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The productivity of return migrants: the case of China's "Sea Turtles"

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Abstract

This paper explores the productivity differential between return migrants ("Sea Turtles") and non-migrants through a case study of China's venture capital (VC) industry. I find that even after correcting for selection bias, return venture capitalists are less productive than comparable non-migrants in targeting promising projects and/or providing value-added services. Given that the VC industry is a useful laboratory in which to look at the performance of return migrants and China's economic development, I discuss why the presumably better human capital accumulated overseas does not translate into productivity in the Chinese market, and how related policies could reverse this situation in the long run.

JEL Codes: F22, G24, O15

Keywords: Return migrants, Venture capital, China

1 Introduction

"Sea turtles," or *haigui* in Chinese, is slang for people who are born in mainland China, spend a few years abroad studying or working, and return home as high-skilled talent. Their true ability aside, the appreciation of foreign brands in the Chinese culture (Law 2006) makes "sea turtle" a favorable name tag. Since China initiated its economic reforms and opened the door to the world in 1978, over 1,905,400 students and scholars have been abroad for various levels of education, and 632,200 of them have become "sea turtles" up to 2010 (see Figure 1). As the volume of return migrants rises over time, many of them have become the pioneers in the sciences, the IT industry, the financial sector, and many other high-technology and innovative fields[1].

Although widely documented in press and elsewhere, very little quantitative research has been done on China's "sea turtles"[2]. This is probably because there is little data available that tracks Chinese returnees and their work statuses, and the group of "sea turtles" is not sizable enough to yield informative inference when compared with the whole labor force. However, it is evident that China is eager to make the best use of its highly-educated brain drainers who are close to the world's technology frontier, and has been implementing policy instruments to attract them back and keep them to stay[3]. The main motivation of this paper is thus to have one step forward to know more about the "sea turtles," add a China's perspective to the bigger picture of the international brain circulation, and provide some policy implications to China and similar emerging economies, which have huge demand for creative minds and entrepreneurial skills to fuel their economic growth.

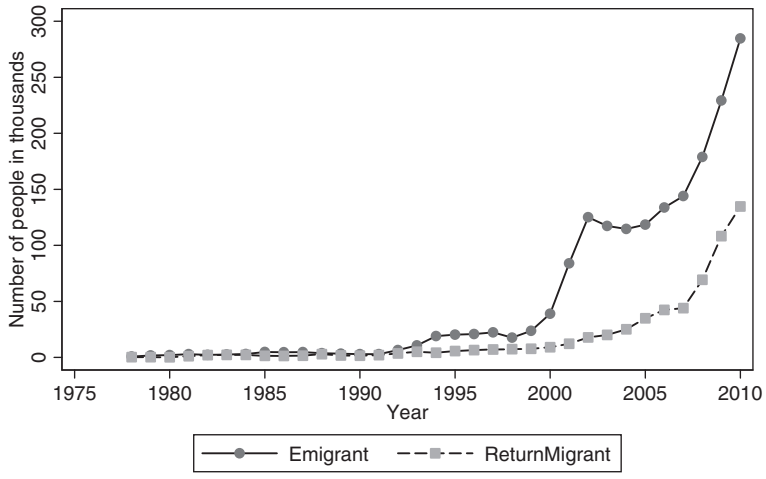

Figure 1 Students going abroad and returning home, China, 1978–2010. (Data Source: Ministry of Education of the People's Republic of China).

I conduct a case study on China's venture capital (VC) industry to evaluate "sea turtles'" productivity. Following Gibson and McKenzie (2012) and Zucker and Darby (2007), who researched high-skilled returnees re-migrating to their home countries, this paper studies a group of well-trained professionals who possess deep knowledge of capital operation and excellent grasp of inter-personal skills. Among the best and brightest Chinese educated abroad, they may have a disproportionate impact on China's economic development, both because of the key role of their industry, and because of the large role in that industry of return migrants, who constitute 40% of my sample of venture capitalists[4]. In addition, the industry-specific approach allows me to obtain a direct measurement of productivity at the individual level. It is better than comparing wage differential, as it is exempt from being affected by various institutional factors.

Despite the advantages of taking this route, the author acknowledges the limitations of this paper, that is, the findings from this specific industry may not be widely generalizable to all other sectors (e.g. academia). It would be the most helpful if viewers consider this study a useful laboratory in which to look at China's economic development and the potential contribution of the "sea turtles," and focus on the facts and problems in the Chinese market this paper will later reveal.

As for the terminology in this paper, VC stands for venture capital, which is a type of financial capital that often goes to early-stage, high-risk ventures with novel technology/ideas. Investors, who own the financial capital, can be wealthy individuals, insurance companies, university endowments, pension funds, etc. They often pool their capital together forming a fund and delegate a financial institution to run it. VC firms are such financial institutions responsible for the profitability of the funds under their management. They collect management fees (a percentage of their managed funds) and carried interest (a proportion of the investment return) from their investors. Venture capitalists in this context are the investment executives of the VC firms and also the main objects of this study. Their duties are to identify investing opportunities among numerous candidate projects, monitor their investees' operation (sometimes by joining the board of directors), provide information (by using their own resources and social networks), and

prepare them to go public, be acquired, or be sold to another financial institution (which I call an "exit" throughout this paper). Portfolio companies are the investees, which receive funding from VC firms and cooperate with their venture capitalists in a number of ways.

The rest of this paper is organized as follows: Section 2 reviews the related literature; Section 3 discusses the data and variables; Section 4 presents the results of the empirical analysis; Section 5 conducts the robustness checks; and Section 6 concludes.

2 Literature review

In the context of international brain circulation, this paper is most related to the research on return migrants, which centers around two core questions: who returns, and how they perform after returning. Borjas and Bratsberg (1996) argue that the return migration of immigrants may be due to their optimal life-cycle residential choices or a correction of their erroneous migration decisions in the first place. During this movement, self-selection prevails, and therefore affects the skill composition and earnings potential of the labor forces in both host and home countries.

After this well-cited work, a number of authors have studied the selection patterns of the foreign-born re-migrating from a variety of host countries. Cohen and Haberfeld (2001) present evidence that among the Israeli immigrants in the US, the ones who migrate back tend to have a higher education, but a lower earning potential in the US. Constant and Massey (2003) study immigrants in Germany, and show that the returnees have strong ties with their home countries, have sent remittances before, and are mostly during their first five years of arrival or near retirement. Gibson and McKenzie (2011) survey the top academic performers who emigrate from Tonga, Papua New Guinea and New Zealand to other countries. For those who return, they find the most important incentives to be non-income benefits such as life-style and family ties in their home countries. According to Lubotsky (2007), low-income immigrants are more likely to leave the US. While in Sweden, young immigrants with university degrees and high (adjusted mean) income have higher propensities to return (Nekby 2006). Finnish returnees from Sweden, as a particular group, are positively selected on education (Rooth and Saarela 2007).

As for the post-return performance compared to the non-migrants in the home countries, returnees engage more in entrepreneurial activities thanks to their savings and/or education accumulated abroad. Examples include Turkish return migrants from Germany (Dustmann and Kirchkamp 2002), returnees to Egypt (McCormick and Wahba 2001), and to Albania (Piracha and Vadean 2010). The overseas experience also has a positive effect on upward occupational mobility for the returnees. Carletto and Kilic (2011) show that returned Albanians with past experience in Italy and countries further afield have a higher likelihood of moving up the career ladder. Cobo et al. (2010) present similar results for Latin American males who have education and non-menial work experience in the US. For the wage-employed returnees, Barrett and Goggin (2010) and Co et al. (2000) find a positive wage premium for the Irish and the Hungarian women. In contrast, Albanian returnees have a negative wage premium (de Coulon and Piracha 2005), and returned Finns have a lower odds of getting employed (Saarela and Finnas 2009).

Instead of looking at labor market outcomes, the current paper focuses on the *productivity* differential between return migrants and non-migrants following the lead of Gibson and McKenzie (2012), Zucker and Darby (2007), and Vreyer et al. (2010). In addition to

being of general interest, the estimation of productivity differential is of special interest in economies like China's where returnees may receive favorable wage treatment or extra rewards that are not associated with their current productivity.

3 Data and variables

3.1 Data

The main data source of this paper is the CVSource database created by ChinaVenture Group, a research and consulting firm providing third party information products to China-located companies and investment institutions. To operate this database, CVSource keeps adding data as they become available on numerous Chinese companies from various sources. These companies are potential candidates for VC investment.

Up to April 13th 2011, the database contains over 690,000 companies (some of which have received VC funding, others of which have not), 1,800 venture capital firms, 5,700 VC deals, 4,500 cases of initial public offerings (IPOs), and 12,500 deals of mergers & acquisitions (M&As) in the Chinese market[5]. I extract a subsample of the data keeping all of the 2,865 VC-backed companies, which receive their first VC funding as early as in 1994 (approximately when China's VC industry started). 378 of them have exited through IPO and 113 through M&A[6]. A company might receive multiple rounds of investment and interact with multiple venture capitalists in each round[7]. However, the following analysis will focus on the first VC deal between each company and its lead venture capitalist. Herein the lead venture capitalist to a company is defined as the one who invests the highest amount in its first round of financing. Presumably he or she has the most profound impact on the company and is likely to claim the largest interest in the end[8].

Besides "sea turtles" (return migrants) and non-migrants, I classify the rest of venture capitalists as either overseas Chinese (who are of Chinese ancestry, but are born and educated in Hong Kong, Taiwan, or other countries outside mainland China) or internationals (who have foreign nationalities, but are sent to work in China by their VC firms). Of the 2,865 VC investments in the sample, the educational information of the lead venture capitalists is available for 1,304 cases. Among those, 40.19% are undertaken by domestically educated venture capitalists, 40.95% by return migrants, 11.35% by overseas Chinese, and 7.52% by internationals. The percentages become 43.33%, 38.34%, 10.83% and 7.5% respectively, if one considers the educational composition of the 720 different venture capitalists in this dataset (as one venture capitalist may take multiple projects during the years of my observation)[9].

The Kaplan-Meier survivor curve in Figure 2 gives a sense of how these four groups of people performed as venture capitalists. On the one hand, the domestically-educated experience a remarkably higher percentage of successful exits according to the raw data. On the other hand, there are no substantial differences among return migrants, overseas Chinese and internationals, which makes me combine them into one group to increase the statistical power in the empirical analysis[10]. In Table 1, I tabulate the number of successful exits each type of venture capitalists achieves within each window period. For example, there are 94 investments undertaken by domestic venture capitalists that manage to exit between year 1 and year 3. "N" denotes the investments still at risk, so a total of 587 observations do not exit before the third year end but still have a chance after that. In the parenthesis, the success ratios are calculated as 1 minus the value that the Kaplan-Meier survivor curve represents.

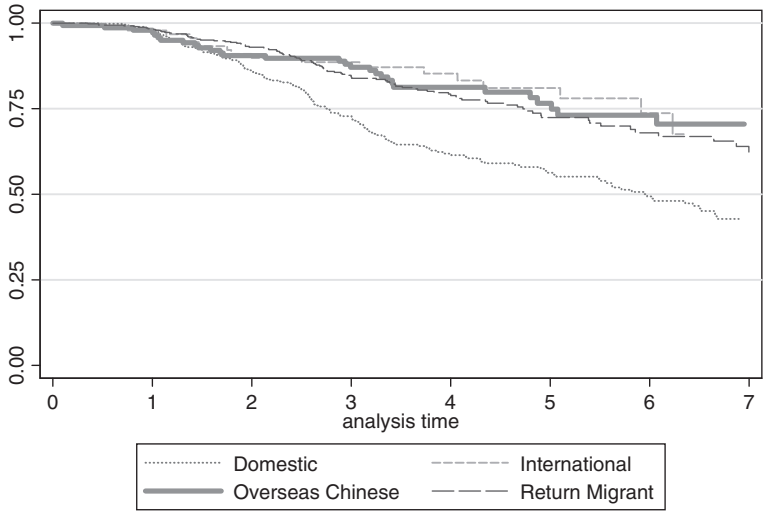

Figure 2 Kaplan-Meier survival estimates for 4 types of venture capitalists.

CVSource categorizes industries into 20 groups: Agriculture & Fishery, Automotive, Chain Stores, Chemicals, Consulting, Energy, Finance, Food & Beverage, Furnishings, Human Resources & Skill Training, Healthcare, Information Technology (IT), Internet, Investment, Logistics, Manufacturing, Media, Real Estate, Telecommunication, and Tourism. I delete the Investment, Real Estate, Tourism, and Logistics industries, for there are fewer than 10 observations in each of them. In the data, IT (19.09%), Manufacturing (16.16%), Internet (15.78%), and Healthcare (11.06%) receive the most attention of the venture capitalists. Manufacturing is treated as the base category when I add in the industrial fixed effects.

As for the geographic categorization, I collapse the regions into several special provinces/cities plus "Other" (20.07%), which stands for the rest of mainland China, and "Not in Mainland China" (2.34%) for companies that are registered in Taiwan, Hong Kong or a foreign country. Beijing (27.68%), Shanghai (15.81%) and Tianjin (1.19%) are municipalities directly under the central government; Shenzhen (8.76%) is a special economic zone where certain policies can be implemented differently from elsewhere; Guangdong (6.04%), Fujian (1.99%) , Zhejiang (6.63%) and Jiangsu (9.6%) are provinces that have witnessed the most rapid growth of private enterprises since China's reform and opening-up policy. I will use fixed effects to control for policy variations specific to these regions.

To examine the representativeness of my data sample, I compared it with China's Venture Capital Yearbook, a reliable data source that provides aggregate data. In the

Table 1 Rate of success for each type of venture capitalists within different window periods

	1 year	3 years	5 years	7 years
Domestic	8 (1.77)	94 (27.18)	40 (43.71)	20 (57.22)
Return migrant	9 (1.85)	56 (15.54)	27 (27.59)	9 (37.65)
Overseas Chinese	3 (2.08)	14 (12.90)	9 (23.42)	3 (32.45)
International	2 (2.14)	8 (11.39)	4 (18.97)	3 (29.52)
N	986	587	287	117

yearbook, 20% of the new investments in 2008 take place in Beijing, 13.86% in Shanghai, and 7.33% in Shenzhen. In my sample in the same year, the corresponding percentages are 32.38%, 18.10%, and 10.48% respectively, which may indicate that my sample over-represents bigger cities. The two sources categorize industries differently, but for those that are similarly defined, IT, energy, and healthcare constitute 22.55%, 8.98%, and 6.99% of the investments in 2008, and 18.57%, 10%, and 9.05% in the CVSource data. Another common phenomenon is that venture capitalists are more likely to invest in companies that are in the development stage[11]. This is also in accordance with the research by Zeng (2004) stating that ventures in the earliest stage or start-up stage have not got as much attention in China as in the developed market.

3.2 Variables

In this paper, I measure the investment output by how fast a VC firm/VC-backed company exits the VC market through IPO, M&A, or trade sale[12]. Being a common measure of success in the venture capital literature, it not only captures a company's ability to evolve into a new developmental stage, it is also a good proxy for fund returns on the VC firm's side[13]. The dependent variable is thus the **Probability of Exit** given some time between the funding date and the exit/censor date has elapsed.

Foreign, the key variable of interest, aims to capture whether foreign-trained venture capitalists perform differently from the domestically-educated. Note that the difference may arise from their abilities to target promising projects and/or to provide value-added services to make their investees exit faster.

There are three sets of control variables for various "inputs" provided by venture capitalists, VC firms and portfolio companies, respectively. **Experience** controls for the skills or lessons a *venture capitalist* has learned in the course of his investment career. For the *VC firm's* characteristics, **Offshore** and **JointVenture** control for funding sources, and the associated difficulties cross-border VC firms may experience in the Chinese market. **Syndicate** captures the network effect, **TotalFund** reflects the firm size, **ExitRatio** reveals firm's historical success and reputation, and **Tenure1** measures the general experience in the market[14]. *Company-specific* variables include **Tenure2** and three stage indicators. Being a measure of size of an investment, **Roundsize** also reflect the size and quality of the invested company (Wang and Wang 2011).

Variables and their measurements are listed in Table 2, and the descriptive statistics (of 887 data points with complete information on every variable) are displayed in Table 3.

4 Empirical analysis

This section discusses whether domestically- or foreign-educated venture capitalists are more productive in helping their invested companies to go public, be acquired, or be sold to another financial institutions, or to "exit" the VC market faster. In the final analysis of the 887 effective observations, 25.5% of them are successful exits and 74.5% are censored[15]. Each observation is a unique pair between a company and its lead venture capitalist, the one who invests the highest amount in the first round of financing and presumably plays the biggest role in the company's success.

For the baseline specification, I employ a semi-parametric Cox proportional hazard model. The hazard in this context is the instantaneous rate of exiting the VC market

Table 2 Variables and explanations

Variables	Definition and measurement
Dependent variable	
Probability of exit	Instantaneous rate of exit given some time has elapsed.
Independent variables	
Foreign	Equals 1 if a venture capitalist holds a foreign degree, 0 otherwise.
Experience	Number of cases a venture capitalist has involved in before a specific investment.
JointVenture	Equals 1 if the funds of a VC firm are from both home and overseas, 0 otherwise.
Offshore	Equals 1 if the funds of a VC firm are from overseas, 0 otherwise.
Syndicate	Number of unique VC firms a specific VC firm cooperates with in the first round of financing a certain company.
TotalFund	The size of funds under a VC firm's management in billions of US dollars.
ExitRatio	Measured by number of successful exits divided by the total number of cases a VC firm has undertaken up till the date a specific investment takes place.
Tenure1	Time span measured in years between a VC firm's founding date and a specific funding date.
Roundsize	The size of an investment measured in millions of US dollars.
Tenure2	Time span measured in years between a company's founding date and the initial funding date.
Development	Equals 1 if a portfolio company is in the development stage when it receives the investment, 0 otherwise.
Expansion	Equals 1 if a portfolio company is in the expansion stage when it receives the investment, 0 otherwise.
LateStage	Equals 1 if the portfolio company is in the late stage when it receives the investment, 0 otherwise.

and is assumed to be the product of a baseline hazard and a compound exponent term. Specifically, the hazard function for the ith observation at time t is expressed as:

$$\begin{aligned}\lambda_i(t|X_i) &= \lim_{h\to 0}\frac{Pr(t \le T_i \le t+h|T_i \ge t, X_i)}{h} \\ &= \lambda_0(t)exp[\,\gamma I(Foreign_i) + \beta' X_i + \epsilon_i]\end{aligned}$$

Empirical results are displayed in Table 4. Each coefficient is the change in the log hazard associated with a one unit change in the corresponding regressor. Accordingly, a positive

Table 3 Summary statistics (Mean)

Variable	Domestic	Sea Turtles	Overseas Chinese	Internationals
Experience	3.6	7.2	4	2.6
JointVenture	22.97%	35.94%	31.78%	9.62%
Offshore	18.60%	56.25%	66.36%	90.38%
Syndicate	1.3	1.4	1.4	1.7
TotalFund	1	2.9	1.7	4.4
ExitRatio	10.22%	9.81%	8.56%	5.02%
Tenure1	5.8	8.4	8.9	11
Roundsize	3.4	5.5	5.6	5.3
Tenure2	5.9	4.7	3.6	4.8
Development	49.42%	47.66%	47.66%	36.54%
Expansion	29.94%	21.09%	14.95%	23.08%
LateStage	4.36%	3.13%	1.87%	3.85%
DealYear	2006	2006	2006	2005
N	344	384	107	52

Table 4 Estimation results from the Cox proportion hazard regression

	(1) Coef. (Std.)	(2) Coef. (Std.)	(3) Coef. (Std.)	(4) Coef. (Std.)	(5) Coef. (Std.)	(6) Coef. (Std.)
Foreign	-0.65***	-0.48**	-0.55**	-0.42*	-0.54**	-0.43*
	(0.15)	(0.19)	(0.17)	(0.21)	(0.17)	(0.21)
Experience	-0.01	-0.01	-0.00	-0.00	-0.00	-0.00
	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)
JointVenture		-0.33		-0.28		-0.24
		(0.21)		(0.23)		(0.23)
Offshore		-0.36		-0.29		-0.25
		(0.22)		(0.25)		(0.25)
Syndicate	0.27***	0.28***	0.29***	0.30***	0.31***	0.31***
	(0.08)	(0.08)	(0.09)	(0.09)	(0.09)	(0.09)
TotalFund	0.01	0.01	0.01	0.01	0.01*	0.01
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
ExitRatio	0.18*	0.17*	0.20**	0.19**	0.20**	0.19**
	(0.08)	(0.08)	(0.07)	(0.07)	(0.07)	(0.07)
Tenure1	-0.02*	-0.01	-0.02	-0.01	-0.02	-0.02
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Roundsize	0.02	0.03	0.03	0.03	0.02	0.03
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Tenure2	0.03**	0.03**	0.03**	0.04**	0.05*	0.06*
	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)
Development	0.75***	0.71***	0.72**	0.70**	0.69**	0.68**
	(0.21)	(0.20)	(0.22)	(0.22)	(0.22)	(0.22)
Expansion	1.31***	1.25***	1.19***	1.18***	1.12***	1.11***
	(0.23)	(0.23)	(0.26)	(0.26)	(0.26)	(0.26)
LateStage	1.58***	1.54***	1.45***	1.48***	1.36**	1.39**
	(0.39)	(0.38)	(0.42)	(0.42)	(0.42)	(0.42)
Industry	NO	NO	YES	YES	YES	YES
Region	NO	NO	YES	YES	YES	YES
Year	NO	NO	NO	NO	YES	YES
N	887	887	887	887	887	887

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Industry, Region and Year denote whether or not industry, region and year fixed effects are included in the regression.

coefficient indicates a higher hazard ratio compared to the base category, while a negative one means the opposite. Given the negative estimates on the variable **Foreign** across specifications, it seems evident that a foreign degree and an international perspective do not necessarily help a venture capitalist to exit faster.

There are several possible explanations for this result. Firstly, the returnees may be less competitive in targeting the most promising projects for lack of social resources. According to anecdotal evidence, there are fewer promising projects than funds available in the Chinese market. When two venture capitalists get to compete for one project, the person with government ties, typically the domestic person, would be more likely to win out. This is simply because government authorities can intervene in the business arena easily and support the market participants based on their own preferences. Not surprisingly, the domestic venture capitalists stay in mainland China in their most productive ages, so that they build up stronger social networks, leaving the foreign-trained in a disadvantageous position[16].

The weaker social networks can also make the foreign-trained face more obstacles when assisting their investees to enter the public market. The Chinese capital market is not yet mature, the threshold for being listed is very high, and the limited opportunities favor state-owned enterprises. There was also a time when the national regulatory authority allocated quotas to different levels of government agencies on the number of companies to be listed in a certain year. Therefore, before being considered by the national regulatory authority, companies had to be nominated by one of these government agencies in the first place (Zeng 2004). Under these circumstances, ties with the regulatory authorities and government officials can be crucial for the final success of an investment.

Furthermore, it is also possible that the value-added services foreign degree holders provide do not quite match the market demand. China adopts different law structures and accounting rules from the western world. As a result, it might be the case that a foreign venture capitalist has "unnecessary" legal concerns, or has little idea of the accounting practices inside the invested companies. It also takes time for them to realize that the interpretation and implementation of laws and regulations can be rather flexible or even ambiguous. Therefore, they need some endeavors to get used to and take advantage of the "structured uncertainty" for their best interest[17]. All of the above-mentioned frictions can reduce the efficiency of their human capital infusion.

These estimates are descriptive of the current talent pool in the Chinese VC market, and they indicate that foreign degree holders are less productive on average. To dig a little further, I ask whether foreign-educated personnel perform equally worse through different exit channels (IPO, M&A or trade sale). Also, I will deal with the endogenous problem, which is essentially the concern about who self-selects to go abroad and who eventually returns. Note that how a venture capitalist matches with a project is not part of the endogeneity issue. As I described two paragraphs before, that is explained by the venture capitalist's ability to "pick" lucrative projects and the social resources he possesses. As can be seen in the next section, I find the estimates really robust .

As for the control variables on the *VC firm's* side, **Offshore** and **JointVenture** are included to measure the effect of regulatory restrictions. Specifically, cross-border VC firms are generally not allowed to exit through the Chinese public market. For them and their employees, who are mostly venture capitalists coming/returning from abroad, the opportunities have to be found in New York Stock Exchange, NASDAQ or other international stock exchange. Controlling for this effect, the estimates on the key variables drop in magnitude, but maintain their statistical significance[18].

Coefficients on the variable **Syndicate** are always significantly positive, implying that lead venture capitalists are more likely linked with successful exits when they are networked strongly with other VC firms. This result accords with Brander et al. (2002), the reason being the connections strengthen the exchange of information and consumer resources, or assist to obtain exclusive opportunities to superior investment projects. **ExitRatio** captures the historical success and reputation of the VC firms, and it is strongly related to the success of the current projects. However, the general experience variable **Tenure1** is always inversely related to the success of the project at hand. Seemingly at odds with intuition, it is actually in accordance with Gompers (1996) who provides evidence that younger VC firms wish to form their reputation in the VC industry faster by taking their portfolio companies public sooner.

On the *company* side, the bigger their size and the more mature they are when receiving investment from their lead venture capitalists, the faster they exit the VC market.

5 Robustness checks

5.1 Competing risks analysis

IPO, M&A and trade sale are three channels for exit, or three "competing risks" that portfolio companies and VC firms would face in the market. These different mechanisms put different requirements on those who wish to exit. In response, this section examines whether foreign educated venture capitalists are better in some channels, while worse in others. Gompers and Lerner (1999) point out that investors obtain the highest return from IPOs, which in return add to venture capitalists' reputation of being successful and get them more access to superior investments in the future. M&As and trade sales yield lower returns, but they are still better than the cases that do not exit at all. In the following, IPO is defined as a "good exit", and M&A or trade sale to be a "fair exit". Then I employ the latent survivor time, stratified and unstratified Cox proportional hazard models to re-examine the importance of the international experience and other influencing factors.

The latent survivor time approach assumes conditional independence for the competing risks and a unique latent exit time for each of them. In constructing the likelihood for a specific exit risk, say k, observations that are exits due to risks other than k and those that have not exited yet are treated as censored. This approach thus provides as many sets of coefficients as are the risk types. The stratified/unstratified Cox proportional hazard approach models the cause-specific hazard functions of all types simultaneously and produces only one set of coefficients. The unstratified model assumes that the hazards of the different risk types are proportional to one another and the risk type indicator will be used as a covariate. Interaction terms are also included to test the equality of the effects of the covariates in different types. In this study, the empirical model is:

$$\begin{aligned}\lambda_i(t|X_i) &= \lambda_0(t)exp\{[\,\gamma_1 + \eta_1 I(f_i = GOOD)]\, I(Foreign_i) \\ &\quad +[\,\alpha_1 + \beta_1 I(f_i = GOOD)]\, x_{i1} \\ &\quad +[\,\alpha_2 + \beta_2 I(f_i = GOOD)]\, x_{i2} \\ &\quad + \cdots + I(f_i = GOOD) + \epsilon_i\} \\ \text{where } f_i &= \{GOOD, FAIR\}\end{aligned}$$

This method can be implemented through a data augmentation process[19]. If hazard functions of different risks types are really proportional to each other, the unstratified method is more efficient. Alternatively, the stratified model sweeps heterogeneity into the baseline hazard and is better in terms of consistency under certain conditions. Empirically, a similar regression procedure can be used.

$$\begin{aligned}\lambda_i(t|X_i) &= \lambda_{0f_i}(t)exp\{[\,\gamma_1 + \eta_1 I(f_i = GOOD)]\, I(Foreign_i) \\ &\quad +[\,\alpha_1 + \beta_1 I(f_i = GOOD)]\, x_{i1} \\ &\quad +[\,\alpha_2 + \beta_2 I(f_i = GOOD)]\, x_{i2} + \cdots + \epsilon_i\}\end{aligned}$$

The estimation results are shown in Table 5. The first column replicates column 6 from the simple hazard analysis for comparison. Column 2 and 3 represent results in the latent survivor time model with fair and good exit as their risk types respectively. The last two columns display those from the stratified and unstratified versions of the Cox model. As

Table 5 Estimation results from the competing risk models

	Simple hazard	Latent survivor		Cox proportional	
		Fair	Good	Strat	Unstrat
	Coef/Std	Coef/Std	Coef/Std	Coef/Std	Coef/Std
Foreign	-0.43*	-0.81*	-0.31	-0.56	-0.60
	(0.21)	(0.40)	(0.25)	(0.37)	(0.38)
Experience	-0.00	0.06	-0.02	0.03	0.03
	(0.02)	(0.03)	(0.02)	(0.03)	(0.03)
JointVenture	-0.24	0.37	-0.47	0.96	0.99
	(0.23)	(0.57)	(0.28)	(0.55)	(0.56)
Offshore	-0.25	0.66	-0.64*	1.61**	1.61**
	(0.25)	(0.53)	(0.31)	(0.50)	(0.51)
Syndicate	0.31***	-0.07	0.42***	-0.08	-0.05
	(0.09)	(0.20)	(0.10)	(0.20)	(0.20)
TotalFund	0.01	0.03*	0.00	0.03**	0.03**
	(0.00)	(0.01)	(0.00)	(0.01)	(0.01)
ExitRatio	0.19**	-0.02	0.20*	0.10	0.10
	(0.07)	(0.19)	(0.09)	(0.19)	(0.20)
Tenure1	-0.02	-0.03	-0.01	-0.03	-0.03
	(0.01)	(0.03)	(0.01)	(0.03)	(0.03)
Roundsize	0.03	-0.01	0.05**	-0.06	-0.06
	(0.02)	(0.03)	(0.02)	(0.04)	(0.04)
Tenure2	0.06*	-0.04	0.07**	-0.07	-0.06
	(0.02)	(0.07)	(0.03)	(0.06)	(0.06)
Development	0.68**	0.03	1.29***	0.74***	0.75***
	(0.22)	(0.37)	(0.32)	(0.22)	(0.22)
Expansion	1.11***	-0.57	1.88***	1.21***	1.20***
	(0.26)	(0.73)	(0.35)	(0.26)	(0.26)
LateStage	1.39**	-35.17***	2.30***	1.54***	1.53***
	(0.42)	(2.32)	(0.51)	(0.42)	(0.42)
Foreign × *GOOD*				0.19	0.24
				(0.43)	(0.44)
Experience × *GOOD*				-0.04	-0.05
				(0.04)	(0.04)
JointVenture × *GOOD*				-1.46*	-1.48*
				(0.58)	(0.59)
Offshore × *GOOD*				-2.41***	-2.39***
				(0.56)	(0.56)
Syndicate × *GOOD*				0.48*	0.45*
				(0.22)	(0.22)
TotalFund × *GOOD*				-0.02**	-0.03**
				(0.01)	(0.01)
ExitRatio × *GOOD*				0.10	0.11
				(0.20)	(0.21)
Tenure1 × *GOOD*				0.02	0.02
				(0.03)	(0.03)
Roundsize × *GOOD*				0.11*	0.10*
				(0.05)	(0.05)

Table 5 Estimation results from the competing risk models *(Continued)*

Tenure2 ×*GOOD*				0.15*	0.13*
				(0.06)	(0.06)
GOOD					0.92
					(0.51)
N	887	887	887	1774	1774

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
GOOD = 1 if failure type of an observation is IPO, and it is included as a regressor in the unstratified model.
Industry, region and year fixed effects are included in all regressions.

can be seen, the latent survivor time approach concerning the good exit yields comparable results to those in the simple hazard analysis, but different from the other exit type. On the other hand, the two versions of the Cox model both have significant interaction terms, but the signs and magnitude of the coefficients on the single variables are much closer to their counterparts in the fair-exit case. These are evidence that the effects of the variables of interest are unequal in the two exit types, and the results in the simple hazard analysis are largely driven by the good-exit cases (IPO). Taking **Offshore** and **JointVenture** for example, they turn out to play more negative roles in the IPO practice than in M&A or trade sale. This is because the regulatory restrictions affecting foreign funds slow down the exit for the cross-border VC firms who want to cash out through stock market, while M&A and trade sale are not affected by this constraint and can be more flexible. No matter through which exit type, however, the foreign-educated people do not appear to be more productive than their domestic counterparts.

5.2 Instrumental variable approach

Up to this point, my goal has been to measure the productivity difference between domestic venture capitalists and their foreign-educated counterparts. This question is of direct interest to VC firms engaged in hiring talent: faced with two observationally identical workers of both types, which will be more productive? Perhaps surprisingly, I find a domestically-educated venture capitalist is, on average, more productive.

Of course, what is of greatest interest to individual VC firms might not be most relevant from the standpoint of a policymaker. For example, a Chinese policymaker might wish, instead, to know the effect on the productivity of the venture capitalist pool of a policy change such as more generous tax treatment for returnees. Since the marginal returnees attracted by such a policy change may have different relative productivities from the mean among the returnee pool that is already in China, our preceding estimates might not bear directly on this question.

Ideally, the best way to answer the above question would be to study responses to actual historical policy changes of the type under consideration. Unfortunately, Chinese policy on return migrants has been largely informal with no clearly demarcated changes over the period of my data[20]. Also, since international migration policy is set at the national level, this sort of policy variation offers very few degrees of freedom[21]. Thus, I take a different approach. Specifically, I exploit industry-level economic shocks in the United States which affect the propensity of Chinese talent to return to China as a venture capitalist, in a manner that is arguably similar to a change in China's remigration policy. Essentially, the argument is that U.S. industry shocks identify a policy-relevant treatment effect (PRTE) (Heckman and Vytlacil 2005) with respect to the types of remigration policy changes

China might realistically implement. Using these industry shocks as instrument for the probability that a venture capitalist working in China is foreign-educated, I examine whether the resulting estimates of the productivity gap differ markedly from my previous estimates. If they are, then the estimates in Tables 4 and 5 may not be representative of marginal remigrants who would be attracted by a policy change.

In more detail, my instrument is the percentage change in the U.S. employment in that venture capitalist's industry in the year before that venture capitalist started investing in China[22]. So, for example, if a venture capitalist's first VC investment in China is in 2000 and in the Internet industry, then I give him the percentage increase in the employment of the U.S. Internet industry in 1999[23]. A priori, these U.S. employment shocks could affect the share of Chinese venture capitalists who are foreign-educated in either direction. On the one hand, positive demand shocks in the U.S. might discourage Chinese expatriates from returning to China due to the increased employment opportunities in the U.S. On the other hand, a U.S. industry boom could induce these people to acquire skills that are specific to that industry, which are potentially useful to a venture capitalist investing in that industry in China[24]. In this case, the U.S. boom would create a positive shock to the supply of return venture capitalists in that industry. In either case, the U.S. industry shocks are a valid instrument as long as they do not forecast unmeasured industry-level demand shocks in China.

The IV results are shown in Table 6. For simplicity, all of Table 6 drops overseas Chinese and internationals from the sample, so the comparison of interest is just between Chinese-born venture capitalists who were domestically- versus foreign-educated. Doing both linear probability and probit regressions for the first stage, I find that positive shocks to U.S. employment growth significantly *raise* the chances that new venture capitalists in China in that industry are foreign-educated in the following year, consistent with the industry-specific skills hypothesis. First-stage coefficients and standard errors on the instrument are reported in the notes to Table 6.

In the second stage, I enter the predicted probability that a venture capitalist is foreign-educated from the above first stage into an accelerated failure time (AFT) model, which models the entire duration time instead of the instantaneous exit ratio[25]. Empirically, this is simply a linear regression of the log duration on the covariates. To account for incomplete durations, in columns (1)-(4) I simply add 25% to the length of all censored durations. Columns (5)-(7) instead handle incomplete durations using a censored normal regression approach, where log durations are assumed to be normally distributed and incomplete durations are handled in a Tobit-type approach, with observation-specific censoring points.

Since a positive AFT coefficient means longer durations (and hence slower exits), we can see from Table 6 that the returnees are still doing relatively worse than non-migrants even in the IV approach. Thus, if my instrument is valid, marginal migrants who are likely to be attracted to China by a change in the relative attractiveness of those two destinations are (like the average remigrant venture capitalist in China) also less productive than the domestically-educated. Further, suppose that the instrument is not valid, but instead that, as seems plausible, U.S. industry booms predict booms in the same industry in China. Now, a U.S. industry boom in one year will have a direct, positive effect on the likely success of venture capitalists in that industry in China in the following year. Since (from the first stage) the U.S. boom also raises the share of foreign-educated VCs in that industry,

Table 6 Estimation results from IV estimation in the AFT model

	25% longer imcomplete durations				Tobit		
	OLS Coef. (Std.)	**IV_LP Coef. (Std.)**	**IV_Probit Coef. (Std.)**	**IV_WR[a] Coef. (Std.)**	**OLS Coef. (Std.)**	**IV_LP Coef. (Std.)**	**IV_Probit Coef. (Std.)**
Foreign	0.12			0.42*	0.05		
	(0.07)			(0.19)	(0.07)		
Fitted_LP		0.31*				0.38*	
		(0.15)				(0.16)	
Fitted_Probit			0.36*				0.35*
			(0.16)				(0.16)
Experience	-0.01*	-0.01*	-0.01*	-0.02**	-0.02***	-0.02***	-0.02***
	(0.00)	(0.00)	(0.00)	(0.01)	(0.00)	(0.00)	(0.00)
Offshore	0.25**	0.09	0.10	0.08	0.28**	0.00	0.04
	(0.09)	(0.11)	(0.11)	(0.12)	(0.09)	(0.11)	(0.11)
JointVenture	0.18*	0.04	0.06	0.04	0.23*	0.00	0.04
	(0.08)	(0.10)	(0.10)	(0.10)	(0.09)	(0.10)	(0.10)
Syndicate	0.04	0.03	0.01	0.00	0.15***	0.12**	0.11*
	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)	(0.04)	(0.04)
TotalFund	0.01	0.01	0.01	0.01	0.02***	0.02***	0.02***
	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
ExitRatio	-0.04	-0.04	-0.04	-0.05	-0.00	0.00	0.00
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Tenure1	-0.02***	-0.02***	-0.02***	-0.02***	-0.03***	-0.03***	-0.03***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Roundsize	-0.01	0.00	-0.00	-0.00	0.00	0.00	-0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Tenure2	-0.11***	-0.11***	-0.10***	-0.10***	-0.18***	-0.18***	-0.17***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Development	-0.27***	-0.25**	-0.22**	-0.21**	-0.08	-0.08	-0.08
	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)	(0.08)
Expansion	-0.20*	-0.24*	-0.24*	-0.22*	0.18	0.15	0.12
	(0.10)	(0.10)	(0.10)	(0.10)	(0.11)	(0.10)	(0.10)
Late Stage	-0.15	-0.17	-0.19	-0.17	0.44*	0.51**	0.45*
	(0.17)	(0.17)	(0.17)	(0.17)	(0.20)	(0.19)	(0.19)
N	728	621	602	602	728	621	602

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Industry, region and year fixed effects are included in all regressions.
The coefficients (standard errors) for linear probability and probit regressions in the first stage are 0.011. (0.004) and 0.028 (0.014), respectively.
[a]IV_WR is a procedure Wooldridge proposed (see Wooldridge 2002, pp.623), which is to do a probit in the first stage, and then to estimate the empirical model using the fitted value as an IV. This approach yields more efficient estimates under certain conditions.

the IV estimate will be biased in the direction of finding that foreign-educated venture capitalists are *more* productive than locally-educated. This further raises my confidence that the foreign-educated are, indeed, less productive[26].

6 Conclusions

China has witnessed an influx of well-educated return migrants ("sea turtles"), overseas Chinese, and internationals from abroad in the past decade, during which time China's high-technology and innovative industries jump-started and burgeoned. "Sea turtles," in particular, are thought to boost the development of these industries thanks to their

advanced technical skills, language ability, extended networks, and other human capital that may have been accumulated while they were abroad. They receive better treatment in many situations, but it is not clear whether these preferences are really justified by the "sea turtles" contemporary productivity.

This paper conducts a case study on China's venture capital industry, which attracts a lot of talent returning from abroad, supports many other high-tech and innovative industries, and epitomizes China's transition towards a more knowledge-intensive economy. Although not meaning to yield generalizable conclusions on the earning power of the return migrants (Barrett and Goggin 2010; Co et al. 2000; de Coulon and Piracha 2005), it reveals some interesting evidence that a group of highly-educated Chinese returnees actually perform worse than their domestic counterparts.

While counterintuitive at first sight, my findings may reflect a mismatch between the skills of the foreign-trained talent and the demands of the Chinese market. It also raises the question about whether there is any obstacle that prevents those people from translating their presumably better human capital into productivity. As Clemens et al. (2009) argued, local attributes may affect people so greatly that observably identical workers can perform significantly differently in different countries of work. Speaking of China, one of the elements that makes its culture distinctive from others is the wide acceptance and utilization of *guanxi*, which means ties, connections, and social networks. To the extent that China's laws and regulations can be flexibly interpreted and executed, *guanxi* serves as a crucial mechanism for allocating limited resources, such as going to a good school, getting a promotion, and in the context of the VC industry, being listed in the public market[27]. For the "sea turtles," however, they go abroad in their most productive ages, failing to build up useful connections or losing what they used to have. By the time they come back and compete with the well-connected non-migrants, they might be stripped of the best opportunities to utilize their human capital when *guanxi* comes into play.

Provided the theory of "skill mismatch" and *guanxi* holds true, does this paper suggest that people should never go abroad suffering the loss of connections, that the government should stop providing preferable treatment to the returnees with lower productivity, or that China should work on removing the obstacle so that the "sea turtles" can utilize their talent more efficiently? My view on this is that, firstly, it has been a short time since we observed the first influx of foreign-educated personnel in the early 2000s. It is likely that the low productivity of the "sea turtles" is a short-run phenomenon, but they will pick up the necessary skills and connections to better fit the market later. If we believe that their human capital is indeed of higher quality, it makes sense for the government to subsidize the "sea turtles" to go through the first few less productive years, attracting them to return and keeping them to stay.

Secondly, as the government keeps offering these favorable signals to better-educated personnel from abroad, more and more young Chinese talent would be encouraged to spend some time overseas and return with innovative ideas and entrepreneurial skills. This would result in a partial replacement of the family-endowed *guanxi* with high-quality human capital adopted from abroad, making one's success more dependent on its own qualifications. This would have positive implications for the country's productivity growth, and it also means that China would benefit more and more from the international brain circulation over the course of its economic development[28].

Endnotes

[1]Robin Li, founder of China's dominant internet search engine *Baidu*, and Hugo Shong, a prestigious venture capitalist and founding partner of *IDG Capital Partners*, are two examples of numerous successful "sea turtles".

[2]See for example "Sea turtles reverse China's brain drain" by Jaime FlorCruz, CNN World, October 28, 2010, http://edition.cnn.com/2010/WORLD/asiapcf/10/28/florcruz.china.sea.turtles.overseas/index.html?hpt=C1; and "Sea turtles are dead", NetEase News, December 26, 2011, http://news.163.com/special/reviews/overseasreturnee.html.

[3]For example, the "1000 Talents" program targets patent holders and high achievers in academia. Upon their return, senior scholars, for instance, can earn several times higher than what local faculty make in addition to other benefits (eg. generous relocation payment, social security benefits, and better education opportunities for their children). For those who are more likely to join the non-state business sector or run their own private business, the state establishes a number of business parks and offers special policies such as tax breaks (Pan 2010).

[4]See Kortum and Lerner (2000) for a discussion on the contribution of the VC investment to the innovative activities in the US.

[5]The sum of IPOs and M&As far exceeds the number of VC deals, because most of the Chinese companies acquiring IPO or M&A are not actually VC-backed.

[6]The Chinese VC industry has a much smaller scale of economy compared to the US. According to the National Venture Capital Association Yearbook 2011, there have been in the US a total of 25,213 VC-backed companies, 73,640 VC deals, 2,984 IPOs and 4,961 M&As between 1985 and 2010.

[7]Often times, venture capitalists from different VC firms form a syndicate and invest in a company together. This is a good way to disperse risks and share each other's unique resources.

[8]Studying the Chinese VC industry, this paper also contributes to the literature that focuses on the determinants of VC performance. Networks (Hochberg et al. 2007) and reputation (Nahata 2008) of the VC firms, human capital characteristics of the venture capitalists (Knockaert et al. 2006; Dimov and Shepherd 2005) and of the entrepreneurs (Wang and Wang 2011) are shown to be important factors.

[9]It is not clear to me whether there is selectivity among the 1,304 VC deals with educational information on their venture capitalists. In China's Venture Capital Yearbook 2009, overseas Chinese and internationals constitute 9.4% of the overall population of venture capitalists, however, the comparable percentage in CVSource is 19.5%. There is no information available regarding return migrants in the yearbook, but it is possible that my current sample over-represents the foreign-educated personnel.

[10]In an earlier draft, I used the four-group categorization for the statistical analysis, which yields qualitatively and quantitatively similar results.

[11]According to the CVSource criteria, the development stage is defined to be when products and services are being developed, potential customers are found, technology risk has declined, whereas no revenues have yet occurred. The start-up stage before development is when only a concept or business plan has been produced, and expansion and late stage are when market are being expanded and profits have been observed respectively.

[12]The sale of a company in its early stages to another VC firm or investor. Slightly different from Gompers and Lerner (2000), Hochberg et al. (2007) and Nahata (2008), trade

sale is considered another type of success in this paper, in that it also enables VC firms to exit (although with a modest return) and get them a chance to access other promising projects.

[13]Hochberg et al. (2007) show that most of the profits VC firms obtain are from investments that eventually exit, which are only a subsample of their total invested projects.

[14]**ExitRatio** is likely endogenous, but removing it from the regression does not change the result at all.

[15]The full dataset includes 2,865 individual observations in total, and 887 of them have non-missing values for all of the variables.

[16]Although detailed data on venture capitalists' previous work experience are not present for everyone, I found from the available evidence that many of the domestic venture capitalists formerly worked for government agencies or state-owned companies, while the foreign-educated group did not share this feature.

[17]See Breznitz and Murphree (2011), p.12, for a discussion on "structured uncertainty" in the Chinese society.

[18]I also tried interacting **Foreign** with **Offshore** and **JointVenture** to see if foreign educated venture capitalists perform uniformly worse in domestically funded and foreign funded VC firms. This corresponds to the conjecture that they play different roles in different types of VC firms (for example, the main task of foreign educated venture capitalists in domestic VC firms is to cooperate with international partners or clients using their language proficiency and knowledge of the global market, rather than to bring VC-backed companies to the public market.), or that they are misallocated across firms. However, there is no sign showing that these effects are strong.

[19]In this question, the dataset is expanded by 2, meaning one original observation becomes two identical observations in the new regression. The failure type indicator is set to be 1,0 for the two observations if they originate from a "fair exit" case; 0,1 if from a "good exit" case; and 0,0 if censored in the original regression.

[20]To the extent that government agencies, research institutions and other employers have the flexibility to make and adjust their talent policies based on their own needs, it is hard to find an obviously enforceable policy change during the sample period that can directly affect returnees' intention to come back.

[21]See Donald and Lang (2007) for a recent discussion of statistical power in comparative case studies such as this.

[22]A venture capitalist's industry is defined as the industry where he made his first investment, which is also considered the date on which he started operating as a venture capitalist in China. Recall that investments typically take several years to either succeed or fail, and that a venture capitalist supervises several investments over a career. Thus, the lag between my instrument and the dates of most of the outcomes I am examining is considerably greater than one year.

[23]The data to construct instrumental variables are collected from the Bureau of Labor Statistics.

[24]Zarutskie (2008) provides evidence that the industry-specific human capital of the venture capitalists has a positive impact on the exit of their portfolio companies.

[25]For a recent application of the AFT framework in economics, see Gordon B. Dahl: Latent and Behavioral Responses to Extensions in Unemployment Insurance Benefits (2011), in preparation.

[26]I also tried two other sets of instruments, which are the employment change in the investment & securities industry in the U.S. and Dow Jones Venture Capital Index for U.S. companies. These two instruments reflect the employment prospect and the overall prosperity of the U.S. VC industry, and should therefore affect venture capitalists' propensity to return. These two instruments only have time variation and therefore have fewer degrees of freedom, but yield qualitatively similar results.

[27]See Simon and Cao (2009), Breznitz and Murphree (2011), and Wang (2011) for reference.

[28]Another potential benefit for the "brain drain" countries is documented in the "emigration lottery" literature (Mountford 1997; Stark et al. 1997, 1998). It argues that given a positive probability of migrating to another country, people in the sending country tend to increase their investment in education in order to get a better chance. For those who end up being left behind, they accumulate more human capital than what they would have had, which can eventually turn into a good thing for the economic growth in the sending country.

Competing interests

The IZA Journal of Migration is committed to the IZA Guiding Principles of Research Integrity. The author declares that she observed these principles.

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