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In a new column by PREA Head of Research Greg MacKinnon, Research Narrative distills recent academic research into clear, practical insights for investors. Each article focuses on a specific issue, highlighting key findings from recent studies to help investors quickly understand what the latest research says about important market questions.

Infrastructure

How has it performed as an investment? (And is it better than real estate?)

Often praised for stable income, diversification, and inflation protection, infrastructure has become a serious consideration for institutional investors. But do infrastructure investments actually deliver these benefits, and how do they compare to real estate in practice? Reviewing recent academic research, this article examines how infrastructure has performed as an investment, how outcomes vary by sector and investment vehicle, and the key considerations investors should be thinking about when allocating capital to the asset class.

Infrastructure is an increasingly important asset class for institutional investors. Researchers from Maastricht University in the Netherlands report that only 12% of pension funds globally invested in infrastructure in 2007, but almost half (48%) did by 2018, with average allocations rising from 2.4% to 4.1% over that time period.[1] Another study estimated that infrastructure AUM held in closed-end funds rose from $59 billion in 2008 to $486 billion in 2019.[2] Presumably, these numbers would be even higher today as the asset class has continued growing.

Real estate investors will be familiar with many of the arguments for an allocation to infrastructure. They are the same as the ones often applied to real estate: good risk-adjusted performance, stable income, diversification, and inflation hedging. But the jury is still out with regards to whether infrastructure does indeed possess these characteristics — research on the asset class is still in its infancy, especially for private infrastructure rather than listed.

Given the rapid rise in capital allocated to infrastructure and interest among institutional investors, it is important to

KEY TAKEAWAYS

STRONG APPEAL

Research suggests that private market infrastructure has delivered attractive risk-adjusted performance and meaningful diversification benefits. Values are affected by economic shocks but less so than other asset classes, increasing portfolio resilience.

NOT A HOMOGENOUS ASSET CLASS

Infrastructure investment characteristics vary significantly by sector, geography, and investment vehicle. Understanding exactly what investments are held within an infrastructure allocation is essential to understanding the relevant risks and potential returns. Diversification within an infrastructure allocation is a key consideration, but often hard to attain for many investors.

THE VEHICLE MATTERS

Many of the attractive characteristics of private infrastructure can be undermined by the closed-end fund structure most commonly used to access the asset class. Evidence shows that fund structure, fees, and exit incentives play a critical role in determining realized outcomes.

Recommended reading

Andonov, A., R. Kraussl, and J. Rauh. 2021. "Institutional Investors and Infrastructure Investing." *Review of Financial Studies* 34: 3880–3934.

Brown, G., C. Lundblad, and W. Volckmann. 2025. "Risk-Adjusted Performance of Private Funds: What Do We Know?" Working paper, Institute for Private Capital.

Carlo, A., P. Eichholtz, N. Kok, and R. Wijnands. 2023. "Pension Fund Investments in Infrastructure." *Journal of Asset Management* 24: 329–345.

Haran, M., D. Lo, and S. Milcheva. 2019. "Performance Drivers in Private Infrastructure Funds." Working paper, Ulster University.

Hu, W., C. Lundblad, and V. Mozumdar. 2025. "The Investment Properties of Real Asset Funds: A Survey of Prior Work and New Findings." Working paper, Institute for Private Capital.

EDHEC Infrastructure Institute. 2022. "Is Infrastructure Shockproof? The Resilience of Infrastructure Equity Investments During Market Downturns, 2000–2022." EDHECinfra Research Publication.

Global Infrastructure Hub — A G20 Initiative. 2022. "Infrastructure Investment Performance — Infrastructure Monitor 2022."

Lim, W. 2024. "Accessing Private Markets: What Does It Cost?" *Financial Analysts Journal* 80(4): 27–52.

MacKinnon, G. 2021. "What Would Higher Inflation Mean for Real Estate?" *PREA Quarterly* (Spring 2021): 18–26.

Marzuki, J. and G. Newell. 2020. "A Global Investment Opportunity in Non-Listed Infrastructure for Institutional Investors." *Journal of Property Investment and Finance* 39:239–255.

understand the nature of private market infrastructure as an investment. This article reviews some of the recent evidence from academic research on infrastructure returns, cycles, vehicles, and fees. It does not mean to be an all-inclusive review of all research; it simply highlights a few relevant and recent research papers that investors may find useful as they learn about this growing sector for institutional investment.

Risk-adjusted investment performance

A research paper from Western Sydney University estimates the historical performance of unlisted infrastructure assets from 3Q2008 to 2Q2019 using the MSCI Private Infrastructure Asset Index.[3] The authors find that private infrastructure asset returns averaged 12.3% per year over the period, handily beating the returns to the various types of listed assets to which they compared it. Further, private infrastructure had the lowest volatility, other than bonds, across the asset classes and the highest return-to-risk ratio (i.e., Sharpe ratio), meaning it outperformed on a risk-adjusted basis. The paper also reports significant diversification benefits from infrastructure within an overall portfolio, and suggests that a significant allocation to private infrastructure assets would have helped improve portfolio performance over the time period surveyed.

It is important for investors to remember, however, that not all infrastructure investments are the same. The same research paper finds that transportation infrastructure significantly outperformed water infrastructure assets, and that uncontracted assets outperformed contracted. Other research finds differences across other components of the overall infrastructure market. For example, an unpublished 2019 working paper from researchers in the UK finds that greenfield investments earned higher returns on average than brownfield, consistent with the profile for riskier investments — i.e., investors are compensated for development risk.[4]

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Just as within real estate an investment in office property is not the same as an investment in multifamily, investors have many choices to make within infrastructure as an asset class. It is imperative that an investor looking to attain certain investment attributes from infrastructure think about the characteristics of the specific assets they are considering, and not simply infrastructure as a general asset class. Investor regret can result if investment in a specific form of infrastructure differs from what was attractive about infrastructure in general.

A report from the G20, looking at the ten years to 2022, also finds that unlisted infrastructure has attractive investment characteristics, performs well on a risk-adjusted basis, and can add positively to the performance of an overall portfolio.[5] This report, however, looks at private infrastructure firms rather than assets (using the EDHEC Infra300 Index). Again, as in previous research, the results depend on the specific sector within infrastructure (transportation performing the best) and location (Europe outperforming other regions). The sector and location results are, of course, dependent on the time period. There is no guarantee that these investments will continue to lead the infrastructure pack in future periods.

The important point is that there can be substantial variation in performance

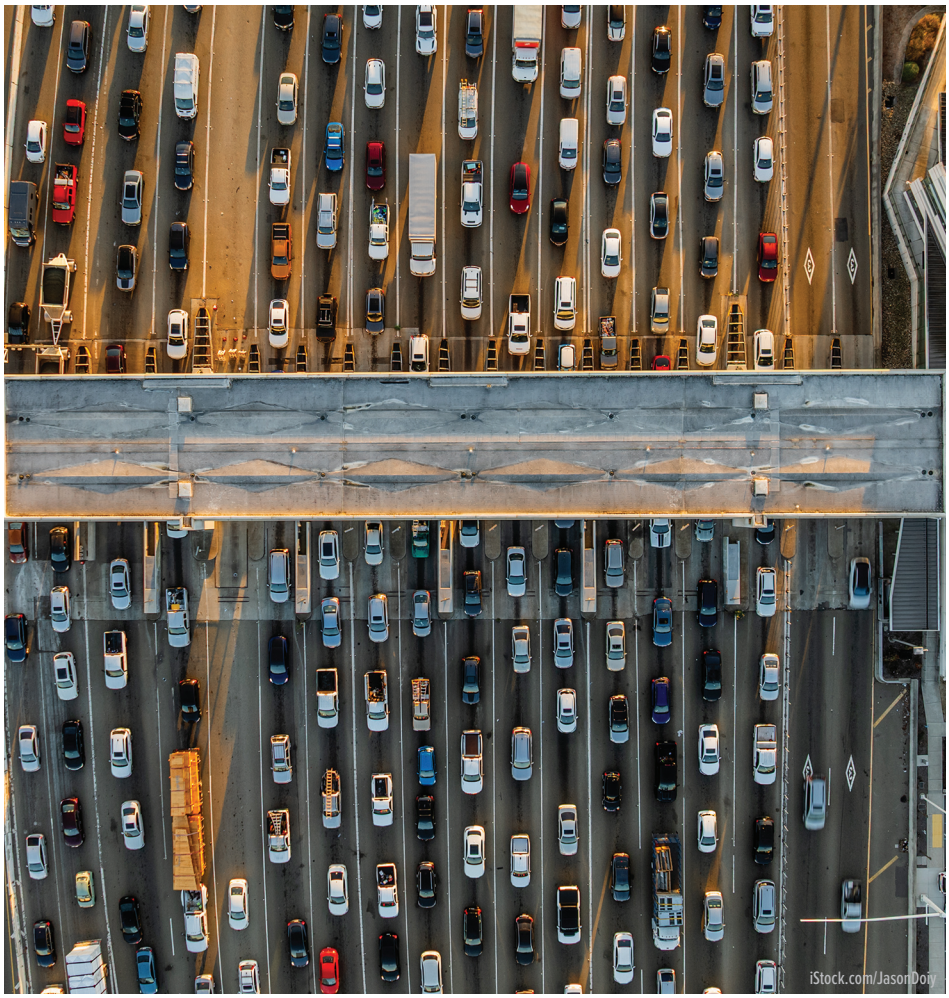
across sectors within infrastructure. It is not a homogenous asset class, and investors must take that into account when developing a strategy for infrastructure investing.

Stability and the cycle

A key attraction of private market infrastructure investment to institutional investors is its perceived stability, the provision of stable income and values over the cycle, and resilience to economic shocks that may affect other asset classes in the portfolio. While this is the expectation, the question is whether this premise is actually true.

A study from EDHECinfra looks at exactly this question by examining the impact of financial, economic, and policy shocks between 2000 and 2022 on infrastructure, and comparing the effect to the impact on equities and bonds.[6] The conclusion is that private infrastructure is not entirely immune to market shocks; asset values do tend to decline during major downturns in equity markets, and correlations with equities increase during major market disruptions such as the global financial crisis (GFC) or COVID-19 pandemic. While infrastructure tends to move in the same direction as equities during crises, the impact is far more muted. Hence, an allocation to infrastructure can help reduce risk in the portfolio and provide some, but not total, protection from major market downturns.

The EDHECinfra study also finds that the ability of infrastructure to cushion a portfolio against big downturns varies with the exact type of infrastructure, and, to fully take advantage of the risk-reducing abilities of infrastructure, an investor should hold a diversified infrastructure portfolio. Given the typical size of many private infrastructure investments that can run into the billions of dollars, smaller institutional investors may find it very difficult to form a diversified infrastructure portfolio on their own, and even the largest investors may find it takes time to build truly diversified exposure to infrastructure. Investors therefore need to consider how much protection they are getting from their infrastructure allocation based on exactly what assets they are invested in within the allocation.



▲ Interstate 80 toll plaza in the early morning

A number of studies have also examined the ability of infrastructure to hedge against inflation, a commonly cited attractive characteristic of the asset class. The results are mixed across different studies, but generally the findings indicate that infrastructure does indeed provide some inflation-hedging potential, at least in developed markets.

However, the report from EDHECinfra points out that the inflation risk for infrastructure is really interest rate risk. Higher inflation can feed through to higher nominal interest rates, thus negatively affecting asset values, especially for those assets that cannot immediately pass inflation through to generate higher cash flows. An article in the Fall 2021 issue of the *PREA Quarterly* walks through how inflation can impact asset values through its effect on cashflows and interest rates.[7]

The end result is that infrastructure may provide some inflation hedging, as does real estate, but this can vary considerably depending on if and how quickly inflation passes through to cash flows and the impact of higher interest

rates on asset values. Once again, the investment characteristics of infrastructure really depend on exactly what infrastructure assets an investor has in their portfolio.

The vehicle matters

The risk-adjusted performance of infrastructure has been impressive and indicates that it can play a valuable role in a portfolio. But most of the research discussed above is based on the performance of private market infrastructure assets (i.e., if investors were holding the assets directly) and private infrastructure firms.

The University of Maastricht study reports that the most common form in which investors actually hold infrastructure investments is closed-end funds, equaling 41% of pension fund infrastructure investments as of 2018. Direct holdings and co-investments constitute a much smaller piece of the infrastructure pie, and they are dominated by the largest institutional investors (led by the Canadian pension funds) that have the staffing and resources to be able to evaluate, make, and manage direct investments. The vast majority of institutional infrastructure investments (and all infrastructure for most investors other than the largest) are done via an intermediary.

The question is thus: Does holding infrastructure investments through funds change the expected investment outcomes, and, if so, how?

Research published in *The Review of Financial Studies* finds that closed-end infrastructure funds perform much differently than investing in the infrastructure assets themselves.[8] The authors of the study note that investors are attracted to infrastructure because of its perceived nature as a long-term asset with stable ongoing cash flows able to diversify the portfolio. However, because of the nature of the closed-end structure with its finite life, fund managers have an incentive to exit deals quickly. The authors show that closed-end funds exit deals much more frequently than other structures such as open-end funds, directly held assets, or listed funds. Managers tend to exit their best performing deals in order to increase reported performance, and cash flows to investors tend to be procyclical as funds exit deals when markets are strong.

The closed-end structure may therefore work against investors in obtaining many of the characteristics they find attractive in infrastructure in the first place.

The authors of the study conclude that institutional investors wishing to have exposure to long-term infrastructure assets would be better off using alternatives to closed-end funds, such as open-end funds or direct holdings, that are better aligned with infrastructure's long-term nature.

Two recent working papers from the Institute for Private Capital (IPC) at the University of North Carolina–Chapel Hill study the performance of infrastructure funds. The first looks at fund performance across a number of different private asset sectors, including infrastructure and real estate (as well as private credit and various subsectors of private equity), using a number of different metrics for funds with vintages between 1990 and 2019.[9] On average, infrastructure provided a higher IRR than real estate. However, in North America real estate funds outperformed infrastructure, while lagging infrastructure substantially in the rest of the world.

The authors of the study conclude that institutional investors wishing to have exposure to long-term infrastructure assets would be better off using alternatives to closed-end funds that are better aligned with infrastructure's long-term nature.

Furthermore, the study finds that investors would have been better off investing in the S&P 500 than in closed-end infrastructure funds, and that infrastructure funds underperformed real estate funds (as well as buyout and venture capital funds).

Looking across funds, the distribution of performance metrics is similar for infrastructure and real estate funds, meaning that an investor selecting a single fund from the market at random would face about the same level of risk in choosing an infrastructure fund as they would in choosing a real estate fund. Comparing performance on a risk-adjusted basis shows that infrastructure funds and real estate funds have performed at about the same level.

Comparing to public market benchmarks, the study finds that private infrastructure funds on average outperformed publicly listed infrastructure, while private real estate generally underperformed public real estate (although the conclusions are not entirely consistent across all performance metrics). While there was no direct comparison of the performance of private infrastructure and private real estate, the fact that one outperformed its

Fund fees and performance

When investing via funds in any sector fees are, of course, a primary concern for investors. While the inherent opacity of private markets makes systematic comparisons of fees across funds challenging, that hasn't prevented researchers from developing valuable insights.

Wayne Lim of Harvard University used a large sample of private market funds to examine fees across a number of different sectors.[10] Using basic information about the fee structure on each fund and their reported net-of-fee performance, he developed a model based on some simple assumptions to estimate the total impact of fund fees on investors. As the analysis is based on realized performance, it cannot be used to judge funds before investment — but it does allow a comparison of how different types of private market funds performed after the fact.

The results show that the ultimate total cost (including both management fees and carried interest over the life of the fund) to investors of fees on infrastructure funds averaged $16.40 per $100 of capital committed. This was substantially lower than estimated fees for private equity, which ranged from $24 to $26 per $100 of commitment. But infrastructure was substantially more expensive in terms of fees than real estate: core-plus fund fees were estimated at $5.40 and opportunistic and value-add funds at $11.20 (again per $100 of capital committed).

This fee differential contributes to the difference in reported net IRRs that Lim finds in his sample of funds — on average, infrastructure funds lagged core-plus real estate by 30 basis points (bps), and lagged opportunistic and value-add by 170 bps.

The University of Maastricht paper by Carlo, Eichholtz, Kok, and Wijnands mentioned previously looks at costs and net-of-costs returns for a number of different approaches to infrastructure investing, including both direct holdings managed in-house and externally managed mandates. For direct holdings, costs include staff, overhead, and research expenses, while costs of externally managed investments such as funds are based on fund fees (plus any internal staff costs for those overseeing the external relationship).

Overall, they report that the investment costs experienced by pension funds for infrastructure were considerably lower (by 160 bps) than for private equity, but slightly higher (by 18 bps) than real estate.

However, the cost for infrastructure was highly dependent on the investment vehicle. Direct investment was the most cost-effective form of investment at 46 bps per year, with co-investments about the same. The annual costs of closed-end funds ran about 160 bps higher than internal investment on average (and fund of funds had even higher costs, although the spread between fund of funds and closed-end funds has come down in recent years). Open-end infrastructure funds were more expensive than internal investment but less than closed-end funds.

Netting the investment costs against gross returns, co-investments in infrastructure have shown the highest net returns, followed by direct, internally managed investments. Closed-end funds lagged by about 200 bps in net return, with fund of funds slightly lower (although the difference between internally and externally managed infrastructure is small enough that statistical tests show it to be insignificant).

Overall, co-investments in infrastructure assets and internally managed direct investing are the least costly and highest returning. Unfortunately, these are often the preserve of larger institutional investors who have the capital required to make large outlays on single assets and still remain diversified, and have the staff and resources required to manage and monitor such investments (the research confirms that large pension funds are more likely to use internal management).

Smaller investors considering infrastructure may have to temper their expectations of long-term performance as they may not be able to attain the same cost efficiencies as their larger peers. Still, even for smaller investors who must use external managers to obtain a diversified infrastructure allocation, the historical performance remains attractive.

public market counterpart and one lagged is informative.

The second study from IPC also looks at the performance of private market investments relative to publicly traded equivalents, based on funds with vintages between 1988 and 2019. Again the study finds that infrastructure funds have outperformed real estate funds based on standard measures such as IRR and TVPI (total value to paid-in capital ratio).[11] Also, private infrastructure funds have tended to somewhat outperform public infrastructure equities, while real estate funds performed about in line with public REITs. However, the study finds that private real estate has outperformed public REITs post-GFC. It may be that the relative performance of private and public markets, and of infrastructure and real estate, changes over time and depends on the state of the market and the point in the cycle.

Overall, the research to date indicates that the performance of closed-end infrastructure funds lags the performance implied by indices of the underlying infrastructure assets, but does seem to outperform publicly traded infrastructure. Understanding these issues is essential for institutional investors as to how to appropriately benchmark infrastructure and what indices to use to help establish strategic asset allocations.

The evidence directly comparing infrastructure funds and real estate funds is fuzzier, but it does appear that infrastructure funds have historically provided higher IRRs. When comparing performance to each asset class's public market equivalents infrastructure does a better job of outperforming public markets. However, these results may vary over time, market conditions, and geography. The final verdict on relative performance is likely still out and further research is needed (and sure to come).

The unasked question

Overall, the existing research in private market infrastructure performance indicates that it provides attractive risk-return characteristics and can be a valuable part of an overall portfolio. However, investors need to carefully consider exactly what sector within infrastructure they are investing in, where they are investing, and through what investment vehicle.

Direct investing and co-investments are generally the preferred avenue, but are not practical for many investors outside the very largest. A diversified private infrastructure allocation for many investors will therefore depend on external management — in this regard, research has found that open-end funds or other long-lived structures would be preferable to closed-end funds.

Overall, the research to date indicates that the performance of closed-end infrastructure funds lags the performance implied by indices of the underlying infrastructure assets, but does seem to outperform publicly traded infrastructure.

Comparisons of infrastructure and real estate have somewhat mixed results. Infrastructure has typically provided higher IRRs on average, but the results appear to depend on the time period.

However, one question that is not answered by any of the research mentioned, and is not even asked, is "What exactly is 'infrastructure'?" In practice, the distinction between infrastructure and real estate is far from clear. Most infrastructure assets can be viewed as a form of real estate, and many types of real estate can reasonably be described as infrastructure. Rather than a clear dividing line, the two exist along a continuum, with assets exhibiting varying degrees of infrastructure-like and real estate-like characteristics. Several sectors, such as data centers, cell towers, and logistics, are commonly found in both real estate and infrastructure portfolios. Assets typically viewed as real estate, such as senior housing and student housing, are also frequently categorized as 'social infrastructure'. Even assets widely regarded as pure infrastructure, such as airports, are effectively portfolios of real estate assets, including parking, retail, and leased operational space.

While these assets clearly differ in function, risk profile, and operational complexity, such differences do not necessarily imply entirely separate asset classes. Just as office and senior housing properties are both considered real estate despite substantial differences, infrastructure and real estate often share more similarities than their labels suggest.

This ambiguity has important implications for investors. A key strategic decision is whether infrastructure and real estate should be treated as distinct allocations with separate teams, or as part of a broader real assets allocation encompassing multiple subsectors with distinct characteristics.

The issue also has implications for measuring the performance of both infrastructure and real estate: To what extent does the recorded performance of infrastructure include assets that could be considered real estate, and vice versa? Is it simply too difficult to separate the two and measure the investment performance of each individually?

As investors increasingly struggle with how to classify certain investments and assign responsibility across teams, the trend toward broader real asset allocations, and away from rigid distinctions between infrastructure and real estate, appears likely to continue.

[1] Carlo, Eichholtz, Kok, and Wijnands (2023).
[2] Andonov, Kraussl, and Rauh (2021).
[3] Marzuki and Newell (2020).
[4] Haran, Lo, and Milcheva (2019).
[5] Global Infrastructure Hub — A G20 Initiative (2022).
[6] EDHEC Infrastructure Institute (2022).
[7] MacKinnon (2021).
[8] Andonov, Kraussl, and Rauh (2021).
[9] Brown, Lundblad, and Volckmann (2025).
[10] Lim (2024).
[11] Hu, Lundblad, and Mozumdar (2025).

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