Can Government-ControlledVentureCapitalFirms Deliver Performance? Evidencefrom China

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Abstract: Weexamine theperformanceofgovernment-controlledVC firms (GVCs)relative tothe performanceofdomesticprivateVCfirms(PVCs)andforeignVCfirms(FVCs)inthe largestemergingmarketeconomy,China.Weusesuccessful/unsuccessfulexitsfromand patent applicationsby VC-financed companiesasperformanceevaluationmetrics.GVCs arelesslikelythanFVCsto experiencebothsuccessfulexitsand unsuccessfulexits.In addition,GVCsoutperformFVCsin patentapplications.However,bothGVCsandFVCs underperformPVCs insuccessful exitsandpatentapplications.Thereis evidencethat stronger localinstitutionalenvironments help improve the performance ofbothGVCs andPVCsrelative toFVCs.Overall,ourresultssuggestthatthereis noone-size-fits-all conclusionregardingtheperformanceofChineseGVCs,whichisrelevanttotheongoing debateontheroleofthegovernmentandGVCsindevelopingtheventurecapitalindustry inemerging markets.

Keywords:venture capital; emerging market; China; government ownership;performance;innovation

JELClassification:G24, G38, O31

1. Introduction

Venturecapital(VC)playsanimportantroleinfinancingentrepreneurship,which isbelievedtobecriticaltoanation's innovationandeconomicgrowth(Schumpeter1934; Lerner2010). Dueto the hugesuccess of the U.S. venturecapitalindustry,many governmentsaround theworldhaveshownakeeninterestinadoptingavarietyof proactivepublicpoliciesthat aimto jumpstarttheir countries'VC industryand entrepreneurship. [1] Whiletheoreticaljustificationscouldbemadeforthegovernment's interventioninthedevelopmentoftheventurecapitalindustry and entrepreneurship (Hall2002; Amitetal.1998;Lerner2010), itisstill hotlydebatedwhetherandtowhat extentthegovernmentshouldbeinvolvedin theVCindustrydevelopment(Lerner2008,2010).

Theobjectiveofthisstudy isto contributeto thisimportantdebatebyexamining theperformanceofgovernment-*controlled*VCfirms(GVCs)in China,definedasVCfirms thatreceivethemajorityoftheirfundingfromeithergovernmentagenciesorgovernment-controlledbusinessenterprises(SOEs)orboth.WeusetheperformanceofPVCsandFVCs

asbenchmarks. PVCs areVCfirmsthatreceivethemajorityoftheir funding from domesticprivatesourceswhileFVCs are VC firms that receive the majority of their funding fromforeignsources.

Thoughstartedonlyaround1998,China'sVC industryhassinceexperienced explosivegrowthandhasemergedasthelargestnetimporterofVCby2003-2007(AizenmanandKendall2012).Moreimportantly,thepastdecadehasalsoobservedtheestablishmentofChina'sownnascentdomesticventurecapitalindustry, mostnotably, thecreationof hundredsofGVCs.WhileitiscommonforgovernmentstoprovideVC firmswithtax creditsandmatching fundsthataugmentprivatecapitalcommitments,or take aminorityownership ofVC funds,China is anoutlier inthat itisprobably the only country withalargenumberof VC firms*controlled*by differentlevels ofthe government. Hence,we believeit is important to evaluate theperformance ofChineseGVCs.

Aprioriitisdifficultto predicttheperformanceofGVCsrelativetonon-GVCs duetomultiplecountervailinginstitutionalforcessummarizedinFigure1.Conventional economicwisdom,referredtoastheincentivehypothesis(Shleifer1998;Lerner2010), wouldpredictGVCstounderperformnon-GVCsduetothewell-knownagencyproblems associated withgovernmentownership.Forexample,GVCscouldpursuepolitical agendas, whichinturncouldnegativelyaffectGVCs'managerial incentives.Inaddition, GVCsmay finditdifficulttouse high-poweredincentivecompensationcontracts(Chen etal.2013).Therefore, managersofGVCsdon'tnecessarily havestrongincentivesto acquireprivateinformationintheselectionofentrepreneurialcompanies forinvestment orclosely monitortheir funded companies.

According to theexperience/resource hypothesis,GVCs (aswellas PVCs)may alsounderperformFVCs becauseChina'sVC industryhasa shorthistory and therefore managersoflocalVCfirmscouldbelessexperiencedthanmanagersofFVCs.Inaddition, localVC firmsarenot asresourcefulasFVCs becausethelattertendtoenjoyglobal reputationand possessaninternational networkof financialintermediariesto support their operations.

However,GVCsmayalsooutperformnon-GVCsfortwo reasons.First,GVCs(as wellasPVCs)mayhavealocaladvantageandthereforecouldoutperformFVCs,hereafterreferred to as the proximity hypothesis. The extant financeliterature shows that distance isassociated withreduced informationaccessand higher monitoringcosts (Covaland Moskowitz1999and2001;KangandKim2008).Hence,localChinese VCfirmsmay possessmoreprivateinformationaboutlocalentrepreneurialcompanies andenjoylower monitoringcoststhanFVCs. [2] However,onecouldalsoarguethatdistancemaycreate incentives forFVCstoperformbetter ex-antescreeningandduediligence,resultingin better performance offunded companies(Daietal. 2009; Nahata et al.2014).

Second,GVCsmayhaveacompetitiveadvantagerelativetonon-GVCs dueto theirinherentgovernmentconnections,referredtoasthepoliticalconnectionhypothesis. Asarepresentativeemergingmarketeconomy,manyimportantaspectsofChinesefirms' operationsaresignificantlyinfluencedbyvariousgovernmentagencies,including input andoutput factormarkets,taxes, bank andpublicequity financing,etc. Priorresearch showsthatdrivenby variouspoliticalandeconomicincentivessuchaspolitical tournamentandsocialstability(LiandZhou

2005;Linetal.2004),localChinese governmentofficialshaveastrongincentive toprovideavarietyofpreferential treatmentstotheChineseSOEsundertheir jurisdictions,includinginformationsharing, taxconcessionsandeasieraccesstobankandpublicequityfinancing(Aharonyetal.2000; BrandtandLi2003;CullandXu 2003).BecauseGVCs'performancedependsonthe success oftheirfunded entrepreneurialcompanies, weexpect GVC-funded companiesto directlyorindirectlybenefitfrom GVCs' government connections, especially theentrepreneurialcompaniesthatarelocatedin the sameprovince astheGVCs'headquarters.Ofcourse, non-GVCscouldpartiallyoffsetthiscompetitivedisadvantage byestablishingtheirownpoliticalconnections,makingtherelativeperformanceofGVCs versus non-GVCs difficult to predict exante.

WecomparetheperformanceofGVCs,PVCs,andFVCsusing2,639Chineseentrepreneurialco mpaniesfundedby607lead VCfirmsovertheperiod2000-2009. Followingpriorresearch(e.g.,Hochbergetal.2007;KortumandLerner2000),wemeasure aVCfirm'sperformanceusing bothitssuccessful/unsuccessfulexitfromafunded entrepreneurialcompanyandthe numberofpatentapplicationsfiledby theVC-funded entrepreneurial company during thelead VCfirm's investment period.

Wefindthat therelativeperformancerankingof thethreeVCfirmtypesdependsontheperformanceevaluationmetric.IntermsofsuccessfulexitS,wefin dthatPVCs outperformbothFVCsandGVCswhileFVCs outperformGVCs. However,we find that FVCsaremorelikelytoexitunsuccessfullythanbothGVCsandPVCs butthereisno differenceintheprobabilityofunsuccessfulexitforGVCsversus PVCs.Interms ofthe quantityofannualpatentapplicationsfiledbyVC-fundedcompaniesover theleadVC firm'sinvestmentperiod,GVCsoutperformFVCs,eventhoughbothGVCsandFVCs underperformPVCs. However,wefind noevidencethatthequalityofthepatents, measuredbytheaveragenumberofcitationsperpatentasof2014,islowerforGVCsthan fornon-GVCs.Infact, wefindnodifferencein patentqualityamongthe threeownership types,suggestingthatthebetterpatentfilingperformanceofGVCsrelativetoFVCsisnot a fiction.

Thebetterperformance ofPVCsoverGVCssuggeststhatincentivesmattermore thanpoliticalconnectionindeterminingthe relativeperformanceof PVCsversusGVCs (see Figure 1). Similarly,thebetterperformanceof PVCs over FVCs supports thehypothesisthatproximitymattersmorethanexperience/resourcesin explainingthe relativeperformanceof PVCsversusFVCs.ThemixedperformanceofGVCsoverFVCs suggeststhateachVCfirmtypehasitsuniquestrengths,withGVCshavingtheproximity advantage and political connectionand FVCs having strongermanagerial incentives and more VC management experience/resources.

WenextexaminewhethertheaforementionedperformancegapsamongthethreeVCfirmtypesvarywiththelocalinstitutionalenvironmentqualityoftheprovincewhere aVCfirm'sheadquartersislocated.Priorresearchshows thatmanagersoflistedChinese firmsaremorelikelytopursueshareholdervaluemaximizationinprovinces with strongerinstitutionalenvironments(e.g., Wangetal.2008).WealsoexpectlocalinstitutionalenvironmentqualitytoaffectVC firms'performance,buttheeffectoflocal institutionalenvironmentqualityontheperformancegapsamongthethreeVCfirmtypes

isdifficulttopredict.Onone hand,GVCsmay sufferfromsignificantagencyproblems andthereforeweexpecttheperformanceofGVCstoincreasewithprovincialinstitutional environmentquality.BecausebothGVCsand PVCsmayfacesignificantresource constraints, wealsoexpecttheperformanceofbothGVCsand PVCsto furtherbenefit from astrongerlocalinstitutionalenvironmentthatcan helprelaxsomeofthese constraints (e.g., human capitaland financialintermediaries).Ontheother hand,the performanceofFVCsmayalsobenefitfromastrongerinstitutionalenvironmentbecause FVCs'twodisadvantages,lackofpolitical connectionandproximity,couldbe significantlyreducedinprovinces withstronger institutionalenvironments.Becauseof theseoffsettingforces,the neteffectof localinstitutionalenvironmentquality onthe relative performancedifferencesofthe three VCfirm typesis anempiricalquestion.

Withregardtosuccessfulexits,we findthatthepreviouslydocumented performancedisadvantageofGVCsrelativeto FVCsisreducedwhilethepreviously documentedperformanceadvantageofPVCsrelativetoFVCsis widenedforVC firms whoseheadquartersarelocatedintheprovinceswithstrongerinstitutionalenvironments. Wefindnoevidencethatlocalinstitutionalenvironment qualityaffectstherelative differencesinunsuccessfulexitsamongthethreeVCtypes.Withregardtothequantity ofpatentapplications, wefindthat thepreviouslydocumentedperformanceadvantages forGVCsversusFVCsand PVCs versusFVCsarewidenedforVCfirmswhose headquartersarelocatedinprovinceswithstrongerinstitutionalenvironments.Whilethe performanceofbothGVCsand PVCsrelativetoFVCsimproveswith localinstitutional environment quality, wefind noevidencethattherelativeperformancegapbetween GVCsandPVCsvarieswithlocalinstitutionalenvironmentquality.Theseresultssuggest thatthe qualityoflocalinstitutionalenvironmentmatterstoagreater extentforthe performance oflocalVCfirmsthanforthe performance ofFVCs.

Wemakeanimportant contributiontotheextantVCliteratureongovernment-sponsoredVCfirms.Toourknowledge,wearethefirststudyontheperformanceof government-*controlled*VCfirmsinemergingmarkets.Becausemostgovernmentsaround the world support the venture capitalindustryin relatively passiveways, suchas giving taxcreditsortakingaminorityownershipofVC funds,mostextantresearchexamines the performance ofVCfirmswitha*minority*governmentownershiponly (Wallsten2000; Branderetal.2010;CummingandMacIntosh2004). NotableexceptionsareBranderetal. (2015)andCummingetal.(2015),butbothCummingetal.(2015)andBranderetal.(2015) primarilyfocusontheperformanceofVCfirmsindevelopedcountries.Aprioriitis unclearwhethertheirfindingsaregeneralizabletoVCfirmsinemergingmarketswherethereisalackofd evelopedinfrastructuresandinstitutionsnecessaryforefficientbusiness operations(Khannaetal.2010)andthereforethegovernmentandGVCscouldplaya morepositiveroleinfosteringentrepreneurshipandinnovation.Inaddition,Cumming etal.(2015) focusonVC firms100%owned bythegovernmentonlywhile Branderetal. (2015)don'tdistinguish thegovernment'smajorityversusminorityownershipofVC firms.WefollowtheextantSOEliteraturebydefiningGVCsbasedonthenotionofcontrol (Wang et al. 2008).

Wealso contributeto thebroaderliteratureongovernment-controlledfirms(e.g., Hunget

al.2012).Consideringtheimportanceofanduniquechallenges facingtheVC industryandentrepreneurship,we believeit isimportanttoseparatelyanalyzethe performanceofgovernment-controlledVCfirms.Wecontributetothisliteraturebybeing thefirststudytoassesstheperformanceofGVCsinthelargestemergingmarketeconomy.

Our findings carry importantimplicationsto theongoing debateinChinaand manyotheremergingmarketson howtosupportentrepreneurshipandthelocalVC industry.ThesuperiorperformanceofPVCsrelativetobothFVCsandGVCssuggeststhe importanceofsupportingthedevelopmentof PVCssothattheycanplaya more significant role indevelopinga nation's localventure capitalindustryand entrepreneurship.ThemixedperformanceofGVCsrelativetoPVCsand FVCssuggests thatcautionshould be exercisedinthegovernment'spush forGVCs becauseGVCs directlycompete withPVCsforbusinessandthereforethegrowthofGVCscouldcrowd outthegrowthofPVCs,resultinginasignificantdistortioninresourceallocationforentrepreneurship,es peciallyinregionswithweakinstitutionalenvironments.[3]Finally,thepoorperformance ofFVCsrelative to PVCs suggeststhatdespite theirperceived superiority,adirectimportofFVCs aloneisunlikely to help emerging marketsreplicate the success ofthe Silicon Valleyand the like.

The rest ofthepaperis organizedas follows. Section 2discusses data sources andsampleselection.Section3examines the performancedifferences inthe entrepreneurial companiesfinancedbythethreeVCfirmtypes.Section4examinestheeffectofVCfirms' localinstitutionalenvironmentqualityontherelativeperformanceofthe threeVCfirm types. Section5concludes.

2. Data sourcesand sampleselection

2.1. Datasources

Thedata onVC firmsand their funded companiesused inthisstudy come from CVSOURCE,aleading venturecapitalandprivateequitydatabasewithanexclusive focusonChina.BecauseVCfirmsare not requiredtopubliclydisclosetheirinvestment portfoliodata,thequalityofdataonVC-fundedcompaniesfromexistingcommercial databasescommonlyusedintheextantacademicresearchhasalwaysbeenaconcern.[4]

OurresearchindicatesthatCVSOURCE'scoverageofVC-fundedcompaniesisrelatively complete.Specifically,wecomparethequantityofVCinvestmentbetweenCVSOURCEandTheAnnu alReportonChina'sVCIndustryDevelopment,anauthoritativeyearbookjointlypublished byChina'sNationalDevelopmentand ReformCommission(NDRC), the government regulator ofChineseVC/PE firmsduring our sample period,and China VentureCapital& PrivateEquity Association. Accordingto aninterimregulationonthe AdministrationofVCFirmsthattookeffectinearly2006,all VCfirmsoperatinginChina havebeenrequiredsince2006to register withthe relevant localgovernmentVC administrationagencyinordertobeeligiblefor receivingvariouspreferential government treatments suchas taxconcessions and government funding.According toa2011VCsurvey conductedbythe NDRCinBeijing,Shanghai,Jiangsu, Zhejiang, and Guangdong,theregionswiththemostVC firms,onlyapproximately 12.86%ofthe surveyedVCfirmsdidn'tplantoregister withthegovernment(TheAnnualReporton China'sVCIndustryDevelopment2012,p.235).[5] AccordingtoTheAnnualReporton

China'sVCIndustry Developmentforthethe availableyears2006-2012,thetotalnumber ofVCinvestmentdealsovertheperiod2006-2012is 9,596. [6] The comparable figure accordingtoCVSOURCEis10,128.[7] ThiscomparisonsuggeststhatCVSOURCE's coverage ofVC-fundedcompaniesis relativelycomplete.

We rely on the information provided by CVSOURCE and a comprehensiveChinesecompanyregistrationdatabasedevelopedbyChina'sState Administrationfor IndustryandCommerce(SAIC)todefine thethreeVCownershiptypes (http://gsxt.saic.gov.cn).WeobtainChinesecompanies'patentdatafromChina'sStateIntellectualProRightsOffice(SIPO)andpatentcitationdatafromtherecentlyavailable GooglePatentCitationsdatabase(www.google.com/patent). Weuse bothcomputer programsandmanuallabor tomatchthecompaniesinCVSOURCEwiththe companiesinSIPObycompany name.Thedatausedtodefinetheotherregression variablescome fromCVSOURCEand otherpublicsourcesas notedintheappendixof variable definitions.

2.2. Sample selection

ConsistentwiththeVCliterature,wedefineaVCfirmasafundmanagement entitythatmanagesoneormoreventurecapitalfunds.Ifaventurecapitalfundisformed asalimitedpartnership,whichwaspermittedonly after2006inChina,the fund managemententityreferstothegeneralpartners ofthefund.Ifaventurecapitalfundis formedasacorporation, thefundmanagemententityreferstothemanagementof the corporation.

We define a VC firm'sformation yearas follows:(a)the yearof the establishment forindependentdomesticVCfirms;(b)theyearofthefirstventurecapitalinvestmentfor non-independentdomesticVC firms (e.g.,thoseaffiliatedwithexisting business enterprises);(c)theyearoftheestablishmentforforeign VCfirmswithaspecificfocuson Chinaor Asiaifthereis nospecificChina focus; (d)theearlieroftheyearofthe fund raising ortheyearofthefirstventurecapitalinvestmentinChinafortheremaining foreignVCfirms.

WedeterminaVCfirm'stypebasedonthesourcesofalltheventurecapitalfunds raisedwithinthethreemonthssincetheformationoftheVCfirm.[8] Ifmorethan50percent oftheVC firm's funds come from either governmentagenciesor government-controlled businessenterprises,theVCfirmwouldbeclassifiedasaGVC.Ifmorethan50percentof theVCfirm'sfundscomefromdomesticprivatesources,the VCfirmwouldbeclassified asaPVC.Ifmorethan50percentoftheVCfirm'sfunds comefrom foreignsources,the VCfirmwould beclassifiedas aFVC.If noneoftheabovethreetypesoffund sources contributemorethan50 percentoftheVCfirm's funds,theVCfirmwouldbeclassified as a joint-venture (JVC).

FromCVSOURCEweidentifiedatotalof1,336VCfirmsthatwerefoundedbeforeyear2012, the lastavailableyear. Weexcludeyear2012because there wereonly21VC firms formed in2012,probablydueto adelayinCVSOURCE'sdata collection.Because thereisnoclearcutdistinctionbetweenVCfirmsandprivateequityfirmsinCVSOURCE, wedefineaVCfirmas onewhoseventurecapitalinvestmentsconstitutemorethan50 percent ofthe firm's totalequityinvestments as ofthe end of2012. Among the 1,336VC firms,279are GVCs,656arePVCs, and 388 areFVCs.Thereare only5 JVCs.Inaddition, duetomissingdata,wecannotidentifythetypefor8VCfirms.Inthesubsequentanalyses, weexcludethe5JVCsandthe8unidentifiedVCfirms.Theserestrictionsresultinasample of 1,323 VC

firms.

Table1showsthedistributionofthe1,323 VCfirms.Panel Ashowsthe distributionoftheVC firmsby foundingyearandtype.Itisclearthatallthreetypesof VC firm types experienced explosive growthoverthe past decade.

PanelBofTable1showsthedistributionofthe1,323VCfirmsbyprovinceandtype.Theprovincewh ereaVCfirmislocatedisdefinedasfollows:(a)theprovinceofthe VC firm'sheadquarters fordomesticVC firms and foreignVCfirmswhose headquarters arelocated inmainland China (1027);and (b)the province ofthemainlandChina office (173)orthe provinceofthefirstventurecapitalinvestment ifthereis nomainlandChina officeinformation(123), for foreignVC firmswhose headquartersarelocatedoutside mainland China.Itmay not betoo surprising thattheVC firmsareconcentrated in relativelydevelopedregionsofChina:Beijing, Shanghai,Guangdong, Jiangsu,and Zhejiang.

Finally,PanelCofTable1showsthedistributionofthe296(173+123)FVCswhose headquartersarelocated outsidemainlandChina.AlmosthalftheseFVCsarelocated intheU.S., consistentwiththe dominance ofU.S. VC firms around theworld.

3. The performance ofVC-funded companies

Following prior research, wemeasure aVC firm's performanceusing two performanceevaluationmetricsdefinedbelow:exit(successfulversusunsuccessful)from aVC-financedcompany(*exit*)andthenumber ofpatentapplicationsfiledbyaVC- financed company during the VC firm's investmentperiod(*patent_number*).Becausethe actualreturnsonVC firms'invested portfolioofentrepreneurialcompaniesare unobservable,we followpriorresearch(Gompersand Lerner2000;Branderetal.2002; Hochbergetal.2007;Sorensen2007;Zarutskie2007;Nahata2008)byusing*exit*asoneproxyforVCfirm performance.Phalippou andGottschalg(2009)demonstrateahigh positive correlationbetweensuccessfulexitsand actualreturns to venture capitalists, suggesting that*exit*should bea good proxy forVC firms' performance.

CummingandJohan(2013)identifyfivecommonwaysaVCfirmmayexitaninvestment inanentrepreneurialcompany: (i)initial PublicOffering (IPO); (ii)M&A, where boththeentrepreneurandtheVC firmselltheirstakeinthecompanytoanother company; (iii) secondary sale, whereVC firmsellsitsinterest butthe entrepreneur doesnot sellhis interest; (iv)managementbuyback,whereentrepreneurrepurchases thestake held by theVC firm;and (v)liquidationoftheentrepreneurialcompany. While itiscommoninthe U.S. VCliteraturetomeasuresuccessfulexitsusingIPOsandM&As only,VCfirmsininternationalVCmarketsoftenexitsuccessfullyviasecondarysalesdue tolackofaccesstotheIPOmarketoranunderdevelopedM&Amarket. Therefore,our definitionofsuccessfulexitincludes not onlyIPOsandM&Asbutalsosecondarysales, whichis frequentinour sampleasshownbelow. Inaddition,totheextentpossible, we also identify VC firms' unsuccessfulexits inthe form ofmanagement buyback and liquidation.OurdiscussionwithChineseVCindustryinsiderssuggeststhatmanagement buybackistypically viewedasafailureofVCinvestments.BecausemanyVCfirmsmay nothaveanincentiveto voluntarilydiscloseliquidationsoftheirfundedentrepreneurial companies,weusearecentlyavailablecompanydatabasefrom China'sState

AdministrationofIndustryandCommerce (SAIC)to identifythemajorityofthe liquidationsinoursample.

Bydefinition,aprimaryobjectiveofVCfirmsistofundearly-stageinnovativebut riskyentrepreneurialcompanies.Hence,wealsomeasurea VCfirm'sperformanceusing asecondproxy,*patent_number*,whichreflectsthedegreeofaVC-fundedcompany'sinnovation.While noteveryinnovationispatentedand noteverypatentleadsto successfuleconomicactivity,patentingandsuccessfulinnovationare highlycorrelated andthereforepatentsarecommonlyused asa measureofinnovationintheexisting VC literature.

3.1. Successfulexits versusunsuccessfulexits

3.1.1. The regressionmodel

Weusethe followingmultinomiallogitmodelto comparethedifferencesin successfuland unsuccessfulexits among the three VC firm types:

$$exit = gvc + pvc + control + e; \quad (1)$$

Seethe Appendixfor allvariabledefinitions.Theunitofobservationisan entrepreneurialcompany-year.Theregressionmodel's samplestarts fromthe first year whenanentrepreneurialcompanyreceivesthe firstventurecapitalinvestmentandends inthe earlieroftheyear oftheVC firm'ssuccessfulor unsuccessfulexitor 2012,thelast availableyear.To make sure that aVC firm has sufficient time to exit,weretainonlythe entrepreneurialcompanieswhosefirstventurecapitalinvestmentoccurrednolaterthan2009.We chooseacutoffof2009becausethetypical investmentcycleofemerging marketventure capital investments is2-3 years.

Whileanentrepreneurialcompanymayreceive venturecapital financingfrom multipleVCfirmsinboththe firstround investmentandsubsequentfollow-up investments,typicallythereisaleadVCfirmforeachentrepreneurialcompanywhoplays adominantrole inmentoringand monitoring theentrepreneurialcompany. Hence,we followpriorresearchbyfocusingontheleadVC firmforeachentrepreneurialcompany inthisstudy(Nahataetal.2014),butwecontrolfortheeffectofVCsyndicateinthesubsequentempiricala nalyses.Foreachentrepreneurialcompany,wedefinetheleadVC firmasthe firmthatmakesthelargestinvestmentinthe firstroundventurecapital investment. [9] IfanentrepreneurialcompanyhasmorethanoneleadVCfirms,wetakethe average ofeachrelevantvariableforthetiedleadVC firms.

Forthe1,323VCfirmsfromTable1,weidentified2,887entrepreneurialcompanies' firstroundinvestmentdealsinvolving772VCfirmsduringoursampleperiod2000-2009. Duetodatalimitation,wedon'tconsiderVCfirms'firstroundinvestmentsthatoccurred priorto2000. Afterexcluding225entrepreneurialcompanieswhose leadVCfirms couldn'tbeidentifiedduetomissingfirstroundventurecapitalinvestmentamount, we obtain2,662entrepreneurialcompaniesinvolving627leadVCfirms. Afterexcluding observationswithothermissingvariables,ourfinalsamplecontains2,639entrepreneurial companiesassociatedwith607leadVCfirms,involving15,639entrepreneurialcompany-yearobservationsover theperiod2000-2012.OurfinalsampleofVC-financed entrepreneurialcompaniesismuchbiggerthanthetypicalChinasample usedinmany cross-

countrystudies,reducingthecommonconcernofpotentialsample selectionbiases intheVCliterature.Forexample,Branderetal.'s(2015)Chinasamplecontains1,226VC-fundedcompaniesover2000-2008whileourChinasamplecontainsalmosttwiceasmany VC-fundedcompaniesoverthesametimeperiod (untabulated).Daietal. (2009,Table7) coveronly 175VC-fundedcompaniesfromChina,Nahata etal. (2014)don'tcoverChina atallwhileChemmanuretal.(2014,Table1)containsonly400VC-backedcompaniesfromChina.

Theregressionmodelincludesthe followingfourtypesofcommon control variables: (a)characteristicsofthe entrepreneurialcompanies (*early,priorpatent, priorcitation*);[10](b)selectcharacteristicsoftheleadVCfirms(*vc_lp*,*synsize*);(c)*initialvcinvestmentyea rfixedeffects*tocontrolforthe degreeofmarketcondition,suchas competitionamongVCfirmsforinvestment opportunities(Hochbergetal.2007;Nahata2008), intheyearofaleadVCfirm's first investmentinanentrepreneurialcompany*;*and (d)marketcondition, includinglocalinstitutionalenvironmentsuchasinvestor protection intheprovinceofanentrepreneurial company's headquarters(*enlocal_invpro*) andthemarket conditionintheyearofaVCfirm'sexit(*exit_condition*) (Lerner1994; Hochberg etal.2007; Nahata2008). We also include thestandard industryandyearfixed effects.WhenassessingtheimpactofVCfirms'ownershipstructureonfirmperformance, itisimportanttocontrolforthedifferencesinentrepreneurialcompany characteristics becausedifferenttypesofVC firmsmaypursuedifferentinvestmentstrategies.For example,someVC firmsmayonly focusonearlystageentrepreneurial companies.By definition,ittakeslongerforVCfirmstoexitfromsuchinvestments,evenif theyare successful.Withoutcontrolling for suchentrepreneurialcompanycharacteristics,we wouldunfairlypenalizethe performance ofVC firmsthathaveinvested inearly stage entrepreneurialcompanies.Likewise,it isnecessarytocontrol forthemarketconditions atboththeentrytimeandexittimeofaleadVCfirmthatarebeyondthecontrolofindividual VCfirms.

However,weexclude frommodel (1)severalcommonVC firm characteristics, includingVCfirm'sinvestmentexperience(LeeandWahal2004;Nahata2008),VCfirm's reputation (Nahata 2008), andVC firm's professional VCinvestmentnetwork (Hochberg etal.2007and 2010). Thereasonisthatthesevariablesareproxiesforthe experience/resource hypothesis notedintheIntroduction.Nevertheless,oursubsequent inferencesarerobusttotheinclusion ofthesevariablesintheregression model (untabulated).

Duetolackofstrongpriors,wedon't have anypredictionson theregression coefficientsforunsuccessful exits. With regard tosuccessfulexits, we make thefollowing predictionsbasedonpriorresearch.We expectthecoefficientone*arly*tobe negative becauseentrepreneurialcompaniesinthe earlystageofdevelopmentarelikely tobe riskierandthereforecouldbelesslikelytosucceed.Wealsoexpectthe coefficientson *priorpatent*and*priorcitation*tobepositivetotheextentthatentrepreneurialcompanies withmorepatentsandhigherpatentcitationspriortothefirstround VCinvestment indicatebetterquality.Eventhoughlimitedpartnershipistheprevailingorganization formofventurecapitalfundsinthe U.S.(Sahlman,1990),itispermitted inChinaonly since2007.Tocontrolforthepossible influenceoforganizationtype onVCfirms' performance, weinclude*vc_lp*.FollowingCasamattaandHaritchabalet(2007)and Branderet al. (2002), wecontrol forthesizeofVCsyndicateinthe firstroundVC investment (*synsize*).Basedontheevidence

fromtheliterature,wepredicta positive coefficient for*vc_lp*and*synsize*.Following Lerner(1994), Hochberget al. (2007)and Nahata(2008), wepredictapositivecoefficient one*xit_condition*because VCsaremore likelytoexitsuccessfullyduringtimesoffavorablemarketconditions. Wehave no predictionfor*enlocal_invpro*.

3.1.2. Regressionresults

PanelAofTable2reportsthe frequenciesofsuccessfulexitsand unsuccessful existsbyVCfirmtypeduringourentiresampleperiod.Thereareatotalof840exitevents, ofwhich83.1%(698)aresuccessfulexists and theremaining16.9%(142)are unsuccessful exits.Most priorU.S.researchignores unsuccessfulexitsduetolackofdata,butour evidenceabovesuggeststhis omission couldbeproblematicinoursamplebecause unsuccessfulexitsconstituteasignificantpercentageofallexits.Ofthesuccessfulexits,

17.3% (121/698)are inthe form ofsecondarysalesthatwouldbeignored ifone follows thetraditionaldefinitionofsuccessfulexitusedintheU.S.VCliterature.Thedistributions ofthevarioustypesofexitsaredifferentacrossthethreeVCfirmtypes.Morespecifically, amongallobservedexitsduringoursampleperiod,thepercentageof exitsthatare unsuccessfulis higherforFVCsthanfor non-FVCs.Ontheother hand,amongall observedsuccessfulexitsduringoursampleperiod,thepercentageofsuccessfulexitsthat are secondary salesorIPOsis lower forFVCs than fornon-FVCs.

PanelBofTable2reportsthedescriptivestatisticsfortheregressionvariables.Untabulatedanal ysisshowsthatapproximately4.4%ofthe firmyearsincludedinthe regressionmodelrepresentsuccessfulexitswhile0.9%ofthe firmyearsareunsuccessful exits.[11]Amongthe2,639uniqueVC-fundedcompaniesinPanelBofTable2,986(37.4%) are funded byGVCs,638 (24.2%)are funded by PVCs,and 1,015 (38.5%)are funded by FVCs,suggestingthatbothGVCsandFVCsaremoreactivethanPVCsininvestmentactivities inour sample period. The valueof*synsize*at the 75thpercentileiszero,suggestingthatmostVCfirmsinChinagosoloininvestment,afindingdifferentfr omtheU.S. literature (Gompersand Lerner2004).

Panel C ofTable 2showsthe regressionresults of themultinomiallogitmodel wherethefirmyearswithoutanexiteventarethedefaultbenchmarkgroup.Withregard tosuccessfulexits,wefindthatthecoefficienton*gvc*issignificantlynegativewhilethe coefficienton*pvc*issignificantlypositive.Inaddition,thecoefficientson*gvc*and*pvc*are significantlydifferentfromeachother.Theseresultssuggest that PVCsperformthe best intermsofsuccessful exit,followedby FVCsandGVCs,respectively.Withregardto unsuccessfulexits,thecoefficientson*gvc*and*pvc*arebothsignificantlynegativeanddon't differfromeachother.TheseresultssuggestthatbothGVCsandPVCsarelesslikelythan FVCs to experienceunsuccessfulexits.Takentogether,our regressionresultsclearly indicatethatPVCsperformthebest,buttherelativeperformanceofGVCsversusFVCs ismixed because GVCsarelesslikelythanFVCstoexperiencebothsuccessfuland unsuccessful exits.

Withregard to the control variables, many ofthem are significant and consistent withour predictions.Specifically,thecoefficientsontwoentrepreneurialcompany characteristics,*early*and*priorpatent*,aresignificantand consistentwithexpectationsfor successfulexits, suggesting thatentrepreneurialcompaniesthatreceivedthefirst round VC investmentintheir earlystage and lower-qualityentrepreneurialcompanies measuredpriortotheleadVC firms'firstroundinvestment arelesslikelyto exit successfully,ceterisparibus.Thecoefficienton *synsize*for successfulexitsissignificant and

consistentwithexpectation,suggestingthatentrepreneurialcompaniesfundedby lead VCfirmswitha largersyndicatein thefirst round investmentare more likelyto exitsuccessfully, ceterisparibus. Finally,the coefficientone*xit_condition*is significantlypositive forsuccessfulexits,suggestingthatexternalmarket conditionsmatterinVC-fundedcompanies'successfulexit.Finally,thecoefficienton*priorpatent*issignificantly negative for unsuccessfulexits,suggestingthatlower-qualityentrepreneurialcompanies measured priorto the lead VC firms'first roundinvestment areless likelyto fail.

3.2. Patentapplications

3.2.1. The regressionmodel

WenextexaminewhetherthethreeVCfirmtypesdifferinthenumberofpatent applicationsfiled by VC-funded companies during a lead VC's investmentperiod:

$$patent\_number = gvc + pvc + control + e; \quad (2)$$

SeetheAppendixforvariabledefinitions.Chinahasthreetypesofpatents:patentsforinvention, patentsfor utilitymodel,andpatentsfordesign.Theprotectionperiodfor inventionpatentsistwentyyearswhiletheprotectionperiodforutilitymodelpatentsand design patents is onlyten years, counted fromthe application date(http://english.sipo.gov.cn/).Theapprovalofinventionpatentsismorerigorousandtakeslonger thantheothertwotypesofpatents.Ourdefinitionof*patent_number*includes theinventionpatentsandutilitymodelpatentsfiledover theperiod fromtheleadVC firm'sfirstroundinvestmenttotheearlieroftheVC'sexitor2012,oursampleperiodend. Becauseinventionpatentstakelonger tobeapproved,*patent_number*includesboth approvedandunapprovedinventionpatentsbutonlyapprovedpatentsfortheothertwo types. We exclude designpatents from*patent_number*because this classificationtype is uniquetoChinaandisoftendeemedlowininnovationquality.Inferencesaresimilar if designpatentsare includedinthe definitionof*patent_number*.

Patentapplicationsare particularlyinteresting tostudyinChinabecausethe ChineseGovernment hasbeenadopting avarietyofproactivepoliciesandincentivesto encourageChinesefirms andventurecapitalfundstoinnovate, especiallyintheformof filing patentapplications(Chan2015;Chen2015).TheChineseGovernmentevenmade anexplicitcallforlocal Chinesefirmstoapply fortwomillionpatents by2015(The Economist2014).Beinggovernment-controlled,GVCsareexpectedtobemoreresponsive totheChineseGovernment'sorder.However,duetomultipleconflictinginstitutional forces noted inFigure 1, itisanopen questionwhetherGVCs canoutperformnon-GVCs inpatentfilings.

ThereisanecdotalevidencesuggestingthatsomeChinesefirmsmayhaveresortedto filing many lower quality patent applications suchas utilitymodelpatents and design patents inresponseto theChineseGovernment'sorder(The Economist2014). Hence,we consider threealternativedefinitions ofpatent performance measurestomitigatethe potential noisesassociated with*patent_number*.To theextentthata firm'smainobjective offilingapatentapplicationistosatisfytheChineseGovernment'sorder, weexpectthe firmto have less incentive to pay the requiredannual maintenance fee tokeep the patent

activeintheyearssubsequenttotheinitialpatentapplication.Hence, weuse *active_patent_number*asanalternativedefinitionofpatentperformance, whichincludes onlytheinventionandutilitymodelpatentsstillactiveasofApril2014,thedatewhenwe collected the patentdata. Recognizing thatthe approvalprocess forinventionpatentsis more rigorous and takeslonger, firms whose mainobjective offiling a patent application istosatisfytheChineseGovernment'sordershouldbelesslikelytosubmitinvention patents.Hence,wealsousethenumber ofinventionpatentapplications (*invent_patent_number*)asanotheralternativeinnovationperformancemeasure.Finally,ifafirm's mainobjectiveoffilingapatentapplicationistosatisfytheChineseGovernment's order,the qualityofthepatentsfiledbysuch firmsislikelytobelower.Weuse *patent_citation*asaproxy for the qualityoffiledpatentapplications.BecausetheGoogle PatentCitationsdatabaseexcludesdesignpatents,theleastimportanttype,ourdefinition of *patent_citation*includes inventionpatentsandutility model patents only.

Theunitofobservationformodel(2)isanentrepreneurialcompany.The sample islimitedtothesameentrepreneurial companiesusedin theregressionmodelof Table2. ForthesamereasonsasinSection3.1,wecontrolforthecharacteristicsofentrepreneurial companies (*early, priorpatent, priorcitation*)and theselectcharacteristics ofthe lead VC firms (*vc_lp, synsize*). Wealso controlfor entrepreneurialcompanies'localenvironmental factorsthatmayaffectpatentapplicationnumberandcitations, includinglocalinvestor protection (*enlocal_invpro*),the localR&D talentandR&D investment(*local_talent*, *local_R&D*).Wepredictapositivecoefficientfor*enlocal_invpro*,*local_talent*and*local_R&D*. Finally,weinclude*vc_length*becausethedependentvariablesofmodel(2),*patent_number*, *active_patent_number*,*invent_patent_number*and*patent_citation*,arecomputedover the period of*vc_length*andthereforewewantto make sure thatour results arenot drivenby anypotentialmechanicalassociationbetweenthedependentvariablesand *vc_length*.As usual,weincludethestandardindustryfixedeffects.Inaddition, weincludethe fixed effectsof*initialvcinvestmentyear*tocontrolforanytimeeffectsassociatedwithaVCfirm's first investmentinanentrepreneurialcompany.

3.2.2. Regressionresults

Table3showsthe regressionresultsofmodel(2). PanelAshowsthe descriptive statisticsoftheregressionvariables.Themeanvalueof*patent_number*is0.685,suggestingthatthea verageVC-fundedcompanyhasonepatentapplicationperyearovertheperiod fromtheleadVCfirm'sfirstroundinvestmenttotheearlierofsuccessfulexitor2012.The meanvalueof*active_patent_number*isveryclose tothatof*patent_number*,suggestingthat mostpatentsare activelymaintained. The meanvalueof*invent_patent_number*is approximatelytwothirdsofthemeanvalueof*patent_number*,suggestingthatthemajority of the patentapplications are thehigherqualityinventionpatents.

PanelBshowstheOLSregressionresultsofmodel (2)forthedependentvariables *patent_number,active_patent_number*, *invent_patent_number*,and *patent_citation,* respectively.Withregardtotheregressionof*patent_number*incolumn(1),thecoefficients on*gvc*and *pvc*arebothsignificantlypositive,butthecoefficienton*pvc*issignificantly bigger thanthe

coefficienton*gvc*.These resultssuggest thatthe entrepreneurial companiesfundedbyPVCsperformthebest,followedbyGVCsandFVCs.Theinferences arequalitativelysimilar ifthe dependent variableisreplaced by*active_patent_number*or *invent_patent_number*(seecolumns(2)and(3)of Table3,respectively)exceptthatthe coefficienton*gvc*is insignificant(p value=0.13)and doesn't differfromthe coefficient on *pvc*for*invent_patent_number*.Wefind noevidencethattheaveragepatentquality (*patent_citation*)issignificantlydifferentacrossthethree VC firm types.In particular,we findnoevidencethattheaveragepatentqualityislowerforGVCsthanforPVCsorFVCs.

GiventhemixedperformanceofGVCsversusFVCswithregardtoexitsinTable2,thebetterperfo rmanceofGVCs relativeto FVCswithregardtopatentapplicationsin Table3isintriguing.Onepossibleexplanationforthisdifferenceinresultsisthatthe quantityof patentapplicationsisanexplicitkeyperformance indicatortheChinese Government has championedaboutingauging the innovationperformanceofdomestic Chinesefirmsduringoursampleperiod.Therefore,GVCs,whoarelikelytobemoreresponsivetothe ChineseGovernment'sorder,couldhaveworkedhardertodelivertheexpected performance demanded bythe ChineseGovernment.

Withregardtothecontrolvariablesinmodel(2),severalofthem aresignificant andconsistentwithourpredictions.Most noteworthy isthesignificantlypositive coefficienton*priorpatent*, suggesting the persistenceof corporateinnovationsuccess.The coefficientons*ynsize*isalsosignificantlypositiveinalltheregressions, suggesting the importanceofVCsyndicateintheinnovationperformanceofVC firms-funded entrepreneurialcompanies.Thecoefficienton*local_R&D*issignificantly positiveinthe regressionsof*patent_number*and*active_patent_number*whilethe coefficienton *enlocal_invpro*ismarginallysignificantlypositive intheregressionsof*patent_number*and *invent_patent_number*,suggestingthataregion'sR&Dinvestment andinvestorprotection haveapositiveimpactontheregion'sVC-funded companies'innovationoutput. As expected, thecoefficienton*vc_length*is positive incolumns (1)to(3).

3.3. The performanceofdifferenttypesofGVCs

OursampleofGVCsincludestwosub-types:(a) GGVCs,definedasGVCsmore than50percentofwhoseGVCfundingcomesfromgovernmentagencies;and(b)SGVCs, definedasGVCsmore than50percentofwhoseGVCfundingcomesfromstate- controlled enterprises(SOEs).SinceGGVCs arecontrolledby governmentagencies directly,weexaminewhethertheperformanceofGGVCsisdifferentfromthatofSGVCs. AsshowninTable4,wefindnoevidencethattheperformanceofGVCsreportedinTables2and3isdriv enbyeitherGGVCsorSGVCsalone.ThecoefficientsonGGVCsandSGVCsarenotsignificantlydiffe rentfromeachother.Theonlyexceptionisthatthecoefficient ons*gvc*issignificantlymorepositivethanthecoefficienton*ggvc*atthe10%significancelevelintheregr essionof*patent_citation*,suggestingweakevidencethat thequalityof patentsfiledduringa leadVC'sinvestment periodishigherforentrepreneurial companies funded by SGVCs thanforentrepreneurialcompanies fundedby GGVCs.

4. The role of localinstitutionalenvironmentquality on VCfirm performance

A large body of prior research shows the importance of local institutional environmentonthebehaviorofpubliclytradedfirmsaroundtheworld(LaPortaetal.1998,2000,2002; Leuzetal.2003;Mcleanetal. 2012). Hence, weexaminewhetherthe relativeperformancedifferences among the three VCfirmtypesshownin Tables2 and 3 depend onthequality oftheinstitutionalenvironmentin the province where a VCfirm's China headquartersislocated.Becauseofmultipleoffsetting institutionalforces,itis difficulttopredict the neteffectoflocalinstitutionalenvironmentqualityontherelative performance differencesamong thethree VCtypes.Onone hand,GVCssufferfrom greater agencyproblems andthereforeastrongerprovincialinstitutional environment maybetterdisciplinethe behaviorofGVCs.Inaddition,bothGVCsandPVCsmay face greaterresourceconstraints (e.g., humancapitaland financialintermediaries)and thereforecouldbenefitmorefromastrongerprovincialinstitutionalenvironmentthatcan helprelaxsomeofthese constraints.Ontheother hand,theperformance ofFVCsmay benefitmorefrom astrongerprovincialinstitutionalenvironmentbecauseFVCs'two disadvantages, lackofpoliticalconnectionandproximity,couldbesignificantlyreduced inprovinceswithstrongerinstitutional environments.

Table5showstheregressionresultsoftheexitmodelinPanelAandthepatentmodelsinPanelBb yallowingthecoefficientsofinterest *gvc*and*pvc*tovarywith*vclocal_invpro*, a continuous variable measuring the degree of local institutionalenvironmentqualityintheprovinceofalead*VCfirm*'sheadquartersinChina. [12] The coefficientsofinterest inTable5are the two interactionterms*gvc*×*vclocal_invpro*and *pvc*×*vclocal_invpro*.Itisimportantto note thatthecoefficientson*gvc*and*pvc*are not meaningful tointerpretinisolationinthepresenceoftheinteractionterms.Wefindthat thecoefficientson*gvc*×*vclocal_invpro*and*pvc*×*vclocal_invpro*in Panel Aaresignificantly positiveforsuccessfulexitsandinsignificantforunsuccessfulexits.Theseresultssuggest thatinprovinceswithstronger institutionalenvironments,therelativedisadvantage of GVCs toFVCs shrinkswhilethe relativeadvantage of PVCs relativeto FVCs expands.[13]

Similarly,the coefficientson*gvc*×*vclocal_invpro*and*pvc*×*vclocal_invpro*inPanelB aresignificantlypositive fortheregressionsof*patent_number*,*active_patent_number*,and *invent_patent_number*.Theseresultssuggest thatthe previouslydocumentedrelative advantageofGVCsand PVCsrelativetoFVCsinthe quantityofpatentapplications widensfurtherinprovinceswithstronger institutionalenvironments.However,we find noevidencethequality ofthepatentsvarieswithinstitutionalenvironmentbecausethe coefficientson*gvc*×*vclocal_invpro*and*pvc*×*vclocal_invpro*inPanelBareinsignificant for theregressionof*patent_citation*.Finally,wefindnoevidencethatthe coefficientson *gvc*×*vclocal_invpro*and *pvc*×*vclocal_invpro*differfromeachotherin PanelsAandB except fortheregressionof*patent_citation*,suggestingthatlocalinstitutionalenvironmentquality doesn'taffecttherelativeperformancedifferenceforGVCsversusPVCs.Overall,theresultsofTable 5indicatethatlocalinstitutionalenvironmentqualityofaVCfirm'sdomicilemattersmore fortheperformance of localVCfirms than fortheperformance ofFVCs.

5. Conclusion

VC firmsareplayinganincreasinglyimportantrolein financinginnovative entrepreneurialcompaniesinmany emerging economies.Inparticular, many governments have beenplaying anactiverole insupportingtheventurecapitalindustry andentrepreneurship. However,therehasbeenlittleempiricalresearchonthe performance ofVC firms,government-controlledVCfirms inparticular,inemerging markets, largely due tolack of data.

TheobjectiveofthisstudyistoexaminetheperformanceofChineseGVCsrelativeto Chinese PVCs and FVCs. GVCs are VC firms that receive the majorityof their funding fromeithergovernment agenciesorgovernment-controlledbusinessenterprisesorboth. PVCsareVCfirmsthat receivethemajorityoftheirfundingfromdomesticprivate sources.FVCsareVCfirmsthatreceivethemajorityoftheirfundingfromforeignsources. WemeasureaVCfirm's performanceusingboththeVCfirm'ssuccessful/unsuccessful exitfromitsinvestedentrepreneurialcompanies andthe quantityofpatentapplications filedduringtheperiodfromthefirstroundVCinvestmenttotheearlieroftheyearofthe VC firm's successful exitor2012, themost available year.

The performance ranking ofthe three VC firm types depends onthe performance metric.Intermsofsuccessfulexit, PVCssignificantlyoutperformbothGVCsandFVCs whileFVCsoutperformsGVCs.However, wefindthatFVCsaremorelikelytoexit unsuccessfullythanbothGVCsand PVCsbutthereisnodifferenceintheprobabilityof unsuccessful exits forGVCs versus PVCs.Interms ofthe quantity of patent applications,GVCs outperform FVCs, eventhoughbothGVCs and FVCs underperform PVCs.More importantly,wefindthatlocalinstitutionalenvironment qualityofaVCfirm'sdomicile affectstheperformanceofthethreeVC firm typesdifferently.Withregardtosuccessful exits,we findthatthe previouslydocumentedperformancedisadvantageofGVCs relativetoFVCsisreducedwhilethepreviously documentedperformanceadvantageof PVCsrelativetoFVCsiswidened forVCfirmswhose headquartersare locatedinthe provinceswithstronger institutionalenvironments.With regardtothequantityofpatent applications, we findthatthe previouslydocumentedperformanceadvantagesofGVCs versusFVCsandPVCs versusFVCsarewidenedforVCfirmswhoseheadquartersare locatedintheprovinceswithstronger institutionalenvironments.Wefind no evidence that therelativeperformancegapbetweenGVCsandPVCsvaries withlocalinstitutional environment quality.

Ourstudymakesanimportantcontributionto theextantVCliteraturebybeing thefirst studytouseacomprehensive sampleofVCfirms andtheirfundedcompaniesto examinetheperformanceofgovernment-*controlled*VCfirms(GVCs)in an important emergingmarket,China.Asurprisingoutcome ofourstudyisthatthe performanceof GVCsrelativeto non-GVCsis far fromuniformacrossdifferentlocalinstitutional environments.Our findingsshouldbeofvaluetotheongoing debateontheroleofthe governmentinpromotingtheventurecapital industry,especiallyin countries with weakerinstitutional environments.

TheprimaryobjectiveofthisstudyistoassesstheoverallperformanceofGVCsrelativeto PVCsandFVCsinChina.Hence,we don'tattempttodistinguishVC firms' selectionabilityfrom

theirmonitoring abilityofentrepreneurialcompanies.Duetothe differentialstrengthsofthethreeVCfirmtypessummarizedinFigure1,futureresearchmay furtherexantinethedifferencesinthethreeVCfumtypes'performancewithregard toselectionandmonitoringofentrepreneurialcompanies.

REFERENCES

[1] Aharony,J.,Lee,C.W.andWong,T.J.(2000).FinancialpackagingofIPOfirmsinChina.*JournalofAccounting Research*38 (1), 103–126.

[2] Aizenman,J.andKendall,J.(2012).Theinternationalizationofventurecapitalandprivate equity.*JournalofEconomicStudies*39(5),488-511.

[3] Amit,R.,Brander,J.andZott,C.(1998).Whydoventurecapitalfirmsexist?TheoryandCanadianevidence.*Journalof Business Venturing*13 (6), 441-466.

[4] Brander,J.,Amit,R.andAntweiler,W.(2002).Venturecapitalsyndication:improved ventureselectionversus thevalue-added hypothesis.*JournalofEconomics&Management Strategy*11 (3), 423–452.

[5] Brander,J.,Du,Q.andHellmann,T.(2015).Theeffectsofgovernment-sponsoredventure capital:international evidence. *Review ofFinance*19 (2), 571-618.

[6] Brander,J.,Egan,E.andHellmann,T.(2010).Governemntsponsored versusprivate venturecapital:Canadianevidence. in*InternationalDifferences inEntrepreneurship*,edited byJ.LernerandA.Schoar,NationalBureauofEconomicResearch,275–320,Universityof ChicagoPress, Chicago,IL, US.

[7] Brandt,L.andLi, H.(2003).Bankdiscriminationintransitioneconomies:ideology, informationorincentives?*Journalof ComparativeEconomics*31 (3), 387–413.

[8] Casamatta,C.and Haritchabalet,C. (2007).Experience,screeningand syndicationin venture capital investments.*JournalofFinancialIntermediation* 16 (3), 368–398.

[9] Chan,R.(2015).Beijing saysChinesepatentstodoubleinfiveyears, withfocuson agriculture. *SouthChinaMorning Post*,January 5,2015.

[10] Chemmanur,T., Hull, T.and Krishnan, K. (2014).Dolocaland internationalventure capitalistsplay welltogether?Venturecapitalinvestmentsand thedevelopmentof venture capitalmarkets.Unpublishedworking paper.

[11] Chen,G.(2015).StateCouncilcallsforangelinvestorstohelpgrowstart-upsandjobsinChina. *South China Morning Post*,March12, 2015.

[12] Chen, Z.,Guan,Y. and Ke,B.(2013). Arestockoptiongrantsto directorsofstate- controlledChinese firmslisted in HongKong genuinecompensation?*TheAccounting Review*, 2013, 88(5), 1547-1574.

[13] Coval,J.andMoskowitz,T.(1999).Homebiasathome:localequitypreferenceindomestic portfolios.*JournalofFinance*54 (6), 2045-2073.

[14] Coval, J. and Moskowitz, T. (2001). The geography ofinvestment:informed trading and asset prices.*JournalofPoliticalEconomy* 109 (4), 811-841.

[15] Cull,R.andXu,L. (2003).Whogetscredit?Thebehavior ofbureaucratsandstatebanks inallocatingcredittoChinesestate-ownedenterprises.*JournalofDevelopmentEconomics*71 (2), 533–559.

[16] Cumming,D.J.andJohan,S.A.(2013).VentureCapitalandPrivateEquityContracting,2nd Edition, Elsevier ScienceAcademicPress.

[17] Cumming, D.J.andMacIntosh, J. (2004). CanadianLabour-Sponsored venturecapital corporations:baneorboon?in*NewVentureInvestment:ChoicesandConsequences*,edited by A. Ginsberg andI.Hasan, 169–200, Elsevier ScienceAcademicPress.

[18] Cumming, D.J.,Grilli, L.andMurtinu, S.(2015).Governmentalandindependentventure capital investmentsin Europe:afirm-levelperformanceanalysis.*JournalofCorporate Finance*.Forthcoming.

[19] DaRin,M.,Hellmann,T.andPuri,M.(2013).Asurveyofventurecapitalresearch.In*HandbookoftheEconomicsofFinance*,editedbyG.Constantinides,M.HarrisandR.Stulz,574-648, North-Holland.

[20] Dai,N.,Jo,H.andKassicieh,S.(2009).Venturecapitalownershiptype,investmentcriteria and venture performance.Unpublishedworkingpaper.

[21] Fan,G., Wang, X. and Zhu, H.(2006, 2007,2008, 2009, 2010, 2011). Neri Index ofMarketizationofChina'sProvinces Report (inChinese), EconomicSciencePress, Beijing.

[22] Gompers,P.A.(1995).Optimalinvestment,monitoring,andthestagingofventurecapital.*The JournalofFinance*50 (5), 1461-1489.

[23] Gompers,P.A.andLerner,J. (2000).Thedeterminantsofcorporate venturecapital successes:organizationalstructure,incentivesandcomplementarities.In:Morck,R.(Ed.), *ConcentratedCorporateOwnership*,editedbyR.Morck,17-50,UniversityofChicago Press for NBER.

[24] Gompers,P.A. andLerner,J.(2004).TheVentureCapitalCycle. 2ndEd.Cambridge:MIT Press.Hall,B.H.(2002).Thefinancingofresearchanddevelopment.*OxfordReviewofEconomicPolicy* 18 (1), 35–51.

[25] Hochberg, Y., Ljungqvist, A. and Lu, Y. (2007). Whomyouknow matters:venture capital networksandinvestment performance.*TheJournalofFinance*62(1),251–301.

[26] Hochberg,Y., Ljungqvist,A. andLu, Y. (2010).Networking as a barrierto entry andthe competitivesupply of venture capital.*TheJournalofFinance*65(3),829–859.

[27] Hung, Mingyi, Wong,T. J., Zhang, Tianyu.2012. PoliticalConsiderations inthe Decision of ChineseSOEs toList in HongKong.*Journalof Accounting and Economics*, 53, 435-449.

[28] Kang,J.andKim,J.(2008).Thegeographyofblockacquisitions.*TheJournalofFinance*63 (6), 2817-2858.

[29] Kaplan,S.,Sensoy,B.andStrömberg,P.(2002).Howwelldoventurecapitaldatabases reflect actual investments? Unpublishedworkingpaper.

[30] Khanna,Tarun,KrishnaG.Palepu,andRichardBullock.2010.WinninginEmergingMarkets: ARoadMapfor

Strategyand Execution.Harvard BusinessPress.

[31] Kortum, S.and Lerner,J. (2000). Assessing thecontributionofventurecapitaltoinnovation.*RandJournalofEconomics* 31 (4), 674-692.

[32] LaPorta,R.,Lopez-de-Silanes,F.,Shleifer,A.andVishny,W.(1998).Lawandfinance.*JournalofPoliticalEconomy*106 (6), 1113–1155.

[33] LaPorta,R.,Lopez-de-Silanes,F.,Shleifer,A.andVishny,W.(2000).Agencyproblems and dividendpolicies around theworld.*The JournalofFinance*52(1),1–33.

[34] LaPorta,R.,Lopez-de-Silanes,F.,Shleifer,A.andVishny,W.(2002).Investorprotection and corporate valuation.*The JournalofFinance*57 (3), 1147–1170.

[35] Lee,P.andWahal,S.(2004).Grandstanding,certificationandtheunderpricingofventure capitalbackedIPOs.*JournalofFinancialEconomics* 73 (2), 375–407.

[36] Lerner,J.(1994).Venturecapitalistsandthedecisiontogopublic.*JournalofFinancialEconomics*35 (3), 293–316.

[37] Lerner, J. (2008). Boulevard Of Broken Dreams: Why Public Efforts To BoostEntrepreneurshipandVentureCapitalHaveFailed.PrincetonUniversityPress,Princeton.

[38] Lerner,J.(2010).Thefutureofpubliceffortstoboostentrepreneurshipandventurecapital.*SmallBusinessEconomics* 35 (3), 255–264.

[39] Leuz, C., Nanda, D. and Wysocki, P.D. (2003). Earningsmanagement and investor protection: aninternational comparison. *JournalofFinancialEconomics*69 (3), 505–527.

[40] Li,H.andZhou,L.(2005). Politicalturnoverandeconomicperformance:theincentive role ofpersonnelcontrolinChina.*JournalofPublicEconomics*89(9-10), 1743–1762.

[41] Lin,Y.F.,Liu,M.X.andZhang,Q.(2004).Policyburdensandthesoft-budgetconstraint:evidence fromChina.*ManagementWorld*(inChinese)8, 81-89.

[42] Maats,F.,Metrick,A.,Yasuda,A.,Hinkes,B.andVershovski,S.(2011).Ontheconsistency and reliability ofventure capital databases.Unpublished working paper.

[43] Mäkelä,M.andMaula,M.(2006).Interorganizationalcommitmentinsyndicatedcross- borderventure capital investments.*Entrepreneurship Theoryand Practice*30(2), 273–298.

[44] Mclean, R.D, Zhang, T. and Zhao, M. (2012). Whydoes the law matters? Investor protectionanditseffectsoninvestment, financeandgrowth.*The JournalofFinance*67 (1),313-350.

[45] Nahata,R.(2008).Venturecapitalreputationandinvestmentperformance.*JournalofFinancialEconomics*90 (1), 127–151.

[46] Nahata,R.,Hazarika,S.andTandon,K.(2014).Successinglobalventurecapitalinvesting: doinstitutionalandculturaldifferencesmatter?*JournalofFinancial andQuantitative Analysis*.Forthcoming.

[47] Phalippou, L. and Gottschalg, O.(2009).The performance ofprivate equityfunds.*Review ofFinancialStudies*22(4),1747-1776.

[48] Sahlman, W. (1990). Thestructure and governance of venture-capital organizations.*JournalofFinancialEconomics*27 (2), 473–521.

[49] Schumpeter,J.(1934).*TheTheoryofEconomicDevelopment:aninquiryintoprofits,capital, credit, interestandthebusinesscycle*, Harvard University Press,Cambridge,MA.

[50] Shleifer,A.(1998).StateversusPrivateOwnership.*JournalofEconomicPerspective*12,133–50.

[51] Sorensen,M.(2007).Howsmartissmartmoney?ATwo-sidedmatchingmodelofventure capital.*TheJournalofFinance*62 (6), 2725–2762.

[52] TheAnnualReportonChina'sVCIndustryDevelopment2012.(2012).ChinaPlanningPress, Beijing.

[53] The Economist. (2014). Intellectualproperty in China: Patent fiction. *The Economist*, December13, 2014.

[54] Wallsten,S.(2000).Theeffectsofgovernment-industryR&DprogramsonprivateR&D:thecaseofSmallBusinessInnovationResearchProgram.*TheRANDJournal ofEconomics*31 (1), 82–100.

[55] Wang,Q.,Wong,T.J.andXia,L.2008.Stateownership,theinstitutionalenvironment,and auditorchoice: EvidencefromChina.*JournalofAccountingand Economics* 46: 112–134.

[56] Zarutskie,R.(2007).Doventurecapitalistsaffectinvestmentperformance?Evidencefrom first-time funds.Unpublishedworking paper.

Appendix.VariableDefinitions

Regression model (1):

Variables	Definition and Measurement	Data Sources
Dependent Variables:		
exit	Equals 1 for the years with successful exits (IPOs, M&As, or secondary sales), 2 for the years with unsuccessful exits (management buyback and liquidation), and zero for all the other years. For each entrepreneurial company, *exit* is defined only for the period that starts from the first year when an entrepreneurial company receives the first venture capital investment and ends in the earlier of the year of the VC firm's successful or unsuccessful exit or 2012, the last available year.	CVSOURCE, CSMAR, SAIC, COMPUSTAT, WIND, Hong Kong stock Exchange, Toronto Stock Exchange
Independent Variables:		
VC_type:		
gvc	A dummy variable that equals 1 if the lead VC firm in the first round VC investment is a GVC. All VC firms are classified into the following three exclusive types: (a) GVCs, defined as VC firms that receive the majority of their funding from either government agencies or government-controlled business enterprises or both; (b) PVCs, defined as VC firms that receive the majority of their funding from domestic private sources; and (c) FVCs, defined as VC firms that receive the majority of their funding from foreign sources.	CVSOURCE and SAIC
pvc	A dummy variable that equals 1 if the lead VC firm in the first round VC investment is a PVC.	CVSOURCE and SAIC

Control Variables:		
Entrepreneurial company's characteristics:		
early	A dummy variable that equals 1 if the first round VC investment occurred at the early stage of an entrepreneurial company's development as defined by CVSOURCE.	CVSOURCE
priorpatent	The natural logarithm of one plus the number of invention and utility model patent applications applied by the entrepreneurial company prior to the first round VC investment.	SIPO
priorcitation	The average non-sel fcitations received by the invention and utility model patents applied by the entrepreneurial company prior to the first round VC investment, measured as of April 2014.	GOOGLE PATENT CITATIONS DATABASE
VC's characteristics:		
vc_lp	A dummy variable indicating whether the lead VC firm has ever raised any limited partnership funds measured at the beginning of an observation year.	CVSOURCE
synsize	The natural logarithm of the number of VC firms participating in the entrepreneurial company's first round VC investment.	CVSOURCE
Market condition:		
exit_condition	VC industry exit condition, defined as the natural logarithm of the number of exits over the prior year if *exit* equals 0, and as the natural logarithm of the number of exits over the 4 quarters prior to the exit date if *exit* equals 1 or 2.	CVSOURCE, CSMAR, COMPUSTAT, WIND, Hong Kong stock Exchange, Toronto Stock Exchange
enlocal_invpro	Local investor protection in the province of the entrepreneurial company's headquarters, proxied by the Fan et al.'s marketization index, measured at the beginning of an observation year. The marketization index is developed by Fan et al., (2006, 2007, 2008, 2009, 2010, 2011), where a higher value indicates greater regional market development. The index is calculated as the average of the following five elements: the relationship between government and market, development of non-state economy, development of product markets, development of factor markets, and development of intermediary organizations and legal environment.	Fan et al., (2006, 2007, 2008, 2009, 2010, 2011)
Other controls:		
Industry	Entrepreneurial companies' industry fixed effects.	CVSOURCE
Year	Year fixed effects.	CVSOURCE
Initial vc investment year	Fixed effects for the year of the first round VC investment	CVSOURCE

Regression model (2):

Variables	Definition and Measurement	Data Sources
Dependent Variables:		
patent_number	The natural logarithm of one plus the average annual number of invention and utility model patent applications filed by the entrepreneurial company within the period from the date of VC firm's first investment to the earlier of VC firm's exit or 2012.	SIPO
active_patent_number	The natural logarithm of one plus the average annual number of invention and utility model patents applied by the entrepreneurial company within the period from the date of VC firm's first investment to the earlier of VC firm's exit or 2012 that are still active as of April 2014.	SIPO
invent_patent_number	The natural logarithm of one plus the average annual number of invention patent applications filed by the entrepreneurial company within the period from the date of VC firm's first investment to the earlier of VC firm's exit or 2012.	SIPO
patent_citation	The average non-self citations received, measured as of April 2014, for the invention and utility model patents applied by the entrepreneurial company within the period from the date of VC firm's first investment to the earlier of the VC firm's exit or 2012	GOOGLE PATENT CITATIONS DATABASE
Independent Variables:		
VC_type:		
gvc	Defined as above	
pvc	Defined as above	
Control Variables:		
Entrepreneurial company's characteristics:		
early	Defined as above	
priorpatent	Defined as above	
priorcitation	Defined as above	
VC's characteristics:		
vc_lp	A dummy variable indicating whether the VC firm has ever raised any limited partner funds measured at the time of the first round VC investment.	CVSOURCE
synsize	Defined as above	
vc_length	The natural logarithm of one plus the number of days from the date of VC firm's first investment to the earlier of VC firm's exit or 2012.	CVSOURCE

Local Environment:		
enlocal_invpro	Local investor protection in the province of the entrepreneurial company's headquarters, proxied by the Fan et al.'s marketization index, measured at the time of the first round VC investment. The marketization index is developed by Fan et al., (2006, 2007, 2008, 2009, 2010, 2011), where a higher value indicates greater regional market development. The index is calculated as the average of the following five elements: the relationship between government and market, development of non-state economy, development of product markets, development of factor markets, and development of intermediary organizations and legal environment.	Fan et al., (2006, 2007, 2008, 2009, 2010, 2011)
local_talent	The natural logarithm of the cumulative number of people elected as academicians of the Chinese Academy of Engineering and the Chinese Academy of Science, or Changjiang Scholars in the province of the entrepreneurial company's headquarters, measured at the time of the first round VC investment.	Website of Ministry of Education of China, Chinese Academy of Science, Chinese Academy of Engineering
local_R&D	The natural logarithm of the R&D expenditure in the province of the entrepreneurial company's headquarters, measured at the time of the first round VC investment.	China Statistical Yearbook of Science and Technology
Other controls:		
Industry	Defined as above	CVSOURCE
Initial vc investment year	Defined as above	CVSOURCE

Other regression variables:

Variables	Definition and Measurement	Data Source
ggvc	A dummy variable that equals 1 if the lead VC firm in the first round VC investment is a GGVC. GVCs are classified into the following two exclusive types: (a) GGVCs, defined as GVCs that receive the majority of their GVC funding from government agencies; (b) SGVCs, defined as GVCs that receive the majority of their GVC funding from state-controlled enterprises.	CVSOURCE and SAIC
sgvc	A dummy variable that equals 1 if the lead VC firm in the first round VC investment is a SGVC.	CVSOURCE and SAIC

Figure1. Asummaryofthe institutionalforcesthatmayaffectChineseVCfirms'performance

Theory	VC firms' expected performance under a theory		
	GVC	PVC	FVC
The incentive hypothesis	Underperform	Outperform	Outperform
The experience/resource hypothesis	Underperform	Underperform	Outperform
The proximity hypothesis	Outperform	Outperform	Underperform
The political connection hypothesis	Outperform	Underperform	Underperform
Net effect	Uncertain	Uncertain	Uncertain

Founding year	Whole sample		GVC		PVC		FVC	
	Obs	%	Obs	%	Obs	%	Obs	%
Priorto2000	111	8.39	42	15.054	26	3.963	43	11.082
2000	91	6.878	42	15.054	28	4.268	21	5.412
2001	63	4.762	28	10.036	20	3.049	15	3.866
2002	34	2.57	7	2.509	10	1.524	17	4.381
2003	35	2.646	10	3.584	16	2.439	9	2.32
2004	57	4.308	7	2.509	13	1.982	37	9.536
2005	78	5.896	8	2.867	28	4.268	42	10.825
2006	121	9.146	8	2.867	46	7.012	67	17.268
2007	177	13.379	24	8.602	109	16.616	44	11.34
2008	153	11.565	30	10.753	88	13.415	35	9.021
2009	119	8.995	27	9.677	75	11.433	17	4.381
2010	165	12.472	30	10.753	117	17.835	18	4.639
2011	119	8.995	16	5.735	80	12.195	23	5.928
ALL	1323	100	279	100	656	100	388	100

Panel B. The distribution of the VC firms by province and type

Province	Whole sample		GVC		PVC		FVC	
	Obs	%	Obs	%	Obs	%	Obs	%
Anhui	12	0.907	7	2.509	5	0.762	0	0.000
Beijing	332	25.094	47	16.846	128	19.512	157	40.464
Chongqing	6	0.454	3	1.075	2	0.305	1	0.258
Fujian	25	1.890	7	2.509	15	2.287	3	0.773
Gansu	1	0.076	0	0.000	1	0.152	0	0.000
Guangdong	196	14.815	32	11.470	137	20.884	27	6.959
Guangxi	1	0.076	1	0.358	0	0.000	0	0.000
Guizhou	2	0.151	2	0.717	0	0.000	0	0.000
Hainan	5	0.378	2	0.717	1	0.152	2	0.515
Hebei	8	0.605	3	1.075	4	0.610	1	0.258
Heilongjiang	4	0.302	3	1.075	1	0.152	0	0.000
Henan	10	0.756	4	1.434	6	0.915	0	0.000
Hubei	20	1.512	10	3.584	9	1.372	1	0.258
Hunan	17	1.285	10	3.584	6	0.915	1	0.258
Inner Mongolia	4	0.302	1	0.358	3	0.457	0	0.000
Jiangsu	125	9.448	47	16.846	69	10.518	9	2.320
Jiangxi	6	0.454	2	0.717	3	0.457	1	0.258
Jilin	5	0.378	3	1.075	1	0.152	1	0.258
Liaoning	5	0.378	2	0.717	2	0.305	1	0.258
Ningxia	1	0.076	1	0.358	0	0.000	0	0.000
Shaanxi	11	0.831	7	2.509	3	0.457	1	0.258
Shandong	31	2.343	9	3.226	11	1.677	11	2.835
Shanghai	326	24.641	34	12.186	127	19.360	165	42.526
Shanxi	5	0.378	2	0.717	3	0.457	0	0.000
Sichuan	18	1.361	11	3.943	5	0.762	2	0.515
Tianjin	33	2.494	8	2.867	24	3.659	1	0.258
Tibet	1	0.076	1	0.358	0	0.000	0	0.000
Xinjiang	10	0.756	2	0.717	8	1.220	0	0.000

Yunnan	3	0.227	2	0.717	1	0.152	0	0.000
Zhejiang	100	7.559	16	5.735	81	12.348	3	0.773
All	1323	100	279	100	656	100	388	100

PanelC.Thedistributionofthe296FVCswhoseheadquartersislocatedoutsidemainlandChina

Countryofthe headquarters	Obs	%
U.S.	141	47.635
HongKong	52	17.568
Japan	27	9.122
Singapore	21	7.095
Taiwan	13	4.392
U.K.	9	3.041
SouthKorea	7	2.365
Switzerland	5	1.689
Israel	5	1.689
France	4	1.351
Germany	3	1.014
Belgium	1	0.338
Canada	1	0.338
Denmark	1	0.338
Italy	1	0.338
Luxembourg	1	0.338
Malaysia	1	0.338
Russia	1	0.338
SouthAfrica	1	0.338
UAE	1	0.338
All	296	100

SeetheAppendixforallvariabledefinitions.

Table2.Regressionresultsof model(1)

PanelA. ThedistributionofexitsbyexittypeandVCfirmtype

Exittyp	GVC	%	PVC	%	FVC	%	total	%
IPO	146	53.285	156	69.333	143	41.935	445	52.976
M&A	24	8.759	21	9.333	87	25.513	132	15.714
Secondarysale	65	23.723	33	14.667	23	6.745	121	14.405
successfulexits	235	85.766	210	93.333	253	74.194	698	83.095
Managementbuyback	2	0.73	1	0.444	5	1.466	8	0.952
Liquidation	37	13.504	14	6.222	83	24.34	134	15.952
unsuccessfulexits	39	14.234	15	6.667	88	25.806	142	16.905
totalexits	274	100	225	100	341	100	840	100

PanelB.Descriptivestatisticsoftheregressionvariables

VARIABLES	Mean	SD	Min	0.25	0.5	0.75	Max	Obs
DependentVariable:								
exit	0.062	0.275	0.000	0.000	0.000	0.000	2.000	15936
IndependentVariables:								
gvc	0.424	0.494	0.000	0.000	0.000	1.000	1.000	15936
pvc	0.207	0.405	0.000	0.000	0.000	0.000	1.000	15936
ControlVariables:								
early	0.332	0.471	0.000	0.000	0.000	1.000	1.000	15936
priorpatent	0.414	0.863	0.000	0.000	0.000	0.000	6.265	15936
priorcitation	0.115	0.474	0.000	0.000	0.000	0.000	10.000	15936
vc lp	0.507	0.498	0.000	0.000	1.000	1.000	1.000	15936
synsize	0.103	0.295	0.000	0.000	0.000	0.000	2.197	15936
exit condition	5.111	1.192	0.693	4.913	5.617	5.852	6.488	15936
enlocal invpro	8.946	1.865	1.720	7.650	9.390	10.270	11.800	15936

PanelC.Themultinomiallogitregressionresultsofmodel(1)

VARIABLES	(1)	(2)
	Successful exit	*Unsuccessful exit*
Constant	-14.322***	-21.042
	(0.000)	(0.263)
gvc	-0.459***	-0.608**
	(0.000)	(0.029)
pvc	0.271**	-0.789**
	(0.022)	(0.010)
early	-0.757***	-0.190
	(0.000)	(0.328)
pripatent	0.186***	-0.336
	(0.000)	(0.116)
pricitation	-0.013	-0.247
	(0.886)	(0.375)
vc_lp	-0.004	0.197
	(0.972)	(0.404)
synsize	0.955***	0.017
	(0.000)	(0.960)
exit_condition	4.950***	-1.521
	(0.000)	(0.645)
enlocal_invpro	-0.011	-0.082
	(0.667)	(0.161)
Initial vc investment year	Yes	Yes
Industry	Yes	Yes
Year	Yes	Yes
Clustering	Entrepreneurial company	Entrepreneurial company
Observations	15,936	15,936
Pseudo R-squared	0.132	0.132
Two-tailed p value for HO:		
gvc=pvc	0.000***	0.567

SeetheAppendixforallvariabledefinitions.Thep-valuesadjustedforheteroskedasticityandclustered attheentrepreneurialcompanylevelarereportedinparentheses.The significancelevelsat1%,5%and10%areidentifiedby***,** and*, respectively.

Table3.Regressionresultsof model(2)

PanelA.Thedescriptivestatisticsoftheregressionvariables

VARIABLES	Mean	SD	Min	0.25	0.5	0.75	Max	Obs
DependentVariables:								
patent number	0.685	0.961	0.000	0.000	0.075	1.200	5.668	263
active patent numbe	0.660	0.944	0.000	0.000	0.000	1.168	5.661	263
invent patent numbe	0.467	0.757	0.000	0.000	0.000	0.715	5.131	263
patent citation	0.077	0.268	0.000	0.000	0.000	0.022	5.000	263
IndependentVariables:								
gvc	0.374	0.484	0.000	0.000	0.000	1.000	1.000	263
pvc	0.242	0.428	0.000	0.000	0.000	0.000	1.000	263
ControlVariables:								
early	0.274	0.446	0.000	0.000	0.000	1.000	1.000	263
priorpatent	0.507	0.950	0.000	0.000	0.000	0.693	6.265	263

priorcitation	0.123	0.459	0.000	0.000	0.000	0.000	10.00	263
vc lp	0.467	0.497	0.000	0.000	0.000	1.000	1.000	263
synsize	0.127	0.325	0.000	0.000	0.000	0.000	2.197	263
vc length	7.437	0.599	3.367	7.139	7.478	7.799	8.466	263
enlocal invpro	8.176	1.907	1.720	6.970	8.540	9.630	11.16	263
local talent	5.164	1.431	0.693	4.277	5.017	6.127	7.286	263
local R&D	14.58	0.993	9.407	14.070	14.93	15.28	15.76	263

PanelB. TheOLSregressionresultsofmodel(2)

	(1)	(2)	(3)	(4)
	patent_number	*active_patent_number*	*invent_patent_number*	*patent_citation*
Constant	-1.610***	-1.941***	-1.535***	0.360**
	(0.000)	(0.000)	(0.000)	(0.049)
gvc	0.114**	0.113**	0.057	0.016
	(0.011)	(0.011)	(0.130)	(0.308)
pvc	0.200***	0.199***	0.091**	0.015
	(0.000)	(0.000)	(0.019)	(0.345)
early	-0.003	-0.002	0.029	0.009
	(0.919)	(0.950)	(0.316)	(0.479)
pripatent	0.507***	0.490***	0.380***	0.018***
	(0.000)	(0.000)	(0.000)	(0.001)
pricitation	-0.056**	-0.057*	-0.037	0.029**
	(0.048)	(0.050)	(0.145)	(0.027)
vc lp	-0.022	-0.015	0.001	0.010
	(0.565)	(0.692)	(0.979)	(0.448)
synsize	0.252***	0.251***	0.244***	0.050**
	(0.000)	(0.000)	(0.000)	(0.038)
vc length	0.103***	0.119***	0.122***	-0.023*
	(0.000)	(0.000)	(0.000)	(0.098)
enlocal invpro	0.024	0.021	0.023*	0.002
	(0.105)	(0.155)	(0.059)	(0.715)
local talent	-0.039**	-0.040**	-0.012	0.009
	(0.034)	(0.031)	(0.426)	(0.123)
local R&D	0.073*	0.083**	0.035	-0.008
	(0.053)	(0.025)	(0.276)	(0.467)
Initialvcinvestmentyear	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Observations	2,639	2,639	2,639	2,639
R-squared	0.4287	0.4195	0.3386	0.0659
gvc=pvc	0.041**	0.040**	0.329	0.890

SeetheAppendixforallvariabledefinitions.Thep-valuesadjustedforheteroskedasticityarereported in parentheses.Thesignificancelevelsat1%,5%and10%areidentifiedby***, **and *, respectively.

Table4.Regressionresultsof models(1)and(2):decomposingGVCsintoGGVCsandSGVCs

PanelA. Themultinomiallogitregressionresultsofmodel(1)

VARIABLES	(1)	(2)
	Successful exit	*Unsuccessful exit*
Constant	-14.319***	-21.029
	(0.000)	(0.265)
ggvc	-0.541***	-0.417
	(0.001)	(0.270)
sgvc	-0.417***	-0.703**
	(0.003)	(0.013)
pvc	0.278**	-0.796***
	(0.019)	(0.009)
early	-0.762***	-0.188
	(0.000)	(0.335)
pripatent	0.185***	-0.336
	(0.000)	(0.116)
pricitation	-0.014	-0.242
	(0.877)	(0.385)
vc_lp	0.010	0.176
	(0.922)	(0.446)
synsize	0.958***	0.011
	(0.000)	(0.974)
exit_condition	4.954***	-1.546
	(0.000)	(0.641)
enlocal_invpro	-0.012	-0.074
	(0.621)	(0.208)
Initial vc investment year	Yes	Yes
Industry	Yes	Yes
Year	Yes	Yes
Clustering	Entrepreneurial company	Entrepreneurial company
Observations	15,936	15,936
Pseudo R-squared	0.132	0.132
Two-tailed p value for HO:		
ggvc=pvc	0.000***	0.343
sgvc=pvc	0.000***	0.779
ggvc=sgvc	0.433	0.407

PanelB.TheOLSregressionresultsofmodel(2)

VARIABLES	(1)	(2)	(3)	(4)
	patent_number	*active_patent_number*	*invent_patent_number*	*patent_citation*
Constant	-1.608***	-1.939***	-1.534***	0.362**
	(0.001)	(0.000)	(0.000)	(0.048)
ggvc	0.091	0.086	0.043	-0.005
	(0.121)	(0.139)	(0.377)	(0.796)
sgvc	0.128***	0.130***	0.065	0.029
	(0.010)	(0.008)	(0.117)	(0.115)
pvc	0.203***	0.202***	0.093**	0.018
	(0.000)	(0.000)	(0.017)	(0.263)
early	-0.005	-0.004	0.028	0.008
	(0.883)	(0.908)	(0.328)	(0.552)
pripatent	0.507***	0.490***	0.380***	0.018***
	(0.000)	(0.000)	(0.000)	(0.001)

pricitation	-0.057**	-0.058**	-0.037	0.029**
	(0.046)	(0.048)	(0.143)	(0.030)
vc_lp	-0.016	-0.008	0.004	0.015
	(0.683)	(0.836)	(0.898)	(0.242)
synsize	0.253***	0.252***	0.244***	0.051**
	(0.000)	(0.000)	(0.000)	(0.036)
vc_length	0.103***	0.119***	0.121***	-0.023*
	(0.000)	(0.000)	(0.000)	(0.096)
enlocal_invpro	0.023	0.020	0.023*	0.001
	(0.112)	(0.166)	(0.063)	(0.778)
local_talent	-0.040**	-0.040**	-0.013	0.009
	(0.032)	(0.028)	(0.415)	(0.139)
local_R&D	0.074*	0.084**	0.036	-0.008
	(0.053)	(0.025)	(0.275)	(0.476)
Initial vc investment year	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Observations	2,639	2,639	2,639	2,639
R-squared	0.4288	0.4196	0.3387	0.0670
Two-tailed p value for HO:				
ggvc=pvc	0.058*	0.046**	0.320	0.153
sgvc=pvc	0.096*	0.102	0.456	0.405
ggvc=sgvc	0.518	0.439	0.660	0.067*

SeetheAppendixforallvariabledefinitions.Thep-valuesadjustedforheteroskedasticityarereported in parentheses.Thesignificancelevelsat1%,5%and10%areidentifiedby***, **and *, respectively.

Table5.Regressionresultsof models(1)and(2):allowingthecoefficientsof*gvc*and*pvc*tovarywithlocal institutionalenvironmentquality

PanelA. Themultinomiallogitregressionresultsofmodel(1)

VARIABLES	(1)	(2)
	Successful exit	*Unsuccessful exit*
Constant	-10.834***	-21.861
	(0.000)	(0.310)
gvc	-3.183***	0.212
	(0.000)	(0.886)
pvc	-2.715***	-1.125
	(0.001)	(0.671)
early	-0.760***	-0.181
	(0.000)	(0.349)
pripatent	0.187***	-0.337
	(0.000)	(0.113)
pricitation	-0.019	-0.233
	(0.832)	(0.398)
vc_lp	-0.099	0.287
	(0.340)	(0.259)
synsize	0.912***	0.046
	(0.000)	(0.892)
exit_condition	4.924***	-1.629
	(0.000)	(0.626)
enlocal_invpro	-0.078**	0.007
	(0.021)	(0.915)
vclocal_invpro	-0.111	-0.097
	(0.119)	(0.510)
gvc×vclocal_invpro	0.283***	-0.093
	(0.000)	(0.539)

pvc×vclocal_invpro	0.296***	0.041
	(0.000)	(0.879)
Initial vc investment year	Yes	Yes
Industry	Yes	Yes
Year	Yes	Yes
Clustering	Entrepreneurial company	Entrepreneurial company
Observations	15,936	15,936
Pseudo R-squared	0.136	0.136
Two-tailed p value for HO:		
gvc×vclocal_invpro= pvc×vclocal_invpro	0.842	0.606

PanelB.TheOLSregressionresultsofmodel(2)

VARIABLES	(1) *patent_number*	(2) *active_patent_number*	(3) *invent_patent_number*	(4) *patent_citation*
Constant	-1.405***	-1.683***	-1.375***	0.359**
	(0.004)	(0.000)	(0.001)	(0.040)
gvc	-0.287	-0.350*	-0.241	0.033
	(0.112)	(0.051)	(0.137)	(0.773)
pvc	-0.303	-0.394	-0.278	-0.083
	(0.221)	(0.106)	(0.198)	(0.421)
early	-0.005	-0.004	0.027	0.010
	(0.870)	(0.892)	(0.342)	(0.421)
pripatent	0.505***	0.488***	0.379***	0.018***
	(0.000)	(0.000)	(0.000)	(0.001)
pricitation	-0.057**	-0.058**	-0.037	0.030**
	(0.046)	(0.048)	(0.141)	(0.026)
vc lp	-0.047	-0.043	-0.017	0.010
	(0.236)	(0.278)	(0.610)	(0.495)
synsize	0.241***	0.239***	0.236***	0.050**
	(0.000)	(0.000)	(0.000)	(0.040)
vc length	0.112***	0.130***	0.128***	-0.023
	(0.000)	(0.000)	(0.000)	(0.108)
enlocal invpro	0.007	0.003	0.012	0.001
	(0.666)	(0.834)	(0.390)	(0.848)
local talent	-0.039**	-0.039**	-0.012	0.009
	(0.037)	(0.034)	(0.441)	(0.120)
local R&D	0.070*	0.079**	0.033	-0.007
	(0.066)	(0.034)	(0.317)	(0.480)
vclocal invpro	-0.006	-0.011	-0.006	-0.000
	(0.788)	(0.597)	(0.749)	(0.988)
gvc×vclocal invpro	0.046**	0.053***	0.034*	-0.002
	(0.024)	(0.009)	(0.059)	(0.855)
pvc×vclocal invpro	0.054**	0.064**	0.039*	0.011
	(0.046)	(0.016)	(0.091)	(0.316)
Initialvcinvestmentyear	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes
Observations	2,639	2,639	2,639	2,639
R-squared	0.4310	0.4224	0.3405	0.0669
Two-tailed p value for HO:				
gvc×vclocal_invpro= pvc×vclocal_invpro	0.733	0.638	0.781	0.043**

SeetheAppendixforallvariabledefinitions.Thep-valuesadjustedforheteroskedasticityare reported inparentheses.Thesignificancelevelsat1%,5%and10%areidentifiedby***,**and*, respectively.

收稿日期: 2015-10-31

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[1] DaRinetal.(2013)report thatby2011non-USinvestmentsaccountedforapproximatelyhalfof allVCinvestments.AizenmanandKendall(2012)also findthatFrance,Israel,Canada,Indiaand Chinahavebeenconsistentnetimportersof VCdeals.

[2] Supportingtheproximityhypothesis,wefindinuntabulatedanalysisthat77%oftheGVCs' investments inoursampleareinthesameprovincesastheGVCs'headquarters. The correspondingpercentagesforPVCs andFVCs are 53% and42%,respectively.Thesepercentages aresignificantlydifferentfromeachother.

[3] Despitethe mixedperformance,one couldarguethatGVCscouldstillplayapositiverole to the extentthatGVCsfundmarginalbutstillworthwhilepositiveNPVprojectsthatwouldnototherwisereceivefundingfromnon-GVCs.Ourinterviewswithadozen VCfirminsidersinChina suggestthatGVCsdirectlycompetewithnon-GVCsforbusinessandthereisnoevidencethat GVCsdeliberatelyselectandfundonlytheentrepreneurialcompaniesrejectedbynon-GVCs. However,itisbeyondthescopeofthisstudytoexaminethiscrowdingouteffectof GVCs.

[4] Forexample,thetwoprimarycommercialventurecapitaldatausedbyresearchers,ThomsonOne(formerlyknownasVentureXpert) andVentureSource(formerlyknownasVentureOne), are knownforincomplete coverageandlackofdetailsonthecoveredventurecapital-funded companies(Kaplanetal.2002;Maatsetal.2011;DaRinetal.2013).

[5] Thetopreasons forVCfirmstoregisterwiththegovernmentaretoreceivetaxsubsidies(66%), to raisevisibilityand recognition(57%),to complywithgovernmentregulation(55%),and to win investmentfundfromTheNationalSocialSecurityFund(17%),respectively.

[6] AVCinvestmentdealreferstooneroundofinvestmentbyoneVCfirminoneentrepreneurialcompany. Thus,ifacompany receivesfinancing fromthreeVCsinonefinancing round,there wouldbethreeVCinvestmentdeals.

[7] AccordingtoCVSOURCE,therewere6,498VCinvestmentdealsduringoursampleperiod2000-2009and5,422dealsduring2010-2012.

[8] Noneofourinferences aresignificantlyalteredifwedefinetheventurecapitalfirmtypebased onthethesourcesofalltheventurecapitalfundsraisedwithinthethreeyearssincetheformation oftheventurecapitalfirm.Forourinitialsampleof1,336venturecapitalfirmsreportedbelow,1075raisedall the fundswhile1,160raisedat least50% ofthe fundswithinthree monthsaftertheestablishmentoftheVC firms.Hence,the VCfirmtypeclassificationisverystableforour sampleVCfirmsovertime.

[9] Approximately70%oftheentrepreneurialcompaniesincludedinoursampleraisedonlyone roundofVCinvestment.

[10] Priorresearchsuggeststhatlargerventurecapitalinvestment isassociatedwithbetter entrepreneurialcompanyquality(Gompers 1995;MäkeläandMaula2006).Sinceventurecapital firms'investmentamountsaremissingforasignificantnumberofoursampleentrepreneurial companies,we don'tconsiderthiseffectinthe reportedtables.However,we wishto indicatethat inferencesarequalitatively thesameifwecontrolforthetotalfirstroundventurecapital investmentinsubsequentregressionanalyses(untabulated).

[11] Untabulated analysis indicates that 75% of the successful exits are local exits rather than overseas exits.

[12] The variables *enlocal_invpro* and *vclocal_invpro* overlap significantly because a significant portion of Chinese firms' investments are located in the same province as the VC firms' headquarters. Hence, we also remove *enlocal_invpro* from Table 5 and obtain similar inferences (untabulated).

[13] To directly interpret the coefficients on *gvc* and *pvc*, we also employ a dummy variable version of *vclocal_invpro* using the median *vclocal_invpro* as a cutoff (untabulated). In terms of successful exits, we find that GVCs underperform FVCs in provinces with weak institutional environments but this performance gap disappears for the GVCs in provinces with strong institutional environments.