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Cross-Border Venture Capital Valuation: Business-Cycle, Institutional Factors, and Distance

Max Berre¹

ABSTRACT

Venture capital investment is a key topic-of-interest in trade-investment ecosystems. While several studies explore the venture capital and start-up ecosystem examining valuations, relatively-few studies delve deeper into the role of macro-level economic factors in influencing start-up deals and valuations. Using a dataset of 1,089 venture-capital investments, containing 1,042 unique EU and EEA, this study examines macroeconomic, macro-sectoral, and macro-level institutional influences on the venture capital market landscape in European markets, finding that while local venture-capital market-size drives start-up valuations, as do growth and business cycle conditions, valuation-impacts show evidence of cross-border yield-chasing. Institutional factors meanwhile, impact valuations via both investors' home markets and acquisition-target markets, with investor-country taxes having the stronger valuation impact, whereas self-dealing regulation and non-tariff barriers can also impact startup-valuations.

Valuation and venture capital markets driven by investor characteristics, by differences between investor and start-up, and by macro-level differences between the investor's market and the start-up's market.

Keywords Valuation, Start-up, Cross-border investment, Venture Capital, Entrepreneurial Finance, Market Size, Institutional factors.

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1. Introduction

Startup and venture capital markets make dramatic headlines. While valuation of startups has become a key topic-of-interest in entrepreneurial finance literature and startup ecosystem, the cross-border aspect of the venture capital market has received relatively little formal academic attention.

This study focuses on international and cross-border aspect of venture-capital markets, examining not only the cross-border macroeconomic dynamics, but also the institutional aspects of cross-border venture-capital markets to answer questions of how and where specifically cross-border venture-capital deals differ from domestic ones. Understanding these nuances can help both investors and entrepreneurs make sense of the ever-changing international-investment landscape, as well as open the door for substantial future economic, financial and policy-related research in a range of fields.

Venture-capital is a key topic-of-interest in trade-investment ecosystems. According to Chemmanur and Fulghieri (2014), globalization and technological innovation are key trends affecting the venture capital industry and entrepreneurial finance in general, with cross-border investment more than doubling its share of all 1991-era VC investments during the early 2000s. Chemmanur and Fulghieri (2014) outline however, that there has been relatively little research on either on the role of venture capitalists and other intermediaries in fostering the growth of young firms until recently. In principle, this means that a gap exists in terms of development of empirical cross-border research focusing on entrepreneurial finance, and particularly on venture-capital markets.

Using a dataset of 1,089 venture-capital investments, containing 1,042 unique EU and EEA market deals involving both domestic and cross-border venture-capital investments, this study examines macroeconomic, macro-sectoral, and macro-level institutional influences on the venture capital market landscape in European markets, finding that valuations are driven by both domestic target-country macroeconomic and macrofinancial market-conditions, as well as investor-side and comparative cross-country regulatory, credit-risk, and institutional conditions.

Overall, local growth-rates and venture-capital cash-on-market drives startup valuations, as do growth and business-cycle conditions, valuation-impacts show evidence of cross-border yield-chasing. Institutional-factors meanwhile, impact valuations via both investors' home-markets and acquisition-target markets, whereas comparative self-dealing regulation and non-tariff barriers also impacts valuations.

This study's contributions shed light on the dynamics of cross-border venture-capital markets, demonstrating that different factors play key roles driving startup-valuations in domestic venture capital deals than in cross-border ones, while cross-border deal-valuations are described as being driven by domestic macroeconomic factors, investor-country tax-rates, and cross-border comparative institutional and legal factors. The question of which factors matter *where* in cross-border venture capital investment has heretofore not been examined by published literature.

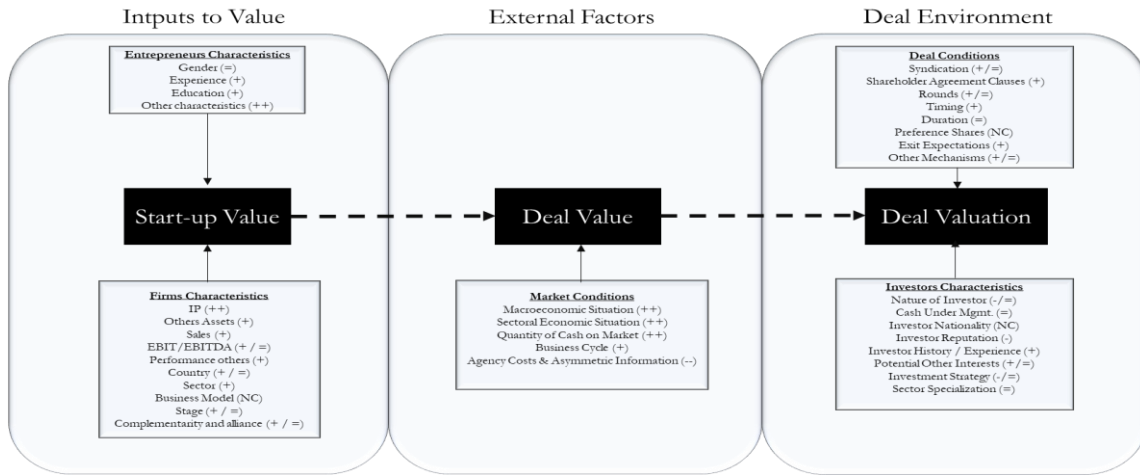
This study develops as follows: Section 2 examines the relevant literature, ranging from firm-specific and industry-specific factors, to country-level economic factors, to country-level institutional and legal factors. Section 3 describes the methodology and dataset used in this study, specifically outlining not only the dataset used, but also the contexts considered in this study's regression structures, comparing domestic and cross-border regressions. Section 4 describes the hypotheses and model-structures used in this study, while Section 5 outlines this study's empirical findings, which are subsequently discussed in detail in Section 6.

A: Startup-Valuation Meta-Model

To approach questions of market-condition valuation-impacts on startups, Berre and Le Pendeven (2021) develop a model outlining the contextually-adjusted startup-valuation-process, taking market-conditions into account. Essentially, startup-value-inputs navigate external market-conditions as part of the valuation-forming process. While the model allows for detail-flexibility for each factor, market-conditions consist, in principle of both sectoral and industry market conditions such as risk-levels, business-models, and market-structure, as well as market-conditions of both macro-financial and macro-institutional nature.

Equation 1: Berre-Le Pendeven Startup-Valuation Meta-Model

$$Pre - Money Valuation = f(((\sum Startup Value) \sum Deal Value) \sum Deal Valuation)$$



B: Key Questions

Central to understanding the impact of cross-border investment on startup-valuations, are several questions examining the nature of the mechanical impacts of cross-border investment-flows. What details about cross-border-investment, in principle drive investment-behavior and subsequent startup-valuations?

Does more cash drive valuation?

Does cash-on-market play a deterministic role in driving startup-valuations? In principle, startup-valuations can be driven by funding-availability present on venture capital and startup-markets. In terms of direct valuation-impact, Berre and Le Pendeven (2020), catalog cash-on-market as unambiguously positive.

Inderst and Muller (2004), and Hellmann and Thiele (2015) examine cash on venture-capital and business-angel markets respectively, finding clear valuation-impact of cash-on-market. Industry-sources also describe total annual VC investment increases as a major driver of valuations and unicorn deals. Examples include KPMG (2019) and Pitchbook (2020).

Do cross-border macroeconomic differences drive investments and startup-valuations?

Do differences in macroeconomic performance between investor home-markets and target-markets drive startup-valuations? In principle, international financial investment flows are driven by potential investment yields. Essentially, investors based in low-growth or recessionary-markets are likely to search booming or high-growth markets for higher-yielding investments, thereby potentially driving startup-valuations.

Shaki and Medrano (2012) describe cross-border yield-chasing investment, as can be observed by the causal and interrelated relationship of several financial markets in the Asia-Pacific region. While this serves as evidence of cross-border financial market investment relationships, private-equity markets are often driven by similar market-forces.

Do cross-border institutional differences drive investments and startup-valuations?

Do differences in institutional performance between investor home-markets and target-markets drive startup-valuations? Comparative institutional soundness plays a role in driving startup-valuations. As is the case with macroeconomic and macrofinancial environments, financial investors also seek overseas markets which provide stronger investor protection.

La Porta et al. (1998) and La Porta et al. (2006) both find that markets with stronger investor protections, more transparency, and stronger private enforcement possibilities give rise to more investor-confidence, leading to larger, more sophisticated and more diversified financial markets in countries with stronger investor protections. Because some key financial markets such as the US, UK, Canada, Netherlands, and Singapore markets have market-capitalizations which are substantially larger than their GDPs, evidence exists that the effect described by La Porta et al. is also at least partially cross-border in nature. Like many other markets, investor confidence is influenced by investor protection from self-dealing and conflicts of interest as well as trade barriers.

Are geographic distances indicative of value?

Do long investment-distances indicate valuable startup deals? Do long investment-distances drive startup-valuation? Long investment-distances can serve as indication of high valuations.

In principle, gravity-models are driven by size and distance, with distance acting as a trade-barrier. Given that Carrère et al. (2020) outlines that research demonstrates that trade falls with distance. Meanwhile, mechanics of gravity-effects within venture-capital markets are known to negatively-impact VC-exit-success

in proportion to both physical geographic-distances (Cumming and Dai, 2010), and to travel-times (Chemmanur et al., 2016).

Because it can indeed be observed that both long-distance, high-valuation and short-range, low-valuation startup-deals exist, distance can be described as a hurdle to low-value startup-investments, such that long-range, low-valuation startup-deals are unlikely and relatively-scare.

2: Literature Review

As demonstrated by several systematic literature reviews on pre-money startups valuations published papers in the field mostly investigate the entrepreneurs, investors and deal-related factors on the valuations (Köhn, 2018; Devigne et al., 2019; Wessendorf, 2019; Berre and Le Pendeven, 2022). Meanwhile, macroeconomic, as well as regulatory and governance-related market conditions attract limited attention. In particular, the cross-border aspects of market-condition impacts on startup-valuations are underserved, while the need for further research into cross-border VC research is laid-out clearly by to Chemmanur and Fulghieri (2014), who outline that while cross-border VC investment has been a major driving trend in the VC industry, there has been relatively-little research published on the topic until recently.

In this study, the differences in institutional and market conditions between the home markets of start-ups and their investors play a central role. In this respect, this study draws its intellectual heritage from several key sources. The of examinations of institutional and macroeconomic drivers for their impact on valuations can be traced to two key literature-trends.

A: Impacts of firm-specific and industry-specific factors

Overall, these valuation-factors are the most classical factors. Classical firm-valuation models typically estimate firm-valuation in relation to firm firm-specific and industry-specific factors such as firm-level assets, revenues, and other firm-level performance indicators, as well as sector-level indicators such as risk-metrics, growth-rates, market-structure, and business models (Damodaran, 2002).

Damodaran (2009) describes the various classical approaches to startup-valuation, which primarily includes elaboration of different DCF valuation-approaches, as well as multiples-based valuation-approaches Both of these approaches are grounded in classical theory and are consistent with Fama (1970), in the sense that valuations reflect pricing driven by measurable, concrete, underlying factors. Meanwhile, Miloud and Cabrol (2011), approach startup-valuation as a function of both firm-specific inputs such as human resources, firm-level performance indicators, and industry dummies.

B: Impacts of country-level economic variables

The role of country-level economic variables and approaches on startup-valuation can be traced to several key authors in the entrepreneurial-finance landscape, going into extensive detail on country-level divergences in both startup-valuations and valuation-approaches, which attribute these divergences to country-level institutional differences as well as differences in country-level valuation-driver-focus.

To begin with, studies comparing the importance to investors and markets of external and internal valuation factors (sometimes referred to as “horse” and “jockey”) have traditionally found that external and contextual-factors such as market-conditions matter most (Gompers and Lerner, 2001; Kaplan et al., 2009).

That being said, studies indicate that different markets prioritize different valuation-factors when determining valuations (Lockett et al., 2002; Wright et al., 2004; 2005). For example, both Wright et al. (2004, 2005) and Manigart et al. (1997, 2000), identify differences between sectors, geographic settings, and investor-contexts, finding for example DCF-valuation to be more prominent in German civil-law jurisdictions than common-law jurisdictions, according to Wright et al. (2004). Lockett et al. (2002) meanwhile, reports that firm characteristics such as EBITDA are weighed differently from country to country. This essentially reinforces the Berre and Le Pendeven (2022) argument that the startup valuation process filters value signals through reigning local market conditions.

Relating macrofinancial investment-regulation to startup and VC markets, Gompers & Lerner (1998) find that regulatory changes affecting pension funds, capital gains tax rates, overall economic growth, and research and development expenditures, as well as firm-specific performance and reputation, affect fundraising. The results are potentially important for understanding and promoting venture capital investment.

Several studies take distance into account. Compared to domestic VC investments, international VC investments present additional risks and challenges because of the geographical, cultural and institutional distance between portfolio companies and VC investors increases (Devigne et al., 2016). Furthermore, distances are known to negatively-impact VC-exit-success This refers to both geographic-distances (Cumming and Dai, 2010), as well as travel-times (Chemmanur et al., 2016).

Specifically examining cross-border VC markets, Schertler & Tykvová (2011) make several key points. First, expected growth differences between the PC’s and VC firm’s country are strongly positively related to the number of international deals between the two countries. Second, expected growth in the VC firm’s home country strongly increases the number of domestic deals, while it slightly discourages the number of international deals. Third, higher market capitalization in the VC firm’s home countries leads to more domestic as well as foreign deals. Fourth, the number of deals financed by foreign investors increases when the expected growth and the market capitalization of the PCs’ countries increase.

C: Impacts of country-level institutional variables

This study is furthermore influenced by several key studies in the economics, finance and entrepreneurial fields. For instance, Devigne et al. (2018), a literature review which examines core literature in the venture capital landscape, as well as drivers which studies have shown to play a deterministic role in international venture capital flows. These include market conditions such as growth rates and growth rate differentials, as well as institutional, and industry-level international differences.

A well-established way to approach information asymmetry as a target of focus is contributed by La Porta et al., who have contributed numerous studies linking corporate governance, valuations, and international financial flows. La Porta et al. (2002) describe that national-level minority shareholder protection and insider concentration has direct impact on valuations, while La Porta et al. (2006) examines the valuation impact of securities laws writ-large, and La Porta et al. (2008) examines shareholder protection against insider self-dealing. Overall, these three studies provide the descriptive statistics which give definition and form to the national-level market conditions by examining national-level juridical differences within financial and company law. The legal view is reinforced by Kaplan et al (2007), who find that startup-valuations vary across legal regimes, finding that weaker outside investor-protection leads to smaller and less-liquid capital markets, more concentrated corporate-ownership, lower corporate-dividends, and lower valuations.

A way to contextualize industry-level and national-level impacts of risks and access to funding further emerges via studies published by policy sources. OECD (2019) outlines that while the growth of alternative finance has driven recent increases in funds and loans available to start-ups and SMEs, several market segments face problems in accessing finance.

While Damodaran (2002) agrees with the outlook presented by La Porta et al concerning insiders, self-dealing, and minority shareholders, Damodaran approaches the valuation landscape with a specifically industry-level outlook. Damodaran (2002) and (2009) approach valuation techniques using sectoral industry-level figures to drive valuations and analysis. While Damodaran (1993) explicitly finds the effect of insiders, Damodaran also publishes aggregated industry-level figures for insider, CEO, and institutional holdings. While this may in principle mean that Damodaran, Devigne et al., and La Porta et al. all approach information asymmetry as a driver of investment in start-ups, Damodaran additionally publishes industry-level unlevered betas, which may indeed be a source of multicollinearity with industry level insider-holding figures, given that the three sources describe information asymmetries as a source of risk.

Zooming-in to focus on governance of startups and venture capital investors at more granular level, focusing on contracts, shareholder agreements, and their constituent clauses as sources of valuation and as responses to market conditions Kaplan and Stromberg (2002) and Kaplan et al. (2007) describe that startup and VC markets governance is contract and negotiation-driven, an aspect which sets VC markets apart from capital-markets in general.

The question of sensitivity to venture capital is explored by Gompers and Lerner (1999), who outline that firms that have the highest demand for venture capital investment, hold substantial amounts of intangible assets, as well as by Popov (2009), an ECB study focusing on the relationship between venture capital markets and firm-size, proposes a model which describes firm size as a product of industry-level firm-sensitivity to venture capital finance and to bank finance, as well as to size of the venture capital market. Popov (2009) finds that industry-level sensitivity to venture capital markets drives firm-level employee size.

3: Methodology and Data

This section presents the methodology, the construction of key variables, and the list of control variables used in the multivariate analysis.

A: Startup Deals Dataset

The dataset expressed in EUR consists of both domestic and cross-border startup investment deals in the UK, EU member-nations, EEA member-nations. The startup-valuations, revenues, as well as firm-specific and investor-specific information is drawn from multiple commercially-available and publicly-available sources. Sector-level and national-level data meanwhile, are drawn entirely from publicly available sources. The dataset grants this study numerous strengths, these include not only the large number of observations, but also a wide diversity in terms of macroeconomic environment and of institutional and legal ecosystems. Data from outside the Eurozone were manually converted to EUR using annual-average exchange-rates.

Because each line within our dataset is specific per-investor-per-deal, deals with multiple investors occupy multiple lines within the dataset, identifying data for startup and investor, as well as relevant industry-level, institutional, and macroeconomic data for both parties. Since a start-up can have several investors, it can have multiple observations in the regression analysis, reflecting each unique investor–startup pair. The dataset style is borrowed from Masulis and Nahata (2009).

With 1,089 observations representing 1,042 deals across 675 startups ranging from Q1-2000 to Q1-2020, our dataset-size is substantial, although only 681 observations contain firm-level revenue figures. The dataset includes deal dates and founding dates for both start-ups and investors, expressed as both dates and years.

B: Dependent Variable

In principle, startup-valuation is the primary dependent variable. That is, the product of share price before a funding round multiplied by the number of outstanding startup shares. Since the dataset is drawn from EU and EEA data, valuations are expressed in EUR. Data drawn from outside the Eurozone, such as from the UK, Poland, Norway, Sweden, and Switzerland were converted into EUR. Table 1a outlines the summary statistics of our pre-money valuations data. While the data’s time and sectoral distribution is somewhat uneven, it does cover several major events, including the end of the dotcom bubble, the Eurozone crisis, and the start of the Covid-19 Pandemic.

Table 1a: Summary Statistics

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	Totals
Mean Valuation	109 000 000	49 700 000	32 900 000	21 800 000	50 800 000	12 000 000	25 700 000	15 200 000	4 181 531	511 000 000	11 900 000	33 300 000	40 100 000	10 300 000	65 400 000	182 000 000	90 100 000	298 000 000	286 000 000	1 130 000 000	1 170 000 000	222 000 000
Std. Dev	239 000 000	155 000 000	29 800 000	15 500 000	29 400 000	7 679 114	32 100 000	9 378 568	3 352 995	690 000 000	.	9 424 469	135 000 000	36 100 000	234 000 000	363 000 000	232 000 000	634 000 000	787 000 000	1 300 000 000	1 420 000 000	602 000 000
Min	795 216	83 579	57 287	6 969 987	30 000 000	762 500	2 970 006	1 708 426	762 500	1 558 441	11 900 000	9 999 972	55 714	53 833	50 000	63 330	63 330	80 000	2 160 000	1 412 881	2 354 802	50 000
Max	1 490 000 000	1 280 000 000	120 000 000	43 700 000	71 500 000	16 500 000	48 400 000	24 000 000	8 899 903	1 270 000 000	11 900 000	36 700 000	556 000 000	229 000 000	1 560 000 000	1 920 000 000	1 920 000 000	2 140 000 000	2 230 000 000	5 380 000 000	5 060 000 000	5 380 000 000
Austria	-	3	-	-	-	-	-	-	2	-	-	-	-	-	1	-	-	-	-	-	-	6
Belgium	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	3	5	-	5	17
Croatia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Czech	6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6
Denmark	-	3	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1	-	3	-	8
Finland	1	-	-	-	-	-	-	-	-	-	-	7	-	1	1	5	2	4	1	-	-	22
France	29	11	4	-	-	5	-	-	-	2	-	1	1	4	-	5	27	16	-	1	-	106
Germany	19	11	3	-	1	-	-	-	2	-	-	-	2	3	5	12	14	33	-	31	2	138
Ireland	-	1	-	-	-	-	-	-	-	-	-	-	-	-	1	5	8	5	-	-	-	20
Italy	3	-	-	-	1	-	-	-	-	-	-	-	1	1	-	1	2	1	-	-	-	10
Latvia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1
Lithuania	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7	-	7
Luxembourg	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	3	-	-	-	-	6
Netherlands	2	1	2	-	-	-	-	-	-	-	-	-	-	-	5	-	-	1	-	-	-	11
Norway	2	4	-	-	-	-	-	2	-	1	-	-	-	-	-	-	-	1	-	-	-	10
Poland	9	8	-	-	-	-	-	-	-	1	-	-	-	-	1	1	2	-	-	-	-	22
Portugal	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	1	2	2	1	-	-	8
Romania	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-	6
Spain	5	-	1	-	-	-	-	-	-	-	-	-	-	2	1	2	4	2	-	4	-	21
Sweden	5	3	-	-	-	-	-	-	-	-	-	1	1	-	1	13	-	2	-	1	-	27
Switzerland	4	1	1	-	-	-	-	-	-	-	1	-	-	-	1	-	2	3	-	-	-	13
UK	43	59	6	4	-	2	1	2	1	1	-	-	12	30	89	151	116	54	5	26	21	623
Total	133	108	17	4	2	7	2	5	5	5	1	9	17	42	106	200	182	130	12	73	28	1089
Business / Consumer Services	-	-	-	-	-	-	-	1	-	-	-	-	5	8	30	33	21	12	-	-	-	110
Aerospace	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	1
Retail	12	9	-	-	-	-	-	-	-	-	-	-	1	3	9	22	31	2	-	7	-	96
Automotive	-	2	-	-	-	-	-	-	-	-	-	-	-	1	1	-	2	9	-	-	-	15
Finance	5	4	2	-	1	-	-	1	-	1	-	-	1	4	5	45	23	23	1	17	4	137
Food/Agro	3	-	-	-	-	-	-	-	-	-	-	-	-	4	16	12	16	16	1	-	1	69
Machinery / Industrial	6	4	1	2	-	-	-	-	-	-	-	-	-	1	-	2	5	3	-	-	-	24
Power	1	1	-	-	-	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	-	6
ICT / Software	62	45	6	1	-	5	2	2	3	-	-	9	5	9	23	27	35	33	5	36	18	326
Pharma / Healthcare	18	21	7	-	1	2	-	-	2	1	1	-	-	1	-	11	13	3	1	1	5	88
Education	-	1	-	-	-	-	-	-	-	-	-	-	1	-	1	3	4	3	1	-	-	14
Electronics	2	1	-	-	-	-	-	-	-	-	-	-	1	2	-	3	2	1	1	-	-	13
Leisure / Entertainment / Tourism	5	3	1	-	-	-	-	-	-	-	-	-	2	2	10	15	18	5	-	3	-	64
Clean-Tech	-	1	-	-	-	-	-	1	-	-	-	-	1	-	-	1	1	4	2	-	-	11
Home	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	-	2
Real Estate	1	2	-	-	-	-	-	-	-	-	-	-	-	-	1	11	3	8	-	9	-	35
Office	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	1	-	-	-	3
Fossil	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Transport	1	-	-	-	-	-	-	-	-	2	-	-	-	2	1	11	6	6	-	-	-	29
Media	7	3	-	-	-	-	-	-	-	-	-	-	-	1	8	1	-	-	-	-	-	20
Total	123	98	17	4	2	7	2	5	5	5	1	9	17	42	105	200	180	130	12	73	28	

C: Control Variables: Baseline Model: Control Scenario

Classical economic theory gives us the DCF model, whereby valuations are driven by risk-adjusted firm revenues. In principle, the control-scenario draws on the factors used by the DCF valuation approach. These are drawn from Damodaran (2005, 2009, 2010).

In order to approach a clear view on the explanatory power and valuation-impact of macroeconomic factors and macro-financial factors in the startup ecosystem, factors used in classical firm-valuation models – in particular, DCF-related factors – should be included empirical models. The DCF approach can be replicated using ordinary-least-square regressions by regressing valuation against revenue, sectoral-beta and country-risk-premiums.

D: The Target-Market: Where the Startups are

Aside from firm-level characteristics such as revenue and firm-assets, firms are known to be impacted by market-conditions in the local market. Theoretically, this is described by Berre and Le Pendeven (2020), who outline that valuations emerge as value-signals such as information and figures concerning a startup's human-resources, assets, and firm-revenue, which are subsequently filtered and contextualized by market-characteristics both locally and at industry-level. Additionally, this is described by Damodaran (2009), who describes that both DCF and multiple-based approaches to startup-valuations incorporate primarily national-level and industry-level market characteristics.

Macroeconomic and Macrofinancial Market-Conditions

In line with Gompers and Lerner (1998) and Bonini and Alkan (2006), which find valuations to be driven by macroeconomic indicators, cyclical indicators and tax-rates, this study's macroeconomic data consist of macroeconomic output-gap, and total overall tax-rates. To this, we add total venture capital market-cash-on-market available at both county level and on global markets, which likely have direct valuation-impacts on startups. These are drawn from OECD and IMF figures.

Institutional and Regulatory Conditions

Both venture-capital-specific literature such as Kaplan et al. (2007), as well as wider economic and financial literature, such as La Porta et al. (1997) and Shleifer et al. (2008) indicate that governance at both national-level and firm-level plays a key deterministic role in driving valuation and overall financial-market activity via both investor confidence and business confidence. In line with existing literature, governance indices covering self-dealing, insider-concentration, trade-openness, trade openness, and overall competitiveness. These are drawn from multiple sources, including the World Economic Forum, as well as Shleifer et al. (2008) and La Porta et al. (2006).

E: The Investor Market: Where the Capital is

In addition to market conditions on the target-market, investor-market conditions can also have a deterministic impact on startup-valuations. In particular, investor markets which as large, macroeconomically-dynamic, with regulatory and governance ecosystems favorable to trade may be substantial sources of investment capital for not only their home-markets startup-ecosystems, but also those of their primary trading partners.

Macroeconomic and Macrofinancial Market-Conditions

Investor-market macroeconomic and macrofinancial conditions are able to impact startup valuations as local market-conditions may act as push-factors encouraging investors to look abroad in order to diversify, increase yields, or maximize returns.

Institutional and Regulatory Conditions

Both venture-capital-specific literature such as Kaplan et al. (2007), as well as wider economic and financial literature, such as La Porta et al. (1997). The rationale for this can be seen in La Porta et al. (1997) and La Porta et al. (2006), who find countries with stronger investor-protection, laws mandating disclosure and facilitating private enforcement to have stronger capital markets. In principle, both disclosure and private-enforcement can take place in the investor's home market.

Additionally, institutional and regulatory conditions that may directly-impact overseas trade and investment flows, such as trade regulation, tariffs rates, and prevalence of non-tariff barriers can directly impact venture capital and private equity investment activity in overseas markets.

F: Cross-Border Effects

Divergences between explanatory-power of domestic cash-on-market and world cash-on-market are indicative of cross-border investment effects. In principle, these cross-border investment-effects would emerge as a result of substantial differences in both the institutional business ecosystem and macroeconomic realities between inter-related open economies.

Macroeconomic and Macrofinancial Market-Conditions

Investor-market macroeconomic and macrofinancial conditions are able to impact startup valuations as local market-conditions may act as push-factors encouraging investors to look abroad in order to diversify, increase yields, or maximize returns.

Institutional and Regulatory Market-Conditions

Comparative institutional soundness plays a role in driving startup-valuations. This is driven by investors seeking overseas markets which provide stronger investor protection. Given that several key financial markets which feature strong investor protection also have market-capitalizations which are substantially larger than their GDPs, evidence exists that the effect described by La Porta et al. is also at least partially cross-border in nature.

G: Macro-Level Independent Variables

Macroeconomic and Macrofinancial Market-Conditions

The macroeconomic data consist of country-risk-premium, macroeconomic output-gap, tax-rates and total venture capital cash-on-market available at both domestic county level and on global markets. These are drawn from the NYU-Stern database, the OECD.

Institutional and Regulatory Market-Conditions

Institutional-data are drawn primarily from two sources. La Porta et al. (2006) provide legal-protection indices for self-dealing and investor-protection. The World Economic Forum's World Competitiveness Report, which not only yields a competitiveness index, but also indices for macroeconomic stability, trade-openness, and availability of SME funding. Use

of European deals data allow us to draw on a wide range of variation in these indicators. All drivers are captured for both the local-market conditions of the start-up and of the investor.

Definitions of Variables in Dataset

Table 1 outlines the variables used in this study. Included are valuation, this study’s key dependent variable, as well as the primary independent variables, ranging from firm-revenues to industry-level variables, including sectoral-beta and sector-level insider-holdings, to macro-level economic variables, including country-risk-premium, cash-on-market, and macroeconomic output-gap, to macro-level institutional variables, such as the LLSV securities law index, and the WEF global competitiveness index, to categorical variables for industry, city, and investor-type. Additionally, kilometer-distance between the investor’s city and the target-startup’s city is taken into account.

Table 2: Dataset and Variable Definitions

Variable	Description
Valuation	Pre-Money Startup-Valuation. Source: EIKON, Early Metrics, Crunchbase
Revenue	Startup company revenue. Source: Eikon, Dun & Bradstreet, Zoominfo,
Beta	Unlevered sectoral beta. Source: NYU Stern dataset
Credit Risk Premium	Country-Level Credit Risk Premium. Source: Moody’s, NYU Stern
Tax Rate	Tax revenue as % of GDP. Source: World Bank Indicators
Output Gap	Deviations of actual GDP from potential GDP as % of potential GDP. Source: OECD
Cash-on-Market	Country-level total venture capital investments. Source: OECD
World Cash-on-Market	Worldwide total venture capital investments. Source: OECD
Non-tariff barriers	In your country, to what extent do non-tariff barriers (e.g., health and product standards, technical and labelling requirements, etc.) limit the ability of imported goods to compete in the domestic market? [1 = strongly limit; 7 = do not limit at all]. Source: World Economic Forum
Insider Holdings	Sectoral-level percent of firms held by insiders. Source: NYU Stern
LLSV Securities Law Index	Index of security laws covering corporate governance rules, shareholder rights, disclosure, and private-enforceability. Source: LaPorta et al. (2006)
WEF Global Competitiveness Index	The Global Competitiveness Index is made up of over 110 variables, organized into twelve pillars, with each pillar representing an area considered as an important determinant of competitiveness. Source: World Economic Forum
Distance (KM)	Distance in kilometres between city where startup is based and city where investor is based.
Domestic Deal Dummy	Dummy Variable. Takes value of 1 when startup and investor are based in same country.
Sector Categorical Variable	Categorical Variable. Industry sector of startup.
City Categorical Variable	Categorical Variable. City where startup is based.
Investor-type Categorical Variable	Categorical Variable. Types of investors involved in deal.

Log-Transformation

As a matter of scale, this study applies log-transformation to several key variables, thereby standardizing the scale of variation. Fundamentally, log-transformation flattens relationships by restraining outlier-effects on dataset-means and medians. the flattening of outliers has the potential to add substantial explanatory-power to regression-models, as log-transformation reduces estimation-problems associated with percentage changes from baseline (Keene, 1995), while maximizing data-scale-flattening (Ribeiro-Oliveira et al., 2018). Variables showing skewed distribution can also be made symmetric using log-transformation (Keene, 1995). The log-transformed variables include log of valuation, log of revenue, log of beta, and log of distance. Nevertheless, original-forms of the log-transformed variables are referred to for narrative and descriptive purposes throughout this study.

4: Hypothesis and Analysis

A: Functional Form

While function forms of theoretical models can take many shapes, ranging from quadratics to interaction-effects, to use of ratio variables, log-transformation serves to essentially flatten these various constructions. Because logarithms turn addition into multiplication, log-transformations functionally flatten variable-relationships and variables based on multiplications, including interaction-effects, and ratio-based variables.

Discounted-Cashflow Model Approaches

DCF-approaches focused on multi-period risk-adjusted revenue-discounting are the most traditional firm-valuation approaches, are constructed on the basis of revenues, growth-rates, and risk-adjusted discount-rates, as described by Eq. 2.

Equation 2: Discounted-Cashflow Approaches

$$\text{Valuation} = \sum_{i=n} \frac{\text{Revenues}}{(1 + \text{risk} - \text{adj. interest rate})^n}$$

or

$$\text{Valuation} = \frac{\text{Revenues}}{(\text{risk} - \text{adj. interest rate} - \text{growth rate})} \text{ for stable states}$$

In principle, DCF-model approaches can incorporate cross-border valuation-influences in several ways. These include impacts on revenues, growth-rates, reinvestment-rates, betas, and country-risk-premia.

Scorecard Approaches

Developed by practitioners, scorecard-valuation methods are modular and relatively straightforward valuation-approaches based on summation of key characteristics, market-conditions, and deal-conditions. In industry, the scorecard approach is typically used by business angels. Industry-emergent techniques for scorecard valuation include Berkus (2016) and Payne (2011). Meanwhile, in published economic literature, this same concept appears as summation-based valuation models, such as published by Hand (2005) and Sievers et al. (2013). For example, Eq. 3 outlines the Sievers et al. (2013) summation-based valuation model, assigning valuation based on summation of financial, and non-financial firm-attributes, as well as deal-characteristics are relevant valuation-coefficients.

Equation 3: Sievers et al. (2013) Summation-based Valuation Model

$$\log(\text{Valuation}_{it}) = \sum \Phi \text{Non} - \text{financial}_{it} + \sum \Delta \text{Financial}_{it} + \sum \Psi \text{Deal Characteristics}_{it}$$

In principle, scorecard approaches can incorporate cross-border valuation-influences in several ways ranging from the non-financial and deal-characteristics prevalent in a given market or cross-border ecosystem, to the role of national-level or cross-border market-conditions in driving the model's factor-coefficients.

A major advantage to scorecard-approaches is their ability to incorporate non-numerical data, which may range from categorical variables to geo-spatial data, to qualitative data and sentiment analysis. Recent emergence of new techniques may lead to increasing sophistication of scorecard approaches, as predictive techniques incorporating to categorical, geo-spatial, and qualitative data become widespread.

B: Hypotheses

Valuations transmit information not just about the target firm's revenues, fundamentals, and contextual market conditions, but also about those of the investor, as well as the relationship between the two market conditions, where they happen to exist. A widely-understood source of value are the general market conditions. At the macro-level, these are macroeconomic indicators such as growth rates (Bernoth and Colavecchio, 2014), cyclical indicators (Fitza et al., 2004; Korteweg and

Sorensen, 2010), SME-finance availability and quantity of cash on the private equity market (Inderst and Muller, 2004). Several studies suggest this to be the case: for example, more and more-successful VC deals occur during boom periods (Heughebaert and Manigart, 2012). While there are several ways that business cycles can directly impact valuation, both revenues and discount-factors (i.e., beta, country-risk-premium) are controlled for in this study directly.

Business cycles might directly impact valuations due to potential future revenue-growth, industry-growth, or macroeconomic-growth, all of which may serve to attract investors, influencing both investor selection and startup-valuation (Wessendorf, 2019). Meanwhile, business cycle growth can impact valuations by means of growth of business networks, partnerships, and relationships (Streletzki and Schulte, 2013). Alternatively, macroeconomic business-cycle conditions can also serve to inflate startup-valuations in the short-run during a boom, albeit on a short-lived basis which may later be corrected, as described by Michel (2014).

Meanwhile, not only does venture capital cash-on-market directly a priori influence pre-money valuations, as described by Inderst and Muller (2004), but also influences entrepreneur-effort, as described by Fulghieri and Sevilir (2009), which both increase valuations directly, and also serve as value-signal to investors.

In addition, institutional indicators such as investor protection law, trade-openness, or legal protection against self-dealing law can be expected to play a key deterministic role. In particular, transparency and self-dealing regulation is known to influence investor sentiment at the country level (La Porta et al., 1997, 2002, 2006). In terms of regulation, this can be measured via legal and regulatory indices specific to firm-level transparency and self-dealing. Meanwhile, policy-makers uphold that trade-openness contributes to competitiveness (OECD, 2019 and World Economic Forum, 2019) via productivity growth and access to both markets and financing. Because productivity growth and access to finance can impact both national-level competitiveness and firm-level competitiveness, valuations can be impacted. These factors can therefore be used to predict valuations. This leads us to the development of several possible hypotheses:

Startup-valuations are likely driven by macroeconomic, macrofinancial, and cyclical indicators in the target's home-market, as well as VC market-indicators. These indicators include local macroeconomic output gaps and country-risk premiums, as well as VC cash-on-market in the country where the startup is based. In principle, these might directly or indirectly impact yields, firm-growth, and discount-rates, meaning that direct valuation-impact relationships likely exist.

Additionally, startup-valuations might be driven by institutional factors in the target startup's home-market. These include both legal indices such as the LLSV Investor Protection Law Index drawn from La Porta et al. (2006), as well as trade-related and competitiveness-related indicators including the WEF Global Competitiveness Index, and WEF non-tariff-barriers indicators. Because these institutional drivers can influence investor-confidence at both the national-level and the firm-level, startup-valuations are likely impacted.

H1a: Domestic Macroeconomic variables in the startup's market are dominant in driving startup valuation

H1b: The quality of the playground that matters. Target-market domestic institutional-environment factors play a strong role in determining valuation.

In principle, the veracity of H1a and H1b can be evaluated by examining the valuation-impact of domestic target-market macroeconomic and macrofinancial indicators and of target-market governance-indicators respectively.

Beyond effects on the domestic market, macroeconomic indicators and cyclical-indicators drive cross-border investor confidence, as well as increasing international cash-on-market. Meanwhile, Startup-valuations may also be driven by institutional factors in the investor's home-market. Because institutional drivers can influence investor-confidence, it can be expected that the impact is felt not only on the macrofinancial-level, but also on the firm level. Therefore, startup-valuations would be impacted by institutional factors alongside impacts felt at the macrofinancial-level.

In addition to the impacts felt in the target-startup's home-market, macroeconomic, macrofinancial and country-level institutional factors, startup-valuations might also be driven by macroeconomic, macrofinancial, and cyclical indicators in the investor's home-market. Wang and Wang (2012), outlines that a country's economic freedom is crucial to cross-border VC performance after controlling for the global VC market, as well as year and industry fixed effects. With this in mind, the role of market-conditions in the investor's home-market. This leads us to:

H2a: Macroeconomic and macrofinancial variables in the investor's market are dominant in driving startup valuation

H2b: Investor-side institutional factors play a strong role in determining valuation.

In principle, H2a and H2b can be evaluated by examining valuation-impacts of investor-side macroeconomic and macrofinancial indicators and of investor-side governance-indicators respectively.

Lastly, it is likely value can be detected by contextual differences between the market-conditions in the investor's home market vis-à-vis the market-conditions of the target startup. According to Wright et al. (2005), an under-researched area of cross-border VC-market research concerns institutional-context influence, especially roles of social networks and cultures.

Fundamentally, differences between the investor's setting vis-à-vis that of the target start-up play a dominant role in determining startup-valuations. Investor-startup differences and distances of different types play deterministic roles in cross-border venture-capital investments, including not only geographic distances, but also cultural, and institutional distances (Buchner et al., 2018). Macroeconomic differences between the investor's setting vis-à-vis that of the target start-up also play a dominant role in determining startup-valuations. Evidence of this can be found in the cross-border financial-market linkages described by Shaki and Medrano (2012).

Mechanically-speaking, cross-border investors chase yield by investing in markets whose growth-rates or business-cycle indicators are stronger than those of the investor's home markets. Therefore, cross-border differences in cyclical-conditions play a key deterministic role in startup-valuations. Empirically, this would mean cross-border differences in cyclical or macrofinancial indicators would be responsible for substantial startup-valuation premiums or discounts.

On the other hand, yield-possibilities aside, investors also engage in international and cross-border investment in order to seek institutional safe-harbors where investor-protections such as those described by La Porta et al. (2006) are stronger than in the investor's home-market. Additionally, not only are investors interested in low-risk markets from the governance perspective, but also from the credit-risk-premium standpoint. Therefore, cross-border differences in risk-metric-conditions and institutional-conditions play a key deterministic role in startup valuations. Investors seek safer markets. Thus,

H3a: Macroeconomic differences between the investor's setting vis-à-vis those of the target start-up play a dominant role in determining startup-valuations.

H3b: Investors seek safer markets. Country-level differences between governance, investor-protection, and country-risk premiums play a dominant role in determining startup-valuations.

In principle, the veracity of H3a and H3b, focusing respectively on economic and institutional-distances described by Buchner (2018) can be evaluated by statistical-significance of cross-border differences in macroeconomic and macrofinancial indicators and of governance-indicators and risk-premia respectively.

5. Empirical Findings

Overall, results are in line with established economic theory, since empirical results are consistent with discounted-cashflow valuation approaches, as well as with both cash-on-market and business-cycle valuation-impacts.

When it comes to the valuation-impact of institutional-drivers, both target-market and investor-market institutional drivers have significant valuation-impacts. That being said, comparative cross-border macroeconomic and institutional indicators also consistently have substantial valuation-impacts within our dataset.

A: Discounted Cashflow: The Baseline Scenario

The DCF valuation approach, which discounts revenues, profits, and cashflow figures using a risk-adjusted discount rate, can be used to both establish the soundness of the dataset and as to control-factors by-which to contextualize all other relevant firm-valuation factors.

In principle, a DCF approach can be approximated using OLS models by including revenue or profit figures and discount-factor inputs. Because the free-cashflow-to-equity DCF model applies a cost-of-equity-based discount factor, an FCFE-based DCF approach would include CAPM-related factors in the estimation model.

Table 3 outlines valuation-impact of revenues, sector unlevered-beta, and country-risk-premium and demonstrates that the data are consistent with discounted cash-flow valuation models, and thereby establishes the soundness of the dataset. Panel A displays the overall valuation-impact of firm-revenues, industry-betas, and country-risk-premium, while Panel B displays their valuation-impact in domestic startup-investment deals, and Panel C displays valuation-impact in cross-border deals. Panel A also includes a domestic-deal dummy.

Table 3: Baseline Discounted Cashflow Valuation Model

Panel A: DCF-based Regressions							
VARIABLES	(1) Ln_Valuation	(2) Ln_Valuation	(3) Ln_Valuation	(4) Ln_Valuation	(5) Ln_Valuation	(6) Ln_Valuation	(7) Ln_Valuation
Ln_Revenue	0.6861*** [0.034]			0.6660*** [0.034]	0.6692*** [0.034]	0.6514*** [0.034]	0.5233*** [0.034]
Ln_**eta		-2.7738*** [0.395]		-1.1629*** [0.389]		-1.0886*** [0.388]	-1.1329*** [0.357]
Credit Risk Premium			-70.7055*** [11.701]		-40.7742*** [13.134]	-38.3685*** [13.092]	-32.5285*** [12.060]
Domestic Deal Dummy							1.9582*** [0.181]
Constant	6.4565*** [0.503]	17.8453*** [0.254]	16.7791*** [0.133]	7.4278*** [0.596]	7.0425*** [0.534]	7.9171*** [0.615]	9.0059*** [0.575]
Observations	646	1,045	1,045	646	646	646	646
R-squared	0.394	0.0451	0.0338	0.403	0.403	0.410	0.501
Adjusted R-squared	0.393	0.0442	0.0329	0.401	0.401	0.408	0.498

Panel B: DCF-based Regressions (Domestic)						
VARIABLES	(1) Ln_Valuation	(2) Ln_Valuation	(3) Ln_Valuation	(4) Ln_Valuation	(5) Ln_Valuation	(6) Ln_Valuation
Ln_Revenue	0.4921*** [0.049]			0.4813*** [0.050]	0.4875*** [0.049]	0.4780*** [0.050]
Ln_Beta		-2.2368*** [0.503]		-0.6942 [0.520]		-0.6504 [0.523]
Credit Risk Premium			-46.5306*** [13.154]		-17.1078 [17.075]	-15.0817 [17.134]
Constant	10.5840*** [0.796]	19.3016*** [0.323]	18.3499*** [0.161]	11.1457*** [0.899]	10.7845*** [0.821]	11.2871*** [0.914]
Observations	257	393	393	257	257	257
R-squared	0.282	0.0481	0.0310	0.287	0.285	0.289
Adjusted R-squared	0.279	0.0457	0.0285	0.282	0.279	0.281

Panel C: DCF-based Regressions (Cross-Border)						
VARIABLES	(1) Ln_Valuation	(2) Ln_Valuation	(3) Ln_Valuation	(4) Ln_Valuation	(5) Ln_Valuation	(6) Ln_Valuation
Ln_Revenue	0.6082*** [0.045]			0.5766*** [0.045]	0.5844*** [0.045]	0.5547*** [0.045]
Ln_Beta		-2.7540*** [0.462]		-1.6353*** [0.492]		-1.5833*** [0.487]
Credit Risk Premium			-79.9106*** [15.858]		-52.4290*** [17.201]	-50.4416*** [17.003]
Constant	6.8632*** [0.634]	16.7620*** [0.298]	15.7956*** [0.171]	8.2723*** [0.756]	7.6581*** [0.680]	8.9922*** [0.787]
Observations	389	652	652	389	389	389
R-squared	0.322	0.0517	0.0376	0.341	0.338	0.356
Adjusted R-squared	0.320	0.0503	0.0361	0.338	0.335	0.351

Standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Overall, Table 3 corroborate the DCF approach, finding that revenues, industry-betas, and country-risk-premiums are either individually or jointly significant, or both. The regressions displayed in Panel A corroborate the DCF valuation-approach, finding that DCF factors are both individually and jointly significant, impacting firm-valuations as the DCF model indicates, explaining between 39 and 50% of log-variation in startup-valuations according to r-squared, with the domestic deal-dummy indicating that European-market domestic-deals are associated with a significant valuation-markup.

In domestic investment deals meanwhile (as outlined in Panel B), firm-valuation figures, sectoral-beta, and country-risk premium are only individually-significant, with r-squared outlining that DCF-factors explain roughly one-quarter of log-variation in startup-valuations at most. Reduced dataset size and degrees-of-freedom notwithstanding, these regression-results indicate that for domestic-deals in particular, the entire story is not being captured.

Cross-border deals examined in Panel C on the other hand, demonstrate not only higher goodness-of-fit indicators, with DCF-factors explaining as much as 36% of log-variation in startup-valuations according to r-squared, but also that DCF-factor are jointly-significant for cross-border deals.

Inclusion of a domestic-deal dummy increases adjusted-r-squared from .4 08 to 0.498, with the domestic-deal dummy coefficient indicating a valuation-premium for domestic deals. Comparing domestic and cross-border deals indicates that DCF factors play a substantially more deterministic role in cross-border deals than in domestic deals within our dataset. Therefore, while domestic deals may see valuation-markups, this is likely due to factors beyond the standard DCF-model.

B: The Target Market

Target-Market Macro-Effects

Macro-level economic effects in the target-market, where the startup is based provide extensive context in terms of local market conditions in which the startup must thrive. Based on macro-level examination carried-out in Berre and Le Pendeven (2021), these might include sector-level risk metrics and market structure, as well as domestic local economic conditions ranging from business cycles to growth rates, to cash-on-market and local tax rates. Table 4 examines the impact of domestic macro-level economic conditions in addition to controlling for firm-level DCF factors. Panel A displays target-market macro-effects for the dataset as a whole and includes a domestic-deal dummy, while Panel B, which covers target-market macro-effects and Panel C, which covers target-market macro-effects for cross-border investment deals. Panel D meanwhile, demonstrates interaction-effects between the domestic-deal dummy and macroeconomic valuation-factors.

Table 4: Valuation-Impact of Target's Macroeconomic Market-Conditions

Panel A: Target-Country Macroeconomic Regressions						
VARIABLES	(1) Ln_Valuation	(2) Ln_Valuation	(3) Ln_Valuation	(4) Ln_Valuation	(5) Ln_Valuation	(6) Ln_Valuation
Ln_Revenue	0.6514*** [0.034]	0.6540*** [0.034]	0.6512*** [0.035]	0.6862*** [0.036]	0.6071*** [0.034]	0.5233*** [0.034]
Ln_Beta	-1.0886*** [0.388]	-1.3509*** [0.383]	-1.1753*** [0.394]	-0.9448b [0.390]	-0.9861*** [0.374]	-1.1329*** [0.357]
Country Risk Premium	-38.3685*** [13.092]	-15.3681 [13.622]	-13.3416 [15.048]	-23.8422* [14.386]	-41.5507*** [13.232]	-32.5285*** [12.060]
Tax Rate		0.1130*** [0.020]				
Output Gap			0.2101*** [0.070]			
Cash-on-Market				0.0006*** [0.000]		
World Cash-on-Market					0.00003*** [0.000]	
Domestic Deal Dummy						1.9582*** [0.181]
Constant	646 0.41	636 0.44	632 0.42	578 0.48	550 0.53	646 0.50
Observations	759	748	697	578	550	759
R-squared	0.41	0.42	0.44	0.48	0.53	0.47
Adjusted R-squared	0.408	0.438	0.421	0.473	0.526	0.498

Panel B: Target-Country Macroeconomic Regressions (Domestic)

VARIABLES	(1) Ln_Valuation	(2) Ln_Valuation	(3) Ln_Valuation	(4) Ln_Valuation	(5) Ln_Valuation
Ln_Revenue	0.4780*** [0.050]	0.4900*** [0.050]	0.4736*** [0.050]	0.5106*** [0.050]	0.4931*** [0.052]
Ln_Beta	-0.6504 [0.523]	-0.6315 [0.518]	-0.6609 [0.531]	-0.3821 [0.516]	-0.4148 [0.534]
Country Risk Premium	-15.0817 [17.134]	-3.9118 [18.594]	2.6766 [18.645]	-2.8077 [17.964]	-25.0148 [17.779]
Tax Rate		0.0480* [0.027]			
Output Gap			0.1426* [0.083]		
Cash-on-Market				0.0006*** [0.000]	
World Cash-on-Market					0.00002*** [0.000]
Constant	11.2871***	9.3107***	11.4132***	9.9069***	9.1687***

	[0.914]	[1.463]	[0.930]	[0.923]	[0.977]
Observations	257	248	247	215	201
R-squared	0.29	0.31	0.31	0.40	0.40
Adjusted R-squared	0.281	0.296	0.302	0.392	0.392

Panel C: Target-Country Macroeconomic Regressions (Cross-Border)

VARIABLES	(1) Ln_Valuation	(2) Ln_Valuation	(3) Ln_Valuation	(4) Ln_Valuation	(5) Ln_Valuation
Ln_Revenue	0.5547*** [0.045]	0.5299*** [0.044]	0.5482*** [0.046]	0.5657*** [0.047]	0.5157*** [0.044]
Ln_Beta	-1.5833*** [0.487]	-2.0745*** [0.477]	-1.6630*** [0.486]	-1.4086*** [0.485]	-1.1790** [0.462]
Country Risk Premium	-50.4416*** [17.003]	-39.3581** [17.158]	-13.5738 [20.569]	-38.4809** [18.884]	-49.2426*** [17.193]
Tax Rate		0.1434*** [0.025]			
Output Gap			0.3478*** [0.102]		
Cash-on-Market				0.0007*** [0.000]	
World Cash-on-Market					0.00004*** [0.000]
Constant	8.9922*** [0.787]	4.4756*** [1.111]	9.0722*** [0.805]	7.7701*** [0.839]	6.0149*** [0.868]
Observations	389	388	385	363	349
R-squared	0.356	0.406	0.376	0.415	0.464
Adjusted R-squared	0.351	0.400	0.370	0.408	0.458

Panel D: Target-Country Macroeconomic Interaction Regressions

VARIABLES	(1) Ln_Valuation	(2) Ln_Valuation	(3) Ln_Valuation	(4) Ln_Valuation	(5) Ln_Valuation	(6) Ln_Valuation	(7) Ln_Valuation	(8) Ln_Valuation	(9) Ln_Valuation	(10) Ln_Valuation	(11) Ln_Valuation	(12) Ln_Valuation
Ln_Revenue	0.5233*** [0.034]	0.5773*** [0.051]	0.5215*** [0.034]	0.5203*** [0.034]	0.5293*** [0.033]	0.5183*** [0.033]	0.5168*** [0.034]	0.5182*** [0.036]	0.5473*** [0.034]	0.5449*** [0.034]	0.5099*** [0.034]	0.5100*** [0.033]
Ln_Beta	-1.1329*** [0.357]	-0.8844** [0.401]	-1.6939*** [0.488]	-1.1483*** [0.356]	-1.3161*** [0.352]	-1.3300*** [0.351]	-1.2182*** [0.359]	-1.2842*** [0.375]	-0.9200*** [0.353]	-0.9442*** [0.352]	-0.9270*** [0.346]	-0.8250** [0.343]
Credit Risk Premium	-32.5285*** [12.060]	-39.6916*** [13.938]	-33.0378*** [12.047]	-53.7710*** [17.081]	-16.1173 [12.545]	-21.4476* [12.642]	-6.8668 [13.728]	-10.4907 [15.172]	-19.5104 [13.012]	-21.6743* [13.014]	-38.1583*** [12.266]	-35.8202*** [12.131]
Domestic Deal Dummy	1.9582*** [0.181]	3.8349*** [1.127]	1.2829*** [0.440]	1.6220*** [0.263]	1.9167*** [0.180]	13.7482*** [4.421]	2.0518*** [0.181]	1.6976*** [0.212]	2.1099*** [0.186]	3.5773*** [0.723]	1.7858*** [0.187]	29.9269*** [7.371]
DOMESTIC x REV		-0.1121 [0.074]										
DOMESTIC x BETA			1.1766* [0.700]									
DOMESTIC x CRP				42.3692* [24.164]								
Tax Rate					0.0919*** [0.018]	0.1384*** [0.025]						
DOMESTIC x TAX						-3.2889*** [1.228]						
Output Gap							0.2268*** [0.064]	0.3353*** [0.092]				
DOMESTIC x OUTPUT GAP								-0.2447 [0.222]				
Cash-on-Market									0.0007*** [0.000]	0.0008*** [0.000]		
DOMESTIC x CASH										-0.2273** [0.108]		
World Cash-on-Market											0.0000*** [0.000]	0.0000*** [0.000]
DOMESTIC x WORLD												-2.4631*** [0.645]
Constant	9.0059*** [0.575]	8.1537*** [0.804]	9.3667*** [0.613]	9.2440*** [0.590]	5.6481*** [0.876]	4.2155*** [1.023]	9.0991*** [0.587]	9.2290*** [0.619]	7.5828*** [0.595]	7.4543*** [0.596]	6.7014*** [0.608]	5.3715*** [0.695]
Observations	646	549	646	646	636	636	632	571	578	578	550	550
R-squared	0.50	0.50	0.50	0.50	0.53	0.53	0.52	0.53	0.57	0.58	0.60	0.61
Adjusted R-Squared	0.498	0.499	0.500	0.500	0.524	0.528	0.519	0.529	0.570	0.572	0.593	0.603

Standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

All panels outline that startup-valuations are positively-influenced by macroeconomic output-gaps, as well as both world and domestic venture-capital cash-on-market. Overall, world cash-on-market has a smaller impact than target-market cash-on-market. While the two coefficients for both are similar in all panels, regressions including world cash-on-market have stronger goodness-of-fit indicators than regressions including target-market cash-on-market, indicating evidence of cross-border investment-activity and valuation-impact.

As is the case in Table 3, Panel B of Table 4, which covers domestic investment-deals finds that the discount-rate factors sectoral-beta and country-risk premium are not jointly-significant, despite being mostly significant in Panel A and Panel C. This indicates that sectoral-beta and country-risk-premium have stronger explanatory-power in cross-border deals than in

domestic deals. Panel C meanwhile, finds that output-gap has relatively-stronger explanatory-power in cross-border deals than is the case in domestic deals. Lastly, Panel D demonstrates that valuations in domestic deals are less-sensitive risk-factors which drive discount-rates, while negative valuation-impacts from cash-on-market-interactions might indicate cross-border competition for investor-attention. Essentially, this indicates that investors are more risk-sensitive and risk-averse when faced with cross-border deals, as opposed to domestic deals, whose risks might be easier to both understand and mitigate, but also that cash-on-market drives cross-border competition for investment.

These findings indicate that while macro-level economic and financial valuation-factors generally have substantial valuation-impact on startups, firm-revenues play the more dominant role in determining valuation of domestic deals. Intuitively, these findings communicate that a key reason investors are interested in cross-border deals would be to take advantage of macroeconomic, country-risk, and business-cycle conditions in foreign markets, whereas domestic-investors are more strictly concerned with firm-revenues.

Target Market Institutional-Effects

In addition to valuation-impacts of firm-level performance-indictors, and macro-level market-effects, institutional impacts are also known impacts on investor-confidence, macrofinancial market-size and sophistication. Examining institutional and regulatory valuation-impacts, Table 5 captures the target-market institutional-environment startup-valuation-impact by including industry-level insider holdings, securities-law-index, global competitiveness-index, trade-openness, and non-tariff-barriers. Panel A displays target-market institutional-effects for the dataset as a whole and includes a domestic-deal dummy, while Panel B, which covers target-market institutional-effects and Panel C, which covers target-market institutional-effects for cross-border investment deals. Additionally, Panel A includes a domestic-deal dummy.

Table 5: Valuation-Impact of Target's Institutional Market-Conditions

Panel A: Target-Country Institutional Regressions							
VARIABLES	(1) Ln_Valuation	(2) Ln_Valuation	(3) Ln_Valuation	(4) Ln_Valuation	(5) Ln_Valuation	(6) Ln_Valuation	(7) Ln_Valuation
Ln_Revenue	0.6514*** [0.034]	0.6694*** [0.034]	0.5785*** [0.034]	0.6169*** [0.035]	0.6552*** [0.035]	0.6531*** [0.035]	0.5233*** [0.034]
Ln_Beta	-1.0886*** [0.388]	-0.5556 [0.405]	-1.4893*** [0.369]	-1.2794*** [0.388]	-1.0604*** [0.391]	-1.0915*** [0.392]	-1.1329*** [0.357]
Country Risk Premium	-38.3685*** [13.092]	-36.9577*** [12.945]	-0.1074 [13.939]	-74.9602*** [15.969]	-36.7022** [14.959]	-37.6043*** [13.431]	-32.5285*** [12.060]
Industry-Level Insider Holdings		-8.7086*** [2.159]					
LLSV Securities Law Index			-0.2729*** [0.030]				
WEF Global Competitiveness Index				-0.1272*** [0.030]			
Trade-Openness					0.0003 [0.049]		
Non-Tariff-Barriers						-0.0200 [0.026]	
Domestic Deal Dummy							1.9582*** [0.181]
Constant	7.9171*** [0.615]	8.6577*** [0.634]	10.5258*** [0.652]	18.1626*** [2.502]	7.8216** [3.319]	9.2149*** [1.868]	9.0059*** [0.575]
Observations	646	645	618	641	641	641	646
R-squared	0.410	0.424	0.489	0.428	0.411	0.412	0.501
Adjusted R-Squared	0.408	0.420	0.485	0.424	0.408	0.408	0.498

Panel B: Target-Country Institutional Regressions (Domestic)

VARIABLES	(1) Ln_Valuation	(2) Ln_Valuation	(3) Ln_Valuation	(4) Ln_Valuation	(5) Ln_Valuation	(6) Ln_Valuation
Ln_Revenue	0.4780*** [0.050]	0.4972*** [0.051]	0.4634*** [0.049]	0.4478*** [0.052]	0.4823*** [0.050]	0.4638*** [0.050]
Ln_Beta	-0.6504 [0.523]	-0.1972 [0.555]	-0.7723 [0.519]	-0.7306 [0.527]	-0.5584 [0.528]	-0.6716 [0.521]
Country Risk Premium	-15.0817 [17.134]	-13.0391 [16.937]	-13.0252 [19.876]	-41.8750** [20.774]	-14.6317 [19.681]	-19.7050 [17.069]
Industry-Level Insider Holdings		-7.4790** [3.314]				
LLSV Securities Law Index			-0.0825* [0.045]			

WEF Global Competitiveness Index				-0.0957**		
				[0.042]		
Trade-Openness					-0.0015	
					[0.062]	
Non-Tariff-Barriers						-0.0825***
						[0.031]
Constant	11.2871***	11.8476***	12.0108***	19.0423***	11.2897***	17.0754***
	[0.914]	[0.924]	[0.941]	[3.528]	[4.207]	[2.408]
Observations	257	256	237	253	253	253
R-squared	0.29	0.30	0.33	0.31	0.29	0.31
Adjusted R-Squared	0.281	0.286	0.318	0.297	0.282	0.302

Panel C: Target-Country Institutional Regressions (Cross-Border)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	Ln_Valuation	Ln_Valuation	Ln_Valuation	Ln_Valuation	Ln_Valuation	Ln_Valuation
Ln_Revenue	0.5547***	0.5661***	0.4841***	0.5155***	0.5536***	0.5514***
	[0.045]	[0.045]	[0.043]	[0.046]	[0.046]	[0.046]
Ln_Beta	-1.5833***	-1.1669**	-1.9821***	-1.8418***	-1.5871***	-1.6177***
	[0.487]	[0.507]	[0.451]	[0.482]	[0.492]	[0.493]
Country Risk Premium	-50.4416***	-50.3770***	-8.3544	-99.8819***	-51.1939***	-51.4382***
	[17.003]	[16.862]	[17.065]	[20.743]	[19.320]	[17.736]
Industry-Level Insider Holdings		-6.7960***				
		[2.491]				
LLSV Securities Law Index			-0.3235***			
			[0.036]			
WEF Global Competitiveness Index				-0.1553***		
				[0.036]		
Trade-Openness					0.0001	
					[0.066]	
Non-Tariff-Barriers						-0.0184
						[0.036]
Constant	8.9922***	9.6274***	11.9868***	21.5147***	9.0121**	10.2731***
	[0.787]	[0.815]	[0.819]	[3.031]	[4.484]	[2.598]
Observations	389	389	381	388	388	388
R-squared	0.356	0.368	0.471	0.385	0.356	0.356
Adjusted R-Squared	0.351	0.361	0.466	0.378	0.349	0.349

Standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

In Table 5, all panels demonstrate either non-significance or slightly-negative coefficients for all macro-level institutional valuation-factors and substantially-negative coefficients for industry-level insider holdings. This indicates that within the dataset, industry-level governance-indicators impact startup-valuation more than target-market macro-level governance-indicators do.

C: The Investor-Market

In addition to prevailing economic, financial, and institutional market-conditions in the startup's home-market, economic and institutional market-conditions prevalent in the investor's home-markets can also impact startup-valuation, given that these drivers may impact what an investor is willing to pay for participation in any given startup investment-deal

Investor-Market Macro-Effects

Table 6 examines the impact of investor-country macroeconomics and macrofinancial market conditions. Mirroring the macro-level economic and financial valuation-factors outlined in Table 4, Table 6 includes investor-side country-risk-premium, tax-rates, output-gap and cash-on-market.

Table 6: Valuation-Impact of Investor-Market Macro-level Market-Conditions

Investor-side Macro Regressions					
VARIABLES	(1)	(2)	(3)	(4)	(5)
	Ln_Valuation	Ln_Valuation	Ln_Valuation	Ln_Valuation	Ln_Valuation
Ln_Revenue	0.6514***	0.6231***	0.6314***	0.6414***	0.6557***
	[0.034]	[0.034]	[0.035]	[0.035]	[0.036]
Ln_Beta	-1.0886***	-1.1520***	-0.9206**	-1.0550***	-0.9741**
	[0.388]	[0.379]	[0.403]	[0.403]	[0.406]
Credit-Risk-Premium	-38.3685***	-148.2589***	-43.5649***	-37.2003***	-41.7329***
	[13.092]	[23.852]	[13.696]	[13.841]	[14.409]
Investor-Market Credit-Risk-Premium		72.3242***			
		[13.242]			
Investor-Country Tax-rate			-0.0398***		
			[0.015]		
Investor-Country Output-Gap				0.0536	
				[0.060]	
Investor-Country Cash-on-Market					-0.0004***
					[0.000]
Constant	7.9171***	8.6313***	9.4522***	8.0452***	7.8742***

	[0.615]	[0.616]	[0.835]	[0.637]	[0.665]
Observations	646	640	618	623	515
R-squared	0.410	0.440	0.415	0.408	0.468
Adjusted R-Squared	0.408	0.436	0.411	0.404	0.464
Standard errors in brackets					
*** p<0.01, ** p<0.05, * p<0.1					

Table 6 demonstrates that both target-market and investor-market credit-risk-premiums impact valuation, with investor-market credit-risk-premium mitigating the valuation-impact of target-market credit-risk-premium. This indicates that there is a valuation-impact of cross-border credit-risk-premium differences. Investor-country tax-rate has an expected negative-impact on startup-valuations, while investor-country output-gap is non-significant. Investor-country cash-on-market also has a negative valuation-impact, which in conjunction with the positive valuation-impact of both world and target-market cash-on-market outlined in Table 3, also indicates likely valuation-impact of cross-border differences.

Goodness-of-fit scores indicate that cash-on-market, credit-risk-premium, and tax-rate to be the most influential investor-country macro-level economic market-conditions. Compared to target-market tax-rate for cross-border deals (Table 3, Panel C), investor-market tax rate yields noticeably-stronger goodness-of-fit, while opposing tax-rate, cash-on-market and credit-risk-premium coefficients indicate likely impact of cross-border differences.

Investor-Market Institutional-Effects

Whereas Table 6 outlines and describes valuation-impacts of investor-side country macroeconomic and macro-financial, Table 7 outlines and describes valuation-impacts of investor-side institutional effects. Mirroring the impact of macro-level institutional valuation-factors outlined in Table 5, Table 7 includes investor-side securities-law index, global-competitiveness index, trade-openness and non-tariff-barrier prevalence.

Table 7: Valuation-Impact of Investor-Market Institutional Market-Conditions

Investor-side Institutional Regressions					
VARIABLES	(1) Ln_Valuation	(2) Ln_Valuation	(3) Ln_Valuation	(4) Ln_Valuation	(5) Ln_Valuation
Ln_Revenue	0.6514*** [0.034]	0.6452*** [0.035]	0.6366*** [0.034]	0.6500*** [0.034]	0.6523*** [0.035]
Ln_Beta	-1.0886*** [0.388]	-1.1779*** [0.406]	-1.0139*** [0.385]	-1.1251*** [0.386]	-1.0829*** [0.388]
Country Risk Premium	-38.3685*** [13.092]	-31.1420** [13.965]	-48.8806*** [13.722]	-32.6742** [13.361]	-37.0001*** [13.359]
Investor-Country LLSV Securities Law Index		-0.0820*** [0.031]			
Investor-Country WEF Global Competitiveness Index			-0.0735*** [0.022]		
Investor-Country Trade-Openness				0.0673*** [0.024]	
Investor-Country Non-Tariff-Barriers					-0.0053 [0.024]
Constant	7.9171*** [0.615]	8.5764*** [0.675]	13.5005*** [1.801]	3.5314** [1.671]	8.2391*** [1.720]
Observations	646	621	645	645	645
R-squared	0.410	0.410	0.421	0.418	0.411
Adjusted R-Squared	0.408	0.407	0.417	0.414	0.407
Standard errors in brackets					
*** p<0.01, ** p<0.05, * p<0.1					

Table 7 demonstrates that aside from investor-country trade-openness, domestic-focused valuation-factors have negative valuation-impacts on startups. Meanwhile, trade-openness, a trade-focused factor, has positive valuation-impact. While these results are counterintuitive, their impact also appears limited, given not only limited statistical-significance but also goodness-of-fit figures comparable to those of Table-3 DCF regressions, indicating limited added explanatory-power.

D: Cross-Border Effects

In addition to simply measuring the valuation-impacts of target-market and investor-country macroeconomic and macro-institutional factors, they must also be contextualized by being compared to one-another, given that cross-border relative

differences may drive both investor behavior and subsequent valuations. These coefficients are generated by calculating the differences between target-market and investor-country figures.

Macroeconomic and Macrofinancial Market Differences

Table 7 demonstrates the impact of cross-border macro-level economic and financial valuation-drivers on startup-valuations.

In addition to cross-border macroeconomic and macrofinancial variables, we investor-startup kilometer-distances.

Table 8: Valuation-Impact of Cross-Border Macro-Level Drivers

Cross-Border Macro-Regressions							
VARIABLES	(1) Ln_Valuation	(2) Ln_Valuation	(3) Ln_Valuation	(4) Ln_Valuation	(5) Ln_Valuation	(6) Ln_Valuation	(7) Ln_Valuation
Ln_Revenue	0.6514*** [0.034]	0.6231*** [0.034]	0.6075*** [0.034]	0.6492*** [0.036]	0.6672*** [0.038]	0.6071*** [0.034]	0.5244*** [0.033]
Ln_Beta	-1.0886*** [0.388]	-1.1520*** [0.379]	-0.9214** [0.387]	-0.9370** [0.404]	-0.8138* [0.434]	-0.9861*** [0.374]	-1.0201*** [0.355]
Country Risk Premium	-38.3685*** [13.092]	-75.9348*** [14.517]	-29.6706** [13.303]	-31.3892** [14.024]	-38.2335** [18.268]	-41.5507*** [13.232]	-33.9610*** [12.185]
Country Risk Premium Difference		-72.3242*** [13.242]					
Tax-Rate Difference			0.1107*** [0.015]				
Output-Gap Difference				0.1103* [0.066]			
Cash-on-Market Difference					0.0004*** [0.000]		
World Cash-on-Market						0.00003*** [0.000]	
Ln_Distance (KM)							0.2751*** [0.024]
Constant	7.9171*** [0.615]	8.6313*** [0.616]	8.1084*** [0.608]	7.7907*** [0.644]	7.1607*** [0.696]	5.3569*** [0.639]	8.5553*** [0.569]
Observations	646	640	609	610	478	550	633
R-squared	0.41	0.44	0.46	0.42	0.45	0.53	0.51
Adjusted R-Squared	0.408	0.436	0.457	0.412	0.445	0.526	0.506

Standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Table 8 demonstrates that cross-border differences in output-gap, tax-rate differences, and world cash-on-market, are associated with higher startup-valuations, while differences in country-risk-premiums are associated with lower startup-valuations. Overall, this indicates that startup-valuations are driven by differences between domestic market-conditions and market-conditions abroad. The statistically-significant near-zero-coefficient of differences in domestic cash-on-market, in conjunction with elevated goodness-of-fit figures indicate that target-market cash-on-market and investor-country cash-on-market may be *equally-impactful*. Country-risk-premiums and country-risk-premium differences meanwhile are jointly-significant and both negative, indicating a compounding-effect. The negative coefficient of country-risk-premium differences indicate that target markets which are substantially riskier than the investor-markets might lead investors of assign unusually-large valuation-discounts. Additionally, log of kilometer-distances are associated with substantial valuation-premiums.

Cross-Border Institutional Differences

In addition to cross-border macro-level economic and financial variables, cross-border differences in institutional and governance-related variables may also drive startup-valuations. Table 9 examines the valuation-impact of cross-border differences in securities law index, competitiveness index, trade-openness, and non-tariff barriers. As is the case with Table 8, this table also includes investor-startup kilometer-distances.

Table 9: Valuation-Impact of Cross-Border Institutional Drivers

Cross-Border Institutional-based Regressions						
VARIABLES	(1) Ln_Valuation	(2) Ln_Valuation	(3) Ln_Valuation	(4) Ln_Valuation	(5) Ln_Valuation	(6) Ln_Valuation
Ln_Revenue	0.6514*** [0.034]	0.5330*** [0.035]	0.6135*** [0.035]	0.6514*** [0.034]	0.6556*** [0.035]	0.5244*** [0.033]
Ln_Beta	-1.0886*** [0.388]	-1.2091*** [0.381]	-0.8296** [0.396]	-1.1434*** [0.389]	-1.0745*** [0.391]	-1.0201*** [0.355]
Country Risk Premium	-38.3685*** [13.092]	-25.2295* [13.579]	-43.5747*** [13.660]	-41.4604*** [13.425]	-37.0035*** [13.404]	-33.9610*** [12.185]
Difference in LLSV Securities Law Index		0.3167*** [0.034]				

Difference in WEF Global Competitiveness Index			0.1145***			
			[0.024]			
Difference in Trade-Openness				-0.0647***		
				[0.024]		
Difference in Non-Tariff-Barriers					-0.0092	
					[0.022]	
Ln_Distance (KM)						0.2751***
						[0.024]
Constant	7.9171***	9.0853***	8.0781***	7.9631***	7.8493***	8.5553***
	[0.615]	[0.617]	[0.632]	[0.621]	[0.624]	[0.569]
Observations	646	601	603	641	641	633
R-squared	0.410	0.484	0.433	0.418	0.412	0.509
Adjusted R-Squared	0.408	0.481	0.430	0.415	0.408	0.506

Standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

In terms of explanatory-power, goodness-of fit figures indicate that coefficients for differences in competitiveness index and securities law index are the dominant cross-border institutional-governance indicators. Meanwhile, the coefficient for differences in trade-openness is negative, indicating that investor-country trade-openness may have more significant valuation-impact than target-market trade-openness, or that the cross-border differences matter, in favor of investor-country market-conditions. These findings might indicate that while target-markets impact startup-valuations via both competitiveness and securities law standards, investor-country market-conditions influence them via trade-openness.

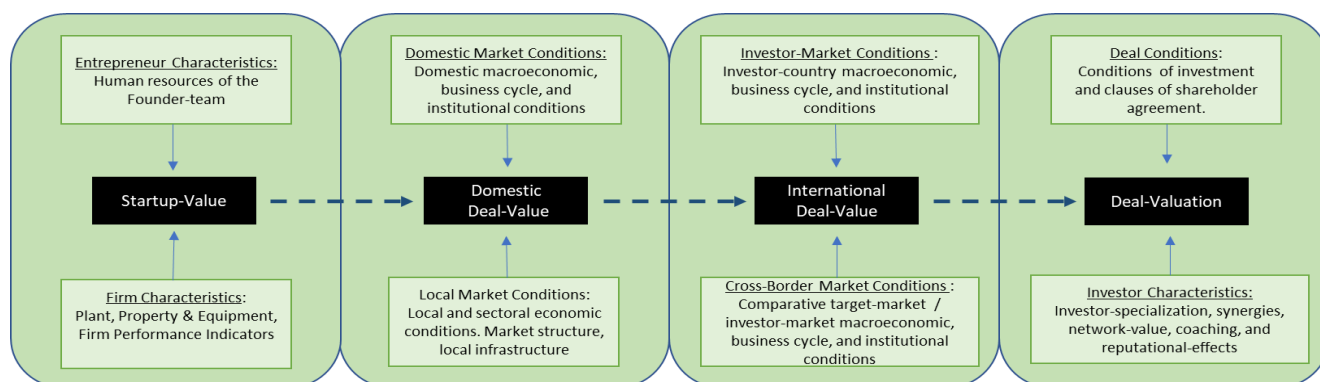
Comparing Table 6 and Table 9, several institutional-variables display negative coefficients in Table 6, but positive and strongly-significant coefficients in Table 9. Cross-border valuation-effects are more impactful than their institutional-differences suggest at first-glance.

Market-Conditions Meta-Model

Considering that the empirical findings demonstrate evidence that startup-valuations are affected by both domestic and investor-country market-conditions, as well as comparative cross-border market-conditions, modification of Equation 1 to capture the mechanics of cross-border market-condition valuation-impact may be necessary, as per Equation 4:

Equation 4: Cross-Border Market-Conditions Meta-Model

$$Pre - Money Valuation = f(\sum Startup Value) \sum Domestic Deal Value) \sum Internaitonal Deal Value) \sum Deal Valuation)$$



Overall Composite Relationship and Fixed-Effects

Taking Equation 4 into consideration, as well as the findings described in Tables 4, 5, 6, 7, and 8, a composite regression table including those startup-valuation factors with strongest and most theoretically-established explanatory-power, capturing the most likely elements of both domestic and international deal-value.

Additionally, the impact of sector, investor-type and city fixed-effects can be included in order to capture the valuation-impact of these categorical variables. Table 10 includes four columns which express this composite relationship in OLS regressions, as well as four columns adding individual and joint fixed-effects.

Table 10: Valuation-Impact of Cross-Border Fixed-Effects

Overall Relationship and Fixed-Effects					Sector FE	Type FE	City FE	Joint FE
VARIABLES	(1) Ln_Valuation	(2) Ln_Valuation	(3) Ln_Valuation	(4) Ln_Valuation	(5) Ln_Valuation	(6) Ln_Valuation	(7) Ln_Valuation	(8) Ln_Valuation
Ln_Revenue	0.4931*** [0.035]	0.4566*** [0.035]	0.4948*** [0.035]	0.4629*** [0.036]	0.4697*** [0.036]	0.4336*** [0.040]	0.4332*** [0.036]	0.3967*** [0.041]
Ln_Beta	-1.1315*** [0.360]	-1.3804*** [0.365]	-1.0134*** [0.370]	-1.2282*** [0.375]	0.2597 [0.643]	-1.3505*** [0.410]	-1.3739*** [0.360]	-0.4845 [0.562]
Country Risk Premium	-64.9092*** [15.274]	-65.6484*** [15.534]	-58.9730*** [16.032]	-58.0412*** [16.151]	-57.7787*** [15.591]	-66.1576*** [18.676]	-48.3461* [24.901]	-104.3488*** [26.997]
Cash-on-Market	0.0007*** [0.000]	0.0008*** [0.000]	0.0007*** [0.000]	0.0008*** [0.000]	0.0007*** [0.000]	0.0007*** [0.000]	0.0012*** [0.000]	0.0006*** [0.000]
Investor-Country Tax-rate	0.0581*** [0.016]	0.0627*** [0.017]	0.0532*** [0.017]	0.0578*** [0.017]	0.0520*** [0.017]	0.0688*** [0.021]	-0.0042 [0.018]	0.0295 [0.019]
Country Risk Premium Difference	-80.9362*** [14.589]	-73.8019*** [14.998]	-75.4332*** [15.455]	-70.1716*** [16.083]	-70.0169*** [15.399]	-87.0900*** [19.056]	-69.1397*** [16.900]	-63.0994*** [19.305]
Difference in ILSV Securities Law Index		0.1243** [0.050]		0.1268** [0.054]	0.1394*** [0.052]	0.1172* [0.063]	0.0091 [0.055]	0.0961* [0.057]
Difference in WEF Global Competitiveness Index			0.0032 [0.038]	0.0076 [0.045]	0.0038 [0.043]	-0.0112 [0.051]	0.0290 [0.045]	0.0172 [0.044]
Domestic Deal Dummy	2.2461*** [0.200]	1.7591*** [0.284]	2.2203*** [0.283]	1.7331*** [0.381]	1.5975*** [0.364]	2.0447*** [0.423]	1.4960*** [0.359]	1.0408*** [0.361]
Constant	6.7667*** [0.800]	7.1603*** [0.808]	6.7465*** [0.827]	7.0468*** [0.836]	6.4003*** [0.906]	7.1567*** [0.959]	9.7099*** [0.883]	9.4983*** [1.034]
Observations	552	533	522	505	502	427	470	393
Within R2	-	-	-	-	0.559	0.349	0.595	0.232
Between R2	-	-	-	-	0.782	0.913	0.467	0.603
Overall R2	0.596	0.602	0.593	0.598	0.587	0.592	0.575	0.600

Standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Concretely, Table 10 demonstrates that all valuation-factors of the composite regression are jointly-significant except cross-border differences in WEF Global Competitiveness Index, which is not statistically-significant, while all other factors are either significant or strongly-significant, with R-squared in excess of 0.57 in all regressions. Furthermore, differences in country-risk-premium boasts a negative coefficient, while the domestic deal dummy indicates a valuation-premium associated with domestic deals, with regression 2 boasting the strongest goodness-of-fit indicators.

E: Deal-Distance-Taxonomy

In addition to borders, both domestic and international deals contend with distances. Overall, the literature confirms that proximity breeds investment. This is the case on the bank-lending market, given that banks located closer to borrowers are more likely to lend to informationally-obscure borrowers, (Petersen and Rajan 2002; Mian 2006; Sufi 2007), and this is the case at the firm-level, as firms decide where to open new plants and locations (Giroud 2013). According to Giroud (2013), proximity facilitates monitoring, reduces information-asymmetry, therefore increasing the productivity of investments.

Local Deals

Investor and startup are based in same city or nearby city. Examples of this include deals occurring in Greater London, Paris, or Berlin metropolitan areas.

Typically, local deals are concentrated in startup and venture-capital hotspots, where the local ecosystem already features high densities of both entrepreneurs and investors. These are driven by the economic dynamics of local economic-clusters as described in detail by Porter (1990). While both high-valuation and low-valuation startups are involved in local deals, many syndicated deals involve at least one local-investor. Valuations are influenced by local-level economic conditions.

Short-Range Domestic Deals

Investor and startup are based in neighboring regions of the same country. Examples of this generally include deals involving investors located in the Berlin, Greater London, or Greater Paris metropolitan areas, while the startups are located in less than 1000 km away in the same country, in areas such as Cambridge, Glasgow, or Cardiff for London-based investors.

These deals typically involve either startup-investor relationships between different local-area startup-clusters, located in different regions of the country, or startup-investor relationships between a venture-capital hotspot and smaller cities.

Short-Range Cross-Border Deals

Investor and startup are based in neighboring countries. Examples of this would include deals involving startups located in Brussels, Amsterdam, or Paris, for investors based in Greater London.

While distances involved similar to those of short-range deals, the additional presence of a national border means cross-border differences in both macroeconomic variables such as country-risk premiums, as well as in institutional variables. The latter may be especially-pronounced in the European market, since all legal families are represented across the European common market.

Long-Range Cross-Border Deals

Investor and startup are based in differing countries, at generally between 1000 and 1500 km distance. Examples of this would include deals involving startups located in Barcelona, Stockholm, or Helsinki, for investors based in Greater London. Typically, long-range cross-border deals occur only in cases of extremely high-value startups, which have high valuations and are concentrated in high value-added industries.

The Role of Distance in Valuation

Given the taxonomy of deal-distances present in the dataset, as well as the impact of the cross-border macroeconomic and macro-institutional factors in Tables 8 and 9 (effectively zero in domestic deals, no matter the investor-startup distance), distance is not only a key valuation-signal, but also, its impact is substantially different when combined with non-zero cross-border factor-coefficients.

Table 11 outlines the relationship between investor-startup distance and startup-valuation, with columns for domestic deals, cross-border deals, and all investment deals. Panel A adds investor-startup distance to DCF-based regressions. Panel B meanwhile, adds investor-startup distance to macroeconomic regressions and Panel C adds investor-startup distance to institutional regressions.

Table 11: Valuation-Impact Controlling for Distance

Panel A: DCF- Based Regressions	All Deals	Domestic	Cross-Border
	(1)	(2)	(3)
VARIABLES	Ln_Valuation	Ln_Valuation	Ln_Valuation
Ln_Revenue	0.524*** [0.033]	0.4597*** [0.048]	0.5386*** [0.046]
Ln_Beta	-1.0201*** [0.355]	-0.5214 [0.505]	-1.5225*** [0.486]
Country Risk Premium	-33.9610*** [12.185]	-14.8207 [17.224]	-51.1300*** [16.907]
Ln_KM	0.2751*** [0.024]	0.3966*** [0.094]	0.1408*** [0.040]
Constant	8.5553*** [0.569]	8.4074*** [1.105]	8.9372*** [0.786]
Observations	633	256	377
R-squared	0.509	0.337	0.376
Adjusted R-Squared	0.506	0.326	0.369

Panel B: Macro-based Regressions			
	All Deals	Domestic	Cross-Border
VARIABLES	(1) Ln_Valuation	(2) Ln_Valuation	(3) Ln_Valuation
Ln_Revenue	0.5254*** [0.035]	0.4169*** [0.052]	0.5117*** [0.046]
Ln_Beta	-0.9075** [0.370]	-0.3569 [0.535]	-1.7823*** [0.465]
Country Risk Premium	-11.9682 [15.220]	10.1261 [20.333]	-12.5339 [21.086]
Cash-on-Market	0.0005*** [0.000]	0.0005*** [0.000]	0.0007*** [0.000]
Output-Gap	0.1778** [0.071]	0.2024** [0.088]	0.1614 [0.106]
Investor-Country Tax-rate	0.0262 [0.016]	-0.0269 [0.022]	0.1663*** [0.026]
Ln_Distance (KM)	0.3036*** [0.027]	0.3429*** [0.128]	0.1289*** [0.040]
Constant	6.8575*** [0.852]	9.8461*** [1.729]	2.5320** [1.166]
Observations	538	188	350
R-squared	0.58	0.46	0.49
Adjusted R-Squared	0.571	0.438	0.484

Panel C: Institutional-based Regressions			
	All Deals	Domestic	Cross-Border
VARIABLES	(1) Ln_Valuation	(2) Ln_Valuation	(3) Ln_Valuation
Ln_Revenue	0.4957*** [0.035]	0.4061*** [0.050]	0.5380*** [0.049]
Ln_Beta	-0.9628b [0.378]	-0.7284 [0.553]	-1.0048c [0.513]
Country Risk Premium	-25.3670c [13.742]	-1.8235 [20.351]	-45.7709b [18.728]
Difference in LLSV Securities Law Index	0.1544*** [0.043]	0.0957c [0.050]	0.6199 [0.442]
Difference in WEF Global Competitiveness Index	0.0037 [0.034]	-0.0761b [0.038]	-0.1931 [0.480]
Investor-Country Trade-Openness	0.0411 [0.025]	0.0090 [0.029]	0.0179 [0.061]
Ln_Distance (KM)	0.2082*** [0.034]	0.3849*** [0.108]	0.1072b [0.043]
Constant	6.1995*** [1.762]	8.7814*** [2.183]	7.4232c [3.995]
Observations	555	201	354
R-squared	0.528	0.399	0.375
Adjusted R-Squared	0.522	0.377	0.362

Standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

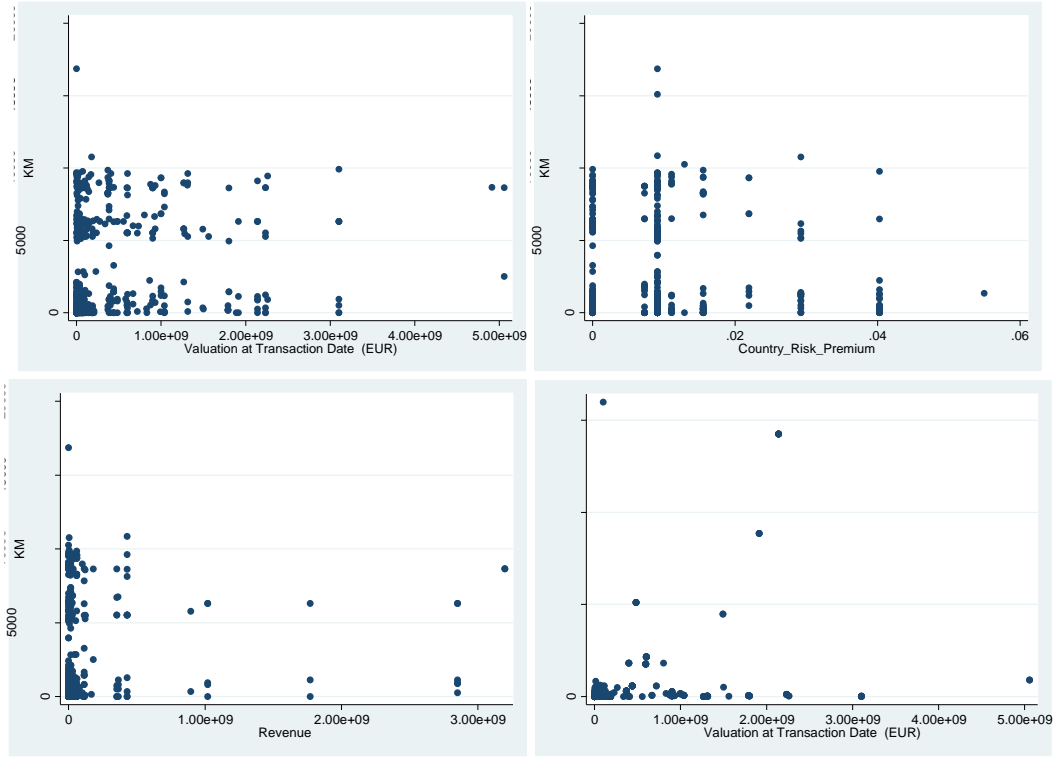
Overall, Table 11 demonstrates that investor-startup distance may have stronger explanatory-power in cross-border deals than in domestic deals. This can be seen in higher goodness-of-fit of cross-border regressions in Panels A and B, as well as the significance of log-of-distance coefficient in all panels. Essentially, Table 10 indicates that distances matter more to startup-valuation in cross-border deals than in domestic deals.

Distance-Hurdle

Conceptually, taking into consideration the dataset's positive association between distance and valuation demonstrated in Table 10, what the deal-distance taxonomy describes is a distance-driven hurdle-rate, which serves to filter-out many would-be long-distance, low-valuation deals, while not concretely affecting start-up valuation. Mechanically, any such filter would impact startup-selection rather than valuation, and likely be driven by either trade-barriers or information-asymmetries.

Figure 1 captures this visually, demonstrating that high-valuation deals appear proportionally-concentrated at longer deal-distances, while distances also appear substitutable with country-risk-premiums, but not directly impacting revenues.

Figure 1: Distance and Valuation, Revenue, Country-Risk



Accordingly, Equation 4 can be modified to include a distance-driven hurdle-function μ , which captures the apparently distance-tradeoff with country-risk-premiums, and by which $\mu \geq 1$ would mean deal-selection, whereas $\mu < 1$ would mean deal-rejection. Selection would become less-likely as either distance or country-risk-premium increases, but more-likely as firm-revenues increase, essentially adopting the shape of a gravity-model, along lines similar to Carrère et al. (2020). Thus Equation 5 yields:

Equation 5: Cross-Border Market-Conditions Meta-Model

$$Pre - Money Valuation = f(((\sum Startup Value) \sum Domestic Deal Value) \sum Internaitonal Deal Value) \sum Deal Valuation)$$

$$s. t. \quad \mu = f\left[\frac{(Revenue)}{(Distance * (Credit - risk - premium))}\right]$$

Whereby, valuations are driven by both domestic and cross-border market-conditions, and subject to μ , a distance-driven hurdle-function. Furthermore, log-transformation would flatten the functional-form, yielding a hypothetical probit-model describing the distance hurdle as follows:

Equation 6: Probit Regression-Model for a Distance-Driven Hurdle-Function

$$\mu = \Phi[\beta_1(Revenue) - \beta_2(Credit - Risk - Premium) - \beta_3(Distance)]$$

Testing this empirically, however, would require access to startup deal-selection data, which, at a very minimum would have to include deal-rejections.

6: Discussion and Conclusions

Overall, the empirical findings indicate several insights concerning startup-valuation and pricing, as well as the role of cross-border aspects in determining not only valuation, but also the relative-impact of various valuation-factors, whose impact is distributed across the target-startup's home-market, as well as the investor's home-market, meaning that cross-border investment-deals fundamentally behave differently – and are valued differently – than domestic-deals.

Fundamentally, empirical-evidence indicates that domestic-deals experience valuation-premiums while cross-border deals experience valuation-discounts. Furthermore, investors are more risk-sensitive when faced with cross-border deals, which may indicate that domestic-deal risks are likely more straightforward to foresee, understand, and mitigate. Given findings outlined by Chemmanur et al. (2016) regarding VC-exit-success, valuation-discounts make intuitive sense, as risks to investor-exit-success appear to be priced-in to cross-border deals.

Mechanically-speaking, classical valuation-approaches indicates that startup-valuations are being driven by firm-level factors, as well as home-market macroeconomic and macrofinancial conditions (Damodaran, 2009).

This paper's findings meanwhile demonstrate that while some valuation-factors are indeed driven by a target-startup's home-market macroeconomic and macrofinancial conditions, investor-market conditions also play a deterministic role, as do comparative cross-border market-conditions. Furthermore, this study's empirical findings demonstrate that the explanatory-power of deterministic-impacts are distributed across target-market, investor-market, and comparative circumstances, with macroeconomic, macrofinancial, and cyclical market-conditions of the target-market playing the dominant deterministic-role, while governance and investor-protection-driven valuation-impacts explain predominantly cross-border comparative-condition valuation-impacts.

Business-cycle and macroeconomic conditions play a key-role in driving startup-valuations, particularly for cross-border deals. While domestic macroeconomic and macrofinancial conditions play a substantial deterministic role in driving startup-valuations, as both business-cycle conditions and cash-on-market drive valuations, cross-border differences in business-cycle conditions, credit-risk premiums, and cash-on-market (both domestic and international) have substantial valuation-impact. Additionally, while target-market country-risk-premiums have negative a valuation-impact in cross-border VC-investments, cross-border differences in country-risk-premiums have dramatically-negative valuation-impacts. Essentially this means that VCs investment much more eagerly in offshore-markets that are safer than home-markets but are weary of even slightly-riskier markets.

Investor-market impacts on the other hand, while contribution only limited explanatory-power, convey interesting empirical results. First, investor-country business-cycles have positive valuation-impact, meaning that the findings demonstrate that booming economies lead to stronger cross-border investments. Meanwhile, investor-country tax-rates have negative valuation-impacts. Essentially, this indicates that while investors have their tax-liabilities in their home-countries, their offshore investments may suffer reductions in value. Lastly, investor-market country-risk-premiums indicate that higher country-risk-premiums are associated with higher valuations in cross-border deals. Mechanically, this likely indicates that increases in country-risk-premiums drive investors to invest in cross-border startups. This is a sign of investor flight-to-safety.

Interestingly, in addition to the valuation-impacts driven by cross-border differences in business-cycle and macrofinancial conditions, cross-border differences in governance-related indicators also drive startup-valuations. Both cross-border competitiveness and securities law demonstrably also have substantial valuation-impacts.

Conclusions

Overall, this study's conclusions are that while cross-border-effects on startup-valuation are empirically demonstrable in the international venture capital business environment, the domestic factors playing a key deterministic role in startup-valuations are different from investor-side valuation-factors playing a key deterministic role. Furthermore, for some valuation-factors (particularly institutional factors), it is the cross-border differences between markets in these areas that drive valuations. Meanwhile, there are also key differences in which valuation-factors play a dominant role in determining the valuation of domestic deals compared to cross-border deals. Concerning the hypotheses, the data indicate that:

H1a: Target-Market Macroeconomy

The data indicate that domestic macroeconomic and macrofinancial valuation-factors play highly-influential roles in determining startup-valuations. In fact, the valuation-impact is substantially more pronounced in cross-border deals than in domestic deals. This is perhaps the study's most institutive and straightforward finding, given that the findings are in line with existing literature describing the impact of domestic macrofinancial conditions, such as Damodaran (2009) and Kaplan et al. (2009). In particular, factors relating to target-market macroeconomy are what Kaplan et al. (2009) describe as "horse" factors, which they identify as critical for both investment-selection and startup-valuation.

H1b: Target-Market Institutional Governance

The data indicate that domestic macro-level institutional valuation-factors have a slightly negative impact, which is stronger in cross-border deals. While these findings are counter-intuitive and diverge from the findings of La Porta et al., having negative valuation-impacts on startups, it should also be noted that this effect is non-significant or semi-significant for some indicators. Taken in conjunction with the findings relating to valuation-impacts of cross-border differences in institutional governance, it may be the case that the majority of the investment-impact and valuation-impact of country-level institutional governance is concentrated on the cross-border market rather than the domestic market. Furthermore, it should also be noted that their impact is outweighed by impact of industry-level institutional factor included in the regressions.

H2a: Investor-Market Macroeconomy

While not all investor-country macroeconomic and macrofinancial valuation-factors are deterministic, investor-market country-risk-premium and investor-country tax-rates appear to significantly impact startup-valuations. Essentially, while it is the case that the target-market matters more than the investor's home-market matter more concerning macroeconomic growth and business-cycle conditions, it is also the case that investors have tax-liability in their home-markets, whereas the targeted startups might be pre-revenue companies, or might be in a position to actively receive tax-benefits or related-subsidies.

H2b: Investor-Market Institutional Governance

Most investor-country macro-level institutional valuation-factors have a significant and slightly negative impact. The exception is trade-openness. While these findings are counter-intuitive and diverge from the findings of La Porta et al., having negative valuation-impacts on startups, it should also be noted that this effect is observed mainly in internally-focused

governance-indicators, such as investor-protection, whereas trade-openness, a trade-focused indicator has a positive valuation-impacts. Taken in conjunction with the findings relating to valuation-impacts of cross-border differences in institutional governance, it may be the case that the majority of the investment-impact and valuation-impact of country-level institutional governance is concentrated on the cross-border market while investor-market indicators are able to play a deterministic role primarily if trade-openness conditions facilitate it.

H3a: Yield-Chasing

Cross-border business cycle conditions play a significant and deterministic role in influencing startup-valuations, as do both domestic and world cash-on-market. This is corroborated by findings in several tables, ranging from the valuation-impacts of world cash-on-market, to valuation-impacts of cross-border differences in business-cycle indicators and cross-border cash-on-market differences, as well as interactions between the domestic-deal dummy and cash-on-market, where the significant-negative coefficient may indicate that valuation-impacts may be stronger for cross-border-deals. Lastly, this is also corroborated by the larger coefficients that macroeconomic and macrofinancial indicators have in cross-border deals than in domestic deals.

H3b: Safe-Harbors

The data demonstrate that investors migrate their investments towards markets with relatively-lower country-risk premiums, as well as towards markets with relatively-higher competitiveness and investor-protections enshrined by securities law. While it may seem that this investor-priority may be at-odds with yield-chasing, it can also be taken to be an investment strategy in a similar vein, in the sense that cross-border-investments may offer opportunity to diversify and optimize investments in risk-reward-terms.

Interestingly, valuation-impacts of cross-border differences in competitiveness and investor-protection diverge substantially from those of domestic-market indicators in this area. This may indicate that investors concern themselves questions regarding competitiveness and investor-protection substantially more when dealing with cross-border markets than when dealing with home-markets.

The dramatic valuation-impact of cross-border country-risk-premium differences is also indicative of investor-preferences for even small relative-improvements in country-risk-premiums compared to local market-conditions investors face on home-markets. This is corroborated by the increased significance goodness-of-fit of all risk-factors (and regressions which include them) for cross-border deals.

Further Research

This fixed-effects results point to business-environment divergences and fault-lines, which serve as a starting-point to model, capture, and understand further startup-market dynamics. For example, while there has been extensive media and press coverage of the city-level impacts on the startup-and venture capital ecosystem, more formal research is needed examining the actual valuation-impact of various city-level drivers. Concrete factors giving rise to global-level startup-cities deserve further examination, as do the specifics of intra-city and inter-city investment deals. Meanwhile, industry-level effects could also be further systematically examined. While extensive economic research exists on many key industries, their internal characteristics and their dynamics, their impact and relationship to the venture capital ecosystem and to startup valuations demand further research.

Building on this, city-industry cluster-combinations could also be examined with further studies, using either econometric, data-science, or spatial-economic techniques, – or a combination thereof – as a way to more fully-explore the cross-border entrepreneurial finance landscape. This could for example, uncover critical fault-lines, interactions, or population-subsets for whom impacts diverge substantially. A detailed look into these questions might enrich what is known about cross-border valuations to a substantial level of detail.

Furthermore, the results outlined in the interaction tables indicate that further research may be warranted examining interaction-effects on valuations driven by interaction between cross-border investments, macrofinancial valuation-factors, country-level governance-factors, sector-level indicators, and firm-level performance indicators. Whereas this study demonstrated that cross-border valuations are more sensitive to risk-factors than domestic-deals are, future studies might be able to zoom-in further, where perhaps these effects are magnified within specific industry-sectors, or in markets which have specific governance-profile characteristics.

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