



BIS Bulletin

No 137

Circular relationships among AI firms

Jon Frost, Rudraksh Kansal, Kumar Rishabh, Vatsala Shreeti and
Leanne Si Ying Zhang

1 October 2026

BIS Bulletins are written by staff members of the Bank for International Settlements, and from time to time by other economists, and are published by the Bank. The papers are on subjects of topical interest and are technical in character. Some of the data used in this Bulletin are drawn from Project Insight by the BIS Innovation Hub. The views expressed here are those of their authors and not necessarily the views of the BIS. The authors are grateful to Iñaki Aldasoro, Gong Cheng, Gaston Gelos, Pablo Hernández de Cos, Fernando Pérez-Cruz, Daniel Rees, Phurichai Rungcharoenkitkul and Philip Woolridge for helpful comments, to Nicola Faessler for administrative support and to Emma Claggett for editorial support.

The editors of the BIS Bulletin series are Gaston Gelos and Frank Smets.

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ISSN: 2708-0420 (online)

ISBN: 978-92-9259-985-0 (online)

Circular relationships among AI firms

Key takeaways

- *Between 2021 and 2025, 28.7% of artificial intelligence (AI) firms' investment deals (by deal value) involved a target company that was also an AI firm, while 55.2% of incoming investments in AI firms came from other AI firms.*
- *Of all the AI-to-AI investment deals between 2021 and 2025, 16.1% (by deal count) and 46.4% (by deal value) also involved commercial supply chain relationships between the investor and target firms.*
- *Circular investment relationships reflect key economic features such as the need to secure critical inputs and the presence of information asymmetries, yet they entail macroeconomic risks and increase opacity.*

Investment in artificial intelligence (AI) has reached an extraordinary scale. The largest AI firms collectively plan to spend hundreds of billions of dollars on AI infrastructure in 2026, and capital expenditure on AI has become macroeconomically significant in many economies (BIS (2026); Frost et al (2026)). A meaningful share of this capital flows through firms that serve simultaneously as suppliers of inputs and investors in firms that buy those inputs. When financing relationships and commercial relationships overlap, a “circular” investment structure emerges.

Using new data on AI firms, investment deals and supply chain linkages, this Bulletin documents investment patterns among the largest AI firms globally, focusing on circular investment relationships. It explains the rationale for such relationships, discusses why they are especially likely among AI firms and explores possible macroeconomic implications.

Defining and measuring circularity in AI investments

In the last two decades, a few firms have grown dramatically and transformed into key providers of AI products and services. A significant part of that growth has come from investment deals, eg mergers and acquisitions (M&A), equity financing or joint ventures. As shown in Graph 1, the average five-year market capitalisation (market cap) of the largest US-based AI firms (represented by the central circles) rose quickly over 2000–25, and particularly after 2015. This reflects both organic growth and their investment in other companies within the ecosystem (the surrounding “satellite” circles in the graph, which represent acquisition targets of the AI firms). Many of the target firms of such acquisitions are AI firms themselves.

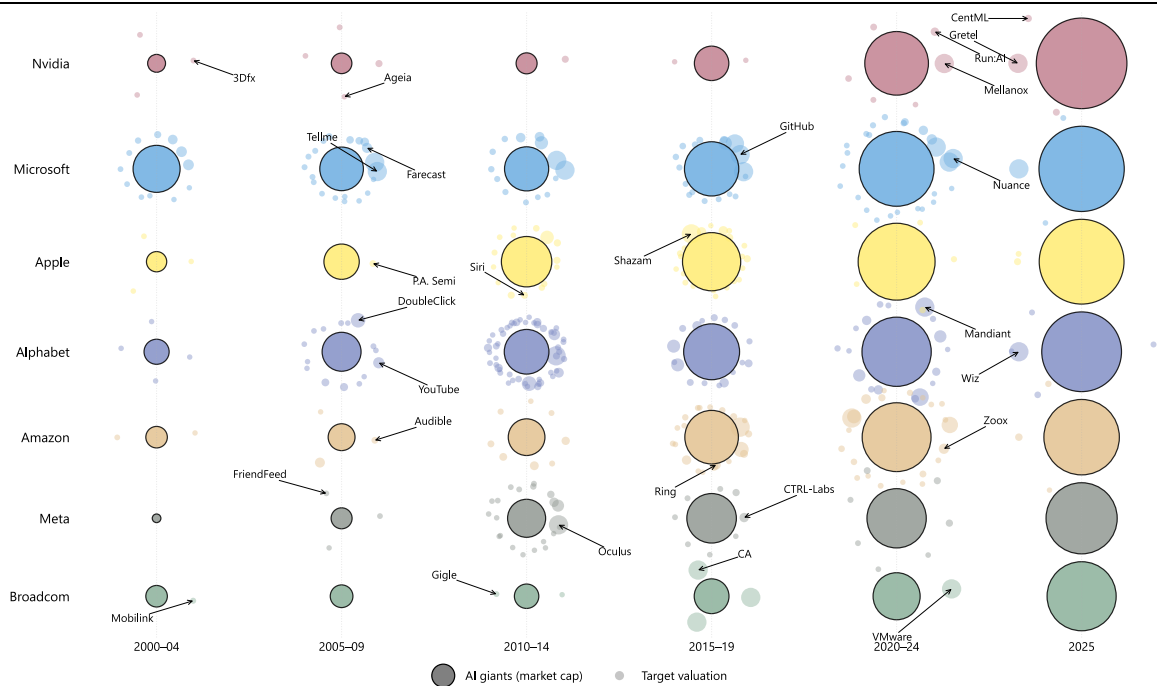
This Bulletin focuses on one particular type of AI investment relationship: those that are circular. An investment relationship established between two AI firms over 2021–25 is defined as circular if the firms also share a supplier-customer relationship at any point in the same period.¹ Three types of circular investment relationships are possible (Graph 2). The first is when the AI firm that invests in a target AI company also supplies inputs (goods or services) to it (type 1). In this case, capital and goods or services

¹ Other definitions, particularly those used commonly in the media, focus on circularity at the deal level, ie a given financing deal between AI firms also having a supply chain or purchase commitment. Some definitions also focus on the financial side alone, defining circularity as two-sided investment flows between AI firms. Our definition is broader; it is at the level of the relationship between firms over a five-year period, rather than the deal level, and includes the commercial component as well.

flow in the same direction. The second type occurs when capital and goods or services flow in opposite directions, ie a customer is financing its supplier (type 2). The third type involves a reciprocal commercial relationship, with goods or services flowing in both directions (type 3).

AI giants have grown both organically and through acquisitions¹

Graph 1

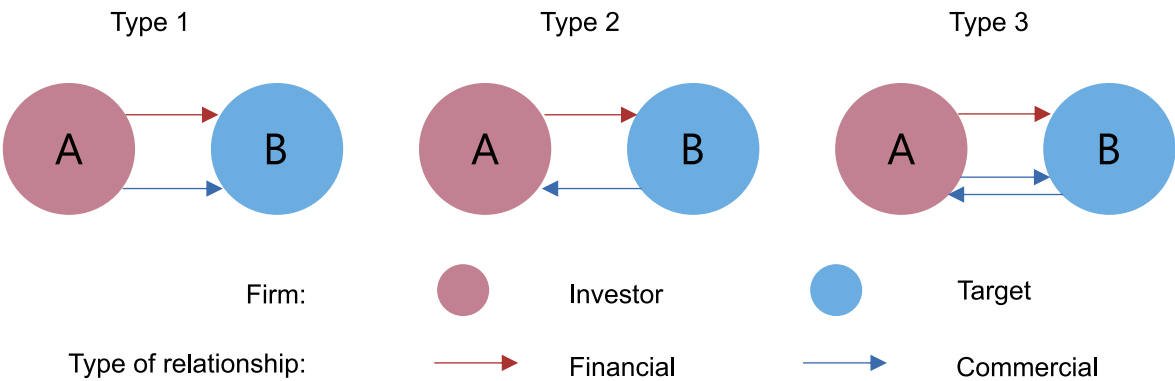


¹ Selected US-based AI firms in descending order by 2025 market cap. Circle size is proportional to the market cap of AI giants (planets) and value of targets (satellites) at the time of an M&A deal, in current US dollars. Data on deals for 2025 are provisional and incomplete. The cited data have not been reviewed by PitchBook analysts and may be inconsistent with PitchBook methodology.

Source: Compustat; PitchBook, a Morningstar company; authors' calculations.

The three types of circular relationships between AI firms

Graph 2



Source: Authors' elaboration.

We use new data from three sources to quantify these investment relationships for major AI firms. We start with a universe of 1,246 AI firms classified into five supply chain layers (compute, infrastructure, data tools, models and applications) as in Rishabh and Shreeti (2026). Second, we extract financing information

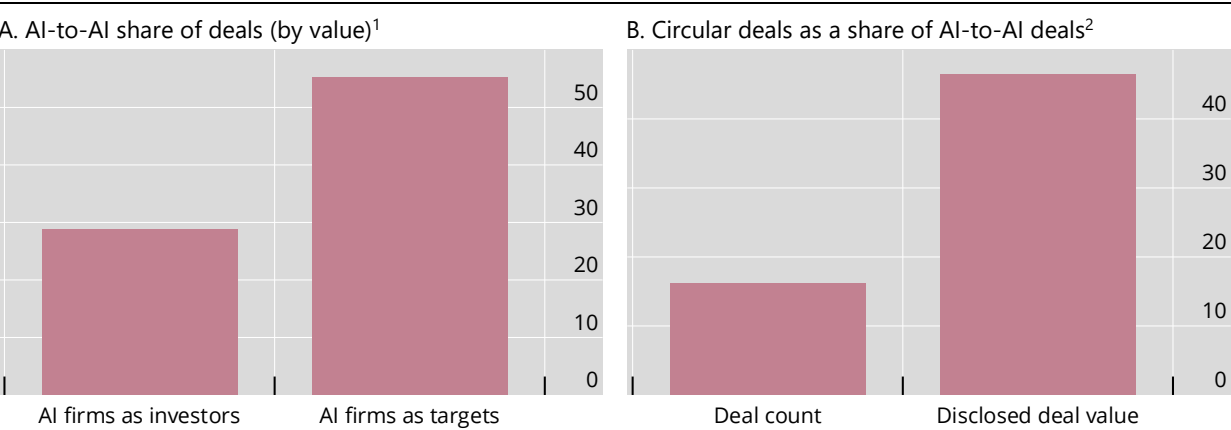
for these firms from PitchBook, a Morningstar company (hereinafter, referred to as "PitchBook"), which contains investment (equity and debt) deal-level information for all the AI firms.² The third component of our data comes from FactSet and includes information on the presence and direction of commercial relationships between firms. Finally, we conduct extensive manual checks to ensure that no commercial or investment relationships are excluded, to the extent possible.

This uncovers 972 intra-AI investment relationships between 2021 and 2025. An intra-AI investment relationship is defined as circular when the investor and target firms are also connected in a commercial relationship (in either or both directions) at any point between 2021 and 2025. Approximately 28.7% of investing AI firms' targets (by deal value) are other AI firms (Graph 3.A). Conversely, 55.2% of AI firms' incoming investment value comes from other AI firms (Graph 3.A). Moreover, 16.1% of deals (and 46.4% of intra-AI deal value) occur between AI firms that also share a commercial supply chain relationship (Graph 3.B).³ In terms of relationship direction, most involve an AI firm that invests in and supplies its products to another AI firm (64%). These numbers suggest that a significant portion of financing and commercial relationships in AI are self-referencing.

Investment relationships among AI firms

In per cent

Graph 3



¹ For AI firms as investors, the share of disclosed value of AI-to-AI deals relative to all deals in which AI firms invest. For AI firms as targets, the share of disclosed deal value of AI-to-AI deals relative to all deals in which AI firms receive investment. ² Circular AI-to-AI deals as a share of all AI-to-AI deals, by deal count and disclosed deal value. An AI-to-AI deal is circular when at least one AI investor in the deal also has a commercial relationship with the AI target during 2021–25. Deals involving multiple AI investors enter the calculations once; if any one of them meets the circularity condition, the deal is classified as circular and its full disclosed value is included. Deal values represent the full financing deal or round rather than individual investors' contributions. The cited data have not been reviewed by PitchBook analysts and may be inconsistent with PitchBook methodology.

Sources: PitchBook, a Morningstar company; FactSet; authors' calculations.

The economics of overlapping financing and commercial relationships

Why would firms that trade with each other also finance each other? Economic theory offers several complementary explanations based on the direction of the commercial relationship between firms.

A supplier can choose to finance its customer for several reasons. A large literature on trade credit and vendor financing argues that suppliers can be efficient providers of financing as they have access to

² The calculations in this Bulletin are those of the authors, have not been reviewed by PitchBook analysts and may differ from PitchBook's methodology and reported figures.

³ Deal values represent the full disclosed transaction value. We do not observe the distribution of the deal value across investors or targets within the same deal.

better information about their customers. Through the commercial relationship, a supplier observes how intensively its inputs are being used and how quickly its customers' businesses are scaling – information outside lenders and investors can only obtain at a cost (Burkart and Ellingsen (2004)). The supplier may also finance its customer to stimulate and stabilise demand for its own products, particularly when those products are expensive and customers face costly external financing. Both mechanisms are plausible for AI. For example, model developers require extraordinary amounts of capital before generating commensurate revenues. Their suppliers, like chip makers and cloud providers, may finance them as they can observe their compute consumption and hence their growth trajectory much more easily than other lenders. In doing so, they also ensure stable demand for their own products.

The rationale behind the reverse case, where a customer finances its supplier, typically involves the need to secure scarce and critical inputs. When an input is produced by only few firms and essential to the customer's own product, an equity stake or financing helps guarantee access to those inputs. Such financing may also allow the customer to influence the supplier's strategic decisions (eg whether it can supply to the customer's competitors). This is particularly relevant in the AI space, where acute shortages for key inputs (eg memory chips) can create crucial bottlenecks. Financial market frictions may also contribute to a customer's decision to finance its supplier of critical inputs (Fee et al (2006)).

More generally, commercial and financing relationships may overlap due to relationship-specific investments. For example, AI markets involve highly specialised inputs, such as data centres configured on customer workloads, chips tailored to models and models optimised for specific hardware. In such cases, firms are exposed to "hold up" risk. Counterparties can exploit sunk relationship-specific investments and inevitable gaps in contracts to renegotiate terms in their own favour (Klein et al (1978)). This can dissuade firms from undertaking relationship-specific investments in the first place. Financing, through lending or partial ownership, can mitigate this problem by aligning the incentives of the two firms (Grossman and Hart (1986)) and lowering monitoring and contracting costs (Williamson (1979)). Investment relationships between suppliers and customers can thus act as a partial substitute for full vertical integration. This pattern is also documented in other industries, such as pharmaceuticals and biotechnology (Pisano (1989); Robinson and Stuart (2007)), telecommunications (OECD (2003)) and manufacturing (Flath (1996)).

What makes AI exceptional is that the industry combines, to an unusual degree, the conditions under which theory predicts overlapping commercial and financing relationships. These include information asymmetries, uncertainty about the commercial prospects of young firms, highly customised inputs and only a few providers of critical inputs (eg photolithography machines or specialised semiconductor chips). Moreover, financing needs are so large that external capital may be costly or unavailable at the required scale. While estimates across other industries are not systematically available, existing evidence shows that direct equity financing of commercial trading partners is not very common.⁴

The submarkets within the AI supply chain with the highest number of circular investment relationships reflect these economic mechanisms. The Sankey flow diagram in Graph 4 maps the number of circular deals between AI firms belonging to different supply chain layers. Investments originating in upstream layers – eg compute and cloud-related infrastructure, where inputs are more critical and relationship-specific – most often involve firms that also have commercial relationships. Indeed, 73% of circular investment relationships come from AI firms that supply compute (in red) or infrastructure (in blue). Such relationships are comparatively rarer in the downstream data tools and models layers (in yellow and dark blue, respectively), where inputs are closer to commodities that need not be specialised.

⁴ For example, in a broad sample of over 10,000 US customer-supplier relationships, Fee et al (2006) find that direct equity stakes in trading partners accounted for only 3.3% of all customer-supplier relationships. For certain AI sub-markets like compute and cloud and related infrastructure, 15.2% of customer-supplier relationships also had financing relationships.

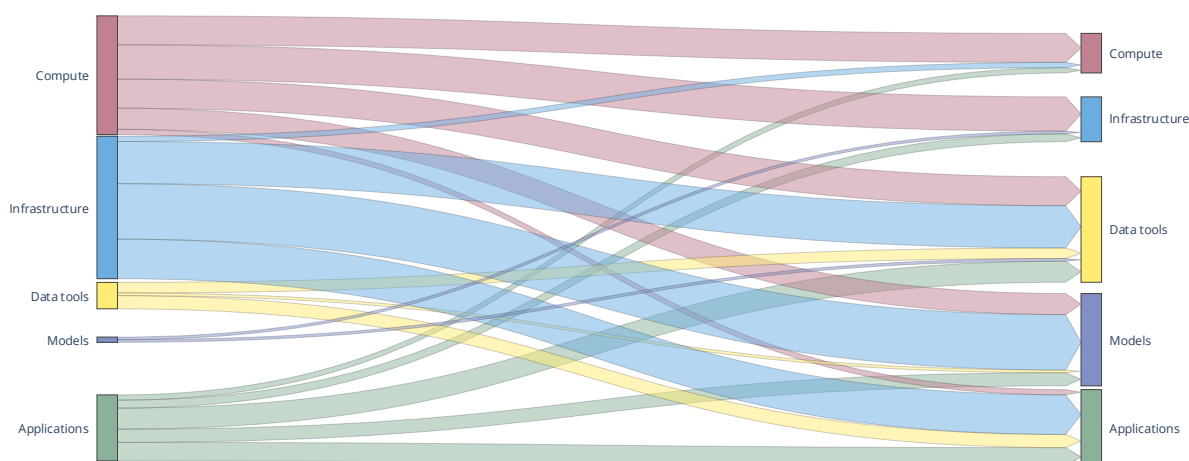
Economic implications of circular investment relationships

Circular investment relationships in AI involve some of the largest firms globally. While these structures can address contracting problems at the firm level, their highly intertwined and capital-intensive nature can also translate into macroeconomic risks. These come on top of the existing risks of over-investment and debt financing in the ongoing AI boom (Rungcharoenkitkul (2026)).

First, circular relationships make reported demand partly endogenous to firms' own financing decisions. For example, when a supplier finances a customer, part of the supplier's revenue growth reflects its own capital investment, rather than organic final demand. This makes it harder for investors, lenders and supervisors to gauge what part of the current AI boom is based on organic demand. The parallel with the telecommunications boom of the late 1990s is instructive: upstream equipment vendors such as Lucent and Nortel financed network operators so that the operators could buy the vendors' equipment (OECD (2003)). This meant that part of the equipment vendors' reported sales was being funded by the vendors themselves. For a time, as operators expanded their networks, equipment orders also expanded and vendors booked both the sales and loans as assets. However, when operators' own revenues failed to materialise or slowed, they could neither repay the loans nor sustain the equipment purchases. Equipment vendors then sustained both financial losses and a loss of sales. Such dynamics may also play out in AI if revenue growth and end user demand fall short of firms' expectations.⁵ Amid heightened AI-driven global equity valuations, this could drive significant financial market volatility.

Circular relationships by AI supply chain layer¹

Graph 4



¹ Number of circular AI-to-AI investment relationships from AI firms acting as investors broken down by their supply chain layer (left-hand side), to AI firms acting as targets broken down by their supply chain layer (right-hand side). The width of each ribbon is proportional to the circular deal count between AI firms in each pair of layers relative to the total circular deal count between AI firms in all layers. The width of each rectangle on the left-hand side (right-hand side) is proportional to that layer's total number of outgoing (incoming) circular investment relationships. The colour of each ribbon takes the colour of the investor layer. A deal with multiple circular AI investors contributes multiple investment relationships. The associated commercial relationship may run in either direction. The cited data have not been reviewed by PitchBook analysts and may be inconsistent with PitchBook methodology.

Sources: Rishabh and Shreeti (2026); PitchBook, a Morningstar company; FactSet; authors' calculations.

Second, circular relationships can increase correlations between firms' commercial and financial exposures, with a potential to amplify spillovers during periods of stress (IMF (2026)). An investor that is also a supplier is exposed to the same counterparty twice: a shock to the customer reduces both the value

⁵ The telecoms example concerns debt financing; nevertheless, the underlying exposure is similar. If revenue growth and end user demand fall short of firms' expectations, investment firms can face both a writedown of their equity stakes and a loss of the sales that those stakes helped generate.

of the equity stake and future product revenues. Because circular deals are concentrated among a small number of very large firms in the upstream layers of the supply chain, adverse shocks could propagate through commercial and financial channels simultaneously, potentially amplifying contagion. These risks may be magnified by the growing use of private credit and special purpose vehicles to finance AI infrastructure, which can create hidden leverage and interconnected exposures that amplify financial stress during downturns (Abbassi et al (2026); BIS (2026)).

Third, these circular arrangements tend to be opaque, making monitoring and supervision difficult. Many of the firms involved in AI are private and may disclose limited information. Even where firms are publicly listed, deal terms can often be complex, mixing cash investments with long-term purchase commitments and guarantees on the value of the underlying assets. Residual value guarantees (RVGs) are one example, where the guarantor pledges to cover any shortfall in an asset's worth (such as chips or data centre equipment) after a fixed period. These contingent commitments sit off balance sheet and only materialise during a downturn – when a guarantor is least able to absorb them. As such, reported deal values may not capture the whole picture, and headline figures can differ substantially from disbursed amounts. Moreover, many of these firms reside in different sectors and jurisdictions, making it difficult for a single supervisor or regulator to monitor these risks.

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