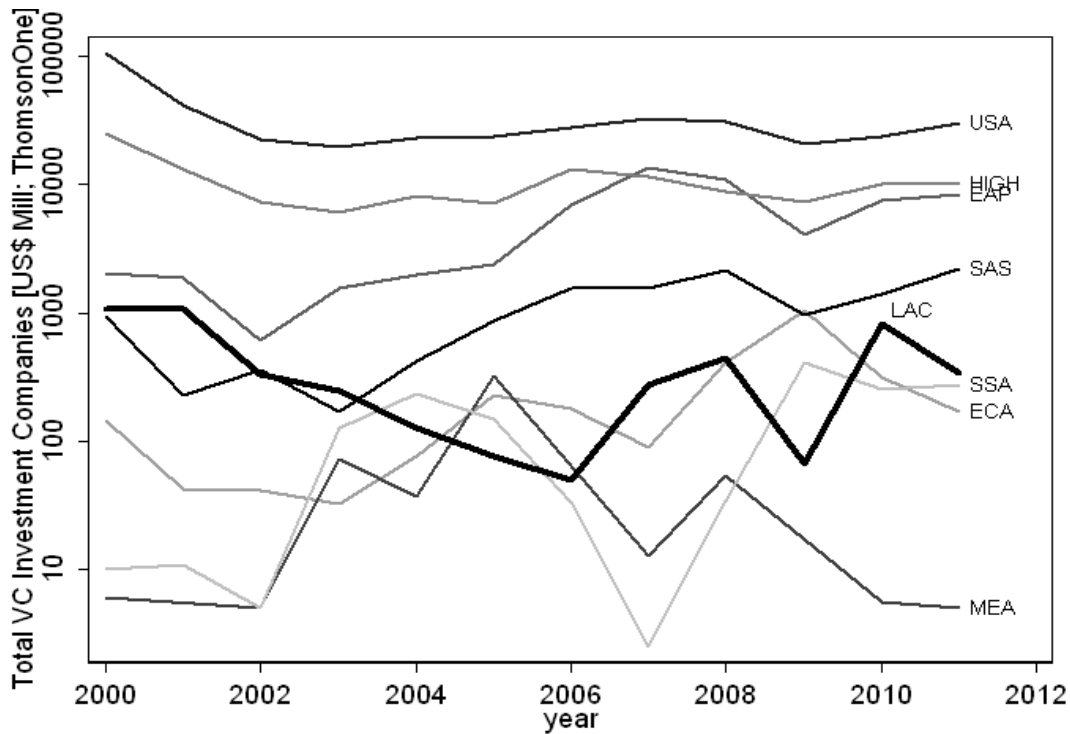


Figure 1 Investments in VC measured by Thomson and by LAVCA for some country-year combinations that overlap.

3. Basic description of VC in Latin America, in comparison to other regions.

Here we will review the levels and growth of Venture Capital in the region with some comparative perspective. Figure 2 shows how VC investments in Latin America and the Caribbean have evolved since 2000 and compares it with other regions in the World in ThomsonOne data. As expected, the leader in funds recorded is clearly the US, almost two orders of magnitude away from LAC, followed by other high income economies.



Regions above follow the definition of the World development Indicators. ECA is Eastern Europe and Central Asia, MEA is Middle East and North Africa, SSA is Sub Saharan Africa, LAC is Latin America and the Caribbean, EAP is East Asia and the Pacific (including China) and SAS is South Asia (including India). The high income region was split between USA and the rest, labeled HIGH.

Figure 2 Sum of reported Venture Capital investments in different regions of the world compiled from ThomsonOne database.

The Latin American region is still currently close to recuperate the volumes recorded at the time of the dotcom crash in 2000, with a trend that resembled an inverted-U, with a trough around 2005.

The graph clearly show that VC flows to companies in the region are proportionally more volatile, which in is in part explained by the fact that a few deals in a year can completely change the figures in the region. Indeed, as one goes up in the level of VC in the graph, regions display lower volatility since they are composed of more deals and make the measurement more stable. Overall, Latin America has received between 100 million and a billion dollars in VC financing during the decade. Nonetheless growth since 2005 is proceeding really fast.

In fact, Table 1 displays the trend growth rates for VC in various regions between 2005 and 2011 (calculated using log-linear regression, figures are not adjusted for the difference between changes in log and percentage changes). The most salient aspect of the data is that the LAC region is clearly among the regions where VC volumes are growing the most, joint with SSA. In Latin America the trend growth is 31.2% a year, well above the 9.7% of the EAP region (containing China) and the 7.6% of the SAS region (containing India). Developed regions during this period were basically draws when one draws a trend.

Many additional checks suggest this might be a real phenomenon rather than a measurement artifact. First, even if the databases have different recording systems, it is reassuring to see that this fast growth in Latin America is qualitatively mimicked when one looks at LAVCA VC deals

between 2008 and 2011, which showed 53% annualized growth (part of the difference is that we are looking at 2008 as a starting point instead of 2005). A second potential worry could be that the rate of reporting is changing over time and the remarkable LAC growth in recent years is a spurious result. But this seems less of a concern because reporting has decreased slightly by 3% per year, suggesting the growth in VC volumes is large *despite* reporting, not because of it. A similar situation arises with the LAVCA data in the Table. Finally, the number of financing rounds reported in the region increased by 11.7% per year according to data from Thomson, being in the top 3 regions. For LAVCA the number of deals increased at 22% growth rate

In short, two databases show that Venture Capital investments in Latin American are growing at a comparatively high rate in the last few years. As mentioned, though, part of this large growth in LAC is due to the very low base.

Table 1. Growth rates in Venture Capital in various regions and comparison with Latin America

Region	Trend yearly growth rate in VC 2005-2011 in			
	Volume reported	Overall N Financing	N Rounds Reporting	Reporting ratio
	(A)	(B)	(C)	(D) =(C) - (B)
SSA	39.40%	-3.80%	-3.20%	0.60%
LAC	31.20%	11.70%	8.40%	-3.30%
EAP	9.70%	14.20%	8.80%	-5.50%
ECA	9.70%	-2.20%	-1.20%	1.00%
SAS	7.60%	15.50%	13.00%	-2.50%
HIGHnon USA	0.40%	-7.90%	-6.30%	1.70%
USA	-0.10%	0.40%	-0.60%	-1.00%
MEA	-64.70%	-0.50%	-26.00%	-25.50%
LAC-LAVCA (* from 2008)	53.50%	22.40%	17.60%	-4.80%

Source: Authors' calculations using ThomsonOne and LAVCA data on VC.

To make a first pass to the composition of investments Figure 3 shows average attributes of investments in companies based in LAC (weighted by round of investment, not by value), namely: the share of investments syndicated, the share of investments in hi-tech and the share of Domestic Private equity financing companies. Beyond the relative decrease of high tech after the commodity boom in 2004-2005, from an average of 60% before that crisis to something like 40% after; there are no other clear trends. The share of deals syndicated has been in the neighborhood of 10 and 20% during the decade, while the domestic share of VC has been between 50 and 70% most of the time.⁵

⁵ One caveat to keep in mind is that Thomson one may over-represent share of foreign deals, at least those coming from the US or other large and well covered economy

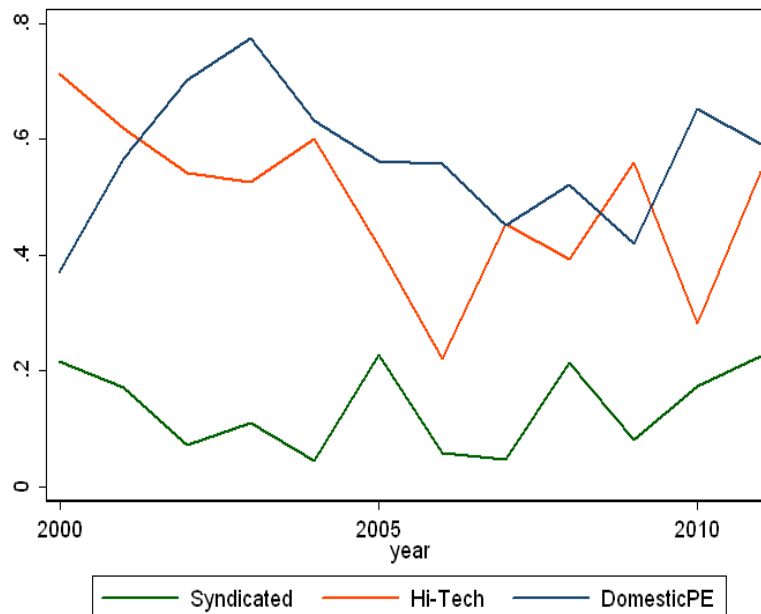
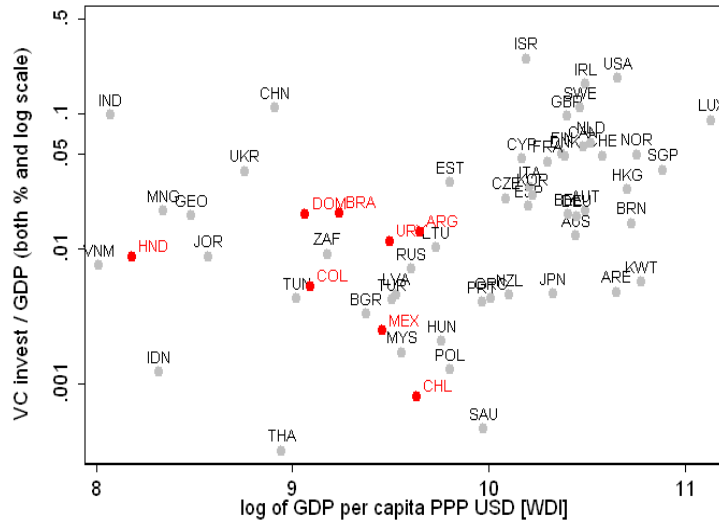


Figure 3 Attributes of financing rounds for VC financing round to companies in Latin America recorded in ThomsonOne by type. Non mutually exclusive categories. Rounds are not weighted by value.

Finally we look at “VC financial development” across countries in Figure 4, displaying the recorded VC investments in each country as a percentage of GDP. This shows how some Latin American economies stand against other countries, conditioning on their level of development. Beware that the vertical axis is both in percentage terms and log scale, because otherwise we would not distinguish anything. A striking fact in the sample is that the average Latin American economy has just a tenth of the VC over GDP that China and India have, despite having twice as much income per capita. In panel (a) using data from regional sources VC/GDP is 0.04% for the average between China and India, while only a tenth of it (0.004%) for the Latin American countries in the sample. Results do not change in a relevant way if we weight by the size of countries in each group (i.e. if we make the Latin American countries in the sample a single entity). Most Latin American countries in the sample seem closer to a few Eastern European economies; or even more developed economies with lower relative penetration of VC, like Italy, Spain or Japan. Although the relative positions of Latin American countries may change when we look at panel (b) using Thomson’s data, the overall picture of the region and the comparison with China and India is strikingly similar.

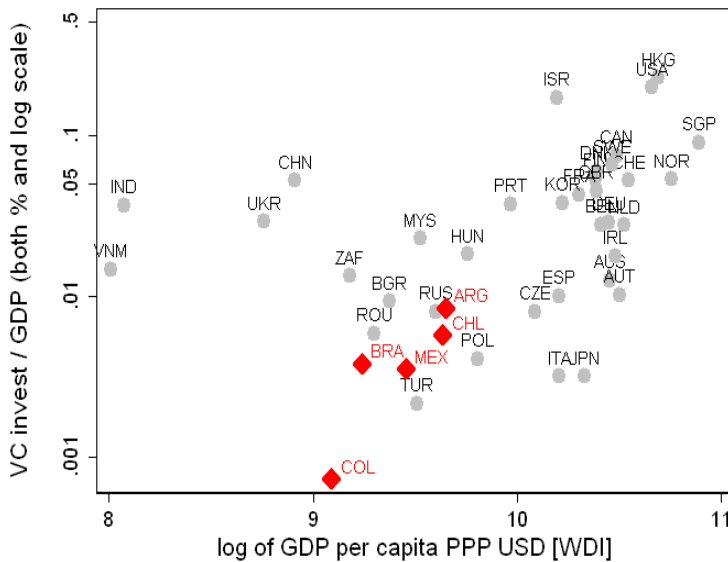
Here it is worth emphasizing that the goal of an economy is not to maximize VC, and in fact many developed economies similar to Latin America do not have a lot of it. An open question for the rest of the paper would be whether VC is low because there is little “deal flow” of projects demanding VC finance (maybe because of the type of innovation or industry where the country has advantages) or because the supply of VC is inefficiently low.

In the next section we will look at stylized facts that make VC investments in LAC different from those in other regions, especially benchmarking against Asian Economies. In Section 6 we will come back to try to disentangle the reasons why large Asian Economies are so above Latin America.



Note: Data averages 2010-2011

(b) Thomson



Note: Data circa 2011

(a) Regional

Figure 4 Venture Capital development measured as recorded VC over Gross Domestic product (VC/GDP) using two sources for VC data (a) ThomsonOne (b) Aggregates from regional associations compiled by Josh Lerner from LAVCA, EMPEA and other sources. GDP was obtained from World Development Indicators accessed 2012.

4. Comparative stylized facts of VC in Latin America

After the broad description, in this section we outline various characteristics of VC investments in a comparative perspective whenever possible.

4.1. Lower share of hi-tech in Latin America's VC

Figure 5 shows that over the last decade VC investments in Latin America are 5 percentage points lower than for other *non*-industrial regions. This trend is also remarked in specifications (4) and (5) in Table 2, which show that the share of projects in hi-tech sectors is *smaller* in LAC than in high income countries and in East Asia (EAP, chiefly China). To check that the shares of hi-tech are not driven by reporting bias, we used those deals which report investment in (4), including later also those which do not (5). The abovementioned differences in regional averages are qualitatively unaffected by the type of measurement, suggesting that the low share of hi-tech in LAC is unlikely to come from a bias in the value of reported transactions. Overall, when looking at early stage investments roughly half of them are high tech in the region, as opposed to 75% in East Asia (pretty close to developed nationals) and 60% in India. Only the ECA region (i.e. mostly post-soviet countries) display shares of hi-tech as low as those in Latin America, although Africa is at the very bottom with only 10%.

Overall, there is a trend that the richer the country, the more VC. This appears both in a worldwide cross country correlation (not shown) and also within Latin American economies in Figure 6.

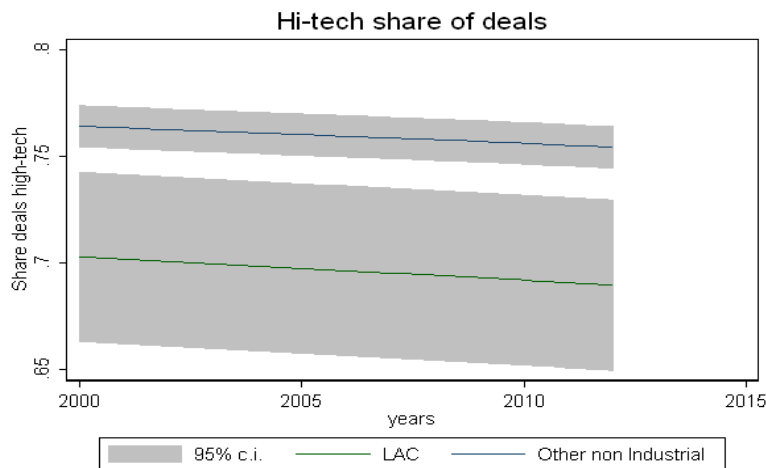


Figure 5. Non parametric regression of the share of deals in hi-tech, calculated for both Latin American countries and other non-industrial countries

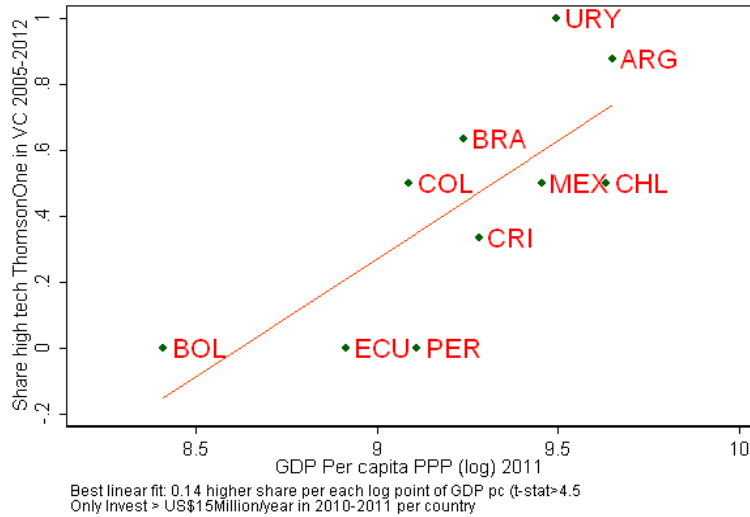


Figure 6 Share of high-tech among seed and early stage VC in Latin America plotted against income per capita PPP.

4.2. Average VC investments in Latin America are bigger than in benchmark regions, but mostly due to non hi-tech.

Table 2 shows the average investment size across regions. In column (1) one can see that early stage VC is bigger in LAC in comparison to developed and many other non high income regions, with the exception of East Asia and the Pacific, which is mostly dominated by deals in China. Trying to understand the origins of this large average size we split the deals depending on whether they are hi-tech or not (2 and 3). This makes clear that the bulk of the difference for Latin America is because of very large investments in non-tech sectors. This contrasts with East Asia (e.g. chiefly China), where investment sizes are bigger both in tech and non hi-tech.

Table 2 Regression of investment size and high-tech investment explained by regional dummies (without intercept). Seed and early stage projects from ThomsonOne 2005-2012.

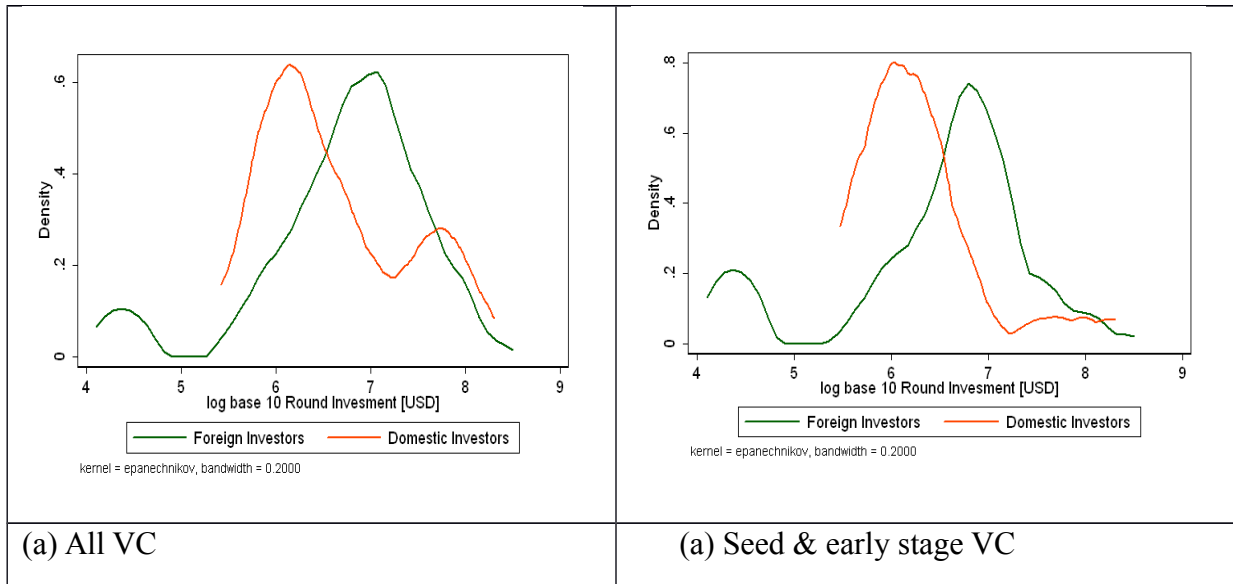
REGION	log investment			share hi-tech	
	(1)	hitech=0 (2)	hitech=1 (3)	log_invest !=. (4)	(5)
EAP	1.288*** (0.02)	1.606*** (0.08)	1.172*** (0.02)	0.733*** (0.01)	0.726*** (0.00)
ECA	0.203 (0.35)	0.701 (0.66)	-0.295 (0.25)	0.500** (0.22)	0.536*** (0.14)
HIGH	-0.579* (0.30)	-0.733** (0.31)	-0.522* (0.31)	0.728*** (0.03)	0.727*** (0.02)
LAC	1.373*** (0.22)	2.655*** (0.58)	0.0912 (0.28)	0.500*** (0.13)	0.483*** (0.10)
SAS	0.682*** (0.03)	1.079*** (0.04)	0.418*** 0.00	0.600*** (0.02)	0.634*** (0.01)
SSA	-0.456 (0.41)	-0.478 (0.39)	-0.247 (1.69)	0.0952** (0.04)	0.0800** (0.04)
Observations	1818	520	1298	1818	2748
R-squared	0.105	0.155	0.09	0.722	0.721

Robust standard errors clustered iso_d *** p<0.01, ** p<0.05, * p<0.1

4.3. Foreign VCs invest higher amounts per round in Latin America

Figure 7 displays the distribution of deals by type of investor, showing that on average foreign firms invest bigger amounts. Panel (a) shows that this is the case for seed and early stage investments, while panel (b) confirms that it is also the case when one considers also the expansion and later stage projects.

Our results for post 2005 data are consistent with the previous findings of Khoury (2012), who used pre-2004 data. Finally, given the way ThomsonOne data is collected it might be more likely that smaller deals by foreign firms (many of the US based) are recorded, as we could see in the left hand size of the distribution in Figure 7, where we there are clearly more foreign VC firms than domestic investors. This bias, however, works in the opposite direction of our finding, making the case for an even higher average investment of foreign firms. When looking at the share of investments made by foreign VC firms in Latin America, we do not see clear differences with other regions of the world (Table 3)



It and uses all Company-Round-Firm observations weighting each observations by the reciprocal of the number of firms in the Company-Round to avoid overweighting syndicated deals.

Figure 7. Kernel density estimate for the size of round financing in which firms participate, depending on whether the VC firm is domestic or foreign. (a) is for seed and early stage investments, while (b) is for all of them. Projects come from the period Jan 2005 – Oct 2012.

4.4. VC Firms investing in Latin America have less experience.

Venture Capital has been described as an industry where there are lots to learn from experience⁶. Unfortunately, though, VC firms investing in Latin America seem to have less experience. Indeed, Table 3 shows that the average VC firm investing in Latin America is 12 years old, in sharp contrast with all other regions that have firms with 18 to 20 years of experience, with the only exception of Sub-Saharan Africa where firms are much younger. In some way VC is subject to a problem similar to the one remarked by Hsieh and Klenow (2012), who show that most US jobs are much older and with much more organizational capital than in Mexico.

⁶ Lerner et al (2009) remark that the experience and focus of the actual board member that sits in the company is what matters the most for returns. We do not have that measure here but it might be reasonable to assume that in less developed economies VC firms are small, so the age of the firm might be a proxy for individual skills.

Table 3 Regressions by region on the share of domestic VC investors and firm age.

REGION	1*domestic		firm age	
	if invest!=.	invest!=.	invest!=.	invest!=.
	(1)	(2)	(3)	(4)
EAP	0.730*** (0.01)	0.699*** (0.01)	18.14*** (0.27)	17.65*** (1.33)
ECA	0.563*** (0.05)	0.500*** (0.05)	18.47*** (3.98)	18.01*** (2.32)
HIGH	0.847*** (0.03)	0.864*** (0.02)	20.56*** (1.45)	21.81*** (1.07)
LAC	0.778*** (0.22)	0.760*** (0.17)	12.95*** (4.42)	11.96*** (2.14)
SAS	0.535*** (0.02)	0.547*** (0.01)	20.54*** (0.33)	21.74*** (1.03)
SSA	0.619*** (0.17)	0.560*** (0.15)	7.840*** (2.93)	12.35*** (3.07)
domesticPE				-4.84*** (1.71)
Observations	1562	2424	1810	2415
R-squared	0.828	0.842	0.566	0.498

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

4.5. VC investments in the region are very procyclical.

Table 4 shows estimates of procyclicality of investment, meaning how sensitive a give type of investment is to the overall economic growth in a country in the period 2000-2011. For that we used an unbalanced panel regression, with country fixed effects, where we regressed the percentage change in VC investments against GDP growth and linear trend. The coefficient on GDP growth, known as cyclicity coefficient, is used in fiscal literature to see whether these types of investments are procyclical with overall economic activity (i.e. a positive coefficient) or anti-cyclical (i.e. a negative coefficient). Column (1) shows that for Latin American countries post 2000 VC investments seem very procyclical, with a coefficient of 19. Meaning that - on average - when the economy as a whole grows or shrinks at 1%, then VC dollars grow or shrink by 19%.

Of course it is well known in the macroeconomic literature that investment is procyclical, but the estimates in (1) indicate VC is importantly more procyclical than investment. As a benchmark, column (3) computed procyclicality for overall investment - a.k.a. Gross Fixed Capital Formation - finding a coefficient of 6.1 in the same sample of country years used before. Models (1) and (3) are not nested so we cannot directly test for the difference in procyclicality, but it is

very safe to say that Latin American VC seems more procyclical than investment. Furthermore, in specifications (4) and (6) we replicate (1) and (3) but for the whole world, excluding US and Canada. This worldwide cyclicity coefficient for VC is just 3.2; well below the 19 in Latin America. Importantly, this difference between Lat. Am. and the worldwide sample looks much higher for VC ([1] minus [4] show 15 units difference but with large S.E.), than for macroeconomic capital formation ([3] minus [6] creates a gap that is only 1 to 2 units).

Finally, column (2) and (4) explore the sensitivity of the extensive margin: meaning the number of VC projects recorded in the database. The point estimate for Latin America is 9.6, almost three times the one for the worldwide sample. As a bottom line for this Table, our sample of VC investments in the Latin American region depicts a remarkably cyclical pattern, with a fraction of it coming from the number of projects and another coming from the average project size.

Table 4 Procyclicality regressions of changes in various types of investment on changes in GDP per capita

VARIABLES	Latin America			All regions but USA & CAN		
	$\hat{\Delta} \% VC \$$	$\hat{\Delta} \% VC N$	$\hat{\Delta} \% GFCF$	$\hat{\Delta} \% VC \$$	$\hat{\Delta} \% VC N$	$\hat{\Delta} \% GFCF$
	(1)	(2)	(3)	(4)	(5)	(6)
Cyclicity ($\hat{\Delta} \% GDP$)	19.02** (6.15)	9.636* (4.52)	6.131*** (0.51)	3.213 (3.56)	3.408** (1.35)	4.35*** (0.35)
Trend (Year)	0.00889 (0.04)	-0.0214 (0.02)	0.00162 (0.01)	0.0323* (0.02)	-0.0133* (0.01)	0.007*** (0.00)
Observations	37	37	37	530	530	514
R-squared	0.321	0.205	0.805	0.008	0.027	0.497
N Country FE	9	9	9	83	83	80

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. For Latin America data is for ARG BHS BRA CHL COL MEX PAN TTO URY. All regressions are of the form $\hat{\Delta} \% y = \alpha \hat{\Delta} \% GDP + \beta \text{Trend} + \text{countryFE}$. Another regression (not shown) analogous to (2) but using the number of projects reporting value of the deal shows a very similar procyclicality coefficient, suggesting that recording might not be the main driving force for our results. Exclusion of 2000 from the sample does not qualitatively change the results for Latin America except that increases the standard error for $\hat{\Delta} \% VC N$, having a p-value slightly above 10%. Specifications (4) and(5) become less procyclical and insignificant when one excludes 2000 for the worldwide regressions, But since that is our benchmark group, the qualitative point about Latin America looking more procyclical is even stronger.

5. VC chasing ideas or VC following from Financial Development?

This last empirical section follows up on section 3 and explores the determinants of cross country variation in VC development. Our regression analysis seems to point out to the relevance of the supply of scientific and technical idea. We relate to Ketelhöhn and Ogliastri (2013) who argue that Latin America has low levels of patenting and innovation. In this section we argue this could be a bottleneck for the development of Venture Capital in the region.

Table 5 shows regressions explaining VC investments in companies as a fraction of GDP (average 2010-2011 using ThomsonOne). As outlined before, we found in all specifications that the Scientific and Technical articles per capita – recorded in the World Bank database - is a robust predictor of VC/GDP. Depending on the specification, a 1% increase in articles per capita is associated with between 0.4 and 0.8% increase in the VC/GDP ratio (% not percentage points since the regression is in log form, as noted in the graphs. Specification (1) and (2) use all countries in the sample and find a statistically significant relationship. Despite the high correlation (0.84) between patent applications and scientific articles, in (1) the number of articles is significant while the other coefficient is not. Naturally, when dropping the measure of patents the point estimate for Scientific articles increases. Importantly, conditional on the articles, a larger income per capita in the country is a negative predictor of VC/GDP in (2), but mostly due to the effect of low income countries in the region. Indeed, when we exclude those countries from the sample (log GDP pc above 8, like Vietnam and India), then GDP per capita is no longer significant, while scientific articles remains a significant predictor. Regressions (3) to (8) focus on our sample excluding low income countries. (4) shows that patents are significant predictors, only when we exclude scientific articles. (5) shows that income per capita becomes significant only when we exclude both indicators of the “supply of ideas”. Specification (6) offers a reduced form of VC/GDP on articles, to make sure the correlation does not go away when we fail to control for some other covariates. It remains robust suggesting that its predictive power on VC/GDP does not stem from a mere correlation with other included RHS variables. Finally, (8) runs the same regression as in (3) but controlling also for regional FE. This does not qualitatively alter the coefficient for scientific articles.

In short, the variables of the supply of scientific ideas in a country seem to predict VC/GDP. Equally important is to notice that in almost all specifications we included a very used indicator of financial development in equity financial markets, namely the market capitalization of listed companies as a fraction of GDP, but we fail to find any statistical relationship with VC/GDP, even when we used it as a single covariate in specification (7). We performed the exercise looking at market capitalization both in logs and as share, and it did not change our qualitative conclusions. In short this Table remarks that the supply of ideas could be very powerful for VC development and there is some evidence that in a horserace that explanation generates a better fit to the data than measures of financial development or mere income per capita.

Table 5 Regressions explaining VC development a cross section of countries circa 2011.

VARIABLES	Log (VC/GDP)							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
log_articles_pc	0.694** (0.32)	0.804*** (0.21)	0.661*** (0.20)			0.402*** (0.12)		0.533** (0.24)
log_patent_pc	0.206 (0.18)			0.40** (0.18)				
log_GDPpc_PPP	-0.901 (0.65)	-0.997** (0.47)	-0.119 (0.50)	0.4 (0.43)	0.844*** (0.26)			0.138 (0.51)
log_pop	0.0278 (0.19)	0.0082 (0.18)	0.147 (0.18)	0.0431 (0.17)	0.0843 (0.14)			0.0242 (0.20)
log_mkt_cap	0.0582 (0.19)	0.0844 (0.19)	-0.0802 (0.17)	-0.0454 (0.17)			0.162 (0.14)	-0.15 (0.22)
Constant	11.74 (8.77)	11.96* (6.97)	0.264 (7.07)	-5.078 (6.59)	-14.1*** (3.75)	-0.898 (1.02)	-5.0*** (0.50)	Region FE
Observations	60	65	59	58	63	62	60	59
R-squared	0.237	0.184	0.27	0.246	0.136	0.178	0.01	0.356

Robust standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1. Specifications (3) to (8) are restricted to countries with middle income, operationalized as log(GDP_pcPPP) above 8. Specification (8) is like (3) but with regional fixed effects..

Concluding Remarks

In this paper we overviewed the main trends of Venture Capital investments in Latin America, benchmarking it with other regions. We find that VC investments in Latin America were growing at very high rates, more than almost any other region in the world, even though they started from a low base.

We remark various stylized facts about VC in the region, which are consistent with an ecosystem in initial stages. First, the region displays a lower share of hi-tech investment when compared to other non-industrialized countries. Second, Latin America's VC investments are on average bigger than in benchmark regions, but mostly due to non hi-tech investments. Among hi-tech there is not a large difference with other non-industrial regions. Third, we find that foreign⁷ VCs invest higher amounts per round than Domestic VC firms in Latin America. This is consistent with a model of selection, where foreign firms participate only if the deals are on average large enough to pay the international transaction costs. Fourth, VC firms in Latin America are younger and less experienced than in other regions. And fifth, we show that VC investments in the region are very procyclical, more so than in other regions and also more than gross capital formation in the same region.

We also we found that a 1% improvements in the VC environment as measured by the EIU-LAVCA index is positively associated with around 9% increase in Venture Capital investments in a country, at least when looking at expansion and later stage. Finally, we explored the cross country variation, trying to disentangle why is it that countries with much lower level of development like India and China have a much higher development in VC. Regressing VC/GDP we found that the production of ideas as scientific articles per capita is a strong predictor of VC, while a standard measure of financial development – meaning Market Cap/GDP - fails to explain the cross country variation.

Overall our findings suggest that Latin America is in an early stage of development of Venture Capital, and that part of the limited development is more due to limitations in the demand for Venture Capital by hi tech projects than by the general availability of capital or financial development in these economies.

⁷ There is still a role for the local investor in attracting cross-border venture capital (see for example Mäkelä and Maula, 2008)

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