Producing Tangible and Intangible Capital

By MATTHIEU GOMEZ AND EMILIEN GOUIN-BONENFANT*

The literature on intangible capital typically emphasizes how intangibles differ from tangible capital in their economic properties. For instance, intangibles can be non-rival (Crouzet et al., 2022), embodied in key workers (Eisfeldt and Papanikolaou, 2013), and harder to pledge as collateral (Falato et al., 2022).

In this paper, we emphasize instead the difference in the production technology of intangible capital. We show that, relative to tangible capital, producing intangible capital relies disproportionately on domestic labor—especially on college-educated labor—and far less on imported inputs. This reliance of intangibles on specialized domestic labor matters for the incidence and effectiveness of investment subsidies.

Our empirical results are built around a simple accounting exercise. For tangible and intangible investment, we ask how one dollar of final spending is ultimately allocated to domestic factors—non-college labor, college labor, and capital—and foreign inputs (or imports). In this measurement exercise, we account for both the direct inputs used by the producing industry and the indirect inputs embodied in its intermediate purchases along the full supply chain. These "total requirements" shares help capture which fundamental inputs ultimately scale when final investment demand rises.

We construct these shares by combining the BEA input–output (I–O) accounts with the Integrated Industry-Level Production Account (KLEMS), which decomposes each industry's value added into non-college labor, college labor, and capital. Relative to official national accounts—and consistent with the literature on intangibles (Corrado et al., 2021)—we adopt a broader definition of intangible investment that includes organizational and brand capital.

Three facts stand out in the data. First, intangible investment is more labor intensive: payments to domestic labor account for 59% of one dollar of intangible investment, compared with 43% for tangible investment. Second, intangible investment is far more skill intensive: payments to domestic college-educated labor account for 42%, versus 17% for tangible investment. Third, intangible investment is much less import intensive: imported inputs account for 6%, compared with 21% for tangible investment.

Taken together, these facts suggest that the supply of intangible capital is likely more constrained than the supply of tangible capital, since tradable intermediate inputs may be scaled up more easily than domestic high-skill labor in the short and medium run. One policy implication is that subsidies aimed at intangibles are more likely to bid up the price of scarce organizational talent than to expand real investment, unless accompanied by measures that expand high-skill labor supply domestically.

I. Data

We briefly describe the data used to measure input cost shares by investment category. Our starting point is the 2017 BEA input–output (I–O) tables (U.S. Bureau of Economic Analysis, 2025*a*), which provide a commodity-by-industry description of production and final demand, with roughly four hundred commodities and industries. The data records, for each commodity, how that commodity is absorbed by intermediate purchases by industries as well as final demand (split into consumption, equipment, structures…). We combine this dataset with the BEA KLEMS Integrated Industry-Level Production Account (U.S. Bureau of Economic Analysis, 2025*b*), which decomposes each industry's value added into payments to non-college labor, college-educated labor, and capital income. Because of the focus of the paper, we now discuss two important measurement issues pertaining to the production of intangible capital. See Gomez and Gouin-Bonenfant (2026) for additional implementation

* Gomez: Columbia University (mg3901@columbia.edu); Gouin-Bonenfant: Columbia University (eg3041@columbia.edu).

details.

Brand and organizational capital. Historically, BEA notion of investment was essentially composed of two tangible categories—equipment and structures—while most intangible outlays were treated as intermediate expenses rather than investment. Over time, the BEA expanded the investment boundary to include a major intangible category, Intellectual Property Products (IPP)—notably by capitalizing software in 1999 and then capitalizing R&D in 2013.

Nevertheless, the BEA's IPP category omits several economically important intangibles—most notably organizational and brand capital—which are typically recorded as intermediate expenses. Following Bontadini et al. (2023), we broaden the investment boundary by treating expenditures that build these accumulated, firm-specific assets as investment, since they raise future productive capacity.

To implement this broader definition, we reclassify intermediate purchases of selected I–O commodities into two new investment categories: organizational capital and brand capital. We classify as investment in organizational capital intermediate purchases of "Architectural, engineering, and related services" (NAICS 5413), "Computer systems design services" (NAICS 5415), "Management consulting services" (NAICS 5416), and "Management of companies and enterprises" (NAICS 55). The last commodity captures headquarters-type services—output produced by establishments whose primary activity is managing other units within the firm—which we interpret as own-account investment in organization. We classify as investment in brand capital intermediate purchases of "Advertising, public relations, and related services" (NAICS 5418) and one half of "All other miscellaneous professional, scientific, and technical services", based on the share of marketing research (NAICS 54191) within that aggregate in the 2017 Economic Census.

Table 1 lists the largest commodities within each investment category. Under our reclassification, organizational capital accounts for 22% of total private investment and brand capital for 9%. Taken together, intangible investment—intellectual property products plus organizational and brand capital—accounts for about half of total private investment.

Own-account investment. One additional measurement challenge is that, unlike equipment or structures, many intangibles are produced in-house rather than purchased on a market. For instance, firms write software with in-house engineers, conduct R&D internally, and build organizational know-how through management time, training, and process improvement. In these cases, there is no market transaction—no price or invoice—that directly records the investment. The BEA nevertheless attempts to measure such own-account investment using a cost-based approach: it totals the inputs used in own-account production, imputing the associated capital income based on the underlying fixed assets. We take these estimates as given in what follows.

A related challenge is that KLEMS input shares are measured at the industry level—i.e., averaged across establishments classified in that industry. However, establishments often produce multiple commodities; own-account R&D and advertising, for example, are often produced within establishments whose primary industry is something else. To recover commodity-level input shares from the industry-level shares reported in KLEMS, we impose a common-technology assumption: a given commodity uses the same input mix regardless of the producing industry. We then back out commodity-level input shares using the BEA Make table, which reports the commodity composition of each industry's output.

II. Results

We now present our results for input shares by investment category. We first compute commodity-level direct-requirement input shares by combining the input–output tables with KLEMS. These direct-requirement input cost shares measure the shares of the producing industries' gross output paid to capital, non-college labor, college labor, imports, and intermediate inputs.

In Figure 1, we aggregate these commodity-level shares to the investment-category level (equipment, structures, intellectual property products, organizational capital, and brand capital) by averag-

TABLE 1—INVESTMENT CATEGORIES AND ASSOCIATED COMMODITIES.

	Share of total investment (%)
Equipment	24
Light truck and utility vehicle manufacturing	4
Automobile manufacturing	1
Machinery, equipment, and supplies	1
Broadcast and wireless communications equipment	1
Household appliances and electrical and electronic goods	1
Structures	27
Single-family residential structures	5
Other residential structures	5
Other real estate	3
Office and commercial structures	3
Power and communication structures	2
Intellectual property products	18
Scientific research and development services	9
Custom computer programming services	5
Software publishers	2
Data processing, hosting, and related services	1
Motion picture and video industries	1
Organizational capital	22
Management of companies and enterprises	11
Architectural, engineering, and related services	5
Management consulting services	4
Computer systems design services	3
Brand capital	9
Advertising, public relations, and related services	8
All other miscellaneous professional, scientific, and technical services	1

Note: This table reports the five biggest commodities within each investment category. Data from 2017 BEA detailed input—output tables.

ing across commodities within each category using final-use expenditure weights. The figure shows that intangible forms of investment are substantially more college-labor intensive than tangibles.

These direct-requirement input shares count domestic intermediate inputs as an input like labor and capital. To account for the fact that those intermediate inputs must themselves be produced, we "unpack" them by attributing to intermediates the labor, capital, and import costs required to make them—and we keep tracing this upstream through the supply chain. The resulting *total-requirement* shares measure where one dollar of final spending *ultimately* ends up once all indirect production is accounted for. Formally, these commodity-level total-requirements input shares are obtained by applying the Leontief inverse of the input–output network to the direct shares.

Figure 2 plots total-requirements shares by investment category. Using total-requirement shares tend to smooth out differences in input shares across the investment categories, reflecting that the intermediate inputs used in each category are more alike than different. One important exception is the share of imports for equipment, which becomes even larger. This reflects the fact that, even when final equipment is produced domestically, some upstream inputs (e.g., components and materials) are heavily imported. Economically, the relevant import share includes not only finished machines imported from abroad, but also the materials and parts imported to build machines domestically.

Table 2 also reports aggregated input cost shares for two broader investment categories: tangible

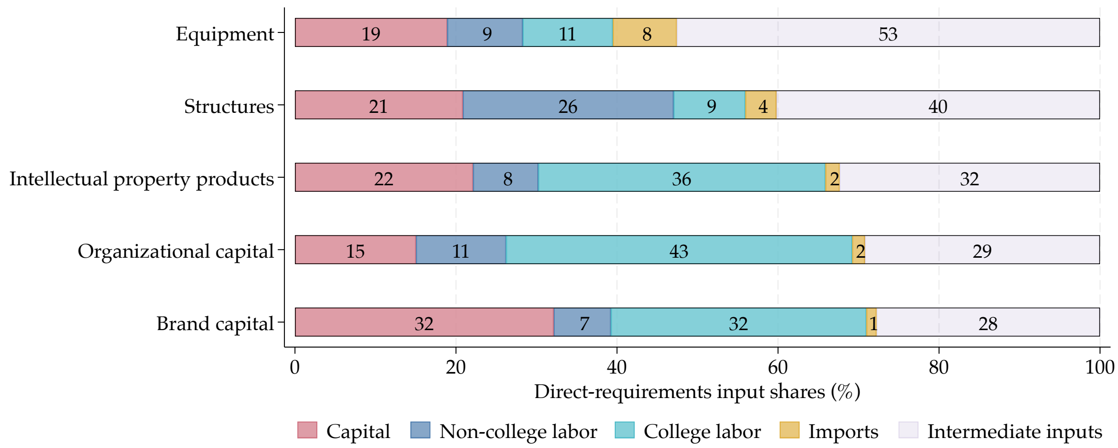

FIGURE 1. DIRECT-REQUIREMENT INPUT SHARES BY INVESTMENT CATEGORY.

Note: The figure reports direct-requirement input cost shares by investment category; that is, the shares of the producing industries' gross output accounted for by payments to capital, non-college labor, college labor, imports, and intermediate inputs. Investment-category level input shares are obtained by aggregating commodity-level input shares using each commodity's final-use share in that category as weights. Data from 2017 BEA detailed input—output tables and KLEMS.

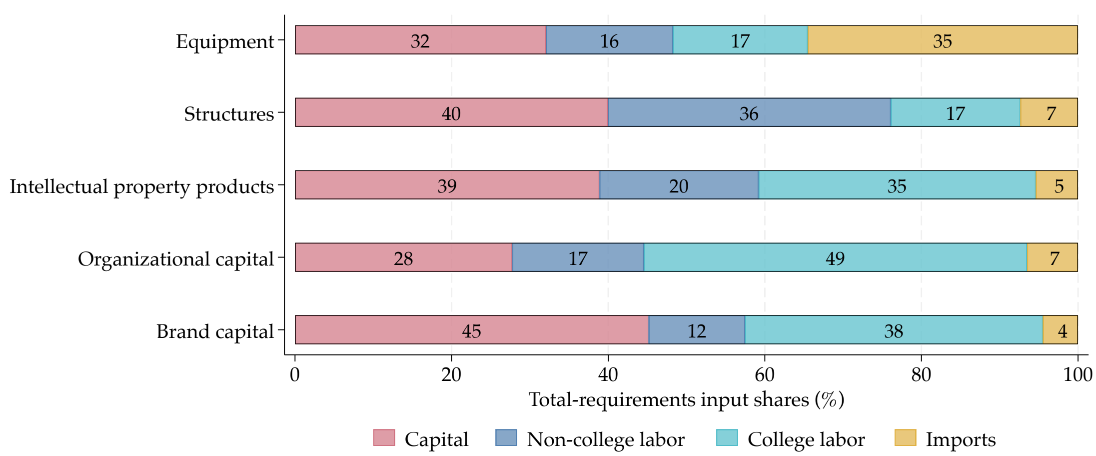

FIGURE 2. TOTAL-REQUIREMENT INPUT SHARES BY INVESTMENT CATEGORY.

Note: The figure reports total-requirements input cost shares by investment category. For $1 of final spending on a given category, it shows the shares ultimately paid to domestic capital, non-college labor, college labor, or spent on imported inputs (netting out domestic intermediate inputs via the input–output structure). Shares sum to 100% across capital, labor, and imports. Investment-category level input shares are obtained by aggregating commodity-level input shares using each commodity's final-use share in that category as weights. Data from 2017 BEA detailed input–output tables and KLEMS.

capital (the sum of equipment and structures) and intangible capital (the sum of intellectual property products, organizational capital, and brand capital).

There are three key takeaways. First, intangible investment relies more on domestic labor: payments to domestic labor account for 59% of intangible-investment costs versus 43% for tangible investment. Second, the difference is especially stark for college-educated labor: college labor accounts for 42% of the total cost of producing intangible investment, compared with 17% for tangible investment. Put differently, the college-labor cost share is about 2.5x higher for intangible than for

TABLE 2—TOTAL-REQUIREMENT INPUT SHARES BY INVESTMENT CATEGORY.

	Total-requirement input shares (%)			
	Capital	Non-college labor	College labor	Imports
Tangible investment	36	26	17	21
Equipment	32	16	17	35
Structures	40	36	17	7
Intangible investment	35	17	42	6
Intellectual property products	39	20	35	5
Organizational capital	28	17	49	7
Brand capital	45	12	38	4

Note: The table reports total-requirements input shares for each investment category. The total-requirements input shares correspond to the shares ultimately paid to domestic capital, non-college labor, college labor, or spent on imported inputs, including both direct and indirect inputs embodied in the full production chain. Shares sum to 100% across capital, labor, and imports. Investment-category level input shares are obtained by aggregating commodity-level input shares using each commodity's final-use share in that category as weights. Data from 2017 BEA detailed input–output tables and KLEMS.

tangible investment. This pattern is consistent with the view that intangible accumulation is tightly linked to scarce specialized human capital, as emphasized in the intangible-capital literature (Atkeson and Kehoe, 2005; Eisfeldt and Papanikolaou, 2013; Corrado, Hulten and Sichel, 2009; Crouzet et al., 2022; Corrado et al., 2022).

Third, intangible investment is much less import intensive than tangible investment. Imports account for 6% of the cost of intangible investment, compared with 21% for tangible investment. This reflects that tangible investment draws heavily on globally traded manufactured inputs (machinery, electronics, material), whereas intangible investment relies primarily on domestic inputs—especially skilled labor.

III. Implications

Our results show that intangible capital is produced disproportionately with domestic labor—especially college labor—and is far less import intensive than tangible capital. One implication of this fact is that the supply of intangible investment may be less elastic than the supply of tangible capital: tangible investment can draw on global supply chains, but scaling intangible investment hinges on specialized labor, a less elastically supplied input in the short and medium run.

This supply-side difference shapes how investment subsidies operate. While subsidizing intangibles can generate large social returns in the presence of knowledge spillovers (e.g., Bloom, Schankerman and Van Reenen, 2013), such policies may run into capacity constraints more quickly: in the short run, they are more likely to show up in higher wages and rents in intangible-producing activities (e.g., headquarters and specialized professional services) than in proportional increases in real quantities.

The same mechanism has aggregate implications for the long-run supply of capital. As investment shifts toward intangibles, aggregate capital formation becomes increasingly tied to the availability of scarce specialized inputs, potentially weakening the responsiveness of investment to financial conditions. Gomez and Gouin-Bonenfant (2026) provides a quantitative exploration of this mechanism.

A policy takeaway is therefore that, in intangible economies, demand-side investment subsidies are most effective when paired with measures that expand the effective supply of specialized labor—training, lower barriers to occupational mobility, and easing constraints on skilled immigration (e.g., H-1B frictions).

REFERENCES

Atkeson, Andrew, and Patrick J Kehoe. 2005. “Modeling and measuring organization capital.” *Journal of Political Economy*, 113(5): 1026–1053.

Bloom, Nicholas, Mark Schankerman, and John Van Reenen. 2013. “Identifying Technology Spillovers and Product Market Rivalry.” *Econometrica*, 81(4): 1347–1393.

Bontadini, Filippo, Carol Corrado, Jonathan Haskel, and Massimiliano Iommi. 2023. “Euklems and IntanProd: industry productivity accounts with intangibles.” University Library of Munich, Germany.

Corrado, Carol, Charles Hulten, and Daniel Sichel. 2009. “Intangible capital and US economic growth.” *Review of Income and Wealth*, 55(3): 661–685.

Corrado, Carol, Chiara Criscuolo, Jonathan Haskel, Alexander Himbert, Cecilia Susanna Jona Lasinio, et al. 2021. “New evidence on intangibles, diffusion and productivity.” *OECD Science, Technology and Industry Working Papers*, 10.

Corrado, Carol, Jonathan Haskel, Cecilia Jona-Lasinio, and Massimiliano Iommi. 2022. “Intangible capital and modern economies.” *Journal of Economic Perspectives*, 36(3): 3–28.

Crouzet, Nicolas, Janice C Eberly, Andrea L Eisfeldt, and Dimitris Papanikolaou. 2022. “The economics of intangible capital.” *Journal of Economic Perspectives*, 36(3): 29–52.

Eisfeldt, Andrea L, and Dimitris Papanikolaou. 2013. “Organization capital and the cross-section of expected returns.” *The Journal of Finance*, 68(4): 1365–1406.

Falato, Antonio, Dalida Kadyrzhanova, Jae Sim, and Roberto Steri. 2022. “Rising intangible capital, shrinking debt capacity, and the US corporate savings glut.” *The Journal of Finance*, 77(5): 2799–2852.

Gomez, Matthieu, and Emilien Gouin-Bonenfant. 2026. “Inelastic Capital.” Working paper.

U.S. Bureau of Economic Analysis. 2025*a*. “Input-Output Accounts Data.” Accessed: 2025-02-15.

U.S. Bureau of Economic Analysis. 2025*b*. “KLEMS Industry-Level Productivity Data.” Accessed: 2025-02-15.