Portfolio Management in Private Equity

Gregory W. Brown[a] Celine (Yue) Fei[a] David Robinson[b]

[a] Kenan-Flagler Business School, University of North Carolina at Chapel Hill

[b] Fuqua School of Business, Duke University and NBER

November 3, 2022

The Big Picture

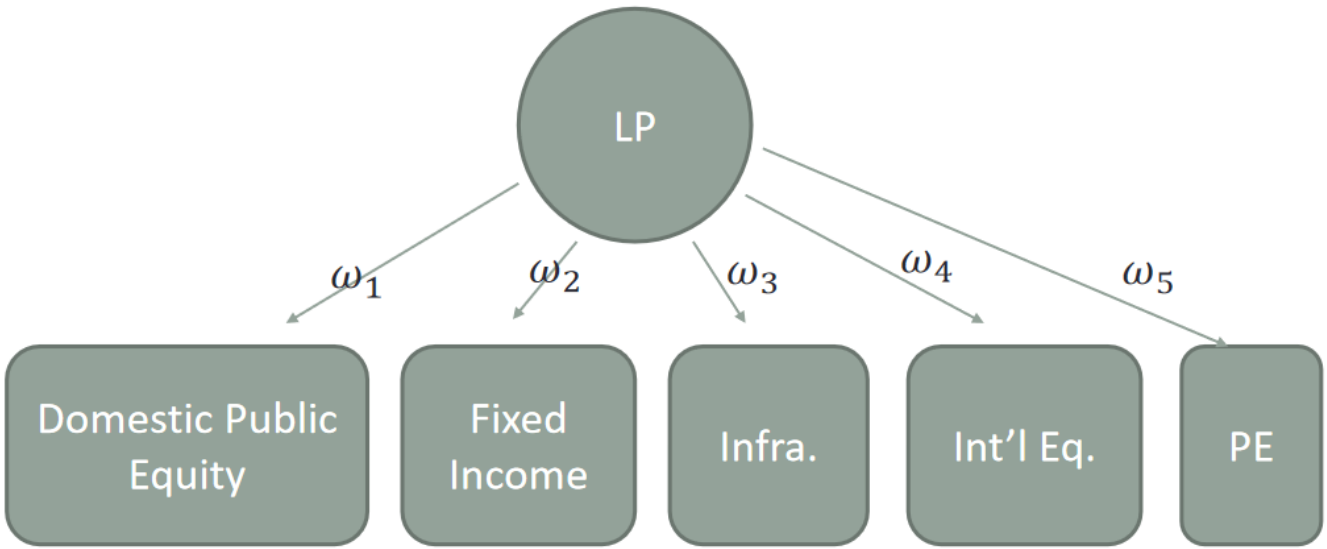
The private equity industry is important to the economy.

- $6 trillion asset class.
- A major component of the portfolios of many insurance companies, pension funds, university endowments and sovereign wealth funds.
- Value creation (e.g., Fracassi, Previtero, and Sheen (2022), Cohn, Nestoriak and Wardlaw (2021), Eaton, Howell and Yannelis (2019)).

What do we know about the PE industry?

The Central Question of This Paper

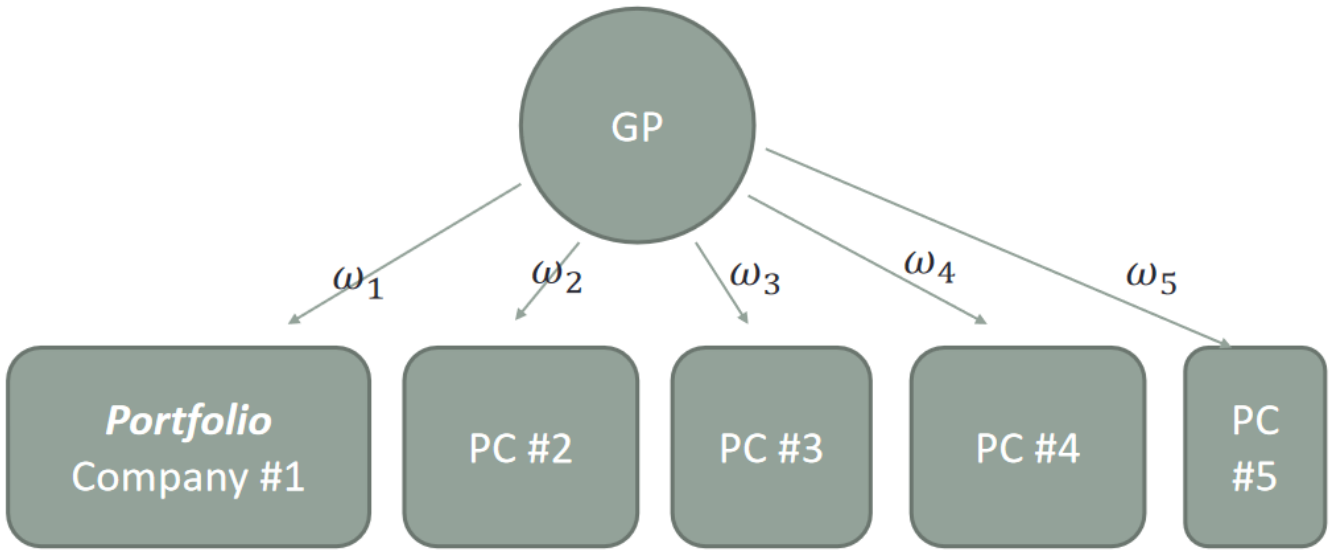
Investor's (Limited Partner) portfolio management decision



We've thought a lot about this problem. . . (e.g., Gredil, Liu, and Sensoy (2020), Giommetti and Sorensen (2021), Gourier, Phalippou, and Westerfield (2022))

The Central Question of This Paper

Manager's (General Partner) portfolio management skills



What about this problem? Very little is known.

Tradeoffs in GP Portfolio Construction
Diversification v.s. Focus

Diversification

- GPs typically need to exceed a hurdle rate on investment before they can earn carry.
- Failure to deliver adequate performance impairs the ability to raise follow-on funds.
- Incentives to maximize lifetime income may induce incentives to "play it safe".
- Note:
  - Security design is an important element we don't observe.
  - Investment choice in terms of size/sequence we do observe.

Tradeoffs in GP Portfolio Construction
Diversification v.s. Focus

Focus

- GPs possessing specialized skill/knowledge maximize returns by concentrating.
- Cost of diversification: wasteful task-shifting between unrelated idiosyncratic problems.
- Attention problems from "too many irons in the fire" a la Lopez-di-Silanes, Phalippou and Gottschalg (2015).

This Paper – New Data, New Question, New Answer

Novel Data

- Research-quality, deal-level return.

The First Paper to Answer the Research Questions

- How do portfolio specialization and concentration matter for risk and return? (Herfindahl-Hirschman Index)
- How are portfolios composed? How the composition relates to risk and return? (Best idea or safest idea?)
- How much does fund (portfolio management) effect explain the return variation? (Hierarchical Linear Regression Model)

Literature

Venture Capital and Private Equity

- Scale of economies: Lopez-di-Silanes, Phalippou and Gottschalg (2015)
- Specialization: Spanjers and Steiner (2022) (hotels), Gompers, Kovner, Lerner (2009) (VC)
- Diversification: Ewens, Jones and Rhodes-Kropf (2013)
- Theory: Fulghieri and Sevilir (2009), ...

Mutual Funds and Hedge Funds

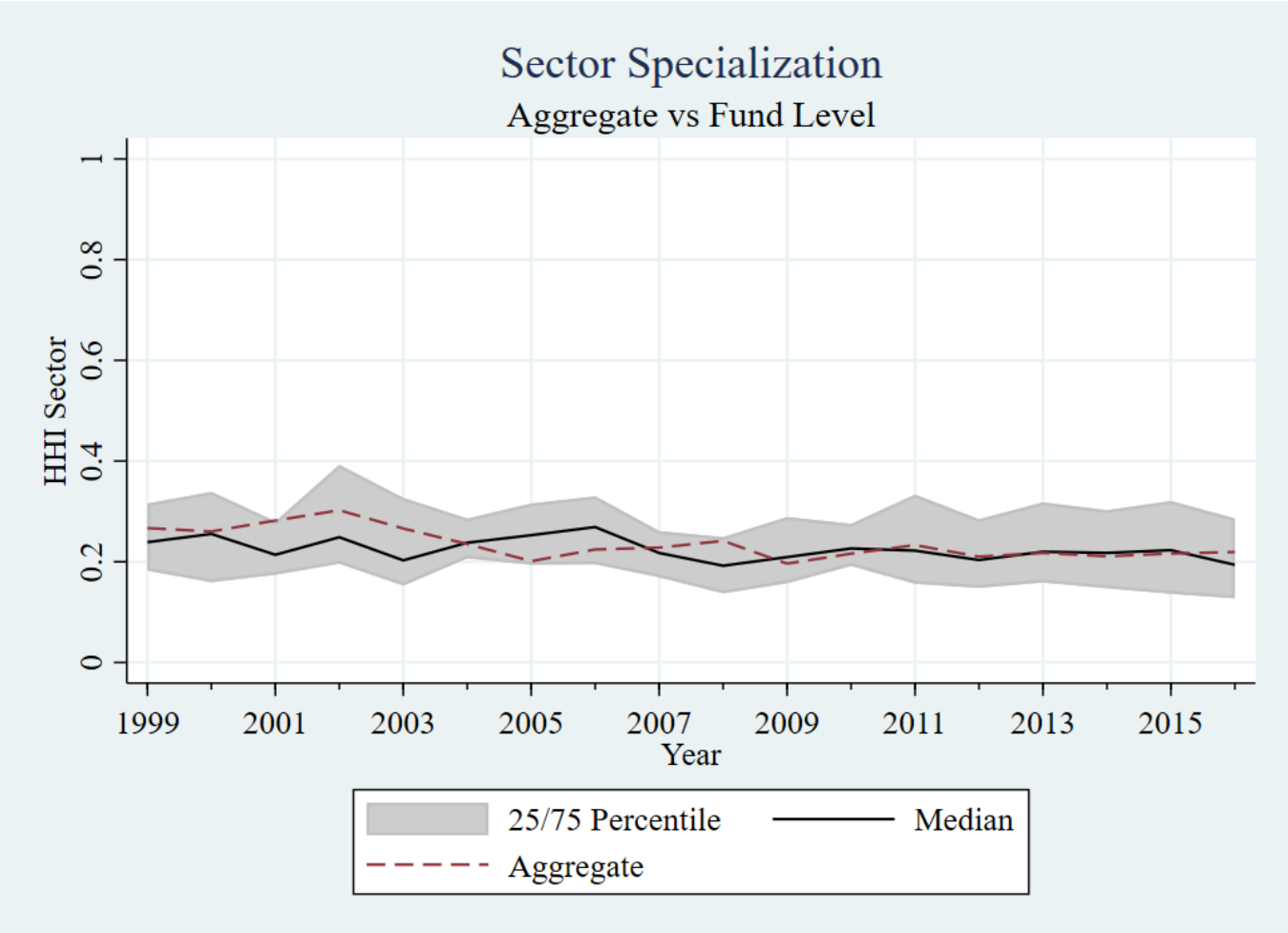
- Specialization: Kacperczyk, Sialm, Zheng,(2005), ...
- Best idea: Anton, Cohen, Polk (2021)

Data

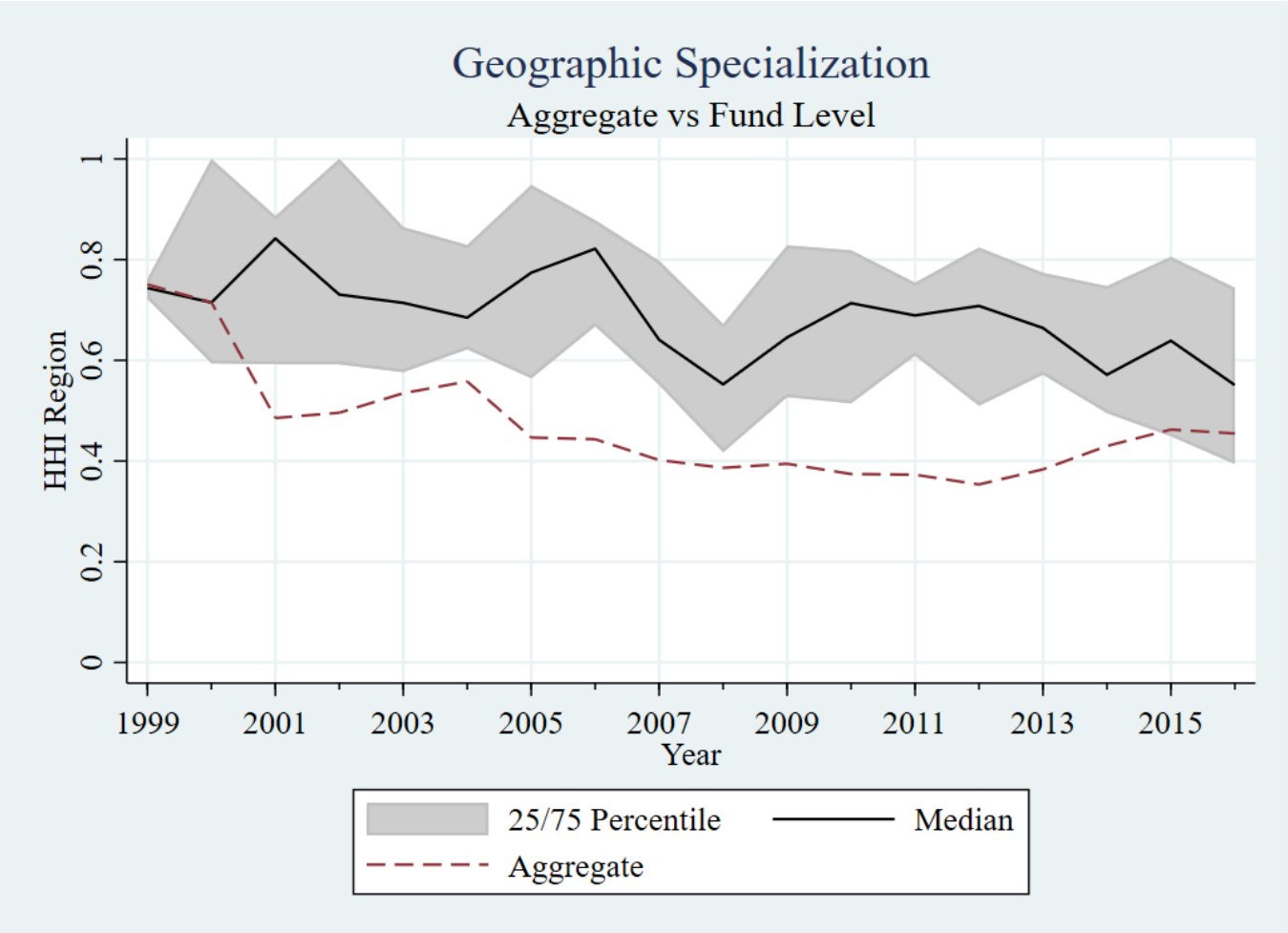
For over 30 years, Burgiss has provided institutional investors with the best-in-class software, data, and analytics in private capital.

- Linked GP-fund-portfolio company dataset (not available in usual commercial database – Pitchbook, VentureSource, etc.).
  - The precise portfolio composition of PE funds.
  - Deal-level return.
- Buyouts: less studied, different economics (than venture capital).
- 5,925 portfolio company investments, 467 distinct buyout funds, vintage years from 1999-2016, 315 distinct PE firms.
- Investment and return data are updated through 2020.
- 52% North America, 36% Europe & Mid-East, 9% Asia & Pacific.
- All 11 GICS sectors (consumer discretionary, health care, information technology, etc.).

Industry Specialization: Fund-Level and Aggregate Level



Regional Specialization: Fund-Level and Aggregate Level



Fund concentration, specialization and performance

- More concentration, lower returns.
- More specialization, higher returns.

Fund Level: Concentration, Specialization and PME

Panel A: Return PME (Value-Weighted)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Fund PME (Value-Weighted)							
Gini Index	-0.52**	-0.31					-0.56**	-0.43
	(-2.00)	(-1.10)					(-2.16)	(-1.59)
HHI Sector			0.15	0.41**			0.11	0.45***
			(0.97)	(2.44)			(0.68)	(2.80)
HHI Region					0.12	0.40**	0.10	0.41***
					(1.06)	(2.55)	(0.85)	(2.67)
Fund Vintage FE	-	Yes	-	Yes	-	Yes	-	Yes
Observations	467	467	467	467	467	467	467	467
Adjusted R^2	0.006	0.130	-0.000	0.137	0.001	0.137	0.007	0.148

Controls: N. of Deals, Fund Size, Fund Duration, Fraction Invested, I(North American)

Fund Concentration, Specialization and Risks

- More concentration, higher risks.
- More specialization, higher risks.

Fund Level: Concentration, Specialization and PME

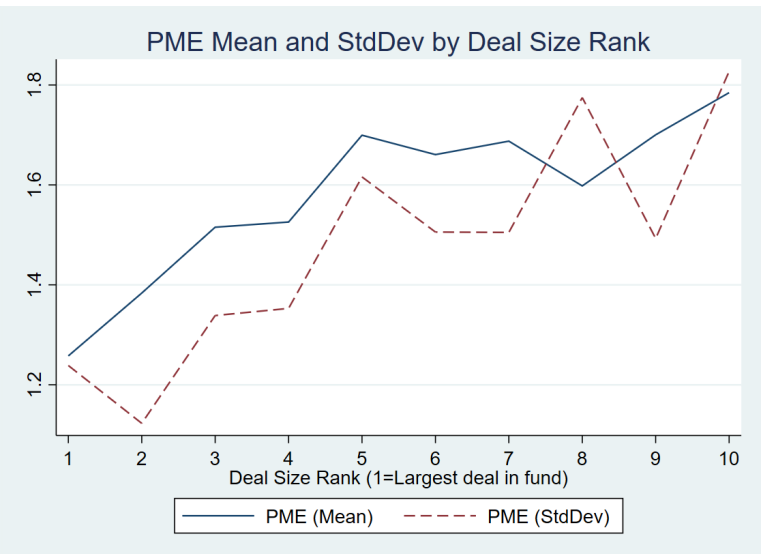
Panel B: S.D. of Deal PME

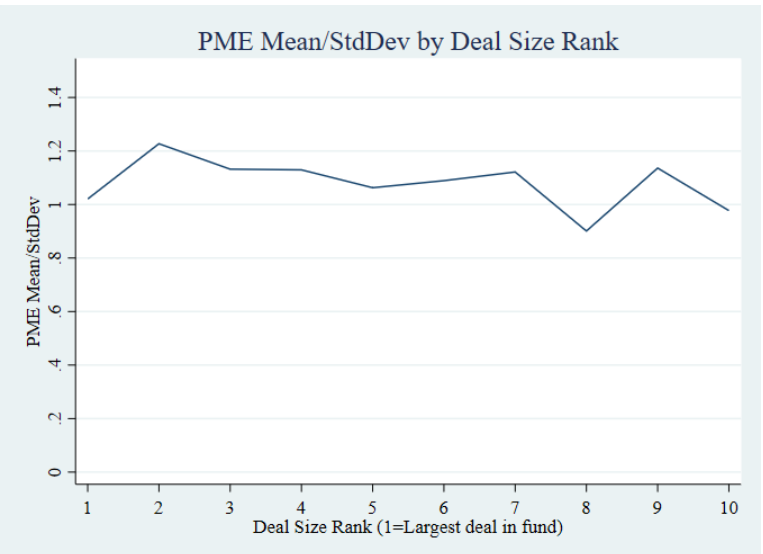
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	S.D. of Deal PME							
Gini Index	1.16***	1.01**					1.09***	0.87*
	(2.83)	(2.03)					(2.72)	(1.78)
HHI Sector			0.35*	0.52**			-0.01	0.43**
			(1.76)	(2.48)			(-0.07)	(2.10)
HHI Region					0.41***	0.64***	0.39**	0.62***
					(2.83)	(2.85)	(2.51)	(2.82)
Fund Vintage FE	-	Yes	-	Yes	-	Yes	-	Yes
Observations	-467	467	467	467	467	467	467	467
Adjusted R^2	0.021	0.128	0.003	0.122	0.018	0.127	0.034	0.142

Controls: N. of Deals, Fund Size, Fund Duration, Fraction Invested, I(North American)

Best idea or safest idea?

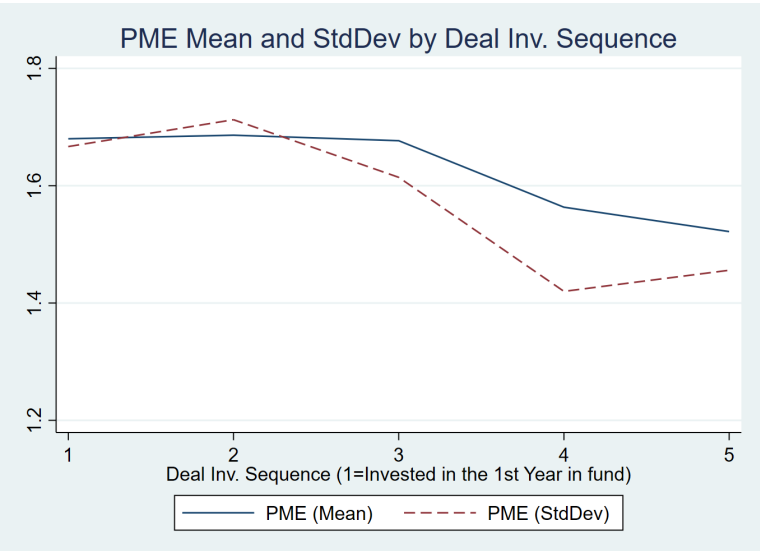
- Larger deal *within-fund* – lower returns.
- PME: Kaplan and Scholar (2005) Public Market Equivalent.
- StdDev: standard deviation of PMEs of that rank group.
  - Ideally, the time-series standard deviation.
  - Use cross-sectional type-specific standard deviation as a proxy.
- The pseudo Sharpe Ratio is almost constant across different size ranks.

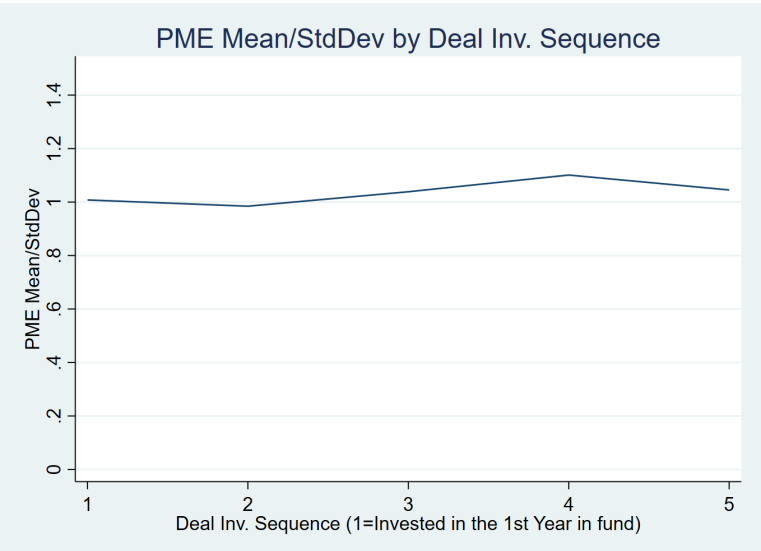




Best idea or safest idea?

- Earlier deal *within-fund* – higher returns.
- PME: Kaplan and Scholar (2005) Public Market Equivalent.
- StdDev: standard deviation of PMEs of that sequence group.
- The pseudo Sharpe Ratio is almost constant across different timing sequences.





Best idea or safest idea?

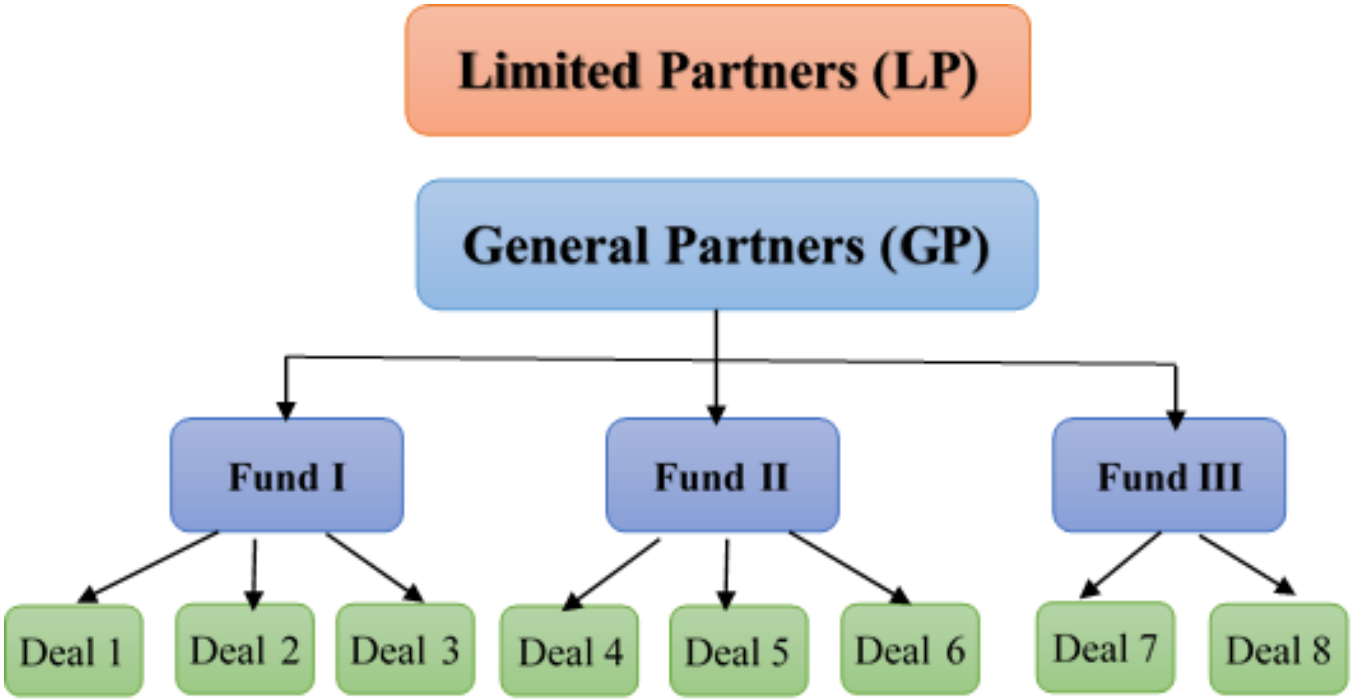
Deal Level: Within-Fund Deal Size Rank, Timing Sequence and PME

	(1)	(2)	(3)	(4)	(5)	(6)
			Deal PME			
Deal-Size Rank	0.05***	0.04***	0.03***	0.05***	0.05***	0.04***
	(6.18)	(5.61)	(4.07)	(6.82)	(5.83)	(4.61)
Deal Seq.	-0.05***	-0.05***	-0.05***	-0.05***	-0.05***	-0.06***
	(-2.63)	(-2.62)	(-3.02)	(-2.70)	(-2.70)	(-3.29)
Absolute Deal Size		-0.41*	0.06		-0.22	0.37
		(-1.77)	(0.19)		(-0.85)	(1.10)
Exit Dummy			0.56***			0.57***
			(11.91)			(9.55)
Fund Size			-0.02			-0.06
			(-1.06)			(-1.33)
Deal Duration			-0.09***			-0.09***
			(-11.89)			(-9.54)
GP FE	N	N	N	Y	Y	Y
Industry FE	N	N	Y	N	N	Y
Geography FE	N	N	Y	N	N	Y
Observations	5925	5925	5925	5925	5925	5925
Adjusted R^2	0.010	0.011	0.077	0.040	0.039	0.094

How important is portfolio management to return?

- Hierarchical Linear Regression Model (Two-Stage)
- Distinguish between variation across GPs in
  - Deal-specific effects (deal selection);
  - Fund-specific effects (portfolio management);
- How much does variation in portfolio management across GPs contribute to return variation?
- Bayesian Estimator
  - Following KS 2017 and CSWW 2019, Markov Chain Monte Carlo (MCMC) and Gibbs sampling techniques.
  - Flexibility of model structure; non-negativity constraints; small sample inferences.

Hierarchical Structural in Private Equity



A Two-stage model (backward) [following KS 2017; CSWW 2019]

- First stage: fund-deal.
- Second stage: GP-deal.
  - Model 1: Deal-specific effects (deal selection);
  - Model 2: Fund-specific effects (portfolio management);

Hierarchical Linear Regression Model – Model

$$DealReturn_{iuj} = X_{uj}^{'}\beta + \Sigma_{\tau=t_{iuj}}^{t_{iuj}+DealLife_{iuj}}(FundRE_u + FundYearRE_{u\tau}) + \epsilon_{uj}$$

- i – GP firms, u – funds, j – deals,
- X_{uj} - observed covariates,
- t_{iuj} - the deal's entry year,
- $DealLife_{iuj}$ – the number of years from the deal entry to exit,
- $FundRE_u$ – fund-specific random effect (fund management),
- $FundYearRE_{u\tau}$ – fund-time random effect (i.e., Overlap effect in 2017; captures overlapping in years across deals.)
- ϵ_{uj} - fund–level deal-specific random effect (noise).
- Deal return is measured using TVPI.

Compare the estimated $FundRE_u$ and ϵ_{uj} across GPs.

Hierarchical Linear Regression Model – Results

Portfolio management across GPs matters (a lot) for returns!

- If we look at deal-specific effects: noise explains 87% of the return variation, leaving GP skills to only explains 6%.
- If we look at fund-specific effects: GP skills explain approximately 45% of the return variation, and noise explains 45%.

Hierarchical Linear Regression Model – Results

Variance decomposition				
	Model 1 – Deal-Specific Effects			
	(1)	(2)	(3)	(4)
skill%	4.68%	5.03%	5.15%	6.43%
	(0.007)	(0.008)	(0.008)	(0.012)
overlap effect%	1.58%	2.74%	3.21%	6.51%
	(0.005)	(0.009)	(0.010)	(0.016)
noise%	93.74%	92.22%	91.64%	87.06%
	(0.009)	(0.013)	(0.014)	(0.021)
	Model 2 – Fund-Specific Effects			
	(1)	(2)	(3)	(4)
skill%	46.39%	44.87%	42.58%	45.69%
	(0.039)	(0.044)	(0.045)	(0.044)
overlap effect%	46.92%	47.40%	49.58%	45.79%
	(0.037)	(0.043)	(0.042)	(0.045)
noise%	6.69%	7.73%	7.85%	8.53%
	(0.006)	(0.020)	(0.018)	(0.033)

Overlap effect: following KS 2017; captures overlapping in years across deals.

Conclusion

We propose a *portfolio* view of private equity industry where GPs tradeoff returns for risk management.

- Industry/geo specialization – similar to mutual funds (e.g., Kacperczyk, Sialm and Zheng (2005))
  - Higher performance of more specialized funds.
- Portfolio composition – different from mutual funds (e.g., Anton, Cohen, and Polk (2021)
  - GPs' biggest deals are their safest deals, not their best ones.
  - GPs' earlier deals have higher returns and are riskier.
  - Near constant "Sharpe Ratio" across deals within a fund.
- Fund-specific effects (portfolio management skills) account for 40% of return variation after subtracting deal-level noise.

GPs carefully manage the composition of their portfolios!