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ABSTRACT

This paper examines the impact of government-sponsored venture capitalists (GVCs) on the success of enterprises. Using international enterprise-level data, we identify a surprising non-monotonicity in the effect of GVC on the likelihood of exit via initial public offerings (IPOs) or third party acquisitions. Enterprises that receive funding from both private venture capitalists (PVCs) and GVCs outperform benchmark enterprises financed purely by private venture capitalists if only a moderate fraction of funding comes from GVCs. However, enterprises underperform if a large fraction of funding comes from GVCs. Instrumental variable regressions suggest that endogeneity in the form of unobservable selection effects cannot account for these effects of GVC financing. The underperformance result appears to be largely driven by investments made in times when private venture capital is abundant. The outperformance result applies only to venture capital firms that are supported but not owned outright by governments.

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1. INTRODUCTION

Governments around the world have taken a strong interest in venture capital. This interest stems in part from the fact that some of the world's most influential enterprises, such as Google, Intel or Apple were financed by venture capitalists. In addition, rapidly growing entrepreneurial enterprises are widely thought to be important sources of innovation, employment, and productivity growth. It is therefore not surprising that many governments have sponsored the provision of finance to entrepreneurial ventures.[1] The overall public sector commitment to venture capital in the world as a whole is substantial, including forgone taxes, outright subsidies, preferential regulation, and public provision of investment capital.

Our main objective in this paper is to assess the record of government support for venture capital. Our performance measure is whether an enterprise allowed for successful exit of early investors through an initial public offering (IPO) or a third party acquisition. We seek to assess the impact of investment from government supported venture capitalists (GVCs) on an enterprise's likelihood of such a successful exit. Our main finding is a non-monotonic relationship between GVC investment and exit performance: compared to a benchmark of enterprises financed by private venture capitalists, a small amount of GVC investment appears to be a good thing, but larger amounts of GVC decrease the likelihood of successful exit.

We combine data from Thomson One (f.k.a. VentureXpert) and the Asian Venture Capital Journal to assemble a sample of 21852 enterprises based in 25 countries that received venture capital funding in the 2000–2008 period. Just under half of these enterprises were based in the United States but the data set also contains substantial representation from various European and East Asian economies, along with Australia, Brazil, Canada, India and Israel. The enterprises cover a wide range of industries but have strong representation in technology-intensive sectors. Our unit of analysis is the individual enterprise, although we make use of data concerning multiple rounds of financing from multiple investors for a single enterprise. Our main dependent variable is whether an enterprise achieved an exit. Our main independent variable is the dollar-weighted share of GVC financing received by an enterprise. We also control for a variety of enterprise and other investor characteristics.

To establish the fundamental non-monotonicity result we use two specifications. The first specification estimates higher-order polynomials of the GVC share. We find that a third order polynomial fits the data best, resulting in a wave-like GVC effect as depicted in Figure 1. Our second specification confirms this pattern using a set of categorical (dummy) variables: one for enterprises that receive some of their funding from GVCs but less than 50% ("minority" GVCs); one for enterprises that receive at least 50% but less than 100% of their funding from GVCs ("majority" GVCs); and one for enterprises that receive all of their funding from GVCs ("pure" GVCs). The base category is enterprises financed only by PVCs.

We are primarily interested in how government support affects enterprise success – a treatment effect. We wish to distinguish this treatment effect from any selection effects – GVCs self-select into financing enterprises that would be successful anyway. We consider two distinct selection effects: dynamic selection and unobservable selection. Dynamic

[1] Our working characterization of venture capitalists is that they are financial intermediaries that seek out and invest in high-potential entrepreneurial ventures, predominantly in high- technology sectors, and that often provide managerial assistance to enterprises that they invest in. See Sahlman (1990) for a more detailed discussion.

selection concerns the possibility that more successful enterprises raise more money, eventually also attracting some GVC funding. Under this hypothesis GVCs would invest mostly in later round when enterprises are already further along the path of success. Our empirical analysis does not support the dynamic selection hypothesis: most GVC financing is provided to enterprises that already receive some GVC financing in the first round of VC financing. Furthermore, the non-monotonic GVC effect holds even if we calculate GVC shares based only on the first venture capital round.

Unobservable selection effects arise if GVCs self-select into supporting successful enterprises for reasons that we do not observe. If so, then the GVC identifier is endogenous in that it is affected by success, the dependent variable. The ability to select successful enterprises is in itself of interest, but is distinct from the treatment effect that we wish to identify. To account for the endogeneity associated with unobservable selection effects we use an instrumental variable approach based on local market conditions, similar to Berger et al. (2005). Specifically, for each country and each year we measure the availability of GVC financing. This availability measure is exogenous from the enterprise's perspective, but correlates with the potentially endogenous choice of GVCs. We find that even after instrumentation the GVC effect persists, and retains its non-monotonic character. We are thus unable to reject the hypothesis that the GVC effect is causal, i.e., our evidence favours a non-monotonic effect of GVC finance on enterprise performance.

To further understand the origins of the GVC effect, we break out our sample into different subsamples. We first ask whether the GVC effect is driven by peculiarities of any one country. Almost half the enterprises are in the US, but they do not drive the GVC effect, nor does any other one country.

We then ask whether differences in investment timing account for the GVC effect. Private venture capitalists are known to invest pro-cyclically, so perhaps governments try to counterbalance this pattern by investing counter-cyclically? We establish that the GVC market share decreases in 'hot markets', defined as years when the total supply of venture capital in a particular country is high. Interestingly, the underperformance of majority GVC can then be traced primarily to investments made in such hot markets. Our interpretation is that, especially in times where private venture capital is abundant, GVCs are ill-suited to make investments without substantial inputs from PVCs.

Once a government decides to sponsor venture capital activity, it has to make an important structural decision to either own the venture capital firm itself, or else to support privately owned venture capital firms with policies such as tax credits or matching funds. We examine whether there is a difference between government-owned and government-supported venture capitalists. The main insight here is that the superior performance of minority GVCs applies only to government-supported but not to government-owned venture capital firms. Again we interpret this finding as suggesting that having some market discipline helps make government promotion of venture capital more effective.

Section 2 motivates the analysis from the perspective of the prior literature. Section 3 is devoted to a description of the data. Section 4 contains the main empirical analysis. Section 5 examines model extensions. The conclusion provides some additional discussion.

2. MOTIVATION FROM PRIOR LITERATURE

Early work on venture capital, including Sahlman (1990), and Amit, Glosten, and Muller (1990) emphasizes the importance of both adverse selection and agency problems in venture capital finance and, by inference, in entrepreneurial finance more broadly. The more recent literature explores how VCs with highly relevant technical background experience devote significant effort to obtaining information about particular enterprises and technologies, and then help to add value to these enterprises. See, for example, Amit, Brander and Zott (1998), Hellmann and Puri (2002), Kaplan and Strömberg (2004), Bottazzi, Da Rin and Hellmann (2008), Chemmanur, Krishnan and Nandy (2008), or Fulghieri and Sevilir (2009a). However, the efforts by venture capitalists might not fully offset the market failure arising from asymmetric information in entrepreneurial finance. We might still expect informational asymmetries to imply undersupply of entrepreneurial finance. Therefore, in the presence of asymmetric information of this type it is possible that government intervention might be helpful in partially offsetting the resulting market failure problems. Our research objective in this paper is based in large part on the fundamental question of whether government intervention can improve upon the response of private sector venture capitalists to information problems.

A second type of problem or market failure that is relevant to government intervention in venture capital is the externality associated with R&D and innovation, leading to an underprovision of innovation. One firm's innovation often provides benefits to other firms that can copy or learn from such innovation. These are positive externalities or spillovers. Because the original innovating firm cannot capture these external benefits it might undertake less innovative activity than would be best from a public policy point of view.[2]Much effort has gone into estimating the extent of such externalities. One classic study of this type is Bresnahan (1986). See also Griliches (1992) and Jaffe (1996) for empirical evidence concerning the extent of R&D spillovers. Moreover, a recent literature suggests that venture capital promotes such innovation. See in particular Kortum and Lerner (2000), Gans and Stern (2000) Hellmann and Puri (2000), Hsu (2006) and Ozmel, Robinson and Stuart (2007). In addition, a small literature recognizes that organizational structure among venture capital firms matters. See Hellmann (2002), Fulghieri and Sevilir (2009b), Hellmann, Lindsey and Puri (2008) or Masulis and Nahata (2009). This literature has focussed mostly on comparing corporate venture capital with private independent venture capital, ignoring government venture capital. It is possible that government support for venture capital might boost innovation towards the efficient level by partially offsetting the market failure associated with insufficient innovation.

Only a handful of papers directly address the effects of government intervention on venture capital. Keuschnigg and Nielsen (2003, 2004) theoretically examine the effect of tax policies for venture capital, and Da Rin, Nicodano and Sembenelli (2006) empirically estimate the effect of R&D policies on venture capital. Leleux and Surlemont (2003) and Cumming and MacIntosh (2006) consider 'crowding out' of private venture capital by government sponsored venture capitalists. Lerner (1999, 2002) provides some evidence of success for the US Small Business Investment Research (SBIR) program. The most closely related work to

[2]There is an extensive literature on this subject, a valuable textbook treatment of which is provided by Tirole (1988, Ch. 10).

the current paper is Brander, Egan and Hellmann (2010), which addresses the performance of GVCs and PVCs in Canada. Our paper is also closely related to Lerner (2009), which provides a general critique of government efforts to promote venture capital finance, along with valuable suggestions for improvement. In this book, Lerner notes the need for more systematic research on the role of government in venture capital. This paper is an effort to make a step in that direction.

3. DATA DESCRIPTION

We have two sources of venture capital data. The larger source, which has been widely used by researchers, is the Thomson One (T1) database of venture capital investments (formerly known as VentureXpert) provided by Thomson Reuters. From this database, we use all recorded enterprises that received their first venture capital funding between 2000 and 2008. The sample period was chosen to account for the fact that T1 has only limited international coverage prior to 2000. After 2000, T1 has good coverage for the US and significant coverage for Canada and Europe, along with some but limited coverage for Asia. We were able to augment the T1 data with data from *Asian Venture Capital Journal* (AVCJ), which has good coverage for Asia. The combined dataset contains 21,852 enterprises, of which 2,026 are a net addition due to the AVCJ database. There are 6,307 distinct venture capitalists represented in the data.[3]

It is sometimes difficult to distinguish between true investments in venture capital and investments in other types of private equity, such as investments in large, well-established privately held enterprises. In order to do so, as a first step, we use the categorization provided by T1and AVCJ. We also do some additional checks and eliminate enterprises with more than U$1 billion in sales or that receive more than U$1 billion of investments (as venture capital investments are typically much less).

All variables are defined in Table 1. The primary unit of observation is the enterprise that receives venture capital. Our main dependent variable is EXIT, which is an indicator variable that takes the value 1 if the enterprise went public or was acquired. T1 tends to underreport the exit events, so we also matched the VC-backed enterprises with the Global New Issuance and Mergers and Acquisitions databases in Thomson Reuters. Because we intend exit as a measure of success, we set exit equal to zero if we observe the exit value and find that it is below the total amount of investments. Ideally we would have liked to measure the success of venture capital investments with returns data. Short of that, it is sometime possible to use exit values or exit multiples as a measure of success (Brander, Egan and Hellmann, 2010). This dataset, however, does not offer any such opportunities. As it contains no return data and contains exit values in only 23% of all exits. We note, however, that using exits as a measure of success is standard in the venture capital literature (Gompers and Lerner, 2000; Brander, Amit, and Antweiler, 2002). Importantly, Phalippou and Gottschalk (2009) actually demonstrate a high positive correlation between exit and returns to venture capitalists,

[3]The VC deals identified from T1 and AVCJ were made in 56 countries but with highly skewed distribution across countries. Our analysis focuses on the top 25 countries, which capture 96% of the VC deals among 56 countries. The main results are not affected by the exclusion of the additional 31 countries. The main reason for dropping them is that the instrumental variable approach in Section 4.3 requires each country to have a sufficient number of investments each year.

suggesting that exits are a reasonable measure of success.[4] Finally, it is likely that other aspects of the performance of enterprises such as employment or innovation are also correlated with exit performance.

Our main independent variables relate to the presence of government sponsored venture capitalists. In identifying which venture capitalists are government sponsored venture capitalists (GVCs) there is an issue of definition – what should count as a GVC? We focus on two main channels of activity that serve to identify GVCs. One channel is the direct provision of venture capital through government-owned venture capital funds. The other channel includes all other forms of government support, such as government investments in independently managed venture capital funds that also rely on private investors, tax concessions to venture capitalists, and subsidies to venture capitalists or to supported enterprises. See Brander, Du and Hellmann (2010) for details.

Our dataset includes enterprises from all major regions in the global economy. Table 2 shows the number of enterprises supported by venture capital on a country-specific basis. It indicates that the US accounts for 10,876 enterprises supported by VCs, 49.8% of the total. There is large variation in the frequency of GVC activity by country. In Canada, over 50% of the enterprises had GVC support, whereas in the US the rate of GVC support was only about one-tenth as much – on the order of 5%. China, France and Germany all have relatively high levels of GVC involvement.

Table 3 provides the main descriptive statistics, while Table 4 shows the correlations between the most important variables. Table 3 includes a comparison of enterprises financed entirely by PVCs with those financed in part by GVCs. The last column of Table 3 reports the p-value for the t-test of the difference of means between PVCs and GVCs. We note that 19,934 enterprises (91% of enterprises) in the data set -- received only PVC funding, while the remaining 1,918 enterprises (9% of enterprises) received some GVC support. The variable "Exit" is an indicator variable showing whether a successful exit (IPO or acquisition) occurred. We note that 15.26% of the enterprises with pure PVC finance had successful exits, while 18.93% of the enterprises with some GVC finance had successful exits, with the difference being significant at the 1% level.

4. THE EFFECT OF GVCS ON EXIT

4.1 Empirical results

Our main objective is to assess whether government-sponsored venture capitalists (GVCs) are associated with better or worse enterprise performance than private venture capitalists (PVCs). As described in the previous section, the unit of observation is the enterprise and the primary measure of performance is whether or not the enterprise experiences a successful exit event – either an IPO or a third party acquisition. We use the Probit regression model. If the probability of exit is Y and GVC is a measure of the share of government venture capital, then we are interested in a regression that has the form $Y = f(GVC, X, \varepsilon)$, where X is a vector of control variables and ε is the random error.

[4]We track exits through 2009. Enterprises that were first financed in 2008 or 2007 are clearly less likely to have an exit. Our econometric analysis includes year fixed effects that correct for the enterprises' different time horizons.

We pay particular attention to the functional form of the GVC measure to account for possible non-monotonicity. Our base measure is the share of the enterprise's VC funding that comes from GVCs. For enterprises that are fully funded by PVCs, this variable is zero. At the other extreme, enterprises that receive all of their venture capital finance from GVCs have a value of 1 for this GVC share variable. For all other enterprises, the GVC variable is strictly between 0 and 1. We explore two possible methods for capturing non-monotonicities, one based on higher-order polynomials and the other on partitioning the interval [0,1] for the GVC share using a set of categorical indicator variables.

We seek to explain performance on the basis of the extent of GVC activity after taking account of other factors. We use a complete set of enterprise country fixed effects to control, at least in part, for the many institutional differences across countries. They also control for country-to-country variations in data collection methods. We account for vintage effects by using calendar year fixed effects showing the year in which the enterprise received its first VC investment. These fixed effects are important to account for the mechanical fact that older firms have more time to exit. They also reflect the possibility that investment made in certain years generate better investments than in others, due to the business cycle and other related factors. We also include a set of dummy variables for industry. The data is categorized into the following industries: Biotechnology, Communications and Media, Computer Related, Medical/Heath/Life Science, Semiconductors/Other Electronics, and Non-High-technology. To ensure that the main GVC effects are not driven by other investor characteristics, we also control for average investor experience and for the presence of a foreign investor.[5]

In Panel A of Table 5 we show the results of using various polynomial functions of the GVC share. We denote the GVC share itself by GVC-Share – the linear term in any polynomial, GVC-Share-2– the square of the GVC share, GVC-Share-3– the cubic power, and GVC-Share-4, the fourth power. Column (1) shows that if we simply use a linear form—regressing exit on the GVC share, there is no apparent significance of government venture capital. Even a quadratic form has no significant explanatory power, as shown in column (2). However, the cubic functional form shown in column (3) provides significant explanatory power. Each power of the GVC share is highly significant in itself and the three coefficients are therefore jointly significant.

Figure 1 shows the cubic polynomial that can be traced out using the estimated coefficients of column (3). As can be seen from the figure, the cubic regression implies the striking result that a modest amount of GVC support is a good thing, but high levels are associated with lower exit performance. Column (4) shows that adding higher order polynomials adds essentially no explanatory power. We conclude that the cubic form yields the best fit with the data.

The pattern shown in Figure 1 is quite striking and calls for some interpretation. The basic message is that a little GVC support is associated with good outcomes but that higher levels of GVC support are counterproductive. (We address the issue of causality and possible endogeneity of explanatory variables in section 4.3) It is as if GVC support acts like a complementary productive factor at low levels but becomes a problem once GVCs approach having a dominant position in the financing mix. This finding suggests that there are

[5] In unreported regressions, we also added a dummy variable to capture whether the enterprise had any VC from the U.S., or even a set of dummy variables for investors from all countries in the sample, but found that our main results were not affected by this.

decreasing marginal benefits of GVC finance, with a positive marginal benefit at low levels and a negative marginal benefit at high levels of GVC.

In the appendix we provide a formal derivation of this intuition using a simple production function where PVCs and GVCs can have complementarities. The most interesting insight from the appendix is that such a production function predicts that the relationship between GVC and performance should be characterized by a third-order polynomial, which is in line with our empirical finding.

Our second approach measures the non-monotonicity using categorical variables. The results are reported in Panel B of Table 5. The simplest categorical approach is to divide the sample of enterprises into just two categories: those that received some GVC finance and those that did not. Over 90% of all enterprises are funded purely by PVCs. We therefore use this as our omitted or base category. Column (1) shows the results of a regression using only the GVC indicator as an explanatory variable, along with the standard control variables. The GVC indicator is statistically significant at the 5% level, suggesting that there is a positive association between GVC finance and exit performance. However, the polynomial analysis above suggests that we should use a finer partition of the GVC share to identify possible non-monotonicities.

Approximately 3% of the enterprises are fully funded by GVCs, and we can treat these enterprises as a distinct category. For the values of GVC strictly between zero and one, where there is mixed financing we can partition the interval (0,1) in different ways. In column (2), GVC-Minor refers to enterprises with mixed funding that get less than 50% of their funding from GVCs while GVC-Major refers to enterprises with mixed funding that get 50% or more (but less than 100%) of their funding from GVCs. While the first column shows that overall GVC has a small positive effect, the second column reveals a strong non-monotonic effect. Enterprises receiving a minority share of their VC funding from GVCs have significantly better exit performance than the base category of no GVC funding. However, enterprises with the majority of their venture capital funding (but less than 100%) coming from GVCs have significantly worse exit performance than enterprises with pure PVC funding (and therefore have much worse performance than those with a minority GVC share). Those enterprises with pure GVC funding have exit performance that is very similar to the pure PVC enterprises.

The third result column provides yet another representation of the data. GVC-1st tercile refers to enterprises with mixed funding that get less than one third of their funding from GVCs, GVC-2nd tercile to those that get between one and two thirds from GVCs, and GVC-3rd tercile that get more than two thirds (but less than 100%) of their funding from GVCs. Enterprises with a positive but low GVC share – less than a third – have very good exit performance with the effect being highly significant in both statistical and economic terms. Enterprises in the intermediate category – with between 1/3 and 2/3 of their funding from GVCs – have exit performance that is not significantly different from and very similar to the base category of pure PVC enterprises. Enterprises with a high GVC share, but less than 100% have worse exit performance than the base category. Finally, enterprises with only GVC funding are similar to the base category.

This categorical characterization closely matches the result from the cubic polynomial in Figure 1. We also tried finer partitions of the data with, for example, four interior categories or five interior categories, but no additional structure becomes apparent. We conclude that the

results from Panel B of Table 5 confirm the results from Panel A. For the subsequent analysis we will focus on the specifications of column (3) of Panel A and column (2) in Panel B of Table 5, as these provide a succinct characterization of the main non-monotonic effect that lends itself to further analysis.

While we believe that exits are a better performance measure than IPOs (which only occur in less than 5% of all enterprises), in unreported regressions we examined whether the effects of GVC continue to apply when using IPOs as the dependent variable. We find that the overall pattern is preserved, although fewer coefficients reach standard levels of statistical significance.[6]

4.2 Fundraising and dynamic selection

Do the effects of GVC in Table 5 arise simply because of the amount of funding provided? To examine this we first need to establish the relationship between GVC and funding amounts. Table 3 indicates that there are no significant differences in the amount of funds raised by GVC-backed enterprises, but that enterprises with minority GVC raise significantly more funding, while enterprises with majority or pure GVC raise significantly less.[7] Controlling for the amount of funding may thus be important. Panel A of Table 6 reports the results when adding a control for the amount of funding. Column (1) reports the preferred categorical specification and column (2) the preferred polynomial specification. We find that all the GVC coefficients retain their signs and significance levels, suggesting that the results are not driven by investment amounts.

A related concern is that enterprises with large funding needs eventually add GVC financing. Could the GVC effect due to some 'window dressing' effect where GVCs add a little money to larger deals at a later stage? We note that of the 1918 enterprises with GVC financing, 1560 (i.e., 81.3%) already receive some GVC financing in their first round. We then separate early from later stage investments. In unreported regressions we find that enterprises that received minority GVC investment as part of their first round were more likely to have follow-up rounds, and also raised larger amounts. This suggests that enterprises with minority-GVC funding behave differently from the start. Panel B of Table 6 shows exit regressions using only first-round GVC measures, i.e., assigning enterprises to different investor classes based only on their initial round. We also control for the amount of funding in the first round.[8] We find similar results as before, except that the coefficient on GVC-Major, although still negative, is no longer significant at conventional significance levels**.** The polynomial specification continues to be significant and retains a shape similar to that of Figure 1.

4.3 Unobservable selection

While the analysis of Section 4.2 addresses one type of selection effect – the possibility of investing at a later stage – we also need to be concerned about other selection effects, in

[6] Details are available upon request.
[7] In unreported regression we verified that these correlations continue to hold in a regression framework with our usual enterprises and investor controls.
[8] Using the total investment amount instead of the first round investment amount does not affect any of our results.

particular selection based on variables known by GVCs but unobservable to us. More specifically, it is possible that both successful exit and the presence of GVC finance are affected by an omitted factor – enterprise potential – making the GVC explanatory variable endogenous.

A standard approach to dealing with potential endogeneity of this type is to use instrumental variables. We need instruments that are themselves exogenous in the sense that they are not affected by the exit performance of the specific enterprise (the so-called "exclusion" restriction). However, the instruments do need to be related to the GVC share of the enterprise: they need to be variables that would identify exogenous variations in the GVC share. For the instrument we suggest that, other things equal, GVC shares would tend to be higher when the general availability of government supported venture capital is high. That is, we expect a given enterprise to have more GVC investment, other things equal, if that enterprise is seeking funding in a time and place when GVC funding is in plentiful supply. In the corporate finance literature, this approach of using local financing availability as instruments, specifically using local market aggregates, goes back to the seminal work by Berger et al. (2005).

In our case, we can use the availability of GVC in a given country in a given year as the basis for constructing instruments. We thus consider each country-year as a separate local market. For each such market we calculate the fractions of enterprises that receive a financing round where GVCs provide a minority, majority, or all of the funding. Because a firm may be fundraising at different points in time, we then weight each fundraising event by the fraction of dollars raised in that round relative to the total amount of funds raised by the enterprise. Thus, in effect, we construct an instrument representing the overall availability of GVC funding, broken down by each type of GVC financing. These instruments are continuous variables and can readily be used in both the categorical and polynomial regression models. We also construct analogous instruments for the first-round GVC variables.

In the unreported first stage regressions we find that the instruments are statistically highly significant in terms of predicting the variables of interest.[9] Moreover, the F-test for their joint significance for all IV regressions in Table 7 is significant at the 1% level, suggesting that all instruments are significantly correlated with the endogenous variables. Table 7 then shows the (second stage) instrumented regressions. The main insight is that all coefficients that were significant in Table 6 remain significant, although their level of significance varies to some extent. The Wald statistics rejects the hypothesis of exogeneity. This suggests that there may be some endogenous self-selection, which justifies the use of instruments.[10] However, once the endogenous selection effects are purged using instrumental variables, it appears that a treatment effect remains. Put differently, the by now familiar non-monotonic effect on exit performance remains present even after controlling for unobservable selection effects.

While the results of Table 7 suggest that our effects 'survive' endogeneity tests, we also want to add a word of caution. We believe that our instruments are reasonable, and the best available, but they also have limitations. One obvious limitation is the absence of any true

[9] Specifically, the IV for GVC-Minor is significant at 1% for GVC-Minor. The same pattern applies with IV for GVC-Major and GVC-Major, as well as for the IV of GVC-Full and GVC-Full. In the first stage of the polynomial specification, at least two of the three instrument variables are significant at 1% for each of the variables GVC-Share-1/2/3. In unreported regressions we also considered higher order polynomials of market aggregates but found them to be weak instruments.

[10] Since we have three variables and three instruments no test of overidentification is possible.

natural experiment, something that would be particularly hard to come by in our cross-country setting. Another limitation is that while our instrumental variable approach can account for unobservable selection patterns *within* markets, it cannot (and doesn't claim to) capture a higher level of endogeneity between market conditions and the availability of government GVC support, i.e., the possibility that governments deliberately choose to be more active in certain markets than others. This doesn't pose a problem for the estimation of Table 7 which is concerned with endogeneity at the enterprise level, but it does raise an interesting question of whether market circumstances - and in particular whether governments are more or less active - affect the relationship between GVC and exit performance. The next section will turn to this issue.

5. BREAKING OUT THE GVC EFFECT

The analysis of Section 4 identifies a non-monotonic effect of GVC and suggests that reverse causality does not seem to be the driving force behind this finding. In this section we seek to deepen our understanding of why such an effect might arise. For this we break out the data into subsamples, to identify under which circumstances the GVC effect is most prevalent.

5.1Is the effect program specific?

A natural question to ask is whether the effect is driven by the peculiarities of one country. Almost half of the enterprises in our sample are US enterprises, so the main concern here is that the GVC effect stems from specifics of the US government's approach to venture capital.

To examine this we divide our sample into two subsamples, one for US enterprises and the other for non-US enterprises. The first two columns of Table 8 compare the financing mix for U.S. versus non-U.S. enterprises. We find that enterprises outside the US are almost three times as likely to receive some GVC funding (12.98% outside the US versus 4.53% in the US). Moreover, GVC-Major and GVC-Pure account for less than 1% (less than 100 enterprises) in the US. This shows that GVCs play a relatively minor role in the US venture capital market.[11]

To examine whether the GVC effect is driven by the US, we rerun the exit regression within the two subsamples. Throughout this section we limit our attention to the categorical regression model with all rounds (Column 1 of Table 6).[12] The first pair of columns in Table 9 reports the results of separating the US and non-US samples. For enterprises outside the US we observe the familiar pattern that GVC-Minor is positive and significant while GVC-Major has a significant negative effect. For US enterprises we observe the same signs, but the coefficients are smaller and statistically insignificant. This suggests that the US is not responsible for the non-monotonic GVC effect. In unreported regressions we also verified that

[11] Another way of putting the point is that the private venture capital market in the U.S. is so large that it swamps the segment of the market supported by governments. In absolute terms, however, total GVC support in the U.S. is substantial. Indeed, the total number of enterprises with GVC support in the U.S. substantially exceeds that of any other country.

[12] This specification is the easiest to interpret. It also has the larger number of GVC investments, which helps in the subsamples.

the results continue to hold if we eliminate any other country from the sample. We thus conclude that the main GVC effect is not specific to any one country.

5.2Timing of investments

It is well known that venture capital markets are highly cyclical (Gompers and Lerner, 2001). One of the possible roles of government in venture capital markets is to ensure a more steady supply of funds, possibly overcoming market herding effects. If GVCs are relatively stable or steady investors compared with PVCs, does this explain some of the performance differences?

To examine the importance of pro- vs. counter-cyclical timing, we develop a simple measure of hot vs. cold markets. We define a market as 'hot' if the aggregate amount of funds raised by enterprises in a particular country and a particular year is above the average amount of funds raised in that country. To be able to uniquely classify enterprises into hot versus cold cycles, we only focus on their first venture capital round.[13] The second pair of columns in Table 8 shows how the market shares of the various types of GVCs differ by hot vs. cold markets. We find a striking result that GVCs have indeed a much higher market share in cold markets (11.24%) than in hot markets (7.35%). Moreover, this pattern holds true (and is statistically significant at the 1% level) across all three types of GVC financing (minority, majority and pure GVC). Interestingly, enterprises initially financed in cold markets have a higher rate of successful exit (16.98% vs. 14.77%).

To ask whether the counter-cyclical timing of GVC investment helps to explain the performance of enterprises supported by GVCs we rerun the exit regressions within the hot vs. cold market subsamples. The second pair of columns in Table 9 shows that minority GVCs have a superior performance in both hot and cold markets, although the coefficient is larger and more significant for hot markets. Moreover, the GVC-Major coefficient is insignificant for cold markets but much more negative and highly significant for hot markets. This suggests that timing does matter. The most important finding is that the underperformance of majority GVC investment occurs only in hot markets. Our interpretation is that in times where private venture capital is abundant, GVCs are less likely to succeed if they dominate the investment in a particular enterprise. However, in times where private venture capital is sparse, this is less of a problem.

5.3 Types of government intervention

Once a government is convinced of the need for intervention, a key question becomes the mechanism of intervention. There is a long-standing debate in the field of public economics regarding the benefits of government ownership versus regulation (De Alessi, 1974). La Porta, Lopez-De-Silanes and Shleifer (2002), for example, examine the benefits of government ownership versus regulation of banks. In the context of venture capital, the main trade-off is between the government owning and operating a venture capital fund versus the government using a variety of support mechanisms for otherwise privately owned venture

[13] An alternative would be to classify enterprises into hot markets if more than half of their entire funding was raised in hot markets. This alternative definition generates very similar results.

capital funds. Examples of government-owned venture capital funds include Singapore's EDBI, Canada's Business Development Bank, or In-Q-Tel, the CIA's own venture capital fund in the US. Examples of government-supported venture capital funds include the US SBICs which receive matching funds from the government, Canada's Labor-sponsored venture capital corporations, which benefit from tax credits, or the UK's Innovation Investment Fund, which acts as a fund of funds.

We thus break out GVCs into two subcategories: government-owned (GOVCs) and government-supported (GSVCs). We classify an enterprise as GOVC-backed whenever at least one of its investors is a GOVC. The third pair of columns in Table 8 focuses on GVC-backed enterprises and shows the distribution of enterprises receiving GOVC vs. GSVC. GOVC-backed enterprises account for just under 30% of all GVC-backed enterprises. GOVCs are more likely to be majority or full investors, whereas GSVCs are more likely to be minority investors.

The third pair of columns in Table 9 compares the performance of GOVCs vs. GSVCs. Unlike the previous two models of Table 9, we cannot just create separate subsamples, since the distinction between GOVCs vs. GSVCs has no equivalent among PVCs. We therefore estimate the model in the full sample, but breaking out the GVC effects into two subgroups. The main result is that the superior performance of minority GVCs can be attributed to GSVCs. Minority GOVCs don't have a significant effect on exits whereas the coefficient for Minority GSVC is large and highly significant. For majority GVCs the effect is slightly more negative for GOVCs than for GSVCs, although both coefficients have similar significance levels with P-values of 10.9% for GOVCs and 11.6% for GSVCs.

Our interpretation of this result is that government ownership poses an obstacle to effective cooperation between GVCs and PVCs. GOVCs are less likely to take minority positions, and if the do, they are less successful. Instead they focus on taking majority stakes (including pure GVC financing) resulting in weaker performance. A likely reason for this lower level of cooperation with private market investors is that GOVCs are likely to have multiple objectives that may interfere with the pure profit orientation of PVCs.

6. CONCLUDING REMARKS

This paper compares the exit performance of enterprises that obtained at least part of their funding from government sponsored venture capitalists (GVCs) with those that received funding from just private venture capitalists. Our most striking result is something we have not seen mentioned in previous work: GVC activity seems to have a non-monotonic relationship with successful exits (IPOs and acquisitions). A modest amount of GVC finance seems to improve the performance of entrepreneurial ventures relative to ventures supported purely by private venture capitalists (PVCs). However, high levels of support from GVCs are associated with weaker performance. Thus, a little bit of government support appears to be a good thing but too much government support has the opposite effect.

Our dataset has the advantage of being a large sample with broad international coverage of venture capital investment. However, it does not allow us to go very far in looking 'inside the black box' by assessing what these venture capitalists do for their client enterprises, aside from providing funds. Prior work of Hellmann and Puri (2000, 2002) and Bottazzi, Da Rin

and Hellmann (2006) uses survey-based data to identify the sources of venture capitalists' value-added, while Chemmanur et al. (2008) use census data to examine total factor productivity. The evidence in this paper suggests that GVCs may be helpful in providing certain kinds of support, including financial support, but may become less useful when they have actual control over business decisions. If they lack control then the usual concerns about governments subverting sound economic objectives to achieve alternative objectives are less likely to arise. Put differently, the results of this paper suggest that GVC finance may be at its most effective when it remains disciplined by private venture capital. Future research might look at exploring the precise channels through which this market discipline works.

This paper focuses on one important summary performance measure: successful exits. While this measure is correlated with other performance measures, such as investor returns, employment and innovation, future research investigating such measures in greater detail would be a valuable complement to this paper.

Our analysis shows that there are significant differences between government ownership and government support of venture capital firms, broadly suggesting that support outperforms ownership. However, there are a variety of support mechanisms that governments use, including matching funds, tax credits, fund of funds, along with other policies. A question for future research is which of these approaches is most effective, both from a government fiscal perspective, as well as from a broader social policy perspective.

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Table 1: List of Variables

Variable Name	Definition
Exit	Dummy variable, equal to 1 if the enterprise provides successful exits for its investors through IPO or acquisition. Exit is set to 0 if exit value is known to lie below the total amount of investments received by the enterprise.
GVC-Share	Total amount of funding provided by GVCs divided by total amount of funding provided by all investors; funding is calculated over all financing rounds. If in any round no information is available on the relative amounts provided by the different investors, it is assumed that all investors provided equal amounts.
GVC-Share-2/3/4	The second, third and fourth order polynomial of GVC-Share.
GVC Indicator	Dummy variable, equal to 1 if there is at least one GVC that investing in the enterprise; otherwise equal to 0.
GVC-Minor	Dummy variable, equal to 1 if GVC-Share is greater than 0 and strictly less than 0.5.
GVC-Major	Dummy variable, equal to 1 if GVC-Share is greater or equal than 0.5 and strictly less than 1.
GVC-Pure	Dummy variable, equal to 1 if GVC-Share is equal to 1.
FRGVC-(...)	Same as above GVC measures, except that the funding shares are based solely on the enterprise's first round of funding.
Total Investment	The natural logarithm of the total amount of funding received by the enterprise.
FR Investment	The natural logarithm of the amount of funding received by the enterprise in the first financing round.
Country fixed effects	A set of dummy variables for each country, that takes the value 1 if the enterprise is from that country; 0 otherwise
Industry fixed effects	A set of dummy variables for the following industries: Biotechnology, Communications and Media, Computer Related, Medical/Heath/Life Science, Semiconductors/Other Electronics, and Non-High-technology. Each dummy takes the value 1 if the enterprise is from that industry; 0 otherwise
Year fixed effects	A set of dummy variables for each year between 2000 and 2008, that takes the value 1 if the enterprise received its first venture capital round in that year; 0 otherwise
Investor Experience	The enterprise's average investor experience is the dollar-weighted average of its investors' experiences, which is calculated as the number of enterprises financed in the past five years prior to the current financing round.
Foreign VCs	The fraction of financing provided by foreign VCs.

Table 2: Venture Capital Activities

This table presents VC activities in25 countries between 2000 and 2008. All variables are defined in Table 1. The unit of observation is the individual enterprise. Number of Enterprises reports number of enterprises financed by VCs. Enterprises with GVC finance (%) reports percentage of enterprises financed by at least one GVCs. Enterprises with an exit (%) and Enterprises with an IPO (%) report percentage of enterprises that provide VCs with successful exits or IPOs, respectively.

Country name	Number of Enterprises	Enterprises with GVC finance (%)	Enterprises with an exit (%)	Enterprises with an IPO (%)
United States	10876	4.53	17.41	1.56
United Kingdom	1515	3.37	12.94	3.96
South Korea	1393	4.09	13.21	13.93
China	1309	21.08	15.66	13.29
India	857	17.74	14.94	7.23
France	816	24.88	12.38	4.04
Japan	772	1.17	14.64	8.29
Australia	660	4.09	18.18	8.79
Germany	492	34.76	10.57	3.66
Canada	427	51.99	21.78	6.09
Israel	358	13.97	13.41	4.47
Sweden	313	2.88	12.14	2.56
Spain	251	1.99	7.57	1.59
Finland	205	8.29	9.76	0.98
Brazil	179	27.37	12.29	6.15
Denmark	174	4.02	8.62	2.30
Singapore	165	5.45	18.18	7.88
Netherlands	163	1.23	6.13	2.45
Ireland	158	9.49	9.49	0.63
Belgium	150	25.33	8.00	3.33
Italy	147	7.48	9.52	4.08
Hong Kong	130	11.54	20.00	16.92
New Zealand	120	4.17	10.83	3.33
Switzerland	118	20.34	15.25	1.69
Norway	104	0.96	19.23	11.54

Table 3: Descriptive Statistics

This table describes the sample in which the unit of observation is the individual enterprise. Mean and Standard Deviation of variables are reported for the entire sample, the PVC sample, and the GVC sample. The last column report P-values of differences in means between the PVC sample and the GVC sample, based on the two-sample T Test (two-sided) assuming unequal variance. All variables are defined in Table 1.

	Entire Sample			PVC		GVC		PVC-GVC
Variable	Obs.	Mean	S.D.	Mean	S.D.	Mean	S.D.	
EXIT	21852	0.1558	0.3627	0.1526	0.3596	0.1893	0.3918	0.0001***
IPO	21852	0.0445	0.2063	0.0419	0.2003	0.0719	0.2585	0.0000***
GVC-Indicator	21852	0.0878	0.2830	0.0000	0.0000	1.0000	0.0000	
GVC-Minor	21852	0.0422	0.2010	0.0000	0.0000	0.4807	0.4998	
GVC-Major	21852	0.0206	0.1420	0.0000	0.0000	0.2346	0.4239	
GVC-Pure	21852	0.0250	0.1561	0.0000	0.0000	0.2847	0.4514	
FRGVC-Minor	21852	0.0209	0.1429	0.0000	0.0000	0.2377	0.4258	
FRGVC-Major	21852	0.0203	0.1409	0.0000	0.0000	0.2310	0.4216	
FRGVC-Pure	21852	0.0302	0.1713	0.0000	0.0000	0.3446	0.4754	
Total Investment	21852	24.539	57.528	24.434	58.1972	25.6319	50.042	0.3240
FR Investment	21852	9.1146	19.818	9.0978	19.9754	9.2895	18.113	0.6609
Investor Experience	21852	27.4418	44.549	28.258	46.0142	18.9578	22.947	0.0000***
Foreign VCs	21852	0.1565	0.3186	0.1537	0.3208	0.1856	0.2925	0.0000***
Non-High-Tech	5479	25.07		25.08		24.97		0.9163
Biotechnology	1346	6.16		5.97		8.08		0.0011***
Communications and Media	2971	13.6		13.6		13.56		0.9571
Computer Related	8541	39.09		39.49		34.93		0.0001***
Medical/Health/ Life Science	1866	8.54		8.52		8.71		0.7849
Semiconductors/ Other Electronics	1649	7.55		7.33		9.75		0.0006***
2000	6120	28.01		28.19		26.12		0.0497**
2001	2704	12.37		12.04		15.8		0.0000***
2002	1513	6.92		6.66		9.7		0.0000***
2003	1403	6.42		6.16		9.18		0.0000***
2004	1577	7.22		7.15		7.87		0.2625
2005	1851	8.47		8.53		7.82		0.2689
2006	2233	10.22		10.36		8.76		0.0188**
2007	2360	10.8		11.12		7.46		0.0000***
2008	2091	9.57		9.79		7.3		0.0001***
No. of Enterprises	21852			19934		1918		

Table 4

The matrix is based on the sample of 21,852enterprises. All variables are defined in Table 1. We use ***, **, and * to denote significance at the 1%, 5%, and 10% level, respectively.

ID	Variable Name	1	2	3	4	5	6	7	8
1	Exit	1							
2	GVC-Indicator	0.0286***	1						
3	GVC-Minor	0.0529***	0.6766***	1					
4	GVC-Major	-0.0152*	0.4675***	-0.0304***	1				
5	GVC-Pure	-0.0025	0.5161***	-0.0336***	-0.0232***	1			
6	Total Investment	0.0532***	0.0059	0.0681***	-0.0311***	-0.0488***	1		
7	Investor Experience	0.0213***	-0.0591***	-0.0176***	-0.0337***	-0.0538***	0.1071***	1	
8	Foreign VCs	0.0295***	0.0259***	0.0636***	-0.0048	-0.0262***	0.0159**	0.1239***	1

Table 5: Effects of GVC on Exit

Panel A: GVC on Exit – Polynomials

The unit of observation in these Probit regressions is the individual enterprise. All variables are defined in Table 1. All FE stands for All Fixed Effects, meaning country industry and year fixed effects. Robust and clustered standard errors at the enterprise's country level are reported in parentheses, where ***, **, and * denote significance at the 1%, 5%, and 10% levels (two-sided), respectively.

	(1)	(2)	(3)	(4)
VARIABLES	Exit	Exit	Exit	Exit
GVC-Share	0.0367	0.377	3.555***	4.686***
	(0.0905)	(0.332)	(0.637)	(1.443)
GVC-Share-2		-0.389	-11.50***	-18.96**
		(0.347)	(1.719)	(8.655)
GVC-Share-3			8.011***	22.02
			(1.156)	(15.43)
GVC-Share-4				-7.690
				(8.205)
Investor Experience	0.0003	0.0003	0.0003	0.0003
	(0.0005)	(0.0005)	(0.0005)	(0.0004)
Foreign VCs	0.185**	0.183**	0.176**	0.175**
	(0.0818)	(0.0836)	(0.0829)	(0.0823)
All FE	YES	YES	YES	YES
Constant	-0.814***	-0.817***	-0.822***	-0.825***
Pseudo R-squared	0.0857	0.0859	0.0875	0.0876
No. of Obs.	21852	21852	21852	21852

Table 5 (continued)

Panel B: GVC on Exit - Categorical variables

The unit of observation in these Probit regressions is the individual enterprise. All variables are defined in Table 1, except for GVC-1st Tercile, which is a dummy variable, equal to 1 if GVC-Share is strictly greater than 0 and strictly less than 1/3, GVC-2nd Tercile, which is a dummy variable, equal to 1 if GVC-Share is greater or equal than 1/3 and strictly less than 2/3, and GVC-3rd Tercile, which is a dummy variable, equal to 1 if GVC-Share is greater or equal than 2/3 and strictly less than 1. All FE stands for All Fixed Effects, meaning country industry and year fixed effects. Robust and clustered standard errors at the enterprise's country level are reported in parentheses, where ***, **, and * denote significance at the 1%, 5%, and 10% levels (two-sided), respectively.

	(1)	(2)	(3)
VARIABLES	Exit	Exit	Exit
GVC-Indicator	0.127**		
	(0.0523)		
GVC-Minor		0.245***	
		(0.0710)	
GVC-Major		-0.162**	
		(0.0720)	
GVC-1st Tercile			0.288***
			(0.0711)
GVC-2nd Tercile			0.0014
			(0.106)
GVC-3rd Tercile			-0.321*
			(0.194)
GVC-Pure		0.0733	0.0725
		(0.0960)	(0.0959)
Investor Experience	0.0003	0.0002	0.0002
	(0.0004)	(0.0004)	(0.0004)
Foreign VCs	0.176**	0.163**	0.163**
	(0.0866)	(0.0815)	(0.0820)
All FE	YES	YES	YES
Constant	-0.835***	-0.830***	-0.828***
Pseudo R-squared	0.0863	0.0873	0.0873
No. of Obs.	21852	21852	21852

Table 6: Effects of GVC on Exit: Controlling for Total Investment

Panel A: Base model

The unit of observation in these Probit regressions is the individual enterprise. All variables are defined in Table 1. All FE stands for All Fixed Effects, meaning country industry and year fixed effects. Robust and clustered standard errors at the enterprise's country level are reported in parentheses, where ***, **, and * denote significance at the 1%, 5%, and 10% levels (two-sided), respectively.

	(1)	(2)
VARIABLES	Exit	Exit
GVC-Minor	0.172***	
	(0.0587)	
GVC-Major	-0.171**	
	(0.0808)	
GVC-Pure	0.118	
	(0.0855)	
GVC-Share		2.931***
		(0.538)
GVC-Share-2		-9.866***
		(1.498)
GVC-Share-3		7.045***
		(1.042)
Total Investment	0.0712***	0.0716***
	(0.0134)	(0.0138)
Investor Controls	YES	YES
ALL FE	YES	YES
Constant	-0.929***	-0.925***
Pseudo R-squared	0.0933	0.0936
No. of Obs.	21852	21852

Table 6 (continued)

Panel B: First rounds model

	(1)	(2)
VARIABLES	Exit	Exit
FRGVC-Minor	0.206***	
	(0.0734)	
FRGVC-Major	-0.0882	
	(0.0894)	
FRGVC-Pure	0.0360	
	(0.0903)	
FRGVC-Share		2.591***
		(0.780)
FRGVC-Share-2		-8.096***
		(2.383)
FRGVC-Share-3		5.549***
		(1.686)
FR Investment	0.106***	0.106***
	(0.0130)	(0.0131)
Investor Controls	YES	YES
ALL FE	YES	YES
Constant	-0.917***	-0.607***
Pseudo R-squared	0.0959	0.0959
No. of Obs.	21852	21852

Table 7: Exit Regressions with Instrumental Variables

This table reports results of second stage instrumental variable Probit regressions. The unit of observation is each individual enterprise. All variables are defined in Table 1. All FE stands for All Fixed Effects, meaning country industry and year fixed effects. The instruments are based on local markets, defined as country – year pairs. For each financing round we calculate the fraction of enterprises that received funding in that market under the GVC-minor, GVC-major and GVC-Pure categories. For each enterprise we then calculate the dollar-weighted average of these market fractions. Due to non-convergence of the maximum likelihood estimators, the Heckman two-step procedure was followed. Standard errors at the enterprise's country level are reported in parentheses, where ***, **, and * denote significance at the 1%, 5%, and 10% levels (two-sided), respectively.

Panel A: Base model

	(1)	(2)
VARIABLES	Exit	Exit
GVC-Minor	1.269**	
	(0.630)	
GVC-Major	-3.358***	
	(1.076)	
GVC-Pure	0.442	
	(0.487)	
GVC-Share		31.46***
		(9.812)
GVC-Share-2		-[]109.7***
		(32.37)
GVC-Share-3		78.72***
		(22.95)
Total Investment	0.0594***	0.0565***
	(0.0126)	(0.0116)
Investor Controls	YES	YES
ALL FE	YES	YES
Constant	-0.883***	-0.881***
No. of Obs.	21852	21852

Table 7 (continued)

Panel B: First rounds model

	(1)	(2)
VARIABLES	Exit	Exit
FRGVC-Minor	3.415***	
	(1.189)	
FRGVC-Major	-0.836	
	(1.041)	
FRGVC-Pure	0.0095	
	(0.404)	
FRGVC-Share		48.35***
		(17.14)
FRGVC-Share-2		-144.3***
		(53.33)
FRGVC-Share-3		96.10***
		(36.46)
FR Investments	0.0833***	0.0823***
	(0.0131)	(0.0132)
Investor Controls	YES	YES
ALL FE	YES	YES
Constant	-0.592***	-0.586***
No. of Obs.	21852	21852

Table 8: Breakout for investments

This table tabulates the means of GVC measures and EXIT by whether or not the enterprise is located in the U.S., whether or not the enterprise was first financed in a hot market, and whether or not the enterprise receives any funding from VCs fully owned by the government. While the location and investment timing are constructed based on the entire sample, full government ownership is constructed based on a sub-sample where the enterprises receive funding from at least one GVC. We performed a t-test for the difference across the two subsamples, and use ***, **, and * to denote significance at the 1%, 5%, and 10% levels (two-sided), respectively.

	Enterprise is located		Enterprise was first financed in		GVC is	
	in US	outside US	hot market	cold market	government-owned	government-supported
GVC Indicator	0.0453***	0.1298	0.0735***	0.1124	NA	NA
GVC-Minor	0.0323***	0.052	0.0368***	0.0515	0.3876***	0.5196
GVC-Major	0.0084***	0.0327	0.0167***	0.0272	0.2743**	0.2180
GVC-Pure	0.0047***	0.0451	0.0403***	0.0692	0.3381***	0.2624
EXIT	0.1741***	0.1378	0.1477***	0.1698	0.1487***	0.2062
No. of obs.	10876	10976	13855	7997	565	1353

Table 9: Breakout of exit regressions

The unit of observation in these Probit regressions is the individual enterprise. The first two columns report regression results based on two sub-samples in which the enterprise are located in or outside of U.S. Columns (3) and (4) report regression results based on two sub-samples in which the enterprises were first financed in the hot market or cold market. Regressions in Columns (5) and (6) are based on one Probit regression where the three GVC variables are interacted with an indicator variable of whether any of the GVCs was government-owned. All variables are defined in Table 1. 'All other controls' includes Total Investment, Investor Experience, Foreign VCs, Country, Industry, Year dummies. Robust and clustered standard errors at the enterprise's country level (except for the within US subsample) are reported in parentheses, where ***, **, and * denote significance at the 1%, 5%, and 10% levels (two-sided), respectively.

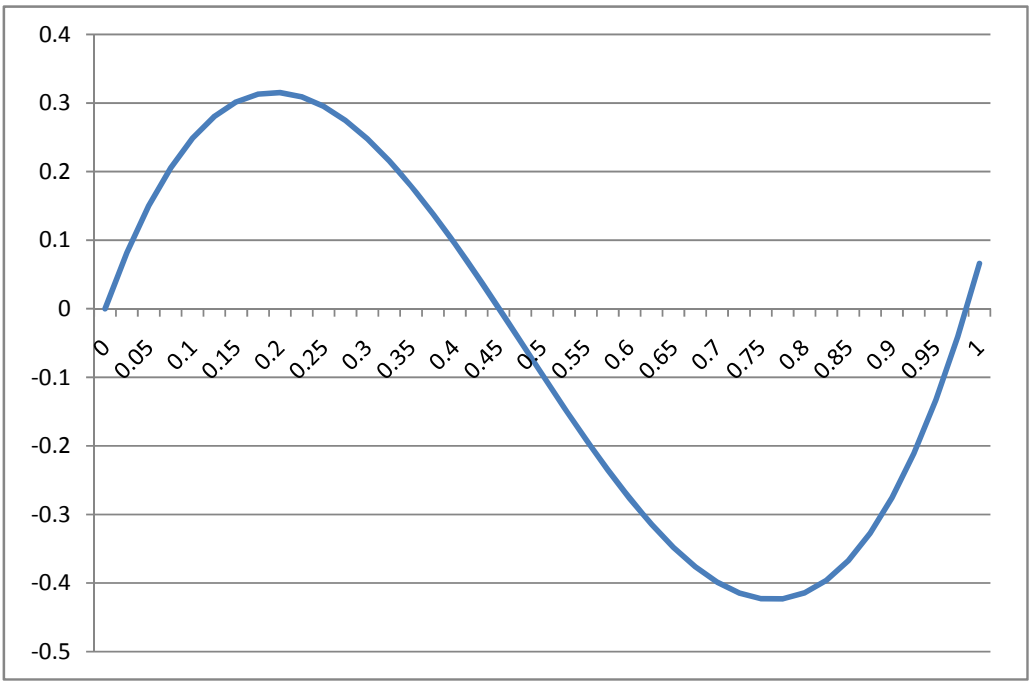
	Enterprise is located		Enterprise was first financed in		GVC is	
	in US	outside US	hot market	cold market	government-owned	government-supported
GVC-Minor	0.119	0.212**	0.210***	0.116**	0.0294	0.207***
	(0.0760)	(0.100)	(0.0789)	(0.0564)	(0.189)	(0.0659)
GVC-Major	-0.0054	-0.207*	-0.260***	-0.0867	-0.246	-0.143
	(0.167)	(0.108)	(0.0890)	(0.0989)	(0.156)	(0.0892)
GVC-Pure	0.203	0.107	0.194	0.0554	0.215	0.0696
	(0.220)	0.212**	(0.138)	(0.115)	(0.180)	(0.0902)
All other controls	Yes	Yes	Yes	Yes		Yes
Pseudo R-Square	0.1276	0.0706	0.1107	0.0835		0.0935
No. of Obs.	10876	10976	13855	7997		21852

Figure 1: The effect of GVC share on exit

This graph shows the shape of the third order polynomial that is implied by the coefficients of the regression in Column 3 of Table 5. Specifically, it shows the equation

$$Y = 3.555*GVC - 11.500*GVC^2 + 8.011*GVC^3.$$

Note that the vertical y-axis does not measure a probability, it only shows the coefficient values for the (non-linear) Probit model. Moreover, note that the equation above has no intercept, implying that y= 0 represents that case of no GVC funding.



APPENDIX:

Theoretical interpretation of decreasing complementarities

To interpret the fundamental non-monotonicity of Table 5 it is useful to briefly consider a mathematical representation of the interaction between GVC finance and PVC finance in generating successful exit events. This is far from a full-fledged economic theory, but helps to clarify our interpretation of the main results from Table 5. Let us think of exit as the output of a production function, where we focus on the investor mix as the key input, and where all other inputs X enter separately into the production function. We use the following simple functional form:

$$Y = a*PVC + b*GVC + c*PVC*g(GVC) + h(X)$$

where $g(GVC) = d*GVC - e*GVC^2$, a,b,c,d,e> 0, and where h(X) is a general production function for all the other inputs X.

The interesting part of this production function is that instead of assuming standard linear complementarities (c*PVC*GVC) we allow for diminishing marginal complementarity between GVC and PVC finance. Formally, we capture this by allowing the GVC share to have a non-linear effect on the complementarities term. For simplicity we use the quadratic function $g(GVC) = d*GVC - e*GVC^2$, so that the marginal complementarity benefit is given by $g' = d - 2e*GVC$, which is a decreasing function of GVC. This term turns negative for GVC > d/2e. Using PVC = 1 – GVC we obtain the following expression for Y.

$$Y = (b - a + c*d)*GVC - (c*e + d)*GVC^2 + e*GVC^3 + a + h(X)$$

The effect of GVC can thus be expressed as a third order polynomial where the coefficient on the linear term is positive (provided (b + c*d) > a). The coefficient on the squared term is negative and the coefficient on the cubic term is positive. This prediction matches the empirical results from Panel A of Table 5. This clarifies why we interpret the fundamental non-monotonicity as the result of decreasing marginal complementarity of GVC with PVC.